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THE IMPACT OF FLOOD ON THE RURAL HOUSEHOLD LIVELIHOODS: EVIDENCE OF BORA WOREDA, OROMIA REGIONAL STATE, ETHIOPIA

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DECLARATION

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This is to certify that the thesis prepared by Endegena Fiseha Giyorgis, entitled: "The Impact of Flood on the Rural Household Livelihoods: Evidence of Bora Woreda, Oromia Regional State, Ethiopia", in partial fulfillment of the requirements for the award of a Master's degree in Water Resource Management complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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Dedication

This thesis work is dedicated to my parents Major general Fiseha Giyorgis and Mrs. Wudnesh Yilma, who inspired me for lifelong learning desire and the pursuit of social justice, and who would have been proud in my achievement.

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Acronyms

DFID Department for International Development

ECSA Ethiopian Central Statistical Agency

FAO Food and Agricultural Organization

FGD Focus Group Discussion

GTP-I Growth and Transformation Plan I

HDI Human Development Index

HHH Household head

IFAD International Fund and Agricultural Development

FTC Farmers Training Center

MoFED Ministry Of Finance and Economic Development

PASDEP Planning for Acceleration, Sustainable Development and Eradication Poverty

SSA Sub-Saharan Africa

UNDP United Nation Development Program

WFP World Food Program

Abstract

Flooding in the Awash River Basin has significant socio-economic impacts on human lives and properties. Immediate impacts of flooding include loss of human life, damage to property, destruction of crops, loss of livestock and non-functioning of infrastructure facilities. Therefore, the study was aimed to assess and examine the impact of floods on rural household livelihood and the measures taken in Bora Woreda, Oromia Regional State of Ethiopia. A two stage stratified random sampling was employed to select 261 sample households from four kebeles. Data was collected using structured questionnaires; field observation and focused group discussion. To analyze the research objectives both descriptive and econometric models employed. The study identified the most important livelihood strategies such as; farm, farm plus nonfarm, farm plus off farm and combination of the three strategies have practiced by farmers while farming is the main one. The study found that total land size, livestock size, education level, access to market, access to road, access to irrigation, access to agriculture extension workers support and the household vulnerability of flood had significant impact on rural household livelihood. 67.4 percent respondents were mentioned that the impact of floods was severe (frequently occurred, takes longer time and damage the whole farm land). However, there is no significant evidence as whether the age, gender, marital status and access to electric power affect the household annual income size. More to the point, accessibility and improvement of livelihood resources like infrastructure (road and clear water) facilities, financial support, farmers capacity improvement, institutional and social capital development also call for policy makers and concerned bodies so that to improve rural households income and to eliminate flood impact.

Keywords; Livelihood, Flood, Flood avert, Poverty, Rural Households, Bora Woreda

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the Study

Flooding is a natural process and part of the hydrological cycle of rainfall. Flood occurs whenever the capacity of the natural or manmade drainage system is unable to cope with the volume of water generated by rainfall. Floods vary considerably in size and duration (WWF, 2018)

The disasters have been increasing, resulting in loss of lives and destruction of the environment. The number of people at risk has been growing each year and the majorities are in developing countries with high poverty levels making them more vulnerable to disasters. Flooding is divided into three major types which are categorized as the river floods, flash floods and coastal floods (Smith and Ward, 1998).

Prolonged rainfall events are the most common cause of flooding worldwide. These events are usually associated with continuous rainfall. Human impacts on river catchments influence flood behavior. Land use changes in particular have a direct impact on the behavior and magnitude of floods. Deforestation results in increased runoff and often a decrease in channel capacity due to increased sedimentation rates. Unless there is a threat to human life and/or property a flood is not considered to be a natural hazard (Nott, 2006).

The direct impacts of a flood are closely related to the depth of inundation of flood water. The extent of a flood has a direct relationship for the recovery times of crops, pastures, the social and economic dislocation impact to populations and due to high poverty levels, people they live in hazardous areas including flood plains and steep hills have become more vulnerable. They have fewer resources which makes them more susceptible to disasters (Grunfet E., 1995).

Floods have the following characteristics: Long, short and no warning, depending on the type of floods (for example, flooding within parts of a major river may develop over a number of days or even weeks, whereas flash floods give no warning) and there may be seasonal patterns of flooding; and speed or onset may be gradual or sudden (Carter, W. Nick, 1991).

The Third World Water Forum (2018) indicated that in recent years, floods had become more frequent and of increasing severity resulting in loss of life, injury, homelessness, damage to infrastructure, environment, education and agriculture.

In Ethiopia, the effect of rural livelihood diversification strategy on rural flood impact reduction did not empirically tested. Previous studies conducted in the area of livelihood rather the studies mainly focused on the area of the impact of flood on the household livelihood. In addition, the characteristic of activities and those barriers are also varying in place and time where not be easy for policy intervention. Therefore, this issue of effect of livelihood diversification on flood impact reduction required an investigation to add some on existing literature (Tsehaynesh et al., 2021).

In view of that, local level analysis is important to provide information to become up with better understanding in which the current study aimed to focusing on area of Bora Woreda in Oromia regional state. The rural farm households in the area are producing cereal crops and highly dependent on the irrigation agricultural production systems (Bora woreda agricultural office annual report, 2019).Heavy rains experienced in the study area that have resulted in recurrent flash floods and water logging in valley and/or low lying areas respectively causing varying impacts on a number of sectors namely infrastructure, education, agriculture, water, health and sanitation (Dawit, 2015).

1.2. Problem of Statement

Flooding has claimed more lives than the other natural hazard. Within the decade 1986 to 1995, flooding accounted for 31 percent of the worldwide economic loss from natural catastrophes and 55 percent of the casualties. The damaging effects of flooding are likely to become more frequent, more prevalent and more serious within the future (Borrows and Bruin, 2006).Floods are the foremost costly and wide reaching of all natural hazards. They accountable for up to 50,000 deaths and adversely affect some 75 million people on the average worldwide in each year, after floods Malaria and Typhoid outbreaks are common, loss of income or services within the floods aftermath and clean-up costs. Flood affected people include increased levels of physical, emotional and psychological health problems (Nott, 2006).

Currently Ethiopia's agriculture depends on rainfall with limited use of water resources for irrigation. At approximately 50 percent of the GDP, agriculture, most of it based on rain-fed

small-holder systems and livestock, contributes by far the largest part of the economy and is currently growing on average 5 percent per year. Highly variable rainfall, frequent floods and droughts, and limited storage capacity continue to constrain the ability of the country to produce reliable food supplies in spite of being relatively rich in water and land resources. Ethiopia has an estimated 3.7 million hectares of irrigable land, yet only about 200,000 hectares (5.4 percent) is presently irrigated and only provides approximately 3 percent of the country's food crop requirements (Girma *et al.,* 2002).

The Awash River Basin faces land degradation, high population density, natural water degradation salinity and wetland degradation. Already desertification has started at lower Awash River Basin. In the high land part deforestation and sedimentation has increased in the past three decades. As more water is drawn from the river there could be drastic climate and ecological changes which endanger the basin habitat and human livelihood. Draining the wetlands for irrigation could imbalance the sustainability of the basin (Girma *et al.,* 2002).

Bora Woreda is faced almost every year with flooding challenges even though the extent is differing each year. The community is living in a low-lying, flood oriented location. The inhabitants are mostly into crop production, mainly Teff, Wheat, Lentice, Maize and other vegetable gardening, some livestock farming and trading. Floods occur in every rainy season. The floods cause displacement of people from their usual dwellings resulting into varying impacts on infrastructure, crops, health, education, environment as well as damage to property (Bora Woreda agricultural and environmental protection office report, 2021).

Human populations worldwide are at risk of natural disasters. Certain conditions like geographical location or people’s income level can affect the degree to which natural disasters impact people’s homes and livelihoods (Carey, 2005). Cities that are near the river or in low-lying areas are flooded and become uninhabitable (Giddens, 2001). Flood annually damaged approximately 4 percent of total production (Paul, and Rasid, 1993).

(Wondim, 2016) Flood Hazard and Risk Assessment Using GIS and Remote Sensing in Lower Awash Sub-basin, Ethiopia, (Mashebe *et al.,* 2016). The Impact of Flooding on the Livelihood of People Living in the Luhonono Area in the Zambezi Region, Namibia, (Yande, 2009) An impact of floods on the socio-economic livelihoods of people: a case study of Sikaunzwe community in Kazungula district of Zambia and (Kale, and Hire, 2007), Nott (2006), (Borrows and Bruin

2006), (Ologunorisa, and Abawua, 2005), (Carey, M. 2005), (Giddens, 2001). They suggested that government should engage communities in order for them to move permanently to higher grounds as they have expressed willingness to relocate, there should be a deliberate policy to compel communities away from the flood prone areas, communities should be encouraged to increase area cultivated on the upland in order to enhance food security, construction of dams should be considered to trap the excess water.

The specific impact of flood has needed research attention. Hence, this study was tried to critically assess options of diverse livelihood and analyzed its relationship with household flood vulnerability using new survey data from the study area. So identifying the impact of the floods on the rural household livelihood status was given a half solution for this chronic problem. Consequently, the results were providing information for designing relevant flood aversion programs and strategies to reduce the problem of floods in the study area.

The rural households in the study area are engaged in diverse livelihood activities, the households' accessibility to different income resources beyond agriculture and the way they use these resources is varying across the ownerships of different household. Moreover, the participation of households to overcomes the flood impacts are determined by complex factors and the effect of the seasonal flood on rural household livelihood yet not empirically tested (BWAEPO, 2021).

1.3. Objective of the Study

1.3.1. General Objective

The general objective of the study was to assess the impact of flood on rural household livelihood in Bora Woreda and the strategy to avert the problems and its determinants.

1.3.2. Specific Objectives:

The specific objectives of this thesis were to:

- Analyse the effect of flood on household annual income size.
- Assess the flood avert strategies adopted by the rural households in the study area.
- Examine factors determining livelihood diversification choice decision.

1.4. Research Questions

This research tries to answer the following questions

- To what extent does the flood affect the household annual income size?
- What are the floods averting strategies adopted by the rural households in the study area?
- How does the different factors determining livelihood diversification choice decision?

1.5. Significance of the Study

This study has significances for several bodies: in the first place, it has a great significance for the researcher himself. Through the study process, the researcher becomes familiar with several research methods and methodology. Secondly, it offered information for policymakers who interested to promote flood avert diversification strategy for the living standard of the farmers in rural areas. Thirdly, if so, the rural households in the study area have benefited from the result of paper by receiving some service and support, if concerned bodies' responded based on information. Lastly, the information which produced through the study were serve as additional reference for future studies, in the areas of flood impact on rural livelihood.

1.6. The Scope and Limitation of the Study

The study covers the impact of floods on rural households livelihood in general where the portfolios of diversification and its determents analyzed jointly in orders to come up with enough information. A comprehensive analysis of rural livelihood involves a range of activities, which needs an ample time to cover all the details. Thus, livelihood strategies (Floods impact averts) are usually recognized at individual and household level.

Moreover, rural livelihood diversification strategies (Floods impact averts) are enormous, and vary from one household to the other. Likewise, factors that affect households' participation into floods impact averts also vary. However, since it is difficult to exhaust all the livelihood diversification strategies (Floods impact averts), the study confined the major and common ones, which are found to be relevant to the topic and the research area. In line with this, for reasons associated with time and resources, the scopes of the study were limit to the study district.

The other limitation is unavailability of baseline data that would reflect the condition of the farm households' Floods impact averts strategy which would have been helpful to compare more

comprehensively and evaluate the relative impact of flood on rural households livelihood, then to mitigate such kind of problem the researcher were tried to collect the data intensively with cooperation with Woreda agriculture extension workers.

Finally, there are some methods in livelihood measure; some traditional parameter and income/consumption methods which are explained in physical terms though each of them has got their own drawbacks. The study aimed to examine the impact of flood on rural households in the case of Bora Woreda hence preferred to choose to wealth status of rural households in terms of either income and consumption which developed in rural kebeles based on traditionally perceived measure and criteria's to categorizing rural households among different groups since this technique is considered more reliable as compared to the others.

1.7. Organization of the Thesis

This thesis was structured in five main chapters. The first chapter deals with introduction of the study that includes the background of the study, statement of the problem, objectives of the study, research questions, significance of the study and scope/limitation of the study. Chapter two presents theoretical perspective about flooding, a review of related literature and previous works. Chapter three discusses the methodological approaches of the study. Chapter four constitutes the data collected from respondents and presented the analyzed result. Chapter five presents conclusions and recommendations of the study.

CHAPTER TWO

2. LITERATURE REVIEW

2.1. Conceptual Definition of Floods and Rural Livelihoods

The concept of rural livelihood and analytical framework has become an important part of rural development and poverty reduction (Scoones, 1998). Livelihood is defined based on different concepts at different times by a number of authors. The following are among the prominent: The most widely accepted definition of livelihood is "A livelihood mean the behavior of household and community or people, holding and access of assets or resources, capabilities, productive activities required for a means of living with expanding choice, getting food for survival, reducing poverty, generating income and asset formation (Chambers and Conway, 1991: Ellis, 1999: Barrett et al., 2001). Supplementary, Chambers and Conway, 1991) gave other definition, livelihood is sustainable if it cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets and provide sustainable livelihood opportunities for the next generation; which contributes net benefits to other livelihoods at each levels in the short and long run. Ellis (1999), presented Social institutions and organization are required for sustaining a given standard of living.

When it comes to personal, level livelihood is defined as the ability of the individuals to obtain the basic necessities in life, which are food, water, shelter and clothing. Hence all activities involved in finding food, water, shelter, clothing and all requirements for human survival at individual and household level are referred as a livelihood. Approximately 90 percent of rural households are involved in farming activities (Davis et al., 2010).

2.2. Theoretical Framework

2.2.1. Rural Livelihood Elements and Outcomes

A. Rural Livelihood Elements

Livelihood assets/resources: A Sustainable livelihood framework offers a holistic and integrative approach with the capacity to analyses and understands the complexity of rural, in the context of the above livelihood definitions. Sustainable livelihood framework is a term that covers research concerning poverty reduction, sustainability and livelihood strategies which applicable for both rural and urban survival strategies. According to this framework,

assets/resources are playing an important role in rural livelihood strategies. Therefore, the five assets in sustainable livelihood are human capital, physical capital, social capital, financial capital and natural capital development (Chambers and Conway 1991; Solesbury 2003).

According to UK Department for International Development, assets may be tangible such: as food and cash savings, land, livestock and other resources. Assets also are intangible: such as claims one can make for food, work, and assistance as well as access to materials, information, education, health services and employment opportunities.

Similarly, Barrett et al., (2001) also cluster assets into two categories as productive and nonproductive assets. Assets or resources are stocks of productive factors that produce a stream of cash or in kind returns. Productive assets can be used as inputs into production process like human capital (time, skills, and health), natural capital (land, water, and forest), financial capital, and fixed or physical capital (farm or manufacturing, equipment, infrastructure etc.). Non-productive assets are those that give up income through generating either transfers or capital gains/losses which include household valuables (jewelry and precious metals), and social claims (e.g., on family or friends, government, churches or other groups). For that reason, assets are the core for the differences in livelihood strategy.

Access: Another concept in the definitions and base for the analysis of livelihood is access, which explains how people have access to resources. It can be explained the way one can use resources, put it into productive use, consume it or exchange it. This concept cannot explain the availability of resources, skill or capacity but it is a way to use it and the right to benefit from it. Therefore, the way a society access resources leads to a difference in livelihood strategy. Those who can access financial resources with a lower cost might strategize their livelihood in a diverse way than households who access financial resources with a higher cost (Parrott et al. 2006; cited in Woinishet, 2010).

Capability: Element is an essential in livelihood study bring about knowledge, skills and experiences. Because of variations in capability to access the basic requirements, there are people who are rich, able to acquire all their basic necessities without difficulty and those that are poor, and lack one or more of their basic necessities. The livelihood of the poor is difficult as they found themselves in a state of poverty and lack basic necessities (Chambers and Conway, 1991). Activities and access to activities are depends on the capability of an individual and the

extent to which the individual exercises determines the type of livelihood they engaged in. Individuals can differ greatly in their abilities to convert the same resources into valuable functioning's 'beings' and 'doings' that implies what people achieve are mostly from what they are capable of doing it (Sen Amartya, 1994).

Activities/strategy: The forth elements is an activities/action implies a type of livelihood strategy. Haggblade et al., (2007), can classified it as primary that include agriculture, mining, and other extractive activities; secondary like manufacturing; and tertiary are those related to service provision. Furthermore, the author makes a distinction agriculture or farm income as production or gathering of unprocessed crops, livestock, forest, fish products from natural resources. And non-agricultural/nonfarm income as all other sources of income, including from processing, transport, trading of unprocessed agricultural, forest and fish products. Whereas as, off-farm income or employment mean "off the owner's own farm" that includes wage employment in agriculture earned on other people's farms along with nonfarm earnings from the owner's nonfarm enterprises or from nonfarm wage earnings. "off-farm income" is thus rural nonfarm income and wage earnings in agriculture.

Other authors Davis, (2004) stated that the rural households have different livelihood income and classified them in to three categories; these are on-farm (agriculture activities, livestock etc.), off-farm (non-agriculture employment/nonfarm, non-home farm agricultural employment) and unearned income (pensions, dividends, interests, remittances). According to the author, rural nonfarm income comprises all non-agricultural activities which create income to rural households either through waged work or self-employment. In this specific paper the all livelihood income generating activities were assessed and analyzed accordingly.

Institutions and organizations: these are another important element in livelihood study. In the process of accessing resources, rural households' interaction with institutions and organization is a mandatory. Institutions could be rules, laws, regulations that shape how and whether resources can be accessed or used. It is the way in which rules and regulations set affect the use and access of resources. It differs even among local communities based on institutional set up. Hence, the livelihood that a household perusing differs due to the institutional set up. For example, the livelihood strategies among communities that have land ownership right and that do not have

land ownership right is very different. Thus, the first activities elements are considered as livelihood diversification strategies (Scoones, 1998).

B. Rural Livelihood Outcome

In the above review livelihood activities and input elements are discussed. In this section the aim is to review another key elements which are basically recognized as an outcome of livelihood diversification strategies and produced by allocation of the above five elements through livelihood process: As (Scoones, 1998), noted that the first three elements focus on livelihoods linking concerns: over work and/or employment; poverty reduction with broader issues of adequacy and security; well- being and capabilities; and the last two elements which may not the concern of this study added as the sustainability dimension and in turn looking at the resilience of livelihoods and the natural resource base. Among others the Poverty reduction element is concerned in this study: therefore, the poverty analysis is a key in the assessment of livelihoods.

2.2.2. Rural Livelihood Diversification Strategies

This section provides conceptual and overviews of livelihood diversification. Therefore, diversification was explained in a number of ways by various scholars. Among many explanations: LHD refers to attempts by individuals and households to find new ways to raise incomes and reduce poverty and environmental risk. LHD includes both on- and off-farm activities which are undertaken to generate income additional to that from the main household agricultural activities, via the production of other agricultural and non-agricultural goods and services, self-employment in small firms, and other strategies undertaken to spread risk; such as environment diversification in agriculture or more radical migratory strategies (Stark and Levhari, 1998 cited in Hussein and Nelson, 1998).

Livelihood diversification also refers a process by which rural families construct a diverse portfolio of activities and social support capabilities in their struggle for survival and in order to improve their standards of living (Ellis, 1999). In line With, main activities are recognized as part of nonfarm and off farm. Moreover, the diversification is all local nonfarm economic activities in rural areas including; agriculture, livestock, fishing and hunting; all off-farming activities, processing, marketing, manufacturing, wage and local employment in the rural villages.

2.2.3. Motivations for Diversification

In some directions diversification motivates need for briefly categorize. Engaging in diversification means the transformation of rural economy into new mainly non-agricultural sectors. Livelihood diversification as a progressive and positive strategy of adaptation which can lead to accumulation and livelihood diversification as a residual sector that offers no more than a 'bargain basement' for coping activities mopping up the failing smallholder agricultural sector (Davies,1996; Warren, 2002).

Even though authors explain in different ways, the main driving forces of livelihood diversification are two such as: push and pull forces. Push forces are that when motivators pursues to income in case the resources needed for the main activities are too limited to provide a sufficient means of livelihood; whereas, pull forces are the strategies for complementarily between different activities to accumulate income and assets for financing further investment (Minot et al., 2006). Diversification by pull factors associated with a rise in income and improves the livelihood of the household while the diversification motivated by push factors extracts a household from poverty (Che-Mat and Abdul-Hakim, 2011). Therefore, in this analysis if diversification has effect on poverty it will possible to say there is push factor.

Several authors suggest that the highly diverse rural non-farm sector offers opportunities for the poor as well as the rich. Poor households frequently seek economic refuge through distress diversification into low-skill non-farm employment such as basket making, pottery, small-scale retailing and seasonal labor migration (Reardon *et al*, 2000). The rich engaged in to more sophisticated, profitable, high investment activities such as transportation, processing, contracting and manufacturing (Barrett *et al.,* 2001; Reardon *et al.,* 2006).

2.2.4. Framework for Livelihood Analysis

Comparable to this review, the institution for development studies provides sustainable livelihood framework which has a number of basic elements which are interconnected to the concepts livelihood analyses. The study of rural livelihood based on sustainable livelihood framework enables to see a wide range of processes and factors. According, livelihoods is starts from a particular context (of policy setting, politics, history, agro ecology and socioeconomic conditions), what combination of livelihood resources (different types of 'capital') result in the ability to follow what combination of livelihood strategies (agricultural intensification/

intensification, livelihood diversification and migration) with what outcomes? In this research the researcher used the analysis approached of livelihood resources accessibility: natural capital: land and water, financial capital: accumulated income, credit access, and livestock, human capital: education, physical (infrastructure): access to road, electricity, clear water, telecom, social capital: membership to social group others: demographic factors and livelihood diversification strategies: farm alone, farm + nonfarm, farm + off farm and farm + nonfarm + off farm.

2.3. Flood and Livelihood

2.3.1. Causes of Floods and Impacts of Floods

Floods can occur because of several different, and sometimes simultaneous, factors. However, one among the largest causes of floods, especially in cases of flash floods, is excessive and heavy rainfall. When rainfall in low-lying areas and concrete environments fall faster than the bottom can absorb, water height rapidly rise, leading to floods. Extreme rainfall in river courses contribute to flooding similarly, as water travels down and overflows riverbanks onto surrounding land (Society, 2012).

Figure 2.1 Awash diversion place and Flooded and damaged farm lands (left to right)

The floods have collateral damage on human life, social and economic infrastructure. Different studies showed that social impacts reflect on health, culture, political, environment, and wellbeing. The literature suggests that socially vulnerable households have lower levels of disaster preparedness. Flood risk is expected to increase due to climate change and continued

socio-economic development. Further, it is clear that floods have had negative impact on people. More than 2 billion people worldwide were stricken by floods between 1998-2017. Which number continues to climb as occurrences of major flood events become more frequent and severe?

Flooding, especially flash floods can devastate entire cities and concrete environments. Throughout history, many have lost their lives as a result of rapid floods, or events caused by severe flooding like landslides and collapsed infrastructure (Earth.org, 2021). One of the largest consequences and effects of floods is that individuals lose their home and property, and essential buildings and infrastructures like hospitals and elderly homes are left incapacitated. Loss of power and mobile communication could be a common occurrence during floods, which might impact livelihoods and access to safety. Floods can have huge economic repercussions to a part, as extreme weather events impact key industries and sectors, notably agriculture, fishing, food crops, health, labour and tourism. Studies have found that frequent flooding could shave 11 percent off a region's GDP by the tip of the century (Earth.org, 2021).

2.3.2. Flood Aversion Strategy

Flood protection measures, especially engineering-based measures, will still place a big burden on national budgets, and this trend is reinforced by temperature change (Narain *et al.,* 2011). because of global climate change, distributions of weather extremes, peak river discharges and water levels can now not be assumed to be statistically stationary (Milly *et al.,* 2008). Moreover, flood protection measures typically have long technical lifetimes, and their protection levels are sensitive to temperature change (Gersonius *et al.,* 2013). it's therefore important to spot economically efficient flood risk management strategies, i.e. welfare-maximizing investments swollen protection measures and other flood risk reducing measures over time, in response to current changes in climate and in anticipation of future global climate change.

Economic analysis of flood risk management strategies aims to efficiently reduce the frequency and therefore the consequences of assorted flooding events. These include low-probability high-consequence flooding events, typically coastal and fluvial floods and high probability-low consequence flooding events, as an example, flash floods in urbanized areas (Vrijling 2001; Wu *et al.,* 2012).

2.3.3. Factors Affecting Rural Household Livelihood Diversification

Livelihood literatures such as Hussein and Nelson (1999), Ellis (2000) cited in Barrett et al., (2001) suggests that still exogenous trends and shocks play an important role in pushing rural people, diversification choices are also firmly rooted in the micro-economic logic of farming families. Diversification in rural households is mainly influenced by differences in resource endowments such as land, labour, capital including access to markets and institutions. In such cases rural livelihood strategies are determined by different elements or factors/ availability of key assets such as:

Human Capital: human capital is a combination of knowledge, habits, social behavior and personality that contribute to economic benefits for an individual and/or community. This knowledge can be attained through education, creativity, availability of skills and talents, experience, training and exposure. Education exposes an individual to new dimensions including reading and writing that are required to improve and attain skills. Therefore education is a necessary for human capital (Ellis, 2000). Educational attainment has been identified as one of the most important determinants of nonfarm earnings. For these reason, the skilled and educated maybe self-employed or can secure stable long term employment at relatively high salaries, while the unskilled and uneducated depend on more irregular, lower paying casual wage labour in the farm sector (Barrett et al., 2001).

Physical Capital: Physical capital is an asset that helps to turn raw materials into finished products and/or services (Ellis, 2000). Physical capitals include equipment such as a tractor on a farm, a sewing machine for a tailor, buildings, infrastructures and etc. Availability of physical capital boosts productivity and enhances income earned by a household. Physical capital allows for work to be accomplished faster as well as for diversification.

Financial capital: Financial capital is any liquid medium that represents wealth such as money, purchasable items, savings, credit, etc. It can also be defined as saved-up wealth that can be used to start-up or maintain a business.

Natural capital: In general, natural capital refers to natural resources (Chamers and Cownway, 1991; Ellis, 2000).

In Ethiopian, rural livelihood diversifications choice has been determined by several factors. As noted by researchers some of them are access to market and good transport, insufficient human capital, lack access to financial capital, access to natural resources like land, poor institutional arrangement facilities to adopt livelihood diversification activities like saving institution (Beyene, 2008; Adugna, 2008; Daniel et al., 2016; Gecho et al., 2014).

Though Ethiopia is trying to make progress, households' income is very low and highly varied. Assets could potentially help smooth when it increases incomes and affect poverty; however, this is no functioning in reality or not well empirical tested. In addition, there are a number of different historical events that impact on opportunities to diversify. For example, improvements of infrastructure lead to increasing market opportunities. Such events do not have a uniform impact, but it affects different households and individuals in different ways.

In general, the literatures insight the impression to the concept, evidences and understanding issues of rural livelihood diversifications such that an activities which combined together on existing main farming sector as well as the reliance on agriculture and the concomitant level of rural poverty. However, to judge the importance of rural livelihood diversifications analysis at grass root level is clearly essential for better understanding and promoting diversification based on its potential for livelihood enhancement and poverty reduction. Diverse livelihoods are also enormous, complex system and concern of majority in everywhere and investigation particularly to the diversification options and its effect on poverty reduction are indispensable. Because, though the sector is essential, little covered by scholar and less understand by policy makers.

2.4. Importance of Rural Livelihood Diversification in Ethiopia

Ethiopian farming dominates all sector and accounts for 95 percent of the total area under crop, more than 90 percent of crop output and 84 percent of the citizens depend on agricultural productions (Gebre-Selassie and Bekele, 2012).

Although agriculture is a dominant and primary source of income it has become failed to guarantee sufficient livelihood for farming households in including Ethiopia (Berg and Kumbi, 2006; Beyene, 2008; Gecho, 2014). About 80 percent populations reside in rural and engaged to agriculture (CSA, 2013). The majority are cultivating and producing mostly basic staples for the subsistence of their HHs (Belaineh, 2002; Berehanu, 2007; Berlie, 2015).

Because of primary dependence on subsistence production in Ethiopia, harvest failure leads to household food deficits and poverty, which in the absence of off farm and non-farm income opportunities leads to asset depletion and increasing levels of destitution at the household level (MoFED, 2010). Income from agriculture sector is subject to price fluctuations, diseases and pests. (Loening, 2008). Reta and Ali (2012) noted that, in rural Ethiopia if there had not been other sources of income apart from agricultural production, the land scarcity by the farmers coupled with agricultural risks could not generate enough income. As a result, the diversity of rural households is an important feature of survival in rural areas (Arega et al., 2013).

2.5. Empirical Studies

Wondim (2016) during this paper "Flood Hazard and Risk Assessment Using GIS and Remote Sensing in Lower Awash Sub-basin, Ethiopia" They found that the flood hazard map of Awash sub-basin indicated that 5 percent, 23 percent, 39 percent and 33 percent of the area considered in Awash Sub-basin were subjected respectively to low, moderate, high and very high flood hazards. Thus, land use planners could use those two maps to make environmentally sound land use decisions and manage the flood problems of the Awash Sub-basin respectively.

Mashebe *et al.,* (2016).During this paper "The Impact of Flooding on the Livelihood of People Living in the Luhonono Area in the Zambezi Region, Namibia". They found that flooding has wedged on the livelihood assets of the community in the Luhonono area, and also stimulated the food insecurity. It was further established that crops and animal farming practices, which are the key livelihood assets for their viable livelihoods, have remained severely affected.

Yande P. Mwape, (2009) "An impact of floods on the socio-economic livelihoods of people: a case study of Sikaunzwe community in Kazungula district of Zambia". They found that floods impacted on people's socio-economic livelihoods and critical aspects such as agriculture, property and assets, housing, health, education, water and sanitation. They suggested that government should engage communities in order for them to move permanently to higher grounds as they have expressed willingness to relocate, there should be a deliberate policy to compel communities away from the flood prone areas, communities should be encouraged to increase area cultivated on the upland in order to enhance food security, construction of dams should be considered to trap the excess water.

Kale,V.S., and Hire,P.S (2007) during this paper a shot has been made to quantitatively evaluate the geomorphic effectiveness of three large magnitude floods occurred in 1959, 1968, and 1969 within the lower Tapi basin. Flood hydrographs of those and other flood events show that the duration of floods can range from 6 to 10 days, and in exceptional cases up to fifteen days. Hence to supply substantial changes within the alluvial sections of the Tapi River, considering the world picture of disaster, particularly within the flood event, the varied rolling vulnerability assessments conducted in several countries indicate that the last twenty years have seen a rise within the frequency and occurrence of climate induced hazards like floods and drought within the countries.

A study of Nott (2006) correctly points out that a traditional level of flood event isn't considered to be a natural hazard unless there's a threat to human life or property. The foremost vulnerable landscapes for floods are low-lying parts of floodplains, low lying coasts and deltas, small basins subject to flash floods. Floods then become a significant natural hazard due to the high human population densities that inhabit these lands. He indicated that the direct impacts of a flood are closely associated with the extent of affected area and depth of floods water. The extent of a flood contains a direct relationship with the recovery times of crops, pastures and also the social and economic dislocation impact to populations of a rustic.

Floods are the foremost costly and wide reaching of all natural hazards. They accountable for up to 50,000 deaths and adversely affect some 75 million people on the average worldwide in each year. In tropical countries after floods Malaria and Typhoid outbreaks are common. It's been estimated that in India and Bangladesh 300 million people sleep in areas that are littered with floods (Nott, 2006). Physical damage to property is one among the key causes for tangible loss in floods. This includes the value of injury to goods and possessions, loss of income or services within the floods aftermath and clean-up costs. Some impacts of floods are intangible and are hard to put a monetary figure on. Flood affected people include increased levels of physical, emotional and psychological health problems.

Borrows and Bruin (2006) analyzed that flooding has claimed more lives than the other natural hazard. Within the decade 1986 to 1995, flooding accounted for 31 percent of the worldwide economic loss from natural catastrophes and 55 percent of the casualties. The damaging effects

of flooding are likely to become more frequent, more prevalent and more serious within the future.

Ologunorisa, T. E., and Abawua, M. J. (2005): The paper explains a number of the techniques of flood risk assessment using case studies from different countries within the world. These techniques are meteorological, hydrological, hydro meteorological and socio-economic and people supported geographic data system. The paper concludes that GIS technique appears to be most promising because it is capable of integrating all the opposite techniques of flood risk assessment.

Carey, M. (2005) argues that human populations worldwide are at risk of natural disasters. Certain conditions like geographical location or people's income level can affect the degree to which natural disasters impact people's homes and livelihoods.

As Giddens (2001) asserted the potential consequences of world warming this is that the rising of sea levels resulting from global climate change, may cause the polar ice caps to melt and also the oceans to warm thereby expanding and resulting to overflow or rising sea levels. This therefore implies that cities that are near the coasts or in low-lying areas are flooded and become uninhabitable. This could have also caused the assorted floods that occurred in most parts of the coastal regions of Nigeria like Lagos, Rivers, Bayelsa, Delta, etc.

Evidently, a study of rural households in Tanzania indicated that agriculture provided about 50 percent of household income, while the remaining 50 percent came from non-farm income activities (Chapman and Tripp 2004). UN agency (2008) suggested that, three powerful and complementary pathways out of rural poverty are: smallholder farming, off farm labour in agriculture, the agricultural non-farm economy and migration. The agricultural non-farm economy accounts 25 percent of full-time employment and 35-50 percent of rural household income in developing regions (Haggblade *et al.* 2010). Thus, rural development and livelihood diversification is significant since rural livelihood diversification may be a driver on economy. Policies might promote the non-farm/off farm sector so as to cut back rural poverty.

2.5.1. Empirical Studies of Livelihood Diversification

According to Jatta (2013), in sub-Saharan Africa, agricultural-based countries are poor in terms of capital per capita GDP and face a rural poverty. Progress toward alleviating poverty has been

insufficient in many countries, notably in Sub-Saharan Africa, but there has been progress elsewhere, with a fall in the absolute number of poor mainly due to economic growth in East Asia, especially China. Despite the fact that Africans participated in several livelihood diversification and regardless the fact that, severe poverty and food insecurity continue, in SSA which is one of the world's poorest region (Babatunde and Qaim, 2010).

Abdul-Malek and Usami, (2010) provided from the study conducted in Bangladesh, there is a growing interest in rural non-farm income as rural economies increasingly showing that rural people's livelihoods are consequential from diverse sources and are not as devastatingly dependent on agriculture as previously assumed. Another study conducted from chain and suggested that, policy-makers are turning their attention to the wider rural economy, as they seek ways to reduce persistent rural poverty. Rural household livelihood diversification is a key to addressing rural poverty and enhancing income and wellbeing status (Janvry *et al.*, 2005; Khatun and Roy, 2012).

Livelihood diversification is vital since rural livelihood diversification is a driver on economy. Policies might need to promote the non-farm/off farm sector in order to reduce rural poverty. Indeed, although the nonfarm and off farm sector in rural livelihood diversification has a paramount effect on household income and poverty reduction the progress is obviously varied among regions and between countries even within a country. In Ethiopia researches were conducted in the area of rural livelihood in different angles. For example, Berg and Kumbi (2006), Berehanu Eshete, (2007), Nasir, (2014) estimated the relation between poverty and participation in non-farm sector based on non-farm accessibility for poor context, but not consider the effect of diversification on poverty.

2.6. Conceptual framework

After careful study of literature review, the following conceptual framework was formulated: When occurred flood the rural farmers arable land was damaged this also reduce the annual production size, the final output of production size lose pushed the households and the area to drought, due to lack of sufficient food for the family the households and communities tried to plan the flood aversion strategy to overcome the major problem. The flood aversion practice was needed the community and institution collective power because the river is huge and covering large areas.

If the flood aversion strategy was good the vulnerability matters of the surrounding community mitigate, this means the land will survive from the flood damage and the production size will survive and the community reach to provide enough food for their families and local markets.

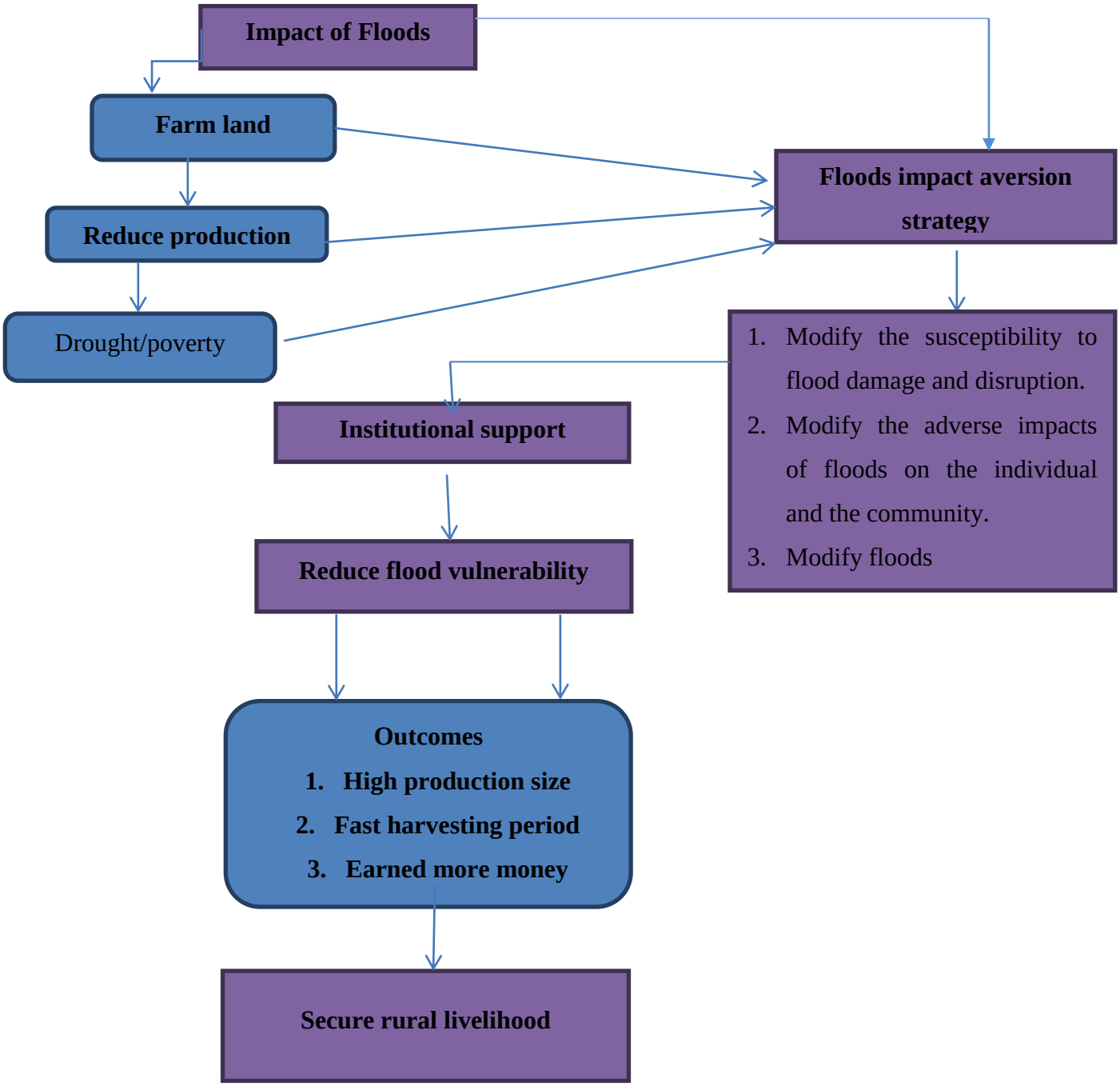

Figure 2.2 Conceptual framework of flood impacts on lives and livelihood

CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1. Description of the Study Area

3.1.1. Location

Bora is a community under Oromia regional State. It is bordered and bounded by Leben Chukuala, Leben Godula and South West by Luna farm, South East by Koka dam. It is part of the former Aanaa of Dugda Bora, part of the East Shewa Zone it is located in the Great Rift Valley. Bora has 43,533 ha and total population of 68,461 are living (Bora, Woreda, 2016). The inhabitants are mostly in crop production, mainly Maize, Teff, and other vegetable gardening and some livestock farming, as well as trading.

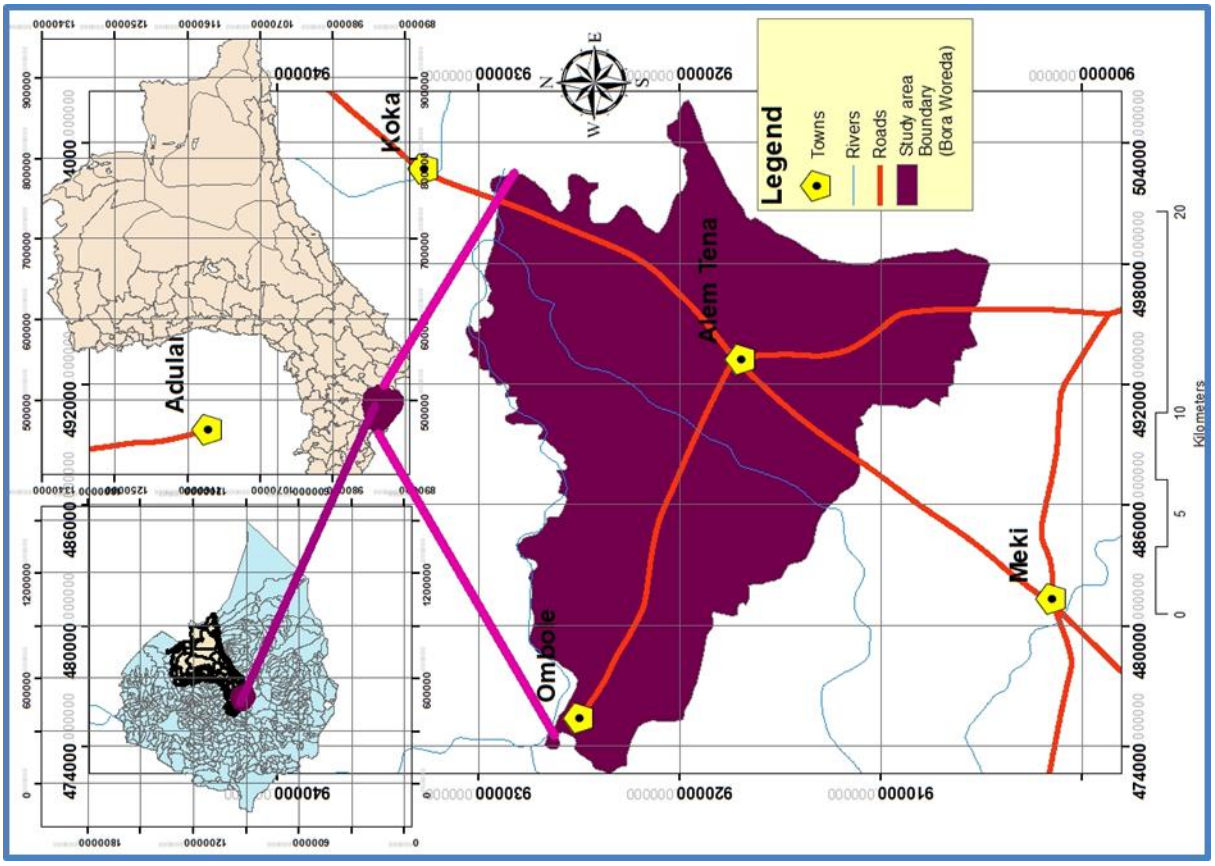

Figure 3.1 Location map of the study area

3.1.2. Climate

The mean annual Potential Evaporate Transpiration (PET) is between 1400 and 1700 mm which is much more than the mean annual precipitation. The average annual maximum and minimum temperatures are 25-27^{0}c and 12-16^{0}c respectively. The relationship between precipitation and PET indicates that the area is moisture deficient, to this effect, the Woreda hardly favors a single season production within the range of 61 and 90 days crop growing period.

The long-term (1978- 2009) mean annual rainfall is 1323 mm, maximum 2205 mm and minimum 690 mm with unimodal distribution. The average maximum annual rain fall was recorded in the months of July, August, September and the average minimum annual rain fall was recorded in the months of January, February, and December. The amount of rainfall for increases and the temperature decreases owing to the high altitude. From the total 31 years rainfall data history 1996 was highly rainy year (the whole rain fall trend data attached on Appended).

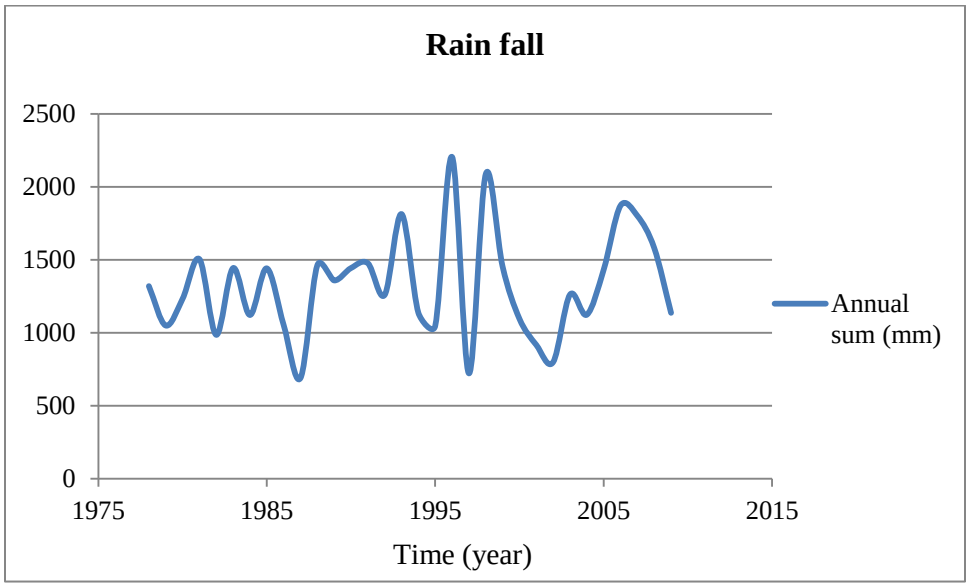

Figure 3.2 Rain fall trend analysis 1978-2009 (*Source:* National meteorological agency)

3.1.3. Socio Economic Aspects

As far as economic condition of the Woreda is concerned, more than 95 percent of the populations are engaged in a mixed agriculture, crop production and animal rearing and the

remaining 5 percent are engaged in different economic activity such as retailer and some are unemployed (OWAO, 2017).

According to the Woreda representative and Rural Development Office reports, agriculture is the emerging economic activity in the study area. Small scale irrigation is recently more practiced at household level in the area. However, livestock is an important household asset and primary means of income for most of the population in the survey area. But, livestock productivity is troubled by number of factors including shortage of grazing land and livestock diseases with poor animal husbandry practices.

Figure 3.3 Farmers economic aspect in the study area

Major annual crops are maize and sorghum; while livestock production includes cattle, goat, sheep, and equine. The land cover types are predominantly of Acacia spp., wood land and open grass land usually intensively cultivated. The natural resources of the Woreda, especially land and land covers, are being depleted at an alarming rate. Increasing of Livestock and human population puts a great pressure on natural resources. The Woreda used to be one of the main centers for the supply of charcoal and fuel wood. The local communities exclusively depended on the natural biomass for local fuel energy (Bekele, 2012).

3.1.4. Land Use

The major land uses in the study area was classified as cultivated, forest, grazing and undefined. In desert areas that have been deforested either by fires or human's infiltration will be reduced,

based on the 1986 land use map the study area was highly covered by the acacia forest but after 37 years the acacia forest size was replaced by the agriculture lands also the size of water body slowly declined. This all affect the flood aversion strategies because the running water easily affect the farming lands without any forest brake.

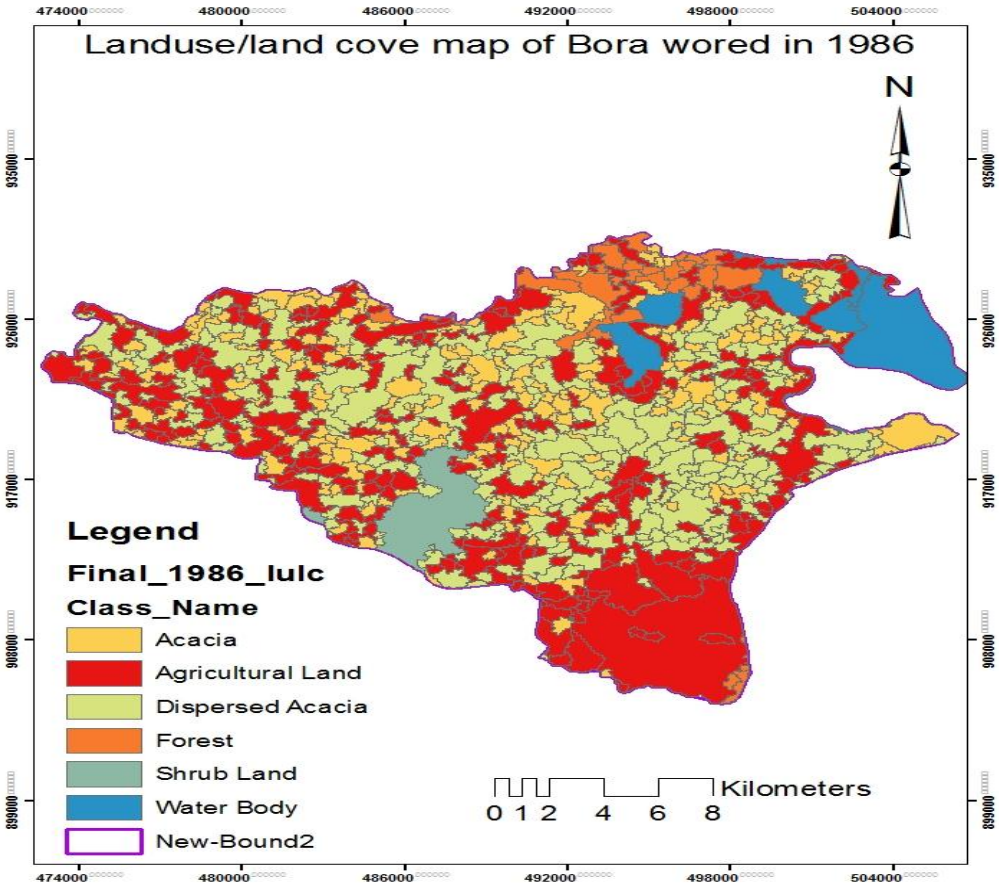

Figure 3.4 Land use/land cover map of Bora Woreda in 1986 (Source: Ministry of water and energy)

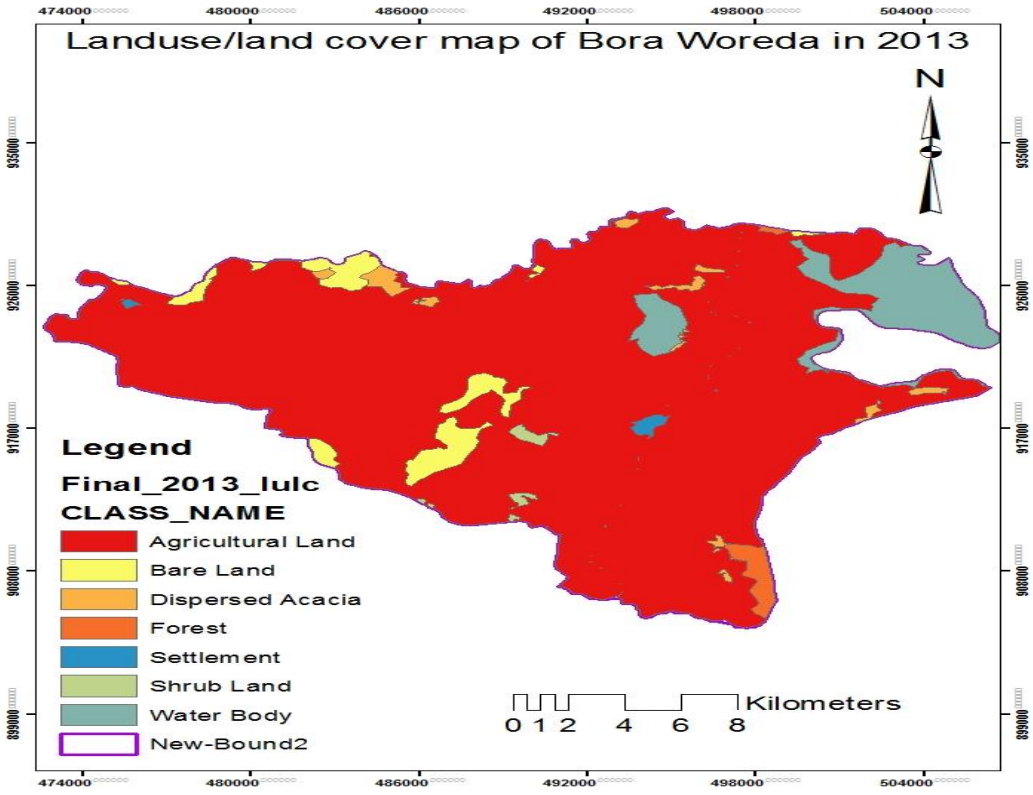

Figure 3.5 Land use/land cover map of Bora Woreda in 2013 (Source: Ministry of water and energy)

3.1.5. The Soil Types of the Areas

The characteristics of the soil were used to classify the soils of the Bora Woreda, the main soils identified in Bora Woreda are: Chromic Luvisols, Dystric Nitisols, Eutric Fluvisols, Luvic Phaeozems, Vitric Andosols and Molic Andosols. In the study area there are different soil types this all help to have different capacities to infiltrate water. Infiltration is a key component that mainly influences the annual rainfall process and plays an important role in monitoring the amount of rain water that will be available for surface runoff after rain (Morgan 1995).

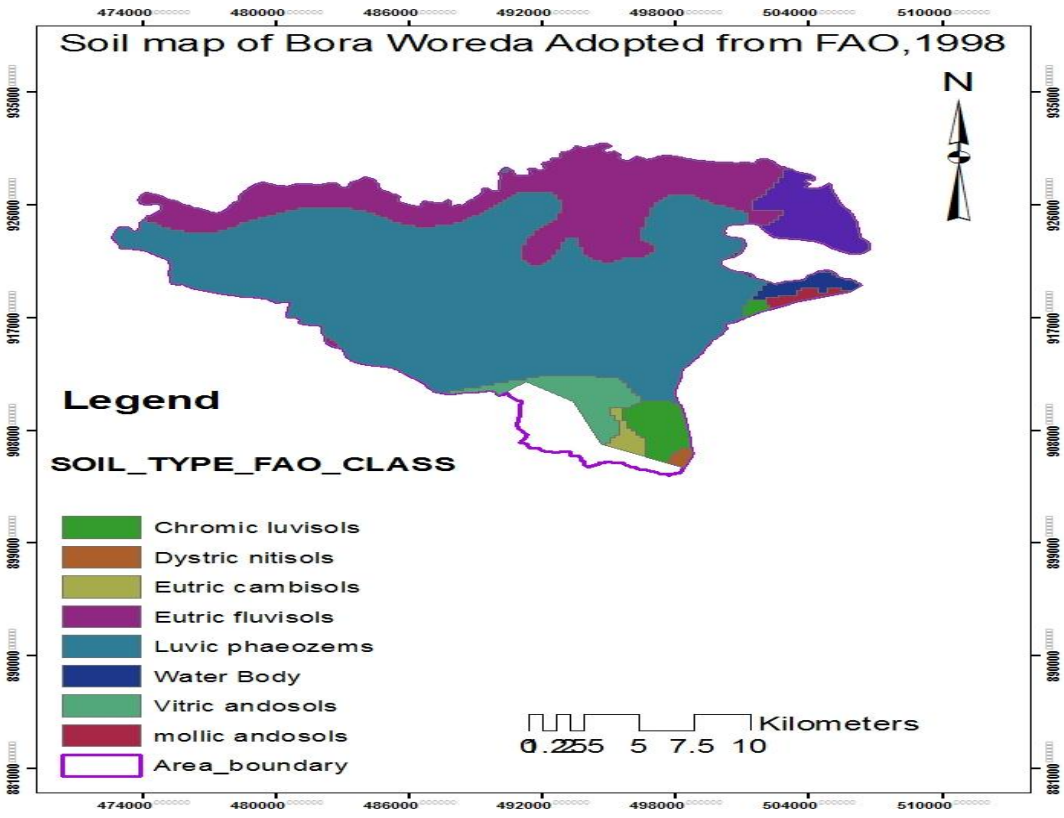

Figure 3.6 Soil map of Bora Woreda adopted from FAO, 1998

3.1.6. River Network

Drainage is an important ecosystem controlling the hazardous as its densities denote the nature of the soil and its geotechnical properties (Pareta, 2004). Drainage system, which develops in an area, is strictly dependent on the slope, the nature and attitude of bedrock and on the regional and local fracture pattern (Alemayehu, 2007). Drainage density (DD) a fundamental concept in hydrologic analysis is defined as the ratio of the length of drainage per basin area.

Drainage density is controlled by permeability, erodability of surface materials, vegetation, slope and time. Drainage density is an inverse function of infiltration (Ajin *et al.*, 2013). Greater drainage density indicates high runoff for basin area along with erodible geologic materials, and less prone to flood. Thus the rating for drainage density decreases with increasing drainage

density. Finally, the drainage density was reclassified into continuous scale in order of flood hazard rating. The drainage density in the sub-basin ranges from 0.014 to 0.949 km/km^2.

One of the reasons for floods in Awash River Basin is geo-morphology of the basin, which is dynamic due to the nature of the river course. The flood vulnerable areas indicating that floods along the river course occur due to changing river cross-sections, which is directly, linked with geology, morphology and sediment characteristics of the river.

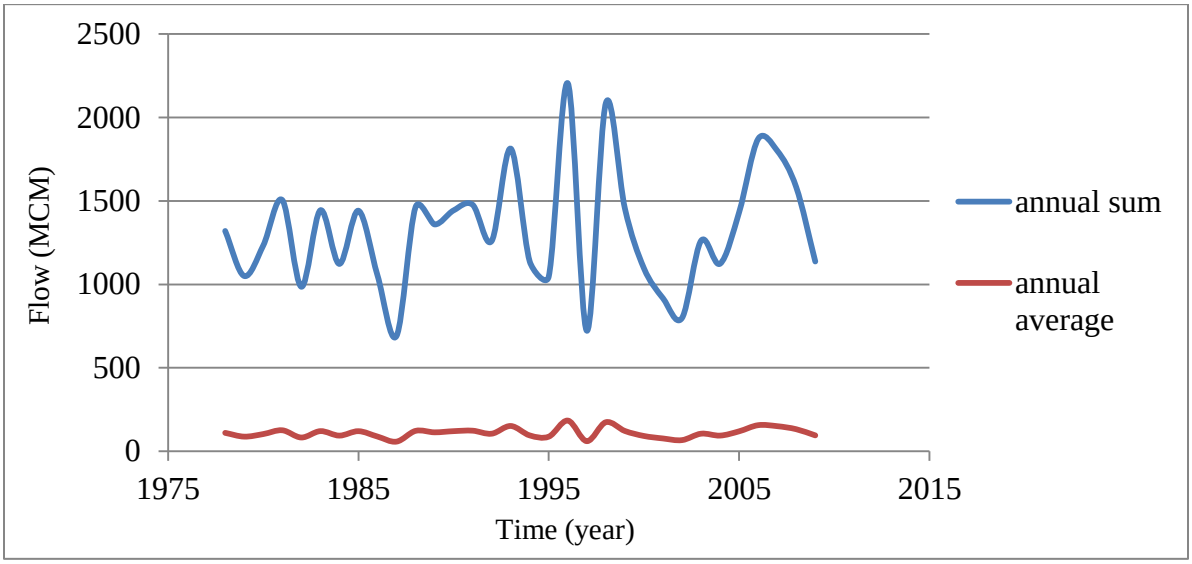

Figure 3.7 Awash Ombole river flow trend analysis

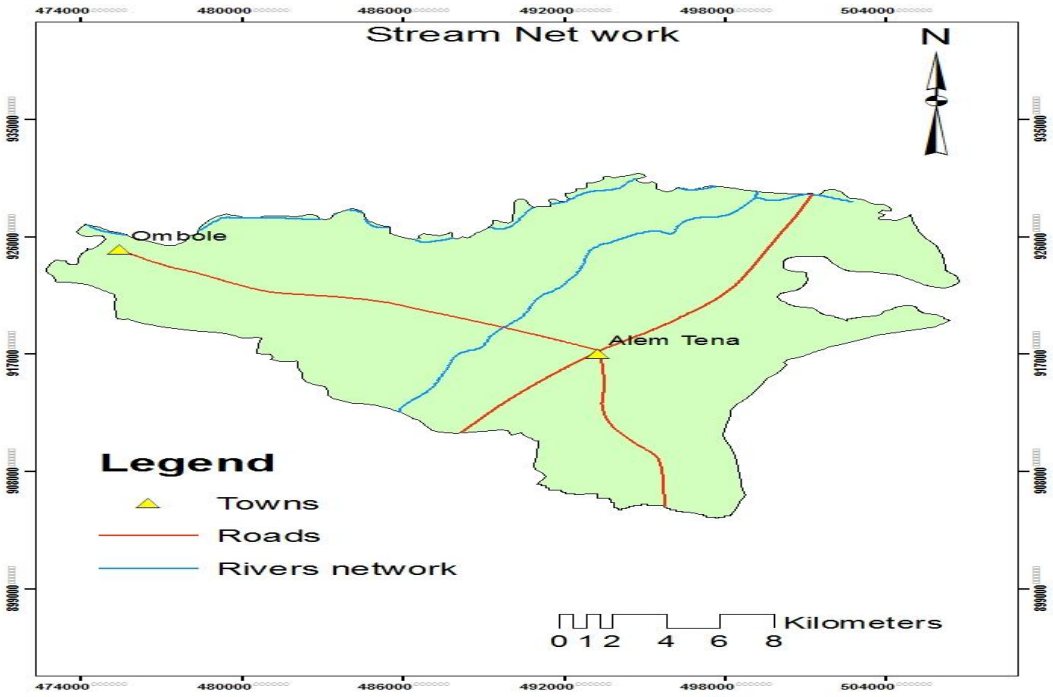

Figure 3.8 Drainage map developed from DEM using ArcGIS

3.1.7. Hydrology

The main source of recharge for the vast groundwater system is the rainfall on the highlands during the rainy season. The major recharge occurs in the north-western, south-eastern highlands and upper basin, where annual rainfall is high. These aquifers are recharged by the streams that originate from the eastern highlands and Seasonal floods occur in summer (Ayenew, 2008).

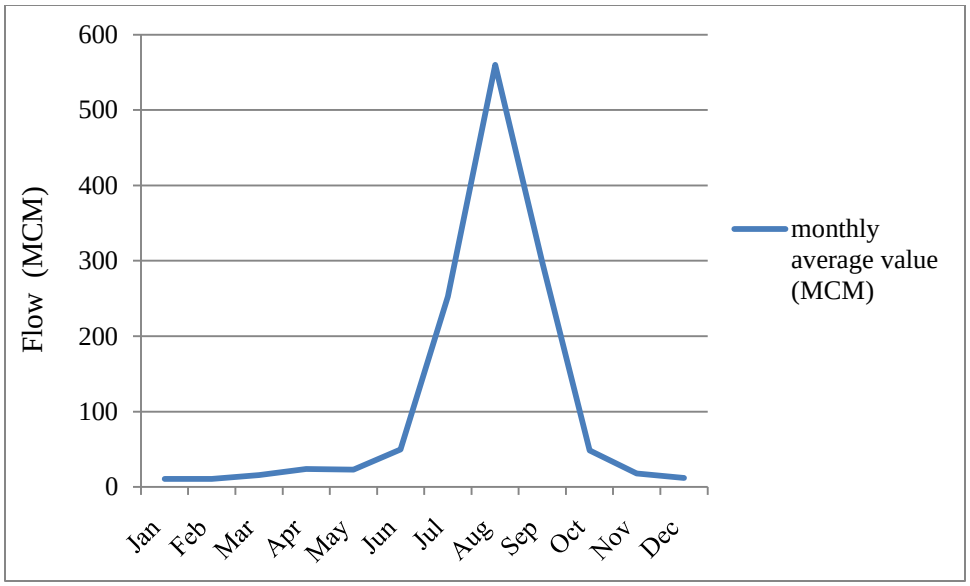

Figure 3.9 Stream hydrograph (Awash Ombole)

3.1.8. The Slope and Physiographic Map of the Study Area

The lower the slope value is the flatter the terrain and in the same way the higher the slope value is the steeper the terrain. Based on their susceptibility the slope elevations have been classified into four classes such as gentile slope, moderate gentle, slightly steep slope and very steep slope. In the classification process, an area at the lowest elevation and slope, very highly affected by flood and then ranked to class four.

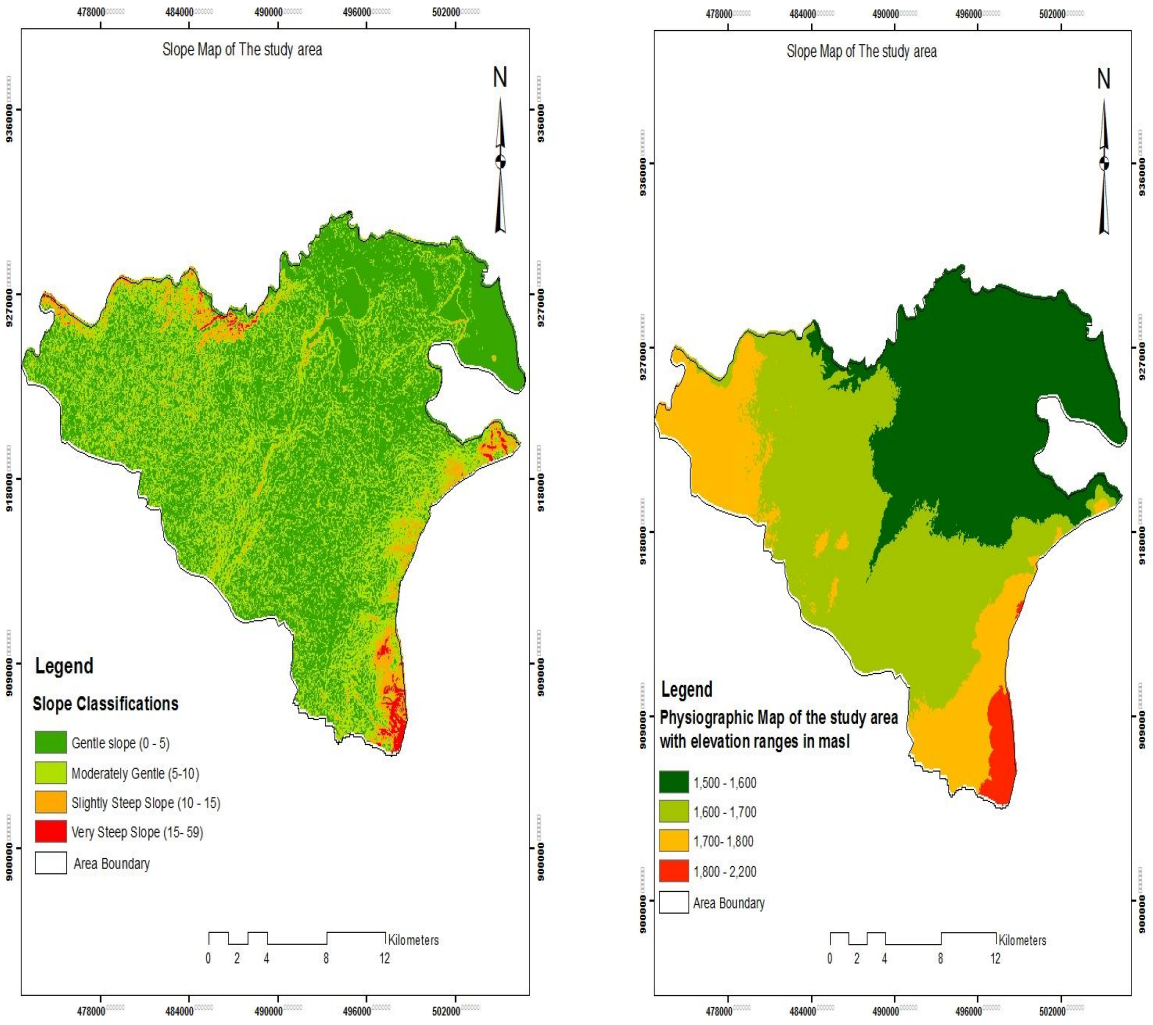

Figure 3.10 Slope map of the study area

3.2. Research Type and Its Approach

The aim of the study was to analyze the impact of flood on rural household livelihood. Therefore, to realize the objectives both qualitative and quantitative research approaches were employed. By qualitative method, it helps to descriptive some existing situations; the respondent characteristics, overview of livelihood activities and key assets or resources of the study area. This was done based on data obtained from household respondents and FGD. On the other hand, quantitative data were used to identify determinant factors, flood trends, livelihood diversification and rural income relation was examined.

3.3. Research Design and Approaches

A research design is typically show the framework within which research was conducted. Up on this, the research road map, conceptual structure in which research was conducted could be presented in the next sections. The research structure which means it shows what was done such as how the data was collected and analyzed as well as it shows what, where, when and how the research performed. It also used as guidance by providing direction, help to manage resources and time while the study conduct.

The study was conducted on both qualitative and quantitative approach in order to find out the impact of floods on rural household livelihood in Bora Woreda. The qualitative and quantitative research method was used structured and close ended questionnaires to sum up the quantitative data of the research. It is a formal systematic approach in which numerical data was be integrated to obtain reliable information about the flood impact on rural household livelihood.

3.4. Data Type and Sources

This study was used both primary and secondary data.

3.4.1. Primary Data

A primary data was collected through questionnaire from rural households, from assigned focus group discussion (FGD). The household heads data source is the basic, where the latter focus group discussions are serving as some additional information.

3.4.2. Secondary Data

Secondary data for the study was collected from various source documents (reports and profiles of the Woreda) on the subject matter from various offices such as: from Woreda Administrative Office, Agricultural and Natural Resource Management Office, Finance and Economic Cooperation office, Micro and Small Enterprise office etc. The types of data were background information about the study area such as rain fall size, soil type, land use/cover, population, household size, number of kebeles and types of crops existed in the study area.

3.5. Research Methods and Techniques

3.5.1. Population

The population of this study is only Bora Woreda rural households. The population of this study does not include all households in the Woreda due to a limitation of resources such as time and money. The 2007 national census reported a total population for this Woreda of 58,748, of whom 30,487 were men and 28,261 were women; 11,403 or 19.41 percent of its population were urban dwellers. According to Woreda administration documents, there are about 182,730 populations, whom 93,642 are men and 89,088 women. Total 40,893 households were targeted to this study.

3.5.2. Sample Frame and Sample Size Determination Technique

A multi-stage cluster sampling technique was used in choosing a sample of 261 households for detailed study. In Bora Woreda there are 18 kebeles from the total kebeles (due to time and budget constraint only four kebeles was selected). The second steps there are 182,730 population and 45,567 households in the whole Woreda and the researcher take four selected kebele population 23,047 and to 6,443 households from the strata. In this study random sampling and stratified random sampling methods was employed taking into account as Bora Woreda administration household list as a sampling frame.

The sample frame of total 6443 households' heads, based on their wealth rank from each four kebeles of agricultural and extension service office were obtained. The wealth rank (such as number of cattle, land size, production size and annual income) is considerable to draw proportional representatives of samples.

Various studies identified that asset ownership such as land ownership; oxen, and other livestock holding are the most important economic resources to differentiation rural society in various wealth categories. Thus, similarly to asset ownership such as the size of land owned, number of livestock owned (plough oxen, milking cow, modern beehive), asset possession and activities in which households are engaged, household participation to extension service and so on were taken by kebele offices as criteria to stratify the wealth groups and documented at each kebele in which of the sample respondents selected from.

Accordingly, the information provided during selection period from the study area a households is considered as poor in the community if it exhibits the following characteristics: landless, lacks

or have one oxen and other types of livestock, lacks seed, has no supporters, has weak labour capacity and members number of community association, have no metal roof house, Sellers of local drinks are also considered. Second the household considered as medium if exhibits own small size of land, two to three oxen or milking cow, two to six goats and sheep, one pack animal. Lastly, households who tills his own or contracted land additionally in a way of additional income seeking is considered to belong to wealth group. Further, this group of household is one who own more than three oxen, three milking cows, ten goats and sheep, two or more pack animals, owns enough land. Better off households are also expected to have significant savings in banks and provide to their children the means to decent education. After having these ground the selection followed.

Secondly, following Kothari, 2004 formula which applied by many researchers (example Daniel et al, 2016; Fassil and Elias, 2016) the study sample household was selected. Kothari, 2004 formula which was used in determining sample size was specified as:

$$\text{Sample size} = \frac{\frac{z^2 \times p\,(1-p)}{e^2}}{1 + \left(\frac{z^2 \times p\,(1-p)}{e^2 N}\right)}$$

Where: N = total households is equal to 6,443 from four kebeles, e = standardization at a confidence level 10% (z value 1.61 and e = 0.05), p= 0.5, q= 0.5 and n = size of calculated 261 sample households and finally a total 261 sample households were selected by employing systematic simple random sampling techniques (Kothari, 2004). To determine each kebele shares and to capture representative samples size from total sample household's probability proportional to size method was used on the following table.

Table 3.1 The selected sample households by kebele and wealth category

Kebeles	Population size	Percentage	Sample household
Dodowedera	6,118	26	68
Elene	6,173	26.7	70
Lafessagermeji	5,092	22	57
Tubesuti	5,664	24.6	66
Total	23,047	100	261

3.6. Data Collection

Household survey: Data were collected from sample household through questioners, a set of structured questionnaires were used to collected data about the households' demographic characteristics, floods trend, key livelihood assets that determine livelihood diversification engagement, which further used to analyze the relation between HH annual income size.

After preparing closed and open ended questionaries' the researcher went to selected Kebeles for 4 weekends (Saturday and Sunday) and duty off days (holiday) and from the Woreda agricultural and extension office list of households the researcher and enumerators randomly selected based on passing five house units the rural households house knocked and fill the questionnaires'. The main respondents were the household heads but most of them unwilling to give the information but the researcher found cooperation letters from the Woreda and make understanding for the respondents and got the information for the sake of academics.

Key informant interview: Such data was collected through face to face interview by four data enumerators after they were trained on theory and practical base. During data collection processes a continuous supervision was made by the researcher. On the other hand, some semi-structured guiding questions used for key person interview, the processes were led by researcher conducted.

During survey data collection periods the researcher was tried to collect the interview to found their sight from two Woreda officials and two acceptable local leaders about the floods incidence

and community based likelihood diversification techniques. This all was conducted during the middle of September month.

Focused Group Discussion: The participants from different appropriate bodies; experts, community leaders, and active representatives those who aware of livelihood diversification and related issues of which one group that consists of 5 member from two sample kebeles (2 from Dodowedera and 3 from Tubesuti) based on agro-ecology were selected and discussion was conducted. After survey data collection periods the researcher was tried to collect one group of Woreda agriculture office civil servants and three local leaders and discuss to found their sight about the floods incidence and community based likelihood diversification techniques. This all was conducted during October month.

Figure 3.11 Focus group discussions

3.7. Methods of Data Analysis

3.7.1. Qualitative Data Analysis

Depending on the objectives of the study and nature of data obtained, analysis was made following different approaches. In the first place descriptive analysis was employed. By descriptive statistics the characteristics of sample respondents were presented and analyzed. It was used to describe, compare, and contrast different categories of sample units by mean, SD, percentage, tabular analysis and frequency distributions so as to assessed and understand the demographic and socio-economic characteristics of respondents; the current situations of

livelihood assets or resources that contributes for effective success or hinders diversification and the contribution of diverse livelihood on household income. In addition, some qualitative information from FGD presented and analyzed in description form. However, in the process of data analysis and interpretation, major attention was given to quantitative data result analysis.

3.7.2. Econometric Model

The focal theme of the study was to analyze the impact of floods on household livelihood income level test. Hence, Econometric models (logistic regression) employed consecutively one after the other. In the first case, in analyzing determinant factors of diversification logistic model applied. When there are more than one alternatives dependent outcomes, the appropriate econometric model would be either logit or probit. Hence, the dependent variables in this study were the rural household either poor or not poor. However, logit regression is not often used in empirical studies due to estimation difficulties imposed by the need to solve multiple integrations related to normal distributions (Greene, 2003: Brown *et al*, 2006: Chilot and Hassan, 2008). On the other hand, binary logit is a simple extension of logistic regression models (Gujarati, 2003; Greene, 2003; Woodridge, 2002). As stated by several scholars binary logit also not chosen merely because of its computational easiness but also it offers a greater ability to predict determinants of household's livelihood and picking up the differences among others (Christiaan *et al.,* 2004). Moreover, Jansen *et al.,* (2004), Berhanu (2007), Adugna (2008), Wassie *et al.,* (2008) and Tatek (2012) are some scholars used this model to analyze the determinants of household livelihood.

The logistic distribution is more preferable than the other econometrics models within the analysis of dichotomous outcome variable, in this it's extremely flexible and simply uses a model from the mathematical point of view and leads to a meaningful interpretation (Gujarati, 2004).

The Logit model may be a maximum likelihood estimator that enables for estimating the probability that an occurrence occurs or not by predicting a binary dependent outcome from a group of observable independent or predictor variables.

$$Yi = \beta 0 + \beta 1X1i + \beta 2X2i + \cdots \ldots \ldots \ldots + \beta nXni + \varepsilon i \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (1)$$

Let us consider a rectilinear regression of the form;

Yi = the end result variable predicted from the equation

Xi = a vector of explanatory variables representing household

β's = a vector of regression coefficients to be estimated

εi = the error terms

Logistic regression assumes meaningful coding of the variables. If not coded meaningfully a logistic coefficient is difficult to interpret.

3.7.2.1. Assumptions of Binary Logistic Regression

Unlike general linear models, binary logistic regression doesn't have many key assumptions; particularly it doesn't require a linear relationship between the dependent and independent variables, normality of the error distribution, homoscedasticity of the errors and measurement level of the independent variables. However logistic regression still requires other assumptions.

1. Binary logistic regression requires the dependent variables to be binary.
2. Since binary logistic regression assumes that P(Y=1) is that the probability of event occurring, it requires that the variable is coded accordingly.
3. Model should be fitted correctly. It implies that all meaningful variables should be included. Also, it mustn't be over fitted with meaningless variables included.
4. Binary logistic regression requires each observation to be independent. Also, it should have little or no multicollinearity, which implies that independent variables aren't linear functions of every other.
5. Binary logistic regression requires linearity of the link between independent variables and log odds. Meanwhile, it doesn't require a linear relationship between dependent and independent variables.
6. Binary logistic regression requires large sample sizes. Studies with small sample sizes overestimate the effect measure. Also, the more independent variables are included within the model; the larger sample size is required.

The main limitation of binary Logistic Regression model is the assumption of linearity between the outcome and the explanatory variables. To mitigate these scenarios used high dimension primary data to consider the regularization.

3.7.2.2. Maximum Likelihood Estimation

Although logistic regression model looks like simple linear regression model, the underlying distribution is binomial and α and β parameters cannot be estimated in the same way as for simple linear regression. The coefficients are usually estimated by the Maximum Likelihood Model (Park, 2013). The likelihood is a probability to get observed values of the dependent variable given the observed values of independent variables. The probability estimation of the dependent variable as applied by Gujarati, (2004) can be represented by;

$$\text{Prob}(Y_i = 1) = F(\beta' X_i) \ldots\ldots\ldots\ldots\ldots (2)$$

$$\text{Prob}(Y_i = 0) = 1 - F(\beta' X_i) \ldots\ldots\ldots\ldots\ldots (3)$$

Where:

$$Y_i = \begin{cases} 1 \text{ if} - \text{HH poor} \\ 0 \text{ if} - \text{HH not poor} \end{cases} \ldots\ldots\ldots\ldots\ldots (4)$$

$$E(Y|X) = 1[F(\beta' X)] + 0[1 - F(\beta' X)] = F(\beta' X) \ldots\ldots\ldots\ldots (5)$$

The F-function represents that the Logit model uses a Logit cumulative distributive function. When an outcome variable is dichotomous or binary, the relationship between variables may be nonlinear and can be converted into linear ones through logarithmic transformation. Therefore, the logit regression equation from which the probability of the outcome variable (Y) is predicted is given by:

$$P(Y = 1|X) = \frac{e^{\beta' X}}{1 + e^{\beta' X}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

$$P(Y = 0|X) = 1 - \frac{e^{\beta' X}}{1 + e^{\beta' X}} = \frac{1}{1 + e^{\beta' X}} \ldots\ldots\ldots\ldots\ldots\ldots (7)$$

Where: P(Y) = the probability of Y occurring as defined in equation (4)

e = the base of natural logarithms

The Logit regression in equation 6 and 7 are expressed in logarithm terms and overcomes the problem of nonlinearity. The result of the Logit regression varies between 0 and 1 values closer to 0 indicates that the outcome variable (Y) is unlikely to have occurred and values closer to 1 indicate the probability of Y occurring.

The output of the Logit regression model explains the probability that the outcome variable (Y) changes when the independent variables change. But the Logit coefficient does not tell us by how much percentage the probability of (Y=1) change when the explanatory variable (X) changes by one unit. The Logit coefficient shows the direction of the change not the magnitude of the change. The magnitude of the effect would be estimated by calculating the marginal effects.

According to Gujarati: (2004)

$$\frac{\partial E[Y_i|X_i]}{\partial X_i} = F(\beta'X)[1 - F(\beta'X)]\beta \ldots\ldots\ldots\ldots\ldots\ldots (8)$$

It indicates how much percent the probability of (Y=1) changes when the X covariates change by one unit. SPSS software version 26 has an inbuilt system to compute the coefficients of the Logit function and the marginal effects.

To analyze the effect of livelihood status on poverty reduction, household wealth status have categorized as poor, and non-poor based on their wealth estimation/approximation/ regardless of the extent of poverty line and it served as response variables. As a result, similar to the above, it is expected that there are qualitative alternative outcome but not nominal rather ordinal in nature and ordinal logit model is appropriate (Green, 2003; Christiaan *et al*., 2004).

This study was focused on estimating household wealth status using poverty monetary measures the consumption approach and daily calorie intake at household levels because is most widely used when measuring poverty. Households with per capital consumption expenditure and average calorie intake less than the poverty line will consider poor and those with costs greater than the poverty threshold was considered non-poor.

3.7.2.3. Evaluation of Binary Logistic Regression Model

Overall Model Evaluation

a) Likelihood Ratio Test

Due to overall model evaluation we can see how strong the relationship between all independent variables and dependent variable is. If logistic regression with k independent variables demonstrates an improvement over the model without independent variables (null model), then it provides a better fit to data (Park, 2013). This is performed using the likelihood ratio test, which

compares the likelihood of the data under the full model with the likelihood of the data under the model without independent variables. The overall fit of the model with k coefficients can be accessed via likelihood ratio test which tests the null hypothesis -2 log likelihood of the null method is compared with 2 log likelihoods of the given model. Likelihood of the given model is likelihood of obtaining the observation if all explanatory variables are included in the model. It measures how well independent variables influence on the dependent variable. If the p-value for the overall model fit statistic is less than 0.05, then decline H0 with the conclusion that at least one of the independent variables has an impact on the outcome or dependent variable.

b) Chi-square Goodness of Fit Tests

Chi-square goodness of fit test is a non-parametric test that is used to find out how the observed value of a given event is significantly different from the expected value:

H0**:** In Chi-square goodness of fit test, the null hypothesis assumes that there is no significant difference between the observed and expected value.

H1*:* In Chi-square goodness of fit test, the alternative hypothesis assumes that there is significant difference between the observed and expected value. If the p-value is less than significance level, the null hypothesis is rejected.

c) Hosmer-Lemeshow test

Hosmer-Lemeshow test also measures how good the model is. The test evaluates whether observed event rates match expected event rates in subgroups of the model population. Divides subjects into 10 ordered groups of subjects and then compares the number actually in each group (observed) to the number predicted by the logistic regression model (predicted). If the H-L goodness-of-fit test statistic is greater than .05, we fail to reject the null hypothesis, implying that the model's estimates fit the data at an acceptable level (Hosmer and Lemeshow, 2000).

3.7.2.4. Statistical Significance of Individual Regression Coefficients

After evaluating the overall model, the next step is to assess the significance of every independent variable. The coefficient of i-th explanatory variable indicates the change in the predicted log odds for one unit change in the i-th explanatory variable, when all other explanatory variables remain unchanged.

a) Likelihood Ratio test

The likelihood ratio test is used to evaluate the overall fit model. The test is also used to evaluate statistical significance of individual predictors.

b) Wald Statistic

The Wald statistic is used to test the significance of individual coefficients in a given model (Bewick *et al*., 2005). The statistic is the ratio of the square of the regression coefficient to the square of standard error of the coefficient.

Cox and Snell's R-Square and *Nagelkerke's R2* is part of SPSS output in the 'Model Summary' Table and is the most-reported of the R-squared estimates. The result indicates the relationship between the predictors and the prediction.

3.7.3. Selection of Dependent and Independent Variables

Table 3.2 Description of Variables

Variables		Types	Variable description
Dependent variable			
Poverty status		Binary	1 if poor and 0 if not poor
Explanatory Variables			
1	Age of household head	Categorical	1= 18-30 years old
			2= 31-40 years old
			3= 41-50 years old
			4= Above 51 years old
2	Marital status of household head	Dummy	0=if single, 1= if married
3	Gender of household head	Binary	0=Female, 1=Male
3	Household income	Continuous	Household income size
4	Family size	Continuous	member of family
5	Size of cultivated land	Continuous	Size in hectare
6	Total livestock	Continuous	Livestock in number
7	Access to credit	Dummy	Yes=1 no=0
8	Access to extension contact	Dummy	Yes=1 no=0
9	Access to electric power	Dummy	Yes=1 no=0
10	Educational level	Continuous	Educational level
11	Access to irrigation	Dummy	Yes=1 no=0
12	Distance from nearest market	Continuous	Distance to market in km
13	Annual production size	Continuous	Quantity in quintal
14	Access to mobile phone	Dummy	Yes=1 no=0
15	Access to water supply	Dummy	Yes=1 no=0

3.7.4. Definition of Variables

A non-poor household is, therefore, that household with per capita income falling above or equaling to two-third of the mean per capita annual income. On the other hand, a poor household

is that household with per capita income falling below two-third of the mean monthly per capita income.

The Independent Variables

Age of the household head: The age of the household head is an important demographic factor that potentially affects livelihood status. The household age increases the poverty status of the household increase due to reduce productivity, large family size and income level (Datt and Jolliffe, 2005).

Marital status of the household head: Married couples was be expected to be more concerned about the household welfare and need to maintain a minimum consumption threshold would lead them to decide livelihood diversification. Moreover, married couples are less mobile and the joint cosigning and responsibility between them could increase the probability of getting a job. Based on generating income married couples have less probability of being poor (White and Rodgers, 2000).

Literacy of the household head: It's a proxy for the education level of the household head. Literate people are more willing to adopt technological advancement and have knowhow about the way to improve their productivity. The tutorial level of a household head hypothesized to own a positive impact on the welfare of households as measured by real consumption expenditure per adult equivalent. The study by (Julie *et al.,* 2008; Similer *et al.,* 2004) revealed that households with educated household head had an improved welfare as compared to their counterparts.

Household Size: The impact of household size on livelihood status was mixing as shown in previous literatures. Here, it's hypothesized that household size affects the variable quantity in either way counting on the demographic composition of the household and have a positive effect if a bigger household size composed of a working labour (hence less dependency ratio) and can have a negative impact if it implies a better dependency ratio. At the identical time, household size also expected to own an opposite impact on the household's vulnerability as compared to its effect on welfare. In line with (Datt and Jolliffe, 1997; Julie *et al.,* 2008; Runsinarith, 2011; Bogale and Genene, 2012), household size and its composition matter the household on the adoption of Agricultural technology.

Households Cultivated Land Size: Land being a very important asset and factor of production within the rural households, the households with larger land size holdings have an improved opportunity of obtaining more yields and hypothesized to own a positive impact on the livelihood diversification. Those that have less land size in an opposite manner expected to be more liable to poverty (Datt and Jolliffe 1997; Hagos and Holden 2003; Fredu, 2008; Runsinarith 2011) shows that household own land size significantly and positively affects the household consumption expenditure.

Household Income: Family income represents the amount of income the family earns either daily or monthly. It is the amount of income (in Birr) generate from work and any activities. It was being expected that the availability of family income is positively related to livelihood status.

Livestock Holdings: Livestock are a very important asset for farming smallholders. Livestock holding significantly and positively affect the household poverty line (Hagos and Holden, 2003; Similer *et al,* 2004; Julie *et al*, 2008; Bogale and Genene, 2012). Livestock holding expected to own positively related to the households livelihood diversification. Thus, households those that have sizable amount of livestock units are hypothesized to own an improved livelihood status, and being less vulnerable.

Access to Irrigation: Households, who have access to irrigation, forced to capable to provide grain over once per annum, and being free from constraints of rainfall and people households with access to irrigated plots was have better consumption than those that don't. Access to irrigation significantly affects household welfare (Hagos and Holden, 2003; Engvall, 2006; Fredu, 2008). Likewise, a household with irrigation access expected to own better welfare and have a greater role in reducing risk within the scarcity of rainfall, hence vulnerability.

Access to extension services: Agricultural extension services are organized and delivered to farmers in different ways and comprise multidimensional services in targeting to extend farmer's potential to livelihood diversification. It includes provisions of recommendation on agricultural production techniques, opportunities, marketing, conservation, and family livelihood. Transfer new technologies to farmers; facilitate the event of local skills and organizations, improving agricultural productivity, profitability through increasing farmer's knowledge to adopt changes

and innovation. Bogale and Genene, 2012, the frequency of extension visits as a proxy significantly affects the household consumption expenditure.

Natural Shocks: Rural households frequently experienced with differing types of shock which can affect the household's income and productive assets inversely, which successively ends up in a discount in household consumption. Drought, flood, pests or diseases which will affect field crops, in-storage, livestock and weather-related shocks like hailstorm and flood that affects field crop, causes of land degradation, consequently, it lowers the household's income and exposed the households into unforeseen contingencies.

CHAPTER FOUR

4. RESULTS AND DISCUSSION

4.1. Socio-economic Characteristics of the Respondents

Survey data about demographic, socio-economic and livelihood concerns were collected from four kebeles of the district households by participation of four enumerators/data collectors under the guidance and supervision of the researcher. The survey data presentation and discussion are given in this chapter. At the beginning the descriptive analysis about demographic and socio-economic characteristics of the sample households; flood incidence, an alternative livelihood diversification level and its contribution on household income presented. Later the study examines the impact of flood on rural livelihood in the study area or on household wealth status analyzed in the subsequent sections.

Prior to data collection the overall sampled household's behavior and their existence could be clearly discussed by the help of kebeles leaders and extension agents at the time of sample selection. Considering community tradition, culture and behavior and to handle them properly using familiarity advantage enumerator was hired from respective kebeles. Then the pre-determined structured questionnaires were filled by interviewing or asking household heads or representatives at their home about their demographic, socio-economic and livelihood related information.

Table 4.1 Socioeconomic characteristics of the respondents

		Frequency	Valid Percent
Gender	Female	86	33.0
	Male	175	67.0
Age	18-30 years old	73	28.0
	31-40 years old	83	31.8
	41-50 years old	46	17.6
	Above 51 years old	59	22.6
Marital status	Married	200	76.6
	Not married	61	23.4
Poverty status	Poor	31	11.9
	Non poor	230	88.1

Note: poverty status measured on the annual expenditure size if the household spend less than 22,572 birr per household member consider poor (plan commission poverty index).

Based on 95 percent confidence level 261 households were selected 96.3 percent respondent's response the questionnaire. In this survey out of the total 261 households, the majority of the respondents were male (67 percent), while 33 percent were female.

Based on table 4.1 indicate that 76.6 percent of respondents are married and 23.4 percent were single or never married. This implies that engaging on farming are major impact to get married because fixed asset (land) had much more chance getting married.

The findings showed that 28 percent (73 respondents out of 261) of the respondents were aged "between"18-30 years, 31.8 percent (83 respondents out of 261) "between" 31-40 years, 17.6 percent (46 respondents out of 261) "between"41-50, and 22.6 percent (59 respondents out of 261) are above the age of 51 respectively. The mean age of the respondents was calculated to be 45 years and it implies that majority of the respondents were still in their economically active age.

An educated level of the respondents in table 4.1 distributed as follows; out of 261 total respondents, 28.7 percent (75 respondents) were literate and 71.3 percent respondents were

illiterate. This implies that almost quarter farmers are not able to read and write in the study area. Education is a key determinant of individual opportunities, attitudes and economic and social Status, Education becomes very important when it comes to children.

It was also observed that 27.6 percent of the respondents are having between 2-5 household members, 40 percent of the respondents had household sizes of 6-9 members and 9.2 percent respondents has ten and the rest households has more than 10 members, respectively. The average household size was 6.31 members. Almost 57.5 percent of the respondents had under 7 years' kids and 31.8 percent respondents have the elder who are the age of above 65 years old. This implies that household who are living in the study areas has large family members, also this lead to serious dependency ratio. The average of households' family size indicated 6.7, which relatively higher than the average family size 5.1 in the rural of Ethiopia (CSA, 2013).

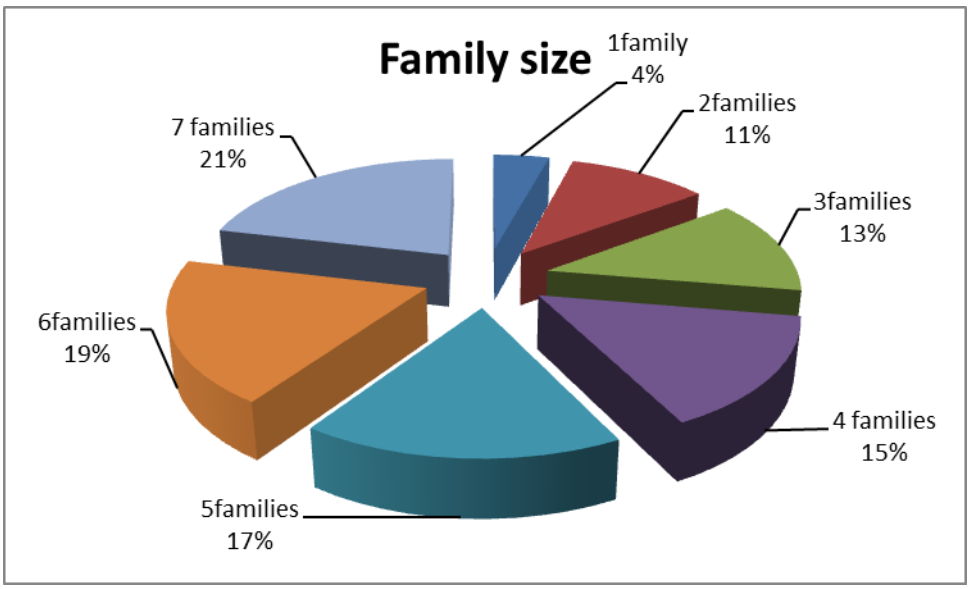

Figure 4.1 Descriptive summery for family size

Land distribution from among the sample households indicted; Land is also a natural capital and valuable asset for the rural poor for their livelihoods also summarized in the study. People need land for agriculture and as a base for their small-scale businesses and non-farm activities. Out of the 261 sampled respondents 94.4 percent have farming land in the study area. The summary statistics for farm land size revealed that an average farmland holding by the farmers of the study area is 51.2 percent have less than 3 hectares of land and 48.7 percent of the respondents have

more than 3 hectares of land. The farmland for agriculture therefore characterized by extremely small holding and fragmented.

Only 23.8 percent of the respondents have access to health center, the 36.8 percent of respondents have access to clean water on their village, 23.8 percent have access to electric power supply and 31.4 percent farmer households have access to irrigation for their farming activities. This all implies that living in the study area had big challenge for the households. Moreover, accessibility to required information when needed (mobile phone owners), access to radio, TV and extension officers is 62.1 percent, 22.7 percent and 15.2 percent, respectively. In view of that, more than 74 percent of them accessed and owning mobile phone.

4.2. Livelihood Diversification and Factors affecting the livelihood

The researcher try to investigate the type of crops which grown in the study area and total size of annual production in quintals. In the study area the major crop type of the respondents are Maze, Teff, Hababb and Onions. Total annual production per household were 56 percent of respondents produce less than 30 quintals different crops from their total farm land, 21.3 percent were produce 31-40 quintals and the rest 22.6 percent respondents produce above 40 quintals. To compare the minimum production size were 20 quintals for 24 respondents and 9.2 percent maximum production sizes were 60 quintals for 56 respondent and 21.5 percent. The average production sizes in the study area were 33.41 quintals (the national average of quintals per hectare productivity is 24 quintals).

The survey data revealed that there are different alternatives of livelihood strategies practiced by households in the study area. Even though farming/agriculture that consists of crop and livestock production or both are the mainly focus of the farmers', the nonfarm and off-farm activities have been found to support the life of many households. In this regard, the farm livelihood diversification seems the most appropriate means of income generating activities and an alternative poverty reduction by utilizing their own indigenous knowledge and with the access to resources they have.

The whole 261 sampled respondents have their own house in form of different building instruments which average estimated asset value 28,000 birr. For rural household who are totally engaged in agriculture livestock is almost 76 percent of the respondents have different types of domestic livestock (cattle, donkey, goat and sheep) for their livelihood. The total livestock

distribution was 33.8 households have less 6 different livestock, 49 percent households have between 7-10 different livestock and 17.2 percent households have more than 10 different livestock capitals.

However, livestock is an important household asset and primary means of income for most of the population in the survey area. But, livestock productivity is troubled by number of factors including shortage of grazing land and livestock diseases with poor animal husbandry practices.

Out of the total 261 respondents 84.7 percent households majorly depend on agriculture source of income the rest 15.3 percent lead there life on major income source from off farm activities just like day laborer on the urban center. The total annual income sizes in terms of money are 34.5 percent of the respondents earn less than 25,000 birr (under poverty line), 31 percent of the respondents earn between 26,000 - 40,000 birr, 17.6 percent of the respondents earn between 41,000 - 50,000 birr and 16.9 percent of the respondents earn more than 50,000 birr per year.

For the purpose of income diversification the rural households had interest to engage on nonfarm and off farm activities. The researcher try to investigate why the farmers starting nonfarm activities (72.7 percent of the respondents they decide to engage due to lack of additional farm land). Out of the total farmers who are not engage on nonfarm activities 62.3 percent had no information about the nonfarm business in the study area.

Lack of saving is the existing reality of the Ethiopian economy, out of the total 261 respondents 192 (75.1 percent respondents) were never save money on financial institution. The credit histories of the sampled households are 56.3 percent of the respondents had loan portfolio and the 100 percent source of loan was from Oromia saving and credit association.

The 64.6 percent of borrower household take the loan for the purpose of family consumption and 17 percent was taking for the purpose of purchase farm input. The total size of loan money was 44.9 percent borrow less than 10,000 birr and the rest 55.1 percent take more than 10,000 birr from the credit association. This implies that there is lack of well strategy to use loan money for production activity. The non-borrow family out of the 114 households set the reason why they don’t like to take money from the credit association because of fear of inability to repay and high interest rate.

Access to infrastructure is fundamental for livelihood then, the researcher try to examine the availability of market in the study area. Only 36.8 percent of respondents have access of near big market within the radius of 1 to 2 kilometer from their residence (63.2 percent of the household does no access the local market easily).

The access of transportation was similar only 36.8 percent of respondents had access to transport near to their village and 39.5 percent respondents have to walk above 3 kilometer to found vehicles.

For farmers agricultural extension service had key role on agriculture productivity but in the study area only 24.5 percent of the respondents getting the extension workers help, even 42.2 percent of households who got help just for once per year and the rest 57.8 percent find support at least twice per year. With regard to institutional support extension service is playing roes as local institutions, since the rural households participated in agricultural activities. Therefore, farmers' average contact to extension service is 1.5 times per years. Though the role of extension service is important this figure of contact level seems very low. This probably the except few model farmers the rest of them rarely contacted extension agents. According to the Woreda representative and Rural Development Office reports, agriculture is the emerging economic activity in the assessment area. Small scale irrigation is recently more practiced at household level in the area.

The other variables included to descriptive analyses are social capital and institutional support. Though the concept of social capital is wide and complex in the literatures, it could be identified in to different forms such as: the social networks, participation, the relationship of trust among households, communities, and some sort of resource exchange arrangements between households and communities.

Exceptional annual income item of households is selling farm output. The findings showed that 11.9 percent of total respondents were earning on average less than 25,000 Ethiopian Birr per year, this implies that participating on agriculture are not guarantee to out totally from poverty based on income measurement.

4.2.1. Sample Distribution by Livelihood Diversification Strategies

The survey data revealed that there are four alternatives of livelihood strategies practiced by households in the study area. Even though farming/agriculture that consists of crop and livestock production or both are the mainly focus of the farmers', the nonfarm and off-farm activities have been found to support the life of many households.

In this regard, the nonfarm livelihood diversification seems the most appropriate means of income generating activities and an alternative income generation by utilizing their own indigenous knowledge and with the access to resources they have. In aggregate, most of the study area farmers are engaged to diversification addition to farm/agriculture activities to improve their income and reduce poverty. Further the employment share composition of diversification strategies indicted that 43 percent were engaged to farm alone 36 percent diversify farm + nonfarm as a self-employment 9 percent participated to farm + off farm diversification while the other 12 percent engaged in all the three combination.

4.2.2. Livelihood Diversification and Its Contribution to Household's Income

As a result the farming/agriculture/ activities like crop, animal and forestry products alone plays a paramount role by contributing about 74.1 percent of the growth annual income share over whole income while the remaining 25.9 percent contributed from non-agricultural/off farm sources such that; 14.7 percent from nonfarm self-employment 8.5 percent from off-farm (wage employment) and about 2.7 percent received as remittance. This result is related with the study presented by (Loening *et al,* 2008) 25 percent (19 percent in Amhara region to 36 percent in SNNRP) in Ethiopia is derived from nonfarm sources. Adugna (2008) also stated off farm and non-farm incomes make an important contribution (23 percent) to household incomes.

When it judged based on the mean income generated from diversification strategies households who engaged into farm plus off farm earned higher mean income (42039.47 birr) where farm plus non-farm diversification is the second by mean (38918.24 birr) income. But, households who engaged to farming alone earned the lowest mean (28071.91 birr) income. The reason for the highest mean earner is attributed to wage employment particularly skilled monthly employee who have collected remunerative income included under off farm strategy even though they small in number. But, this does not mean that off activities offered higher contribution than farm or nonfarm in aggregate.

4.3. Floods Occurrence

Natural disaster is one of the main determinants to lose the capital and agricultural asset in rural areas. The researcher tries to identify the situation; only 60.3 percent of the respondents recognize there is natural disaster in their village during their entire life on the radius of 5 kilometer, but 21.5 percent of the respondents considering their was human violence during the last twelve months which are constrained their life in the area.

In the study area floods was occurred frequently each year 53 percent of the study area households was vulnerable to flood impact, 38 percent respondents was affected by different natural impacts and 9 percent respondents are affected by shortage of rain. Most of the respondents proved that the impact of floods in the study areas was highly determining their livelihood.

Out of the total 261 respondents, 176 households (67.4 percent) were mentioned that the impact of floods was severing (frequently occurred, stay at long and damage the whole farm land), 74 respondents, 74 households (28.4 percent) was mentioned that the impact of floods was medium level (usual occurred, stay at long and damage the most part of the farm land) and 11 households (4.2 percent) was mentioned that the impact of floods was minimal (rarely occurred and manageable). This all showed that the impact of flood was affecting most of the rural households each year.

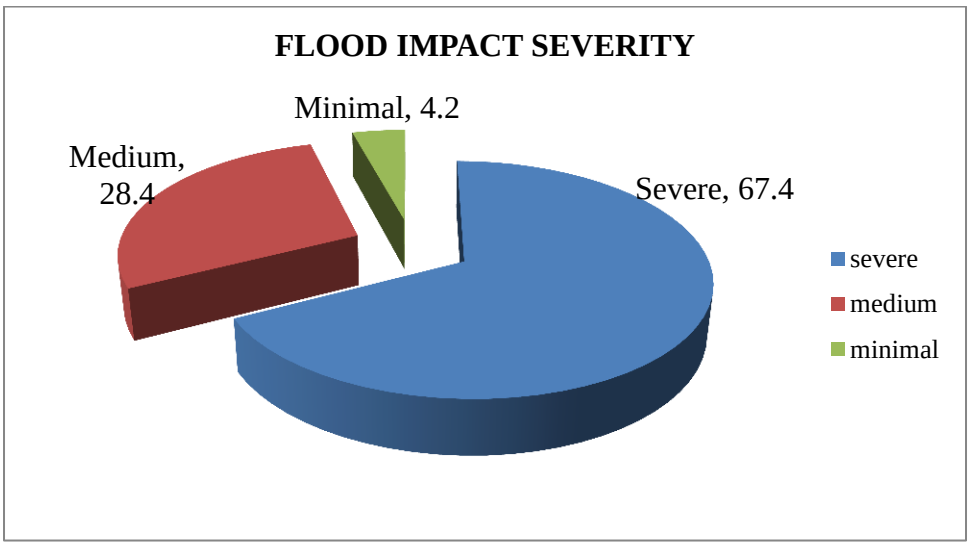

Figure 4.3 Descriptive summery for flood impact severity (Researcher's own calculation using survey data 2021)

4.4. Flood Avert Strategies Adopted By the Rural Households in the Study Area

The focused group discussion mentioned that most farmers produce vegetables like potatoes, tomato and varieties of onions using irrigation and supply for surrounding local markets. The farmers further mentioned the types of difficulties they face in marketing their agricultural products like lack of all-weather road, lack of means of transport and limited local market demand as some of the problems. The results clearly show that the flood impact, poor infrastructure and limited access to markets were found to reduce productivity of rural farmers in the study area.

The main river course diverts in to two parts, the society which lives in the area are migrated to neighboring kebeles and the small towns in case of flooding, the different kinds of crops were damaged or flooded the social services and infrastructures- such as road, dyke and electric power are not well developed in the assessment areas, there is no social services like school, health station and drinking water supply water quality problems efficient use of water resources and others, children have not chance to learn because there is no school these makes luck of development, luck sustainable life, the areas were flooded for the long time, luck of environment protection, human settlements socio-economic infrastructures, particularly absence of water supply is a critical problem in and around the area there is great shortage of grazing lands for their animals or livestock, awash river is separated into two different parts,

they are using irrigation farms by using water from the river by gravity, flooding is quite common in bora and liben chukala Woreda and villages are disconnected in to two by the flooding.

4.4.1. Logistic Regression Result

In this thesis, the IBM SPSS version 26 software was use to conduct logistic regression. Let us see what happened when we used all thirteen explanatory variables as predictors in our model. It was necessary to check for multicollinearity. The reason for this is, if multicollinearity turns out to be significant, the simultaneous presence of the two variables was attenuate or reinforces the individual effects of these variables. The problem of multicollinearity was checked by variance inflation factor VIF (variance-inflating factor) based on the test for each variable was 1.19 which is less than 10 then there is no multicollinearity problem (Gujarati, page 366).

Based on the "Case Processing Summary" output it is visible that 258 cases used out of 261 (98.9 percent cases included).

Table 4.2 Case-Processing Summary (*Model* output, 2021)

Case Processing Summary			
Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	258	98.9
	Missing Cases	3	1.1
	Total	261	100.0
Unselected Cases		0	.0
Total		261	100.0
a. If weight is in effect, see classification table for the total number of cases.			

The case processing summary simply tells us about how many cases are included in our analysis. The dependent variable encoding reminds us how our outcome variable is encoded '0' for 'poor' and '1' for 'non poor'. The category is assigned the value zero is called the reference category. When interpreting the results all comparison made with references to this category.

Table 4.3 Classification Table (block model)

Classification Table[a,b]					
	Observed		Predicted		
			Wealth status		Percentage Correct
			Poor	Non poor	
Step 0	Wealth status	Poor	31	0	100.0
		Non poor	230	0	.0
	Overall Percentage				56.9
a. Constant is included in the model.					
b. The cut value is .500					

According to table 4.3 the model is accurate 56.9 percent of the time, the reason we can be so confident that our baseline model has some predictive power.

Omnibus Tests of Model Coefficients

The omnibus test of model coefficients indicates whether the inclusion of this block of variables contributes significantly to model fit. A p-value (sig) of less than 0.05 for block means that the block 1 model is a significant improvement to the block 0 model.

Here the chi-square is highly significant (*chi-square=176.026, df=27, p<.001*) so our new model is significantly better. The *Sig.* values are $p < .001$, which indicates the accuracy of the model improves when we add our explanatory variables.

Table 4.4 Omnibus Tests of Model Coefficient (Model output, 2021)

Omnibus Tests of Model Coefficients				
		Chi-square	df	Sig.
Step 1	Step	176.026	27	.000
	Block	176.026	27	.000
	Model	176.026	27	.000

Model summary

Model summary has values shown in table 4.5 indicate how good the model fits the data.

Table 4.5 Model Summary (Model output, 2021)

Model Summary			
Step	-2 Log likelihood	Cox and Snell R Square	Nagelkerke R Square
1	191.781[a]	.480	.644
a. Estimation terminated at iteration number 20 because parameter estimates changed by less than .001.			

In this summary -2 Log likelihood (goodness of fit test) is 191.781. By itself, this number (is not very informative) this statistic measures how poorly the model predicts the decisions (Karl L.Wuensch, 2014). The p-value for our overall model is less than 0.05, which means that null hypothesis rejected and there is evidence that at least one of the explanatory variables contributes to the prediction of the outcome.

Cox and Snell R square and Nagelkerke R^2 are both methods of calculating the explained variation. The Cox and Snell R^2 can be interpreted like R^2 in a multiple regression but cannot reach a maximum value of 1. The Nagelkerke R^2 can reaches a maximum of 1 (Karl L.Wuensch, 2014). For our model, the explained variation ranges from 0.480 to 0.644 depending on whether we reference Cox and Snell R square or Nagelkerke R^2, respectively. Nagelkerke R square is the modification of Cox and Snell R square and is more preferable to use. From the table 4.5 we can conclude that between 48 percent and 64.4 percent of the variation in poverty status the model can explain situation. In our case, it is 0.644 indicating moderately strong relationship of 64.4 percent between the predictors and the prediction.

Table 4.6 Classification Table (Model output, 2021)

Classification Table[a]					
	Observed		Predicted		
			Wealth status		Percentage Correct
			Poor	Non poor	
Step 1	Wealth status	Poor	31	19	87.6
		Non poor	230	197	77.6
	Overall Percentage				83.3
a. The cut value is .500					

The classification table tells us how good the fitted model is for prediction purposes. Based on SPSS output result 261 households included in the analysis, 83.3 percent of them (or 19+197=216) classified correctly based on their youth's characteristics.

This table is equivalent to that in Block 0 but is now based on the model which includes our explanatory variables. As you can see, our model is now correctly classifying the outcome for 83.3 percent of the cases compared to 64.4 percent in the null model.

Hosmer and Lemeshow Test

The Hosmer-Lemeshow test shown in following table explores whether the predicted probabilities are the same as the observed probabilities. An overall goodness of fit of the model indicated by p-values > 0.05 (Hosmer and Lemeshow, 2000). This model produced a significant difference between the observed and predicted probabilities indicating a poor model fit.

Table 4.7 Hosmer and Lemeshow Test (Model output, 2021)

Hosmer and Lemeshow Test			
Step	Chi-square	df	Sig.
1	1.516	8	.992

The null hypothesis showed that the model fits the data well. Table 4.7 the Chi-square test statistic is insignificant p-value 0.992 (as the p-value exceeds 5 percent). Thus, conclude that the model fits the data well.

Based on table 4.8 all thirteen variables distributions were fair because the total difference between observed and expected variables.

Table 4.8 Contingency Table for Hosmer and Lemeshow Test (Model output, 2021)

Contingency Table for Hosmer and Lemeshow Test						
		Wealth status = poor		Wealth status = non-poor		
		Observed	Expected	Observed	Expected	Total
Step 1	1	27	26.820	0	.180	27
	2	26	25.900	1	1.100	27
	3	25	24.638	2	2.362	27
	4	20	22.483	7	4.517	27
	5	21	20.065	6	6.935	27
	6	15	15.733	12	11.267	27
	7	12	10.834	15	16.166	27
	8	11	5.145	21	21.855	27
	9	9	4.676	26	25.824	27
	10	7	4.206	26	25.794	26
	11	6	2.145	21	21.855	27
	12	1	1.176	26	25.824	27
	13	0	.206	26	25.794	26

4.4.2. Discussion

Table 4.9 provides the regression coefficient (B), the Wald statistic (to test the statistical significance) and the all-important Odds Ratio (Exp (B)) for each variable category. If the odds ratio Exp (B) is less than one (i.e.,the estimated regression coefficient is negative), then this means that the odds (or the likelihood) of being poor is higher for the reference category. If Exp (B) is greater than one, then the odds are higher for a particular category as compared to the reference category.

Table 4.9 Variables in the Equation (Model output, 2021)

Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	age			8.241	2	0.706	
	age(1)	0.374	0.991	0.143	1	0.706	1.454
	age(2)	0.059	0.925	0.004	1	0.949	1.061
	gender(1)	0.095	0.945	0.01	1	0.92	1.1
	Education level(1)	-1.102	0.632	3.044	1	0.081*	0.332
	Marital status(1)	-0.223	0.614	0.132	1	0.716	0.8
	Family size(1)	-0.331	0.611	0.293	1	0.588	0.718
	Land size	-1.168	0.532	4.825	1	0.032**	0.311
	Livestock amount	-2.065	0.605	11.653	1	0.087*	0.127
	Access to market(1)	-3.318	0.678	23.973	1	0.001***	0.036
	Access to road(1)	-4.182	0.712	34.515	1	0.001***	0.015
	Access to electric(1)	-.689	.397	3.009	1	0.228	.502
	Access to irrigation(1)	-6.563	1.263	26.984	1	0.000***	0.001
	Extension workers	-4.117	1.219	11.414	1	0.000***	0.016
	Floods vulnerability (1)	20.133	8.047	.000	1	0.099*	0.454

	Constant	-22.676	188.041	.000	1	.999	.000
a. Variable(s) entered on step 1: age, gender, education level, marital status, family size, land size, livestock amount, access to market, access to road, access to electric, access to irrigation, extension workers, and Floods vulnerability.							

Note: *** Significant at 1%, ** Significant at 5%, * Significant at 10%

4.5. Effects of Flood on the Household Annual Income

The household total land size is significant at the 5 percent level of significance (p-value 0.032). The odds ratio for land size is 0.311 since the coding land size (1) refers to the household has more than 3 hectares. The reference category land size (2) refers to the household who has less than 3 hectare. Thus, the odds ratio of being non poor are 68.9 percent (0.689= 1-0.311) higher for the household how had greater than 3 hectare of land compared to the household who had less than 3 hectare of land, keeping all other covariates constants. This implies that land is the major sources of total production size in the Bora Woreda unless the productivity size supported by efficiencies and technology, then based on fixed nature of farming land the responsible bodies must be help the farmers to build enough productivity on small parcel of land in the Awash valley boarders.

The household educational status is significant at the 10 percent level of significance (p-value 0.081). The odds ratio for land size is 0.332 since the coding land size (1) refers to the household head are literate. The reference category education status (2) refers to the household who are illiterate. Thus, the odds ratio of being non poor are 66.8 percent (0.668= 1-0.332) higher for the household head who are literate compared to the household who are illiterate, keeping all other covariates constants. This implies that education is the basic step for the household decision making on livelihood diversification strategy.

The household livestock size is significant at the 10 percent level of significance (p-value 0.087). The odds ratio for livestock size is 0.127 since the coding land size (1) refers to the household has livestock.The reference category livestock size (2) refers to the household who has no livestock. Thus, the odds ratio of being non poor are 87.3 percent (0.873= 1-0.127) higher for the

household how had livestock compared to the household who had no livestock, keeping all other covariates constants. This implies that livestock are the means of additional income both on selling themselves and use their output such kind of milk, eggs, better, then based on livelihood income diversification strategy the responsible bodies must be help the farmers to raring animals through flood conservation works.

The access to market for the household is significant at the 1 percent level of significance (p-value 0.001). The odd ratio for access to market (1) is 0.036 since the coding access to market (1) refers to the households has access to market near to village. The reference category access to market (2) refers to the household who had no access to market. Thus, the odds of being non poor are 96.4 percent (0.964=1-0.036) higher for the household who had access to market compared to the household who had no access to market, keeping all other covariates constant. This implies that market access is fundamental for improving rural household's livelihood status in the study area.

The access to road for the household is significant at the 1 percent level of significance (p-value 0.001).The odd ratio for access to road (1) is 0.015 since the coding access to road (1) refers to the households has access to road near to village. The reference category access to road (2) refers to the household who had no access to road. Thus, the odds of being non poor are 98.5 percent (0.985=1-0.015) higher for the household who had access to road compared to the household who had no access to road, keeping all other covariates constant. This implies that road infrastructure access is fundamental for improving rural household's livelihood status in the study area.

The access to irrigation for the household is significant at the 1 percent level of significance (p-value 0.000). The odd ratio for access to irrigation (1) is 0.001 since the coding access to irrigation (1) refers to the households has access to irrigation near to farmland. The reference category access to irrigation (2) refers to the household who had no access to irrigation. Thus, the odds of being non poor are 99.9 percent (0.999=1-0.001) higher for the household who had access to irrigation compared to the household who had no access to irrigation, keeping all other covariates constant. This implies that for the households who are living in the biggest valley areas are essential for improving rural household's livelihood status in terms of variety on all-weather productivity.

The access to agricultural extension workers support for the household is significant at the 1 percent level of significance (p-value 0.000). The odd ratio for access to agriculture extension workers support (1) is 0.016 since the coding access to agriculture extension workers support (1) refers to the households has access to agriculture extension workers support. The reference category access to agriculture extension workers support (2) refers to the household who had no access to agriculture extension workers support. Thus, the odds of being non poor are 98.4 percent (1=1-0.016) higher for the household who had access to agriculture extension workers support compared to the household who had no access to agriculture extension workers support, keeping all other covariates constant. This implies that basically for farmers who are intensively living there lives in agricultural activities agricultural extension workers support and technical support was fundamental for improving rural household's livelihood status in the study area.

The household vulnerability of flood impact on the rural household is significant at the 10 percent level of significance (p-value 0.099). The odd ratio household vulnerability to flood impact (1) is 0.454 since the coding vulnerability of flood impact (1) refers to the households has vulnerability to flood impact. The reference category household vulnerability to flood impact (2) refers to the household who had no vulnerability to flood impact. Thus, the odds of being non poor are 54.6 percent (1=1-0.454) higher for the household who had no vulnerability to flood impact compared to the household who had vulnerability to flood impact, keeping all other covariates constant. This implies that basically for farmers who are close to the valley and vulnerable to floods are victim to lose of production and fixed assets and overall the rural household's livelihood status in the study area.

However, there is no significant evidence as whether the age, gender, marital status and access to electric power affect the household wealth status. This study recommends a careful review on the reforms to be taken in relation to flood impact and livelihood situation in general Awash valley areas.

4.6. Factors Affecting the Flood Avert Strategies

The local and regional government flood adverse strategy was not deeply discussed with the local community and proper stakeholders such as NGOs, the main averse strategy was launched based on temporary flood tackled issues, the lack of awareness creation for the local community make the community less concerned on the long term consequences of the river flood, mega

flood aversion copied strategy needs huge finance and technology but in the local administration the aversion capital shortage was the problem.

Local governments closely with surge inclined communities facilitate mindfulness creation and informing of the dangers of flooding and take suitable crisis surge reactions and measures counting migrating chance populace to higher grounds. Exercises incorporate dispersal of surge alarm messages and ceaseless checking upgrades; and coordination of surge crisis reaction at times of flooding.

CHAPTER FIVE

5. CONCLUSION AND RECOMMENDATION

5.1. Conclusion

In this thesis, the real data collected from 261 rural households. Descriptive statistic such as frequency distribution and percentage were used to analysis demographic and socio economic data as they relate to the household flood impact and livelihood analysis. The study conducted binary logistic regression in SPSS software version 26, which calculated the predicted probability of the event.

Floods have contrary impact on the livelihoods of Bora Woreda community for a long period of time. Flooding is quite common and a serious socio-economic problem in the upper Awash River Basin. As a result, Awash Basin Authority is responsible in a flood protection and control feasibility on Awash River in the flood prone area. Concerning on the, the livelihood of the community in the assessment area is based on livestock production and farming.

According to the Woreda representative and Rural Development Office reports, agriculture is the emerging economic activity in the study area. Small scale irrigation is recently more practiced at household level in the area. However, livestock is an important household asset and primary means of income for most of the population in the survey area. But, livestock productivity is troubled by number of factors including shortage of grazing land and livestock diseases with poor animal husbandry practices.

The research found that the variable household total land size, the household livestock size, the household access to market, the household access to road, the household access to irrigation, the household access to agriculture extension workers support and the household vulnerability of flood impact on the rural household is significant impact on rural household livelihood, keeping all other covariates constant. However, there is no significant evidence as whether the age, gender, marital status and access to electric power affect the household wealth status.

5.2. Recommendation

In the short term it is better improving livelihood assets/resources and removing barrier factors that hindered the growth of agriculture productivity. Therefore, working on farmers' education should important. Because, if an individual's is able to read and write they have a higher chance

of choosing appropriate strategies in order to advance their livelihoods and flood protection. Hence the important role of education in diversification require due attention in promoting farmers' education through strengthening and establishing formal and informal education, FTC, expanding adequate technical and vocational schools. Further, mobilizing farmers about the productivity particularly for those who are living in the nearest to the river.

In the long term an expansion and improving infrastructure (rural road, clear water projects, and rural electrification) facilities and financial support also need attention of the government and other concerned bodies like: NGOs, private, and public participation to facilitate diverse livelihood and to mitigate floods impact. Because, household who nearest to these facilities have easily accessed to other linked services like; transport service, health service, and they take their products easily to market and they save their valuable time. Access to these facilities also means access to non/off farm activities and skills that can be benefited rural household.

In the short term flooding specially in the Awash River basin is the main problems and has significant impacts on human lives, irrigation, socio-economic and environmental aspects. Immediate impacts of flooding include loss of human life, damage to property, destruction of crops, loss of livestock, non-functioning of infrastructure facilities and deterioration of health condition due to waterborne diseases. Also need attention of the government and other concerned bodies like: NGOs, private, and public participation to facilitate diverse livelihood and to mitigate floods impact.

In the short term flash floods, with little warning time, cause more deaths than slow-rising riverine floods. The communities and officials in Bora Woreda need to be construction of dyke is possible. The communities expressed that the existing natural course of the river is very narrow but it will be rehabilitated. Majority of the population in the area have develops experience in modern irrigation system. If the construction of dyke will be considered the availability of water supply, grazing land, irrigation farms will be facilitated in selected areas. If it will be construction of dyke according to the community there is no negative impacts in the area, sustainable life will be develop in the area.

In the long term the livelihood of the community is based on livestock production, farming, large and small scale irrigation will be develop, However, there are potential of irrigated land together in the area. In line with this, enhancing the communities' knowledge on improving livestock

production, farming, irrigation and the whole social services has to be given emphasis. Awash basin authority, regional government, zonal, Woreda and local community all stakeholders will be responsible.

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Appendixes

Questionnaires

Household survey questionnaires to be fill by sample household heads

The aim of this questionnaire is to collect data about "The Impact of Flood on Rural Household Livelihood in the study area, Bora Woreda, Oromia regional state,Ethiopia."

The information you provide is pertinent for successfully accomplishing the research. For this sake, I really confirm you that all the data will used for academic purpose and will analyzed anonymously and because of your provision, you will never exposed to any harm.

Your responses will be kept confidential and have a great deal of importance increasing the accuracy and reliability of the study to draw policy recommendations.

Thanks a lot!

NB. Circle the relevant option and fill the specific information

I really thanking and appreciating your kind cooperation in advance and I need to say thank you!

Enumerator's name: _____

Kebele code no: _____

Interview date: _____

Questionnaire code: _____

Enedegena Fiseha

Section I: Background Information

1. Age 1= 18-30 year 2= 31-40year 3 = 41- 50year 4 = > 51year

2. Sex 0 = Female 1= Male

3. Marital status 0 = Single 1 = Married

4. Educational level? 0 = Illiterate 1 = Primary education (1 – 8 grade)2 = Secondary education (9 – 12 grade)3 = Diploma

4 = Tertiary education (Degree and above)

5. Total family size by age group and sex.

Age group of family	Male	Female	Total
< 7 years old			
8-14 years old			
15-35 years old			
36-65 years old			
>65 years old			

Section II. Questions related to household resource and livelihood strategies

Household fixed assets

6. Did you have land? 0 = Yes 1= No

If yes, what is the total land do you have? (In hectare) _____

And, Annual production in quintals _____

7. What type and how many of house/s do you have?

Type of house/s	Unit	Quantity	Value in birr
Made in metal sheet/ iron	Number		
Made in Grass	Number		
House from town	Number		
Others	Number		

8. Do you have/own livestock? 0 = Yes 1= No

If yes, how many of the following livestock do you have?

Types of Livestock	Unit	Quantity	Value in birr
Oxen	Number		
Cows	Number		
Sheep	Number		
Goats	Number		
Horses	Number		
Donkeys	Number		
Chicken	Number		
Other	Number		
Total	Number		

9. Which of the source of income is/are the base for your household livelihood? Tick/ choose any (one, two or more of them)

Farm	Non-farm	Remittance	Others (rent of land, dividend, pension etc

10. If farm is source of your livelihood ‘’Tick’’ each activities from the following list that your household participated in? In addition, estimate corresponding annual/yearly income in Birr for each source o of income for one year of December 2013– December 2014E.C.

Source of rural livelihood	Mark the source	Approximately Annual income in Birr per sources
Farm/Agricultural activities		
Crop production		
Livestock production (raring)		
Fatting (Cattle or/and goat)		
Poultry production		
Vegetables and fruit		
Others		

11. Does your household participate in other sources of livelihood developing (a wide income earning) activities to cover all types of insufficiency and shocks? 0 = Yes 1= No

12. If non-agriculture are the sources of your livelihood, in which of the following your household engaged. Estimate corresponding annual income for each.

Source of livelihood	Mark the source	Approximately Annual income in Birr per sources
Commercial activities / trade		
Trade of agricultural products (grain, vegetables, fruits, etc)		
Trade of live animal		
Trade of unprocessed forest products		
Animal rent (Horse)		

Other retailer		
Manufacturing		
Food preparing and sale		
Sale beverage /drinks/brews (tella, areke, tej,), tea etc		
Metal and wood works		
Sand and Stone quarry		
Local handicraft (Pottery, carpenter, etc.)		
Producing and selling local textile product		
Leather and leather product		
Service provision		
Providing transport services (by horse cart, motorcycle etc)		
Shuruba sira (traditional hair dresser)		
Local tour guide		
Any other service		
Off- Farm activities		
Daily wage labour in local area on agricultural activities/farm labor/work for others in payment,		
Daily wage labour in local area on non-agricultural activities work for others in payment		
Wage labour in other area/ seasonal base migration to work in other areas at least up to 3 months		
Formal employment (in monthly salary)		
Sell of firewood, grass		
Income from Remittance		

From urban of Ethiopia		
From other countries		
Unearned income source		
Rent of land		
Pensions		
Support and gift (direct support)		
Property Rents income (house, animal rent)		
Write if any		
Total		

13. What was your most important motive for starting nonfarm or off farm activities?

    1= Small size of land holding

    2= Support from cooperatives

    3= No access to agricultural land

    4= Obtain income to support agricultural work

    5= Market opportunity

    6= Advice from relatives/friends

    7= for agricultural input

    Other, specify_____

14. If you did not engage in or your engagement is limited in, nonagricultural activities listed above what is the reason for no engagement?

    1= No need for non-farm activities

    2= Lack of knowledge

    3= No experience on no farm (tourisms sector)

    4= Shortage of labor for household duties

5= Unattractive income

Specify if any_____

15. Do you have save money from any financial institutions including: banks, micro finance institutions, equb and saving groups? 0 = Yes 1= No

If your answer is yes, how many saving amount in birr do you have? _____

16. Currently, how much is your annual household gross income approximately or in which of the following total annual income group you assign yourself?

Income level		Income level	
< 5000		30000-35000	
5000-10000		35000-40000	
10000-15000		40000-45000	
15000-20000		45000-50000	
20000-25000		50000-55000	
25000-30000		>55000	

Part III. Detail information related to accessibility to other livelihood assets/resource

17. Did you borrow money/ got credit during the past three years? 1= Yes2= No

If no, why?

1= No access to credit

2= Fear of inability to repay

3= High interest rate

4= No need of credit

5= Lack of collateral

Others (specify) _____

18. If your answer is yes how many amount of credit/loan you get per year beginning from 2012.

    2012 E.C _____Birr. 2013E.C _____birr 2014E.C _____birr

19. From which source(s) did you borrow?

    1= Oromia credit and Saving Association

    2= Banks

    3= Service cooperative

    4= Relatives and friends

    5= Local money lender

    Other (specify) _____

20. What was the purpose of your past loan? To run petty trading and off farm activities

    1= To cover school expenses

    2= Purchase of farm inputs

    3= For family consumption

    4= To rent-farm land

    5= To construct/maintain house

    6= To flood impact aversion

    Others (specify) _____

21. Do you have an access for market in your village? 0= Yes1= No

22. How long is from your residence to the nearest big market? _____hours

23. Do you have access to town? 0= Yes1= No

    If yes, how far is your residence from the nearest town? _____Km

24. Can you get transportation access throughout the year? 0= Yes1= No

    If yes, how far is you get the transport service from your residence? _____Km

25. Do you have your own mobile phone? 0 = Yes 1= No

If no, what is your means of information?

1= Radio

2= TV

3= Extension workers

4= From friends

If others, specify_____

26. Do you have access for modern electricity services? 0= Yes1= No

27. Do you have access to water supply? 0= Yes1= No

28. Did you receive any institutional support like; extension service and any training in the past three years? 0= Yes1= No

29. What is the flood severity in the study area?

1= severe

2= medium

3= minimal

4= neutral

If others, specify_____

30. What is the frequency of flood per year in the study area?

31. Is there any possible action took by stakeholders to avert the flood impact?

32. What is the local or household level strategy taken to mitigate the flood impact?

Focus group discussion questions

1. How long the floods impacts exist in the study areas?
2. What will be your life/livelihood if the river had no flood impacts?
3. What will be the coming rural household livelihood if the impact of flood will be terminated?

ውድ የጥናቱ ተሳታፊዎች

ይህ ዳሰሳ ጥናት መጠይቅ በኦሮሚያ ክልል ባህርቦራ ወረዳ አዋሽ ወንዝ ዳር ዙርያ ውስጥ በሚኖሩ ገበሬዎች ዙሪያ የተዘጋጀበት ዓላማ ምን ያህል ገበሬዎች በጎርፍ አደጋ ምክንያት ችግር እንደሚገጥማቸው ማረጋገጥ የሚለውን ለማወቅና ችግሮችን ቀርፎ የተሻለ ሥራ ለመስራት እንዲያስችል ነው፡፡ ለዚህም ይረዳን ዘንድ ይህን መጠይቅ አዘጋጅተናል፡፡ ስለሆነም ለዳሰሳ ጥናቱ ውጤት ማማርና መፍትሄ ማምጣት እርስዎ የሚሰጡት መረጃ ትልቅ አስተዋጽኦ ስላለው እባክዎ በኃላፊነትና በጥንቃቄ ይሙሉ፡፡

በመጨረሻም ሁሉንም ጥያቄዎች በመሙላት እንዲሳተፉ ትብብርዎን እየጠየቅን የሚሰጡንን ማንኛውንም መረጃ ሆነ አስተያየት ሚስጥራዊነቱን በመጠበቅ ለዳሰሳ ጥናት አገልግሎት ብቻ የሚውል ይሆናል፡፡

ማሳሰቢያ፡- ከዚህ በታች ለተዘረዘሩት የተለያዩ ጥያቄዎች በተቀመጠላቸው መስፈርት መሠረት ለእያንዳንዱ ጥያቄ ማግኘት የሚገባውን የ‘‘ክብ’’ ምልክት በማድረግ የተለመደ ትብብርዎን እንዲሰጡን እንጠይቃለን፡፡

የመጠይቅ ቁጥር _____

የመረጃው ሰብሳቢ ስም _____ ፊርማ _____

መረጃው በትክክል መሞላቱን ያረጋገጠው ኃላፊ ስም _____ ፊርማ _____

ለፍቃደኝነትዎ በቅድሚያ እናመሰግናለን!

ክፍል አንድ: አጠቃላይ መረጃ

1. ጾታ 1 = ሴት 2 = ወንድ
2. እድሜ

   1 = 18 - 30 ዓመት 2 = 31- 40 ዓመት 3 = 41-50 ዓመት

   4 = ከ51 ዓመት በላይ

3. የጋብቻ ሁኔታ 1 = ያገባ 2 = ያላገባ
4. ማንበብና መጻፍት ችላለህ/ሽ/? 1 = አዎ 2 = አልችልም

   መልስዎ አዎ ከሆነ የትምህርት ደረጃ፡

1 = ከ1 – 8 ክፍል 2 = ከ9 - 12 ክፍል 3 = ዲፕሎማ 4 = ዲግሪ 5 = ከዲግሪ በላይ

5. አጠቃላይ የቤተሰብ ብዛት (በጾታ እና በእድሜ ተከፍሎ)

የቤተሰቡ አባል እድሜ	ሴት	ወንድ	ድምር
< 7 ዓመት			
8 -14 ዓመት			
13 - 35 ዓመት			
36 - 65 ዓመት			
ከ 65 ዓመት በላይ			

ክፍል ሁለት፡ አባወራው/እማወራዋ ያለው/ያላት ጥሬ እቃ፣ ገንዘብ ወዘተ እና ቋሚ እቃዎች

6. የእርሻ መሬት አለዎት? 1 = አዎ 2 = የለኝም
7. ለጥያቄ ቁጥር 6 መልሶ አዎ ከሆነ ምን ያህል የእርሻ መሬት አለዎት (በሄክታር) _____
8. ለጥያቄ ቁጥር 6 መልሶ አዎ ከሆነ ምን ምን ዓይነት ሰብል ያመርታሉ

   1. ጤፍ
   2. ስንዴ
   3. ማሽላ
   4. ሌላ ከሆነ እባክዎ ይጥቀሱ _____

9. በአመት የሚያመርቱት ምርት ምን ያህል ነው? (በኩንታል) _____

10. ምን ዓይነትና ምን ያህል የመኖርያ ቤት አለዎት?

የመኖርያ ቤት ዓይነት	መለኪያ	ብዛት	የሚያወጣው ዋጋ በብር
ከብረት የተሰራ	ቁጥር		
የሳር ቤት	ቁጥር		
የከተማ ቤት	ቁጥር		
ሌላ	ቁጥር		

11. ከብቶቸች/የቤት እንስሳት አለዎት? 1 = አለኝ 2 = የለኝም

12. ለጥያቄ ቁጥር 11 መልሶ አዎ ከሆነ ምን ምን ዓይነት የቤት እንስሳ (ከብቶች) አለዎት

የእንስሳት/ከብቶች አይነት	መለኪያ	ብዛት	የሚያወጣው ዋጋ በብር
በሬ	ቁጥር		
ላም	ቁጥር		
ፍየል	ቁጥር		
በግ	ቁጥር		
ፈረስ	ቁጥር		
አህያ	ቁጥር		
ዶሮ	ቁጥር		
ሌላ	ቁጥር		
ድምር	ቁጥር		

13. ለጥያቄ ቁጥር 13 መልሶ ግብርና ከሆነ ምን ምን የግብርና ስራ እንደሚሰሩ እባክዎ ይጥቀሱ

የገቢ ምንጭ	ዓመታዊ የገቢ ምንጭ በብር

የግብርና ስራዎች	
የሰብል ምርት	
እንስሳት በማሳደግ	
ማደለብ	
ማር በማምረት	
ዶሮ እርባታ	
ከአትክልት እና ፍራፍሬ ምርት	
ደን እንክብካቤ	
ሌላ	

14.ለጥያቄ ቁጥር 13 መልሶ ከግብርና ውጭ ከሆነ ምን ዓይነት ሥራ እንደሚሰሩ እባክዎ ይጥቀሱ

የገቢ ምንጭ	ዓመታዊ የገቢ ምንጭ በብር
የንግድ ስራ	
ግብርና ምርት ንግድ	
የከብቶች ንግድ	
የቸርቻሮ ንግድ	
አምራችነት	
ምግብ ማምረትና መሸጥ	
የአልኮል ምርት ሽያጭ	
የእንጨትና ብረታብረት ስራ	
አሸዋና ድንጋይ ካብ ስራ	
የእጅ ሥራዎች (አናጺ)	
የጨርቃ ጨርቅ ምርትና ሽያጭ	
የቆዳና ቆዳ ምርት	

አገልግሎት ሰጭነት	
የትራንስፖርት አገልግሎት	
የሹፋባ ስራ	
የአስንብኝ ሥራ	
ማንኛዉም ዓይነት አገልግሎት	
አፍ-ፋርም ስራ	
የቀን ስራ በግብርና ስራ ላይ	
የቀን ስራ	
መደበኛ ስራ (በወርሃዊ ክፍያ)	
የከሰልና የእንጨት ሽያጭ	
ክፍያ/ስጦታ ገቢ	
ከኢትዮጵያ ከተሞች	
ከውጭ ሀገር	
ሌላ የገቢ ምንጭ	
ከመሬትኪራይ	
ጡረታ	
ቀጥተኛድጋፍናስጦታ	
የንብረት ኪራይ (የቤት፣ የእንስሳት ወዘተ)	
ሌላ ካለ ይጥቀሱ	
ድምር	

15. ከግብርና ሥራ ውጭ እንዲሰሩ ያነሳሳዎት ምንድን ነው?

1. የእርሻ መሬት ማነስ

2. የህብረት ድርጅቶች ድጋፍ
3. የእርሻ መሬት ተደራሽነት ማጣት
4. የግብርና ስራን ለመደገፍ
5. የገበያ ምቹነት
6. በጓደኛዬ ምክር
7. ለግብርና ምርት ግብዓት
8. ሌላ ካለ ይጥቀሱ _____

16. ይቆጥባሉ 1 = እቆጥባለሁ 2 = አልቆጥብም

መልስዎ አዎ እቆጥባለሁ ከሆነ

17. በወር ውስጥ ስንት ይቆጥባሉ?

1 = 500 - 1000 ብር

2 = 1000 – 2000 ብር

3 = 2000 ብር በላይ

18. አመታዊ ገቢዎ ስንት ነው?

የገቢ መጠን		የገቢ መጠን	
ከ 5000 በታች		30000 - 35000	
5000 - 10000		35000 - 40000	
10000 - 15000		40000 - 45000	
15000 - 20000		45000 - 50000	
20000 - 25000		50000 - 55000	
25000 - 30000		ከ55000 በላይ	

ክፍል ሶስት፡ ስለአባወራው/እማወራዋ ገንዘብና ንብረት ተደራሽነት

19. ላለፉት 3 ዓመታት ገንዘብ ተበድረዋል/የብድር አገልግሎት አግኝተዋል?

1 = አዎ 2 = አላገኘውም

20. ለጥያቄ ቁጥር 22 መልስዎ አላገኘውም ከሆነ ለምን?

1. የብድር ተደራሽነት ስለሌለ
2. መልሼ መክፈል ስለማልችል
3. ብድር ስለማልፈልግ
4. ዋስትና ስለሌለኝ
5. ሌላ _____

21. ለጥያቄ ቁጥር 22 መልስዎ አዎ ከሆነ በምን ያህል መጠን ብድር አግኝተዋል

1. 2012 _____ ብር
2. 2013 _____ ብር
3. 2014 _____ ብር

22. ብድር ያገኙበት ዘዴ

1. ከኦሮሚያ ብድርና ቁጠባ ድርጅት
2. ከባንክ
3. ከአገልግሎት ሰጭ ድርጅቶች
4. ከዘመድ/ከጓደኛ
5. ከአከባቢ አበዳሪዎች
6. ሌላ _____

23. ብድሩን የተበደሩበት ምክንያት

    1. የትምህርት ቤት ወጪ ለመሸፈን
    2. የእርሻ ግብዐት ለመግዛት
    3. የቤተሰብ ፍጆታ
    4. የጎርፍ አደጋን ለመከላከል
    5. ቤት ለመስራት/ለማደስ/
    6. ሌላ _____

24. በአካባቢዎ ገበያ ምን ያህል ይርቃል? (በሰዓት) _____

25. በአቅራቢያዎ ካለው ከተማ በምን ያህል ይርቃሉ? (በኪ.ሜ) _____

26. የትራንስፖርት አገልግሎት ካሉበት ቦታ በምን ያህል ርቀት ያገኛሉ? (በኪ.ሜ) _____

27. ተንቀሳቃሽ ስልክ (ሞባይል) አለዎት?

1. አዎ
2. የለኝም

28. ለጥያቄ ቁጥር 33 መልስዎ የለኝም ከሆነ መረጃ ለማግኘት የሚጠቀሙት ዘዴ

1. ሬድዮ

2. ቴሌቭዥን
3. ከኤክስቴንሽን ሠራተኞች
4. ከጓደኛ
5. ሌላ _____

29. ዘመናዊ የኤሌትሪክ አገልግሎት ያገኛሉ?
    1. አዎ
    2. አላገኝም
30. በአካባቢዎ የጤና ተቋም ካለ ምን ያህል ይርቃል?
    1. ከ1 ኪ.ሜ ያነሰ
    2. 1 - 2 ኪ.ሜ
    3. 2 - 4 ኪ.ሜ
    4. ከ 5 ኪ.ሜ በላይ
31. በአካባቢዎ ምን ዓይነት የተፈጥሮ አደጋ ይከሰታል?
    1. የዝናብ እጥረት
    2. ከመጠን በላይ የሆነ ዝናብ
    3. ወቅቱን ያልጠበቀ ዝናብ
    4. ጎርፍ
    5. አንበጣ
    6. ሌላ _____
32. የግብርና ኤክስቴንሽን ሠራተኞች በዓመት ምን ያህል ጊዜ ይጎበኝዎታል?
    1. በዓመት አንዴ
    2. በዓመት ሁለቴ
    3. በዓመት ሦስቴ
    4. ከ ዓመት ከ4 ጊዜ በላይ
33. የጎርፍ አደጋ ምን ያህል ተደጋጋሚ ነው?

    _____

    _____

34. የጎርፍ አደጋ ምን ያህል ጉዳት ያደርሳል?

    _____

    _____

35. የጎርፍ አደጋውን ለመከላከል ምን ዓይነት ዘዴዎችን ይጠቀማሉ?

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Rainfall trend 1978-2009

Flow measurement	year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	average	annual
Flow (MCM)	1978	13	15	20	12	13	51	241	528	312	84	17	15	110	1320
Flow (MCM)	1979	19	14	21	17	27	32	221	443	177	48	17	14	88	1050
Flow (MCM)	1980	13	13	10	8	17	30	261	597	227	32	12	12	103	1233
Flow (MCM)	1981	11	10	42	59	21	17	249	503	513	52	16	14	125	1505
Flow (MCM)	1982	12	11	10	15	14	17	130	477	200	71	16	13	82	986
Flow (MCM)	1983	10	10	14	30	63	59	161	650	378	43	15	11	120	1444
Flow (MCM)	1984	10	7	8	6	11	66	339	373	269	18	8	8	94	1122
Flow (MCM)	1985	7	6	4	7	27	19	231	769	322	29	10	10	120	1442
Flow (MCM)	1986	5	15	15	26	22	59	188	417	267	22	9	9	88	1054
Flow (MCM)	1987	8	9	34	100	58	76	132	192	47	17	10	8	58	690
Flow (MCM)	1988	9	8	8	11	9	25	139	668	506	58	13	10	122	1463
Flow (MCM)	1989	11	15	18	30	14	23	291	510	390	35	11	11	113	1359
Flow (MCM)	1990	9	31	50	63	13	29	252	630	303	46	10	8	120	1444
Flow (MCM)	1991	7	12	24	7	7	27	264	686	398	26	9	9	123	1477
Flow (MCM)	1992	9	16	9	11	11	28	194	545	373	44	11	9	105	1260
Flow (MCM)	1993	8	12	7	27	33	72	333	710	496	85	21	11	151	1814
Flow (MCM)	1994	8	6	7	12	11	27	198	422	376	44	13	13	95	1137
Flow (MCM)	1995	11	11	8	39	15	28	193	510	196	21	8	8	87	1048

Flow measurement	year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	average	annual
Flow (MCM)	1996	15	10	16	32	58	218	521	933	341	35	15	11	184	2205
Flow (MCM)	1997	11	8	8	14	11	41	155	320	84	27	28	16	60	722
Flow (MCM)	1998	13	9	30	21	30	66	368	982	418	112	24	15	174	2088
Flow (MCM)	1999	13	10	12	9	9	54	296	721	166	127	22	14	121	1454
Flow (MCM)	2000	11	9	5	8	15	33	169	478	236	82	32	16	91	1096
Flow (MCM)	2001	2	2	11	5	10	68	277	383	140	10	5	3	76	917
Flow (MCM)	2002	13	8	11	13	12	29	158	379	126	23	17	8	67	799
Flow (MCM)	2003	8	6	11	25	16	57	315	485	265	40	21	14	105	1262
Flow (MCM)	2004	10	7	10	38	14	53	237	447	226	45	24	12	94	1124
Flow (MCM)	2005	13	9	27	19	80	66	343	539	249	47	27	14	119	1432
Flow (MCM)	2006	11	9	25	42	40	66	434	767	386	48	29	15	156	1872
Flow (MCM)	2007	12	12	13	20	30	102	353	718	429	65	27	19	150	1802
Flow (MCM)	2008	12	10	8	9	14	42	328	610	431	47	56	15	132	1582
Flow (MCM)	2009	24	10	9	24	13	18	121	520	300	67	15	17	95	1137