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College of Development Study

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Perceived Impacts of Land Degradation on Livelihood of Farming Communities in Upper Gumara Catchment Northern, Ethiopia

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Impacts of Land Degradation on Livelihood of Farming Communities in Upper Gumara Catchment Northern, Ethiopia

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This is to certify that the thesis prepared by Debrie Mersha Entitled: Impacts of land degradation on livelihood of farming communities in Upper Gumara catchment: northern, Ethiopia submitted in partial fulfillment of the requirements for the Degree of Masters of Arts (In Environment and Sustainable Development) complies with the regulations of the university and meets the accepted standards with respect to originality and quality.

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DECLARATION

First, I declare that this thesis is the result of my own work and that all sources or materials used for this thesis have been duly acknowledged. This thesis is submitted in partial fulfillment of the requirements for Master degree at Addis Ababa University. I confidently declare that this thesis has not been submitted to any other institution and anywhere for the award of an academic degree, diploma, or certificate.

Name: Debrie Mersha

Signature----------

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List of Acronym

BOA	Bureau of Agriculture
BOEPLAU	Bureau of Environmental Protection, Land Administration and Use
CSA	Central Statistical Agency
DAS	Development Agents
FAO	Food and Agricultural Organization
FGD	Focus Group Discussion
GDP	Gross Domestic Product
GEF	Global Environmental Facility
HH	Household Heads
IFPRI	International Food Policy Research Institute
IFSP	International Food Security Program
IPCC	Intergovernmental Panel on Climate Change
LADA	Land Degradation Assessment on Dry Land Areas
LD	Land Degradation
LULCC	Land Use Land Cover Change
MOARD	Ministry of Agriculture and Rural Development
POPIN	United Nation Population Information Network
SNNPS	Southern Nations and Nationalities and Peoples
SPSS	Statistical Package for Social Science
UNEP	United Nation Environmental Program
USAID	United States Agency for International Development
WCED	World Commission on Environment and Development

Abstract

In Ethiopia land degradation is the main challenge for agricultural sector and food security in particular and economic development as a whole. It negatively affects the livelihood of the farmers. In view of the impacts of land degradation on livelihood, the study was conducted in Deremo, Kanat, and Meskel-Tsion and Semena kebele of Upper Gumara catchment in Northern, Ethiopia. The main objective of the study was to investigate the impacts of land degradation on livelihood of farming communities in Upper Gumara catchment Northern, Ethiopia. 196 household heads were selected from each target kebeles by using simple random sampling technique. In order to achieve the objective of the study both primary and secondary data were generated. Primary data were generated through questionnaire, FGD, key informant interview and personal observation. Secondary data were obtained from woreda agricultural office, research and articles. Descriptive statistical methods of analysis were applied like cross-tabulation, percentage table and graphs. The finding of the study indicated crop and livestock productivity are declining as a result of land degradation and this seriously affects the livelihood of the farming community. In addition to this water resource in the study area were drying up over time. The magnitude of land degradation is increasing over time because of high population pressure, frequent farming, and topographic nature. The livelihood of farming community is affected by land degradation in the study area. As a result of this the farmers were applied different strategies like daily labor, farm animal sale, irrigation, handcraft and preparing charcoal and selling it to cope up the effect of land degradation. So, the agricultural office of the woreda should give greater emphasis on Land management and on non-farm source of income.

Key Words: *land degradation, livelihood, impact, coping mechanisms*

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Throughout the history of the world, one of the greatest and persistent threats to human existence has been environmental degradation Land degradation is a decline in land productive quality caused by human activities and natural activities, has been a major global issue since the 20thcentury and it has reminded high on the international agenda in the 21st century (Onumadu et al, 2001).

Land is the primary means of production used to generate a livelihood for rural residents of most developing countries. Land is the main asset that farmers have to accumulate wealth and, equally importantly, what they transfer in the form of wealth to future generations (Nega *et al*., 2003). Land degradation includes all process that diminishes the capacity of land resources to perform essential functions and services in ecosystems (Hurni *et al*., 2010). It is caused by two interlocking complex systems: the natural ecosystem and the human social system. Interactions between the two systems determine the success or failure of resource management (Berry, 2003). The interaction between human societies and the resource bases upon which they depend can be characterized by the dynamic tension between three interacting elements that are: human population dynamics, natural resources (e.g. productive capacity), and technological progress and economic growth (Andries, 2003). The degradation of these resources is caused by the heavy pressure from the human and livestock populations, coupled with many other physical, socio - economic and political factors (Sonneveled, 2002).

Land degradation affects a large number of people over a significant portion of the earth's surface which has led to extreme poverty and hunger. Around the world, land degradation can be viewed as any change or disturbance to land perceived to be undesirable that affect human activities like agriculture and settlements (Eswaran, *et al*., 2001).

Land degradation is one of the most serious problems that threaten the livelihood of people across the world. As outlined by Belay (2004), land degradation is the largest environmental problem in the Sub-Saharan African country. As the author argues, land degradation affects the livelihood of the people negatively in terms of decrease land productivity, severe erosion,

desertification, lack of fire woods, increase sediment deposits, drying up of spring and water bodies etc.

According to Intergovernmental Panel on Climate Change IPCC (2001), in Africa agriculture has been the main contributor to current economy ranging from 10% to 70% of Gross Domestic Product (GDP) and is highly affected by land degradation leading to exploitation of natural resources like forests, settlement and cultivating of fragile land, like hills and sloppy areas. Due to the information gap among people in Africa on land conservation, this has led to miss-management of natural resources causing land use change, although this has been highly challenged by global warming throughout the world.

Ethiopia is among the poorest country where land degradation caused damage to its inhabitants. This physical deterioration of its area had left millions of its population in suspicious how to live harmoniously with nature and smooth handling of their livelihood (D.L John & L.A Lewis, 2007).

Land degradation in the Ethiopian highlands (i.e areas above 1500 m.a.s.l) has been concern for many years. Land degradation, which refers to the deterioration or total loss of the productive capacity of the soil for present and future, is a great threat for the future and it requires great effort (Feyera D &Tsetadirgachew L, 2015).

1.2. Statement of Problem

Land degradation in Ethiopia has become a serious problem affecting all spheres of social, economic and political life of the population. It is one of the major challenges to agricultural development and food security of the country (Kruger et al. 1997 &Habtamu, 2006). Ethiopia is one of the sub-Saharan African countries endowed with natural resources (Gete, et.al, 2006). However, resource degradation is one of the serious problems in Ethiopia persisting for a long period of time (Hurni et.al. 2010). About 85% of the population of Ethiopia is highly depending on agriculture to sustain their livelihood. However, the productivity of agriculture is being seriously affected by land degradation problems (A.Woldu, 2004 & L.Berry, 2003).

Land degradation manifested in terms of soil erosion, nutrient depletion, gully formation, water scarcity, reduction in yield of crop and desertification becomes a serious problem in the highlands of Ethiopia, particularly in Amhara region. It accounts for 45% of the total land area of

the country and 66% of the total land area in Amhara region. (Lakew et.al, 2002). Land degradation is an alarming problem in Amhara region where soil erosion leaving 20,000-30,000 hectares of land unproductive (Taffa, 2009). So, Lake Tana basin is the largest basin in Amhara region where land degradation affects its inhabitants. This is because of settlement and agricultural expansion on the expense of other land covers, high population growth and the dependency of the rural population on crop cultivation. In addition to these there are other factors which aggravate the problem in the basin. These includes traditional and continuous cultivation the land without fallow period, together with steep terrain, ragged topography, loss of top soil, erratic and intense nature of the rainfall and the use of crop by-products for livestock feed (Getachew, A &Wagayehu,B,2015).

In general, the misuse and mismanagement of cultivated land by farmers causes serious land degradation in Tana sub basin. The production and productivity of the area deteriorated year after year and has become difficult for farmers to feed their families. As a result of land degradation the living standard of the population is worsening year after year (SWARD, 2005).
So, Land degradation is a serious threat in the Gumara watershed which is reflected in the form of soil erosion. Erosion is a major watershed problem causing significant loss of soil fertility and productivity. Increased sediment loads that shorten the useful life of the reservoir, the lives of other water-related structures, and increase the cost of maintenance and sediment remediation are off-site impacts of erosion (MoARD, 2004)).

Previously many studies have been conducted on the same issues in the watershed but many of the focuses on the watershed as a whole, on land use/land cover change through the use of GIS, runoff and sediment yield modeling, but my focus is on level of land degradation in each target kebele not on watershed as a whole, its effect on livelihood of the community in each target kebeles and coping mechanisms used by the community. Therefore, this study investigates perceived impacts of land degradation on livelihood of farming community in Upper Gumara Catchment.

1.3. Objectives of the Study

1.3.1. General Objective

The main objective of this study was to investigate the impacts of land degradation on the livelihood of farming communities living in Upper Gumara Catchment in Northern Ethiopia.

1.3.2. Specific Objectives

In addition to the main objective the study more specifically attempts to:

1. To categorize the perceived level of degradation as high, medium and low in the four target kebeles of Upper Gumara catchment.
2. To assess the perceived effects of land degradation on the livelihood of farming communities living in Upper Gumara Catchment.
3. To identify perceived alternative options/ coping strategies used by the farming communities in Upper Gumara Catchment.

1.4. Research Questions

In order to achieve the main research objective and seek answers to the stated objectives the following major research questions were designed:

1. What looks like the perceived level of land degradation in each target kebeles of Upper Gumara catchment?
2. What are the perceived effect land degradation results on livelihood of farming communities in each target kebeles of upper Gumara catchment?
3. Do farmers use perceived alternative options order to cope up the effects of land degradation on their livelihood?

1.5. Significance of the study

Ethiopia is one of the sub-Saharan African countries facing a serious land degradation problem, particularly soil erosion and a decline in land productivity. This in turn, affects the livelihood of the majority of the population. Therefore, the study expected to contribute some information in the following way:

- The result of the study also expected to serve as a source of information for the researcher those who want to conduct further study on the issue.
- The result of this study furthermore expected to generate useful information to solve land degradation problem, particularly in the study area.

1.6. Scope of the study

The scope of the study was limited to the four selected kebeles in Upper Gumara catchment on land degradation and its effect on the livelihood of the farming communities. The data was

organized to ensure maximum coherence and synergy between the different elements of research.

The research was carried out using accepted standards, methods and procedures to full fill the intended objectives. The research was identified and categorized the level of land degradation, its effects on the livelihood of the farming communities and also it identified the coping mechanisms used by the community to reduce the effect of land degradation on their livelihood.

1.7. Limitation of the study

In the time of this study the following challenges were making the data collection more difficult: The study was conducted within a short period of time and this limited the number of potential respondents and the information obtained from them. Funds for this study were inadequate to target large sample respondents. Besides, some of the respondents wanted interview allowance. To encounter this problem small sample was selected to represent the population. The difficulties have been faced in collecting data this means that sample respondents were not responding well and positively the others seem not to understand anything, also the respondent targeted for key informant interview seems to very busy and they have no enough time to respond. The study area was highland area and it was inaccessible for transportation so, this makes the data collection very difficult. Finally, knowledge gap to use statistical tools to analyze the result was faced. In addition to this any measurement to categorize the level of degradation in the study area is not the concern of this study.

1.8. Organization of the study

This study organized into five chapters. The first chapter deals with the introduction part this including the background of the study, statement of the problem, objectives of the study, research questions, significance of the study, the scope of the study, limitation of the study and operational definition of the terms. The second chapter deals with the review of the related literature including definition and concepts, empirical literature and conceptual framework. Chapter three of this study contains the methodology of the study including, description of the study area, methods of data collection, research design which guides the researcher and methods of data analysis. Chapter four of the study addresses the results and discussions, which presents analysis and interpretation. The last part of the study chapter five contains conclusion and recommendations.

1.9. Operational Definition of the terms

Impact: the powerful or strong effect that something or somebody has. In the context of this study, impact refers to the effects of land degradation on activities that are means of livelihood in the study area such as crop and livestock productivity, firewood and water resource.

Land degradation: a decline in the quality or performance of land. Or erosion of the earth's land surface by water, wind, or ice

Livelihood: Job, work or something that provides income to live. In the context of this study, livelihood refers to activities on which people depend to sustain their life like crop productivity, livestock productivity, and availability of water resource and firewood and others.

Sustainability: able to maintained or exploiting natural resource without destroying the ecological balance of an area.

Equity: actions, treatment of others, or general condition characterized by justice, fairness, and impartiality.

Capability: the power or practical ability necessary for doing something.

Asset: the property that is owned by a person or an organization.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This chapter organized into three parts. The first part deals with definition of concepts. The second part includes empirical literature related to land degradation and its impacts on livelihood of people and the third part provides a conceptual framework.

2.1.Definition of Concepts

2.1.1. Land Degradation

As it is a broad concept, land degradation has no single and universally accepted definition (Addise Ermias 2014).

Different organizations give different meanings to land degradation (Bethlehem E, 2016)

- **World commission on environment and development (WCED, 1987 &Taffa, 2001):** define land degradation as the loss of utility or potential utility, the reduction or loss or change of features or organisms which cannot be replaced.
- **UNEP 2009:** define land degradation as a reduction of resource potential by one or combination of processes including water and wind erosion, acting on the land.
- **FAO 1979:** land degradation is a process which leaves the current or potential capability of soils.
- **LADA 2009:** the reduction in the capacity of the land to provide ecosystem goods and services and to assure its function over a period of time for its beneficiaries.

2.1.2. Livelihood

A livelihood can be defined as the activities, the assets and the accesses that jointly determine the living gained by an individual or household (Ellis, 1998). When it comes to an individual, a livelihood is the ability of that individual to obtain the basic necessities of life, which are water, shelter, and clothing. Therefore all the activities involved in finding food, searching for water, shelter clothing and all the necessities required for human survival at the individual and household level are referred to as a livelihood. Approximately 90% of rural households are involved in farming activities (Davis et al, 2010 a.b). In Africa 70% of the household income is

from framing activities while in Asia and Latin America, 50% of the income from farming activity (Davis et al, 2010a.b).

A livelihood compromises the capability of assets (stores, resources, claims) and accesses and activities required for a means of living. A sustainable livelihood is which can cope with and recover from stress and shocks, maintain and enhance its capabilities and assets and provide sustainable livelihood opportunities for the next generation and which contributes net benefit to other livelihoods at the regional and global level and in the short and longterm (Chambers &Conway, 1992). The concept of sustainable livelihood based on the idea of capability, equity and sustainability and each of which are ends and means of livelihood.so, in the context of this study livelihood refers activities on which the community depends to sustain their life like crop productivity, livestock productivity, and fire wood resource.

2.1.3. Capability

"The ability of a person to perform certain basic activities is a capability (Chamber &Conway, 1992). It includes to be adequately nourished, to be comfortably clothed, and to avoid escapable morbidity and preventable mortality, to lead a life without a shame, to be able to visit and entertain one's friends, to keep track of what is going on and what others are talking about (Chambers & Conway, 1992). While this concept of capability is a general concept, there are also livelihood capabilities that are more specific and include the ability to cope with stress and shocks, and the ability to generate and make use of livelihood opportunities" (Chamber & Conway, 1992).

2.1.4. Equity

"Although equity can be measured in terms of relative income distribution in other ways the word refers to the equal distribution of assets, capabilities, and opportunities and especially enhancement of those of the most deprive" (Chamber & Conway, 1992).

2.1.5. Sustainability

"Sustainability has many more meanings. In the context of environment, sustainability focuses on such global issues as pollution, global warming, deforestation, overexploitation of nonrenewable resources and physical degradation" (Chamber & Conway, 1992). "Sustainability

advocates earth-friendly lifestyles of organic agriculture with low external inputs, an institution that can raise their own revenue and self-supporting processes which cooperate without subsidy (Desalegn K, 2013). In terms of household level sustainability refers to self-sufficiency, longterm self- restrain and self-reliance. The social meaning of sustainability in the context of livelihood refers to the ability to maintain and improve livelihoods while maintaining and enhancing the local and global assets and capabilities on which livelihoods depend" (Desalegn K, 2013).

2.2. Income and livelihood

"Douglas et al.(2006) & Jonsen (2003), articulated that there are several different methods of characterizing livelihood strategies. Inequality in income and wealth distribution among people results from livelihood strategies".

2.3. Food security and livelihood

"Food security refers to secure and regular access by all people at all times to enough food for a healthy and active life. This food has to be safe, nutritious, used appropriately and meet food preferences. Food security can be achieved by ensuring sufficient availability or supply (e.g. through agricultural production or food aid) and also access (e.g. entitlements to food through market exchange, labor or social network)" (Corney, D.et al, 1999).

"Food insecurity is the opposite of the state of lack of access to food or an adequate diet either temporarily (transitory food insecurity) or continuous over time (chronic food insecurity). Livelihood approaches are relevant to food insecurity measurement at national and international levels. Food security most closely links to livelihood concepts. Livelihood approaches may also provide a practical tool to tie together the concept of food insecurity, hunger, and poverty" (Corney, D.et al, 1999).

"Livelihood analysis is a key to interpreting the relationship between short and long-term phenomena that affect food security, particularly at the national level. Livelihood approach is important for the measurement of food insecurity and to take actions to reduce food insecurity" (Save the children, 2000).

2.4. Components of livelihood

The component of sustainable livelihood includes vulnerability, assets, mediating institution, livelihood strategies and livelihood outcomes (Chamber &Conway, 1992).

I. **Vulnerability context:** The vulnerability context frames the external environment in which people exist. Critical trends as well as shocks and seasonality, over which people have limited or no control, have a great influence on people's livelihoods and on the wider availability of assets. Not all of the trends and seasonality must be considered as negative. Vulnerability emerges when human beings have to face harmful threat or shock with inadequate capacity to respond effectively (DFID, 2000).

II. **ASSET:** the livelihood asset or capital includes human capital, social capital, financial capital, natural capital and physical capital.

   A. **HUMAN CAPITAL:** human capital is a combination of knowledge, habits, social behavior and personality that contributes to economic benefit for an individual and /or community (Ellis, 1996). Human capital can be attained through education, creativity, availability of skills and talents, experiences, training, and exposure. Human capital also includes the health of an individual, household, and community (Ellis, 1996).

   B. **PHYSICAL CAPITAL:** physical capital refers an asset that helps to turn raw materials into finished products and/or services (Ellias, 2000). An example of physical capital includes equipment such as a tractor or a farm a sewing machine for tailor, buildings and computers. 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. To be able to make full use of physical capital, there is a need for human capital that is required skills for example to operate machinery and to manage asset (Ellis, 2000).

   C. **SOCIAL CAPITAL:** social capital refers to relationships, institutions, norms that shape social interactions. Social capital plays a major role in the productivity of an individual, organizations, and community. Social networks are considered as the horizontal association between individuals, which increase productivity by reducing the costs of doing business and facilitate coordination and cooperation, associations

and links within a community needed to give a sense of identity and purpose to these communities (Ellis, 2000).

D. **NATURAL CAPITAL:** natural capital is the base of all human activity. Natural capital includes land, air, water, living organisms and all ecosystems on earth that are necessary for human survival and well-being. (Barbier & Hochards, 2014 and Ellis 2000).

E. **FINANCIAL CAPITAL:** financial capital refers to wealth such as money, purchasable items, savings, credit, etc. It can be defined as save-up wealth that can be used to start up or maintain a business. Availability of capital allows for the growth of the business through innovation, diversification and skill enhancement; i.e engaging in activities that will assist in earning income and resources needed by the household (Ellis, 2000).

F. **POLITICAL CAPITAL:** connection to people in power, access to resources, leverage, and influence to achieve goals.

III. **LIVELIHOOD STRATEGIES:** livelihood strategies are organized sets of lifestyle choices, goals and values, and activities influenced by biophysical, political/legal, economic, social, cultural and psychological components (Scoonnes, 1998, Ellis, 1991). It is vital to note that livelihood strategies of the household are influenced by different factors such as social, natural, physical, environmental and economic conditions. This implies that the livelihood strategies of the household are strongly influenced by the mediating institutions and livelihood assets or capitals.

IV. **MEDIATING PROCESSES:** are institutions, organizations, processes, policies and social relations that determine the access to livelihood assets to pursue livelihood strategies. These are developed through formal and informal institutions (Desalegn K, 2013).

V. **LIVELIHOOD OUTCOMES:** are the results obtained from the combination of different assets using livelihood strategies. It could be desirable (positive) and undesirable (negative) outcomes according to different factors and situation (Desalegn K, 2013).

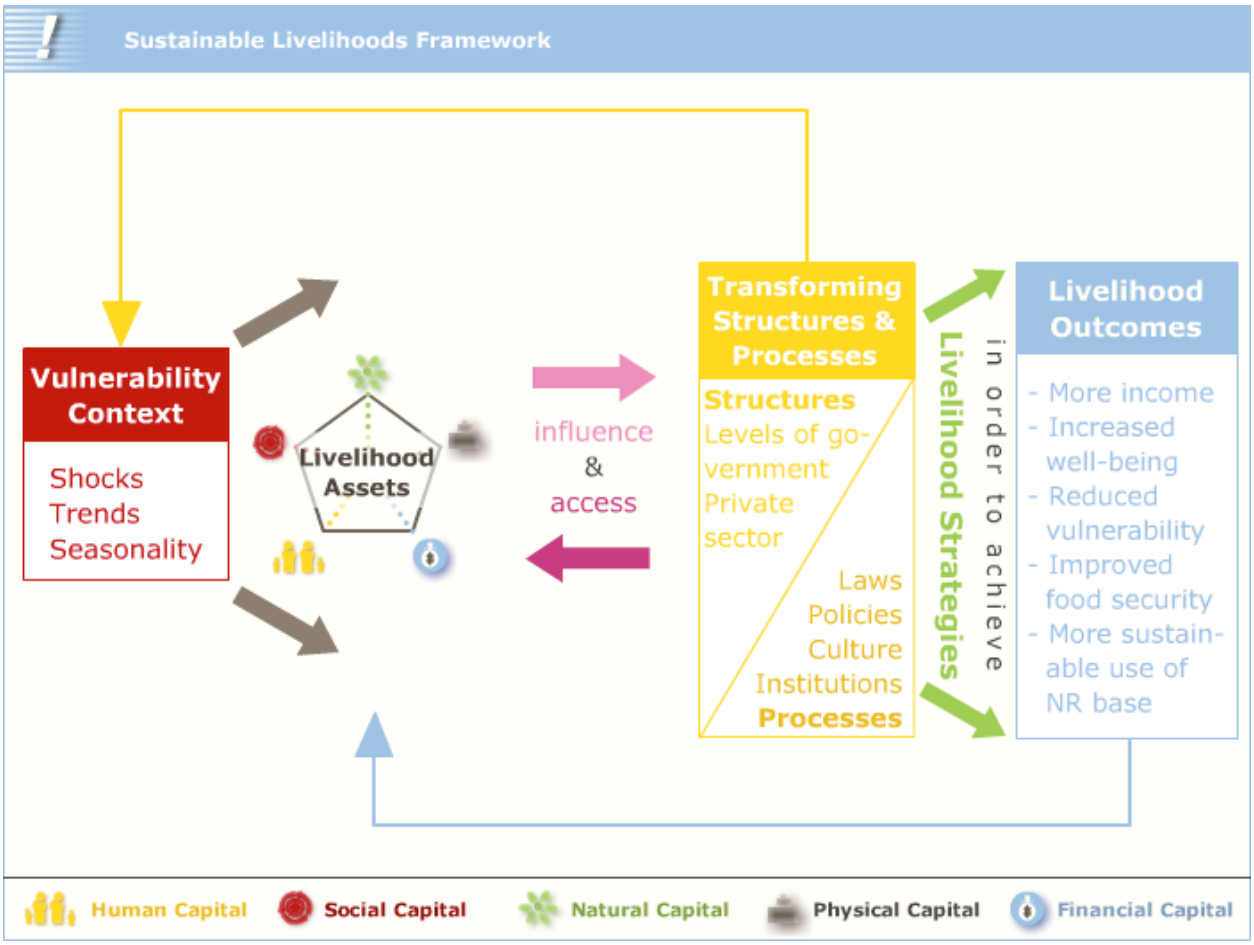


Fig. 2.1: Livelihood framework

Source: DFID (2000)

2.5. Extent and Magnitude of Land degradation in High Lands of Ethiopia

The Ethiopian highlands used to have an adequate fauna and flora, dependable soils, and climatic conditions. In the course of time, however, the highlands have become the most degraded area in Africa if not in the world (Terefe, 2003). Due to the high degree of degradation, important renewable natural resources such as soil, water, forest and biodiversity are highly deteriorating in the Ethiopian highlands. Soils in Ethiopia are becoming resistant to fertilizer since they are degraded to the extent of not absorbing water with fertilizers thus resulting in low crop yield (Desta, 2009).

Land degradation especially in the highlands, has been identified as the most serious environmental problem in Ethiopia (Aune, J.etal.2001). Some 27 million hectares representing

approximately 50% of the highlands are already significantly degraded. The remaining 50% of the highlands are highly susceptible to degradation (Genene, T. 2006. & GEF, 2003.).

According to GEF, (2003) & Abiy, T. (2008.), the hararghea highlands in eastern Ethiopia, Tigray, Wollo, and Semen Shoa highlands in the north and the Gamo-gofa highlands and Bilate river basin , which starts in the eastern scopes of Gurage highlands and stretches through eastern hadiya and kambata highlands are some of the seriously degraded land surfaces in Ethiopia.

In light of the increasing population and the low levels of urbanization, all projections indicate that land degradation in Ethiopia bound to be proceeding at aggravated rates unless significant progress is made in conservation, rehabilitation restoration practices (Ahmed, N. 2007.)

In general, the extent of land resources degradation in Ethiopia, especially the degree of soil erosion, nutrient depletion and deforestation in high land areas of the country lost due to land degradation which has different causes behind its (Addise E, 2014). Because of the rapid extent of degradation, resources such as soil, forest and biodiversity are highly deteriorating in Ethiopian highlands. This problem is further aggravated by the expansion of agriculture to marginal areas (Gete, 2002). Land degradation, particularly soil degradation has significant negative impacts on productivity of lands because degradation and productivity of the soil are inversely related; that means when degradation is high the productivity is low. This productivity of soil is significantly affected in Ethiopia due to the serious soil degradation in the country (Desta.D, 2009). It indicates that the soils in the agricultural areas of the country are not fertile to support the livelihoods of the people.

2.6. Impacts of land degradation on livelihood in Ethiopia

The livelihood of rural people is directly linked to the utilization of land resources for food production, energy sources, and shelter. Mismanagement of these resources reduces the livelihoods of those who are dependent on these resources. The majority of the Ethiopian population (85%) relies on land resources for their livelihood, mainly through land cultivation (Bekele, 2001:4).

In Ethiopia, the issue of land degradation is so vital since the livelihood of the biggest portion of the country's population and the overall economy of the country depend on agriculture. Land

degradation is seriously affecting agricultural production and food security of the country's population. Nowadays, it is becoming one of the most important problems of food security in the country (Aklilu, 2006). This is for the reason that, the high degree of land degradation in Ethiopia, especially the degradation in the form of soil erosion is one of the major environmental problems that have negatively affected the performance of agricultural sector as the overall economy. Accordingly, the livelihood of the Ethiopian population is threatened by the increasing trend of land degradation (Aklilu, 2006 & Habtamu, 2006).

The impact of land degradation on Ethiopia's agricultural economy is very large. Ethiopia is losing 30,000 hectares of land on annual basis due to degradation and so far more than 2 million hectares have already been severely damaged (World Bank, 2007b). The country is losing a significant volume of soil every year due to soil erosion. The annual loss of soil in highlands of Ethiopia was estimated to range from 20 to 100 tons/hectare per year which leads to an annual productivity loss on cropland of 0.1% to 2% of total production for the country (Lakew, *et al* 2000).

Land degradation is by-product of environmental change results in increasing migration, increasing price of farming inputs, decrease in soil fertility, decreasing arable land and all of these affecting the ability of households to provide sufficient livelihood for their family, thus aggravates the risk of out- migration, reduction of agricultural productivity, lack of enough food, reduction of economy, starvation (Hannes, 2012).

In general, the impacts of land degradation can be classified as ecological and socio-economic effects.

2.6.1. Ecological Impacts

Land degradation has multiple and complex impacts on the global environment through a range of direct and indirect processes affecting a wide range of ecosystem functions and services (GEF, 2006).The main environmental impacts of land degradation include a rapid loss of habitat and biodiversity modifications of water flows and sedimentations of reservoirs and coastal zones (project development facility, 2007).

According to project development facility (2007), land degradation has many environmental impacts at regional and global level. Degradation of forest and woodlands have impacts on global biodiversity, change in forest cover and wetlands are impacting the flow of major rivers,

large -scale loss of forest cover, changes in air circulation patterns and affect global climate change.

2.6.2. Socio-economic effects

Land degradation threatens food security for many of the poorest and most food insecure living in Asia, Africa, and Latin America. It also causes poverty, a decrease in ecosystem resilience and provision of environmental services (Temesgen G et al.2014).In addition to this land degradation adversely affects the health, well-being, and livelihood of individuals (Vivian et al.1994).

According to project development facility 2007, economic implication of land degradation is severe in sub-Saharan African countries. This is because 65% of the population lives in rural areas and the main livelihood of 90% of the population is agriculture. Soil erosion is the most serious problem in Ethiopia. The country losses billions of birrs because of soil erosion, water and biodiversity losses (Paulos, 2001). Land degradation is one of the major causes of low and declining agricultural productivity and continued food insecurity and rural poverty in Ethiopia (IFPRI, 2005). The highlands of Ethiopia are affected by deforestation and soil degradation, which erode the resource base and increase the repeated food shortage caused by drought (Tilahun et al. 2001).

The following are some of the socio-economic impacts of land degradation:

2.6.2.1.Effects Of Land Degradation On Agricultural Productivity

The economy of many developing countries including Ethiopia is heavily dependent on agriculture, and the livelihoods of the vast majority of their populations depend directly or indirectly on this sector. This dependent on agriculture increases the vulnerability of the economy of these countries to problems related to land degradation (Tilahun, A., 2002). The Land is being the critical agricultural resource and the basis for the survival of most people in Ethiopia. The largest portion of the employment for labor is contributed from the agricultural sector. In spite of this, land degradation throughout the country, threatening both the economy and survival of the people. It is a severe problem that leads to low agricultural productivity, which aggravates food security problem, is of the major environmental threats that have well been acknowledged as a serious problem in Ethiopia (Kahsay B., 2004).

Land degradation in the form of soil erosion and declining fertility in the country is a serious challenge to agricultural productivity and economic growth (Tilahun, A., 2002).

2.6.2.2.Impacts on livestock

The declining of grazing land as a result of high degree of land degradation highly affects the productivity of livestock. This, in turn, affects the livelihood of the population particularly in rural areas. This because of that in rural area livelihood of the population is highly dependent on livestock productivity (Yohannes .W, 2016).

2.6.2.3.Impacts on firewood resource

Most of the people of the country depend on firewood as a source of energy. But land degradation causes lack of firewood (Meles.E, 2014).

2.7.Extent and Impacts of land degradation in Amhara Region

Land degradation is a severe problem in highland areas of the country, which covers about 45% of the nation's total land area and 66% of the total land area of Amhara region.

In addition to natural factors, the effects of a long history of settlement, traditional farming methods and increasing population pressure which forces the people to cultivate stepper slopes have aggravated the devastating land and resource degradation in Amhara Region (Askale, 2005; Berhanu & Feyera, 2005).

The high population which is increasing at alarming rate has caused cropping and grazing activities to be shifted to hillsides and ecologically fragile areas, forced the people to use crop residues and dung or fuel rather than using them as sources of organic fertilizer to improve soils and have to lead reduction in land management activities such as fallowing, planting trees and investing in conservation structures (Lakew et al., 2000).

Throughout history, the region suffers from recurrent drought and pest invasion. There has been no single year since 1950 where there was no drought in the eastern part of the region (USAID, 2000). This recurrent drought unable the land to regenerate and develop secondary bush and tree vegetation, aggravate runoff and removal of the topsoil during the first raindrop periods and finally results in land degradation.

Livestock production is a major component of the economy of Amhara region. The region has been the home to about 35% of the total country's livestock population (BoA, 1999) and based on agricultural sample survey 2012/1013, high population of livestock per kilometer square were found in this region (Samson & Frehiwet,2014). Uncontrolled grazing on cropland contributes to soil compaction and the need for tillage to prepare fields for crops, making practices such as reduced tillage less feasible. Grazing concentrated on hillsides, fragile area slopes on marginal

and cultivated land after harvest results in soil compaction, low moisture retention and high runoff, which are the main causes for the formation of the gully, excessive vegetation removal and reduced in crop yields (Lakew et al., 2000).

Land degradation is a very challenging problem in Amhara Region that causes many socio-economic and environmental problems. As the economy of the region totally depends on agriculture and its products, land degradation (i.e. Loss of soil, change in water quantity and quality, vegetation loss) is greatly influencing the livelihood of the community. It is estimated that the annual rate of soil loss in the region due to water erosion is about 119 million tons, which amounts to 70 % of the total soil loss in the country as a whole (IFSP, 2004). About 29% of the total area of the region experiences high erosion rates (51.2 t/ha per year); 31% experiences moderate erosion rates (16.50 t/ha per year); 10% experiences very high erosion rates (>200 t/ha per year); and the remaining 30% experiences low erosion rates (<16 t/ha per year) (Lakew *et al*., 2000).

The situation is becoming catastrophic because increasingly marginal lands are being cultivated, even on very steep slopes (Tesfahun & Osman, 2003), grazing land is becoming scarce, and what remains is thereby exposed to extreme grazing pressure (IFSP, 2004). This has resulted in low and declining agricultural productivity and continuing food insecurity and rural poverty (Assemu & Shigdaf, 2014). Poverty then drives populations to over-exploit the remaining natural resources triggering a vicious cycle, accelerating land degradation still further. The Decline in soil fertility and food scarcity also lead to the migration of the rural population.

2.8. Land degradation in Tana sub-basin

Tan basin is the second largest sub-basin of the Blue Nile, and covers an area of 15,114 kilometer square. The land use in the Lake Tana basin is predominantly cultivable land (71%) grazing (9%), infrastructure (6%), forest (3%) and others. Agriculture is the main economic activity in Tana sub-basin. Both crop pattern and cropping pattern are widely known in the area. More than 80% of the cultivated during the cropping period under the rain-fed system and the remaining are cultivated using irrigation and residual moisture respectively. The farming system is mainly characterized by mixed systems.

Currently, Tana sub-basin faces a number of problems. The problem mainly linked to unprotected population growth, migration to Bahir Dar for better jobs and rapid urbanization increases the rate of problems. This problem includes soil erosion, deforestation, wetland

farming, habitat destruction, improper solid and liquid waste management, overgrazing etc. (Teshale et al., 2002).

Deforestation is the major problem in Tana sub-basin which contributes to soil erosion and consequently to decline of agricultural productivity (USAID, 2004). In Tana basin, a total of 1163585.5 ha of forest was lost or converted to another land cover. Tana sub-basin is heavily affected by watershed management problems caused by overpopulation, poor cultivation and improper land use practices, deforestation and overgrazing as a result of sediment depositions in the lakes and reservoirs are becoming major issues (Setegn et. al., 2008).

Land degradation is the main problem in Tana sub-basin causing both on-site and off-site effects. On-site effects including decreasing in the productive capacity of the land including reduced in crop yields and livestock yields. The Off-site effects include a decline in river water quality and sedimentation of river beds and reservoirs (ANRBoEPLAU, 2015).

2.8.1 Land degradation in Gumara watershed

Gumara watershed is one of the categories of Tana sub-basin. Land degradation is a serious threat in Gumara watershed which is reflected in the form of soil erosion. Erosion is the major watershed problem causing significant loss of soil fertility and productivity. An increase sediment lead that shortens the useful life of the reservoir, lives of other water- related structures and increase the cost of maintenance and sediment remediation are off-site impacts of erosion.

As the study conducted by Mesfin et al. (2016), shows that wet land, shrubland, and forest land are declining over time and cultivated and settlement land are increasing in Gumara watershed.

As a result of land cover change in the watershed, biodiversities are lost. For instance, indigenous trees like *Juniperus procera* are destroyed. Today these indigenous trees are found in only protected areas such as churches, monasteries, and inaccessible steeper mountainous areas. In many parts of the watershed indigenous trees are replaced by exotic trees like eucalyptus (Mesfin et al., 2016).

Soil erosion is the major problem in gumara catchment. The persistent deforestation happened in the watershed for decades due to different human activities especially for crop production together with the rugged landscape has exposed the watershed to soil erosion. The accumulation of sediments and its water logging nature especially during rainy season as well as soil depletion due to repeated cultivation are common agricultural productivity in the lower layering of the study watershed. The Decline in soil fertility, soil erosion caused by deforestation and intensive

cultivation of stepper slopes has resulted in a decline in agricultural production and productivity (Mesfin et al., 2016).

2.9. Empirical literature

In this section, the work of different researchers related to land degradation and its impact on the livelihood of people is presented. It mainly deals with the methodology, the major findings and the recommendation of the researcher.

1. The research conducted under the title of the challenges and prospects of land degradation: the case of misrakbadawacho woreda of Hadiya zone, SNNP, Ethiopia by (Addise E, 2016). In this research stratified sampling was used to select the study kebeles. Systematic random sampling was used to select a number of samples from each kebele. The relevant data to meet this study were obtained from both primary and secondary source. Household survey, key informant interview, focus group discussion and field observation were tools of primary data collection. Both quantitative and qualitative methods of analysis were applied in this study. As the finding indicates that the study woreda has serious land degradation problems. The livelihood of the framer in the study area depends on subsistence agriculture and land degradation problem is appeared to be one of the major challenges for crop production. So, the livelihood of the sample households in the study area is affected by land degradation problems (Addise E, 2016).

Based on the finding of the study, the researcher recommends the following issues to minimize the problem of land degradation (Addise E, 2016).

- In association with the increased population pressure, a number of adverse effects on the environmental conservation of the study area and land restoration practices have been identified.
- In making an intervention in land management practices, there should be active participation of local people primarily farmers.
- To improve the productivity of farmland focus should be given to increase techniques of an agricultural system that soil fertility improvement and conservation practices to boost production from a small plot of land.

- Land restoration practices in the study area can be further promoted if they are carried out in conjunction with other development activities like provision of family planning, education and empowering women.

2. Research conducted under the title of farmer's awareness about land degradation and their attitude towards land management practices: a case of Sidama zone, Aletawonda woreda, southern Ethiopia by (Anteneh G/Mariam, 2010). This researcher has followed stratified random sampling procedure in selecting the farmers' household to be survived. Both primary and secondary data sources were used. In this study, the data were summarized and analyzed by employing different methods. For descriptive part of the research percentage and mean value was used. Chi-square tests were used to see whether there is a significant association between farmers' response and their attitude towards land degradation and management. To gather primary data sources field survey and the structured interview was applied. The finding of this study shows that there is a remarkable awareness related to land degradation and management practices.so there is a significant association between farmers' awareness of land degradation problems and attitude towards land management practices (Anteneh G/Mariam, 2010).

   Based on the finding of this study, the researcher proposed the following recommendations (Anteneh G/Mariam, 2010):

   - The educational/ training program which was provided for farmers should be modified by considering the existing knowledge practices in particular areas.
   - There is a need for more development agents (DAs) to lay more emphasis on sustainable practices and also to disseminate information to farmers and to address the needs pertaining to sustainable land management practices.
   - The government and non-governmental organization should consider granting assistance to the farmers in the form of credit as these would enable them to take action to use a sustainable land management practices.
   - There is a need for publicity on land management practices which should be done mostly on mass media especially in radio and television so as to create more awareness and favorable attitude of farmers towards land management practices.

3. The research conducted under the title of assessment of change in smallholder farmers' livelihood due to land degradation in Ludea District, Tanzania by (Cosms Bendecit,

2009). This study combined cross-sectional and longitudinal design in data collection. Purposive sampling was used to select the study villages in the district. Primary data, secondary data, and remote sensing data were the sources of data. The Questioner was the main instrument to collect primary data. Remote sensing was the major method used to capture longitudinal data on the trends of changes in the land cover change in the study areas. Both qualitative and quantitative methods of analysis were applied. The findings of the study have shown that land degradation manifests itself in various forms of land change. The major change in the land that has direct impacts on the livelihood of smallholder farmers considered in this study was a change in land use/ cover soil fertility loss and decline in water level (Cosmas & Benedict, 2009).

4. In view of the study conclusion the researcher suggested the following recommendations (Cosmas Benedict & 2009):
   - In order to promote sustainable use of land and other natural resources, it is recommended that the village government should set and enforced by laws on the establishment of new settlements, mark boundaries of various land uses.
   - In order to limit land degradation, there is a need for agricultural extension programs to be associated with the development of technologies which enable the use of abandoned fields.
   - There is a need to train smallholder farmers on alternative potentials of land apart from farming/ improved livestock keeping, commercial tree planting, and fish farming.

2.10. Conceptual framework

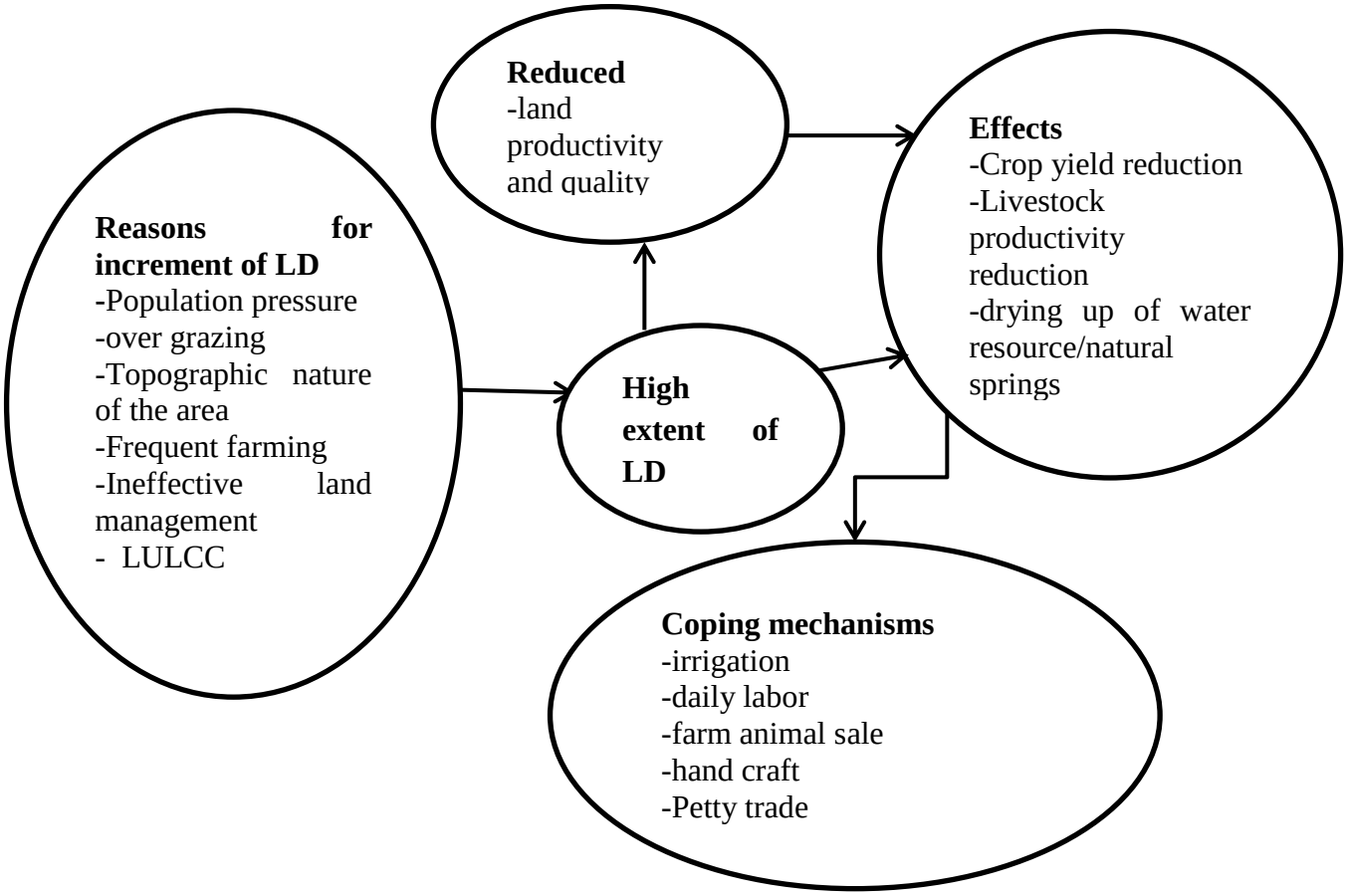


Fig 2.2 Conceptual framework for land degradation and its impact on livelihood

Source: Adopted and modified from Kassu K, 2011

High extent of Land degradation caused by different factors like population pressure, overgrazing, frequent farming, ineffective land management continuous LULCC and topographic nature of the area resulted in decline productive quality of land and loss of soil fertility. This in turn, leads to change in livelihood outcomes such as crop yield reduction, livestock reduction, drying up of springs and food insecurity. Finally, it leads to the application of coping strategies like irrigation, daily labor, farm animal sale, handcraft and sometimes petty trade.

CHAPTER THREE

3. METHODOLOGY

This chapter presents the research methodologies used in the study. It starts with a description of the study area followed by research design, sampling technique, type and sources of data, primary data collection instruments and methods of data analysis.

3.1.Description of the study area

3.1.1. Location of the study area

The study area is found in North West part of Ethiopia in Amhara Regional State, south Gondar Zone, located between latitudes $11^{0}34^{'}$-12^{0} N and longitudes $37^{0}33^{'}$-$38^{0}11^{'}$E. The elevation ranges from 1784 to 3408 m above mean sea level (masl). It has 1470.20km^{2} and forms a part of Lake Tana basin forming the source of Blue Nile, northern Ethiopia.

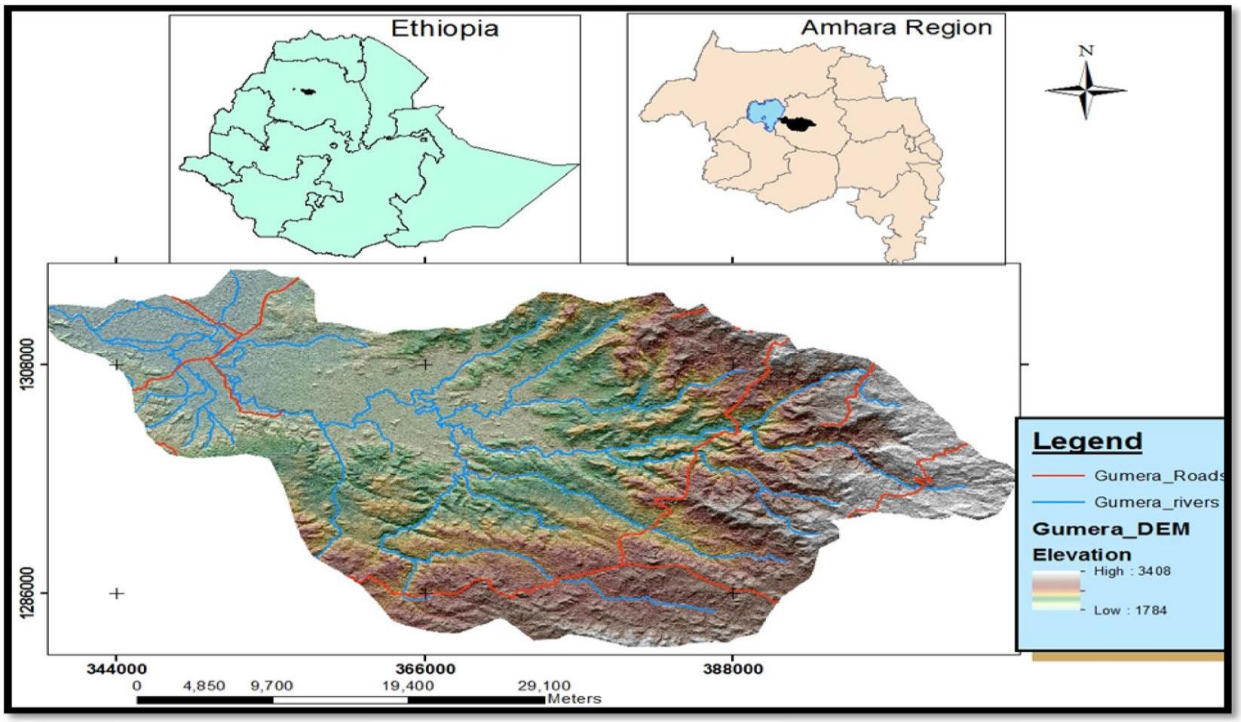


Fig 3.1.Map of the study area

3.1.2. Topography and climate

A mountainous and hilly dissected terrain with steep slopes characteristics the upper stream whereas an undulating topography and gentle slopes from the downstream parts of the study watershed. The area is drained by numerous smaller streams including Gumara (the largest stream in the watershed) that flow to Lake Tana. The climatic type is generally humid (EMS, 2013). The mean annual temperature is 20.5^0 and the average total annual rainfall is 1300 mm. more than 75% of the total rainfall occurs in the months of June-September (kremt season).

3.1.3. Land cover/ land use and soil type

Table 3.1 Land use/land cover of the watershed

Land use type	Area in meter square	Percent
Cultivated and settlement land	141,887.32	96.53
Shrub land	1064.25	0.73
Grass land	945.99	0.65
Forest land	2826.32	1.93
Wet land	266.6	0.19
Total	146,990.48	100.00

Source: WWDSE, 2007

It is understood that the type of a given soil is a function of the interplay of a variety of factors (FAO, 2006). Among other things, topography, climate and organic matter content and time are the major factors that determine the structure and composition of soils. Based on FAO classification system, six soil types namely, Haplic luvisol, chromic luvisol, Lithic leptosol, Eutric vrtisol, Eutric Fluvisol and Chromic Cambisol are common soil types in Gumara Watershed (MoARD, 2004; WWDSE, 2007).Corresponding to topographic variation different natural vegetation types were observed in the area. As a result, *Juniperus podocarpus* (locally known as *Tid*) and *Juniperus procera* (locally known as *Zigiba*) were found at elevation of 3000 masl. Whereas *Dodonaera Angustifola* (locally known as *Kitkita*) and *Euclea Schimpera* (locally

known as *Dedho*) were found between 1900 and 2200 masl. *Ficus sp*. (locally known as *Warka*) found in gentler slopes.

3.1.3. Population and Socio-Economic Features

The total population of the watershed was 198,879 (1984), and 485,816 (2007) and 487 576 (2013) (CSA, 2007; South Gonder Zone Office of Agriculture, 2013). Agriculture is the major means of livelihood in the area on average farm size of about one hectare.

3.2.Research Design

Both qualitative and quantitative approaches were employed to achieve the objectives of the study. In data collection, the research design was cross-sectional design. As a result of limited time and resource for study cross-sectional design is desirable to obtain detail information regarding existing livelihood situations of farmers across the study area. Cross-sectional survey constitutes a collection of data from sample households in Upper Gumara catchment at a single point in time on aspects of household characteristics and livelihood strategies.

3.3.Study population

This part presents the total household heads in the target kebeles in Upper Gumara catchment. The catchment encompasses seven kebeles (kanat, Deremo, Meskeltsion, Semena, Soras, Mynet, and Seharna). From these target kebeles are Kanat, Deremo, Meskel Tsion and Semna. The study population is the list of all household heads in the selected kebeles. There are 1004 household heads in kanat kebele, 1394 household heads in Deremo, 1264 in Meskel Tsion and 1246 in Semena kebele. The total household head in the target kebele is 4908. The reason for the selection of these kebeles is there is severe land degradation in those areas. This is because of the fact that households in these kebele face the problem of land degradation. So it is important to focus on these households in order to understand the effect of land degradation on the livelihood of the farming community.

3.4.Sample Selection and Sampling Technique

The main objective of this study was to investigate the impact of land degradation on th livelihood of the farming community in four selected kebeles encompassed in Upper Gumara catchment; to this end to get the necessary information and the representative population; this

study used the combination of the purposive and random sampling technique. In order to select upper gumara catchment purposive sampling technique was applied; the major reason behind this is severity of land degradation. On the other hand, systematic sampling technique was used to select sample household heads. According to information obtained from agricultural office of Farta Woreda the catchment encompasses seven kebeles. Thus the four kebeles namely Kanat, Deremo, Meskel-Tsion and Semena were randomly selected. The four selected kebeles have 25167 total population and 4908 total household heads. Samples were taken from each kebeles considering household head sex (male and female).

3.5.Sample Size Determination

To take sample, we always have a stage if deciding a sample an appropriate sample gives high precision, accuracy and confidence with the minimum cost. In order to have the optimum sample size, there are a number of issues and points one has taken into account.

- objective of the study
- Research design
- Cost constraint and plan for statistical analysis.

The sample size of this study is determined by the following formula.

$$\mathbf{n = N/ \{1+ N (e)^2 \}\ (Yemane,1967)}$$

$$\mathbf{n= 4908/1+4908\ (0.07)^2}$$

$$\mathbf{n=4908/1+4908(0.0049)= 195.9344 \approx 196}$$

Where N = Total Household head size

n = Sampled size

e = Level of confidentiality (at 7%)

Based on the result of the above formula the sample size for this study was 196. From this total sample size 40, 56, 50 and 50 household heads of Kanat, Deremo, Meskeltsion, and Semna were selected respectively for the questionnaire.

Table 3.2. Summarization of distribution of sample household heads by kebeles

S.N	Kebeles	Total population	Total household head	Sample size (n)	Percent (%)
1	Kanat	6578	1004	40	20
2	Deremo	7502	1394	56	28
3	Meskeltsion	4760	1264	50	26
4	Semena	6327	1246	50	26
Total		25167	4908	196	100

Source agricultural office of farta woreda, 2010E.C

As shown in the above table 3.2 the total sample size was 196. After having decided on sample size, sample household heads were systematically selected from each target kebeles. Therefore, after determining the sample size of each kebele's from the total household heads which was 4908,196 of total household heads were sampled to fill the questionnaire for this study.

3.6.Type and Source of Data

All the data necessary for this study were obtained from both primary and secondary sources and from satellite images. The nature of the data is both qualitative and quantitative.

3.6.1. Primary Data

The most important sources of data in this study were the primary sources to obtain firsthand information on household demographic characteristics, socio-economic characteristics, issues related to land degradation and its impact on the livelihood of farming communities and adoption mechanisms used by these communities. The sources of the information were household survey/questionnaire, key informant interview, focus group discussion and field observation.

3.6.2. Secondary Sources

The secondary source of information includes books, articles, research journals, and different reports. These grasped the background information, description of the study area and lessons and experiences that helped to look and understand the issues under inquiry.

3.6.3. Primary Data Collection Instruments

3.6.3.1.Household Survey

A Household questionnaire was used to obtain information from a selected sample of 196 household heads of the four selected kebeles. It was important to generate quantitative data from sample household heads in the watershed area and it was the most efficient way of obtaining views from farmers. In the survey, household demographic characteristics, socio-economic characteristics, issues related to land degradation and its impact on the livelihood of farming communities and adoption mechanisms were obtained. A detail questionnaire to gain adequate information on land degradation was developed and distributed to the identified household heads.

3.6.3.2.Key Informant Interview

Key informant interview was used to gather qualitative information regarding to the problem. Through this instrument, information regarding experts from agricultural offices, DAs, kebele land use managers and kebele administrators was obtained. Key informant interview was important in getting information related to the level or magnitude of land degradation each target kebeles and its impacts on the livelihood of farmers. It was important to ensure the diversity of information and for the triangulation of information gathered.

3.6.3.3.Focus group discussion

The focus group discussion was used as one critical source of primary data in addition to the household surveys. Focus group discussions were conducted in the four selected kebeles. For focus group discussion questionnaires were prepared. The respondents included in the discussion were local elders, women, and youth. Data that were obtained through FGD includes the problem of land degradation, its impact on the livelihood of farming communities and options used by the farming communities in order to sustain their livelihood.

3.6.3.4.Field observation

Opinions obtained from direct personal observation were included in the analysis of the result. Personnel observation covers events in the real-time and the context of events (Yin, 2008). Personnel observation allows for a photograph and it is important to the researcher to obtain deep insight which helps to understand the characteristics of the phenomenon under study. It is important to obtain a richer understanding of the problem and behavioral pattern of the respondent which they might be unaware or might not be adequately described.

3.7.Methods of Data Analysis

In this study, both qualitative and quantitative methods of analysis were applied. Qualitative information recorded on notebooks from focus group discussion, conversation from key informant interview and from personal observation will be organized and constructed coherently and analyzed in word description form. Accordingly, information obtained from key informant interview with wereda agricultural office workers, kebele administrators and development agents (DAs) and from focus group discussion with different elderly people woman and youth was organized in the form of verbal/ narrative information. A software package, statistical package for social science (SPSS) version 21 was used as a tool to analyze quantitative information gathered through a survey instrument. This involves coding and entering the collected data into the computer to analyze and tabulate the results. The data was coded before entering into the cells of the SPSS. The analysis was done by using descriptive statistical analysis, i.e frequency distribution, percentages, bar graphs and cross-tabulations.

Ethical consideration

Ethical principles play an important role in research with human participants. The ethical clearance is aimed at protecting human participants from potential risks, such as disclosure of anonymity and confidentiality. Prior to collecting information from the respondents, the researcher explained to the respondents the objectives of the study, and how the findings would help them and the country at large. There were some ethical issues need considerations while collecting data for this research work. First, the researcher has taken care of the confidentiality and avoidance of coercion. Secondly, it was the duty of the researcher to show patience and respect for the culture and personality of the respondents. In this regard, the researcher forwards

to share the values and goals of a particular group in order to infiltrate the group. While administering the questionnaire, the researcher informs the respondents not to write their names. This helps to save the privacy of respondents on one hand, and contribute for acquiring more accurate information as the respondents feel free(no fear for their privacy) while giving their opinions on the other hand.

CHAPTER FOUR

4. RESULTS AND DISCUSSIONS

This chapter contains four main parts. The first part deals with demographic and socio-economic characteristics of sample household heads. Under demographic characteristics sex, age, educational background and family size of the household heads are included. Under economic characteristics main occupation and land holding size of the household heads are included. The second part assesses land degradation, its magnitude and extent in the study area. In this part emphasis is given on indicators of land degradation, history of occurrence of land degradation, severity of land degradation in each target kebele, reasons for increment of land degradation. The third part deals with effect of land degradation. This mainly gives emphasis on impacts of land degradation on crop production, livestock productivity, water resource and firewood resources, severity of land degradation on livelihood, type of effect face as a result of land degradation. The fourth part deals with the coping strategies applied by the community to overcome the effect of land degradation on livelihood.

4.1. Demographic characteristics and economic activity of the sample household heads

4.1.1. Demographic Characteristics

In this section age, sex, marital status, family size and educational background of the respondents were analyzed by using cross-tabulation techniques of analysis.

Table 4.1 Age of the HH * kebele of the HH Crosstabulation

			kebele of the HH				Total
			Deremo	kanat	Meskel-Tsion	Semena	
age of the HH	15-65	Count	54	37	42	44	177
		% within kebele of the HH	96.4%	92.5%	84.0%	88.0%	90.3%
	>65	Count	2	3	8	6	19
		% within kebele of the HH	3.6%	7.5%	16.0%	12.0%	9.7%
Total		Count	56	40	50	50	196
		% within kebele of the HH	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Survey result, March/ 2018

Table 4.2 Chi-Square Test of age and coping mechanisms of the household

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.200[a]	1	.655		
Continuity Correction	.000	1	1.000		
Likelihood Ratio	.378	1	.538		
Fisher's Exact Test				1.000	.828
Linear-by-Linear Association	.198	1	.656		
N of Valid Cases	145				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .18.
b. Computed only for a 2x2 table

As shown in the above table majority of the respondents 177(90.3%) were found in the age of 15-65 from the total respondents. This indicates that the majority of the respondents were found in the working age and them well known about the issue of land degradation and its impact on livelihood. This enables to obtain detail and reliable information. The remaining 19 (9.7%) of the respondent were found in the age of greater than 65 and this was important to obtain detail information regarding the history of occurrence of land degradation in that area. . As indicated in the above table the age of most of the respondents was lying in the working age which has a positive implication to do any daily work, to implement irrigation activities to overcome the effect of land degradation on livelihood than old aged household heads. This is because of that household who lie in the working age are endowed with more labor access than the old aged household heads. Older aged farmers have face labor constraint to apply the alternative options to cope up the problem of land degradation like working daily labor, practicing irrigation activities etc. In addition to this as indicated in the above there is a significant association between age and coping mechanisms i.e. P-value is significant at 0.65.this P-value is less than 1.0.

Table 4.3 Sex of the HH * kebele of the HH Cros tabulation

			kebele of the HH				Total
			Deremo	Kanat	Meskel-Tsion	Semena	
sex of the HH	Female		13	14	11	11	49
		% within kebele of the HH	23.2%	35.0%	22.0%	22.0%	25.0%
	Male		43	26	39	39	147
		% within kebele of the HH	76.8%	65.0%	78.0%	78.0%	75.0%
Total			56	40	50	50	196
		% within kebele of the HH	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Survey result, March, 2018

Table 4.4 Chi-Square Test of sex and coping mechanism

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.720[a]	1	.396		
Continuity Correction	.002	1	.969		
Likelihood Ratio	1.226	1	.268		
Fisher's Exact Test				1.000	.543
Linear-by-Linear Association	.715	1	.398		
N of Valid Cases	145				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .52.
b. Computed only for a 2x2 table

As indicated in the above table, from the total respondents 196, 147 (75.0%) were male headed and 49 (25.0%) were female-headed. Sex distribution between Meskel-Tsion and Semena were found the same. Male sex distributions of Deremo kebele were found greater than the three remaining kebeles. This indicates that the majority of the respondent was male headed and it has a positive implication on the application of coping mechanism to overcome the effect of land degradation on livelihood. Male-headed households are better endowed with labor than female-headed households. This enables them to apply coping mechanisms like daily labor, irrigation activities, preparing charcoal and selling it etc. This indicates that livelihood of female-headed

households is more affected by land degradation than male-headed households. As shown in the above table chi-square test of sex and coping mechanism there is a significant association between sexes and coping mechanism i.e. P is significant at 0.39

Table 4.5 Marital status of the HH * kebele of the HH Crosstabulation

			kebele of the HH				Total
			Deremo	Kanat	Meskel-Tsion	Semena	
Marital status of the HH	Single	Count	1	6	3	2	12
		% within kebele of the HH	1.8%	15.0%	6.0%	4.0%	6.1%
	Married	Count	51	34	42	46	173
		% within kebele of the HH	91.1%	85.0%	84.0%	92.0%	88.3%
	Divorced	Count	4	0	1	0	5
		% within kebele of the HH	7.1%	0.0%	2.0%	0.0%	2.6%
	Widowed	Count	0	0	4	2	6
		% within kebele of the HH	0.0%	0.0%	8.0%	4.0%	3.1%
Total		Count	56	40	50	50	196
		% within kebele of the HH	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Survey result, March, 2018

Table 4.6 Chi-Square Test of marital status and coping mechanism

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.287[a]	3	.962
Likelihood Ratio	.534	3	.911
Linear-by-Linear Association	.007	1	.931
N of Valid Cases	145		

a. 6 cells (75.0%) have expected count less than 5. The minimum expected count is .06.

As shown in the above table, from the total sample respondents of 196, 12 (6.1%) were single. From these single household heads 1 (1.8%), 6 (15.0%), 3 (6.0%), 2 (4.0%), and 12 (6.1%) were found in Deremo, Kanat, Meskel-Tsion, and Semena kebeles respectively. And 173 (88.3) were married heads. From these married respondents 51 (91.1%), 34 (85.0%), 42 (84.0%), 46 (92.0%), were found in each target kebeles respectively. And also 5 (2.6%), and 6 (3.1%) of the respondents were divorced and widowed respectively. As shown in the chi-square test P-value is significant at 0.96.

Table4.7 Family Size* kebele of the HH Cros tabulation

			kebele of the HH				Total
			Deremo	Kanat	Meskel-Tsion	Semena	
family Size	1-4	Count	2	5	2	3	12
		% within kebele of the HH	3.6%	12.5%	4.0%	6.0%	6.1%
	5-8	Count	42	25	31	39	137
		% within kebele of the HH	75.0%	62.5%	62.0%	78.0%	69.9%
	9-12	Count	12	8	13	7	40
		% within kebele of the HH	21.4%	20.0%	26.0%	14.0%	20.4%
	>12	Count	0	2	4	1	7
		% within kebele of the HH	0.0%	5.0%	8.0%	2.0%	3.6%
Total		Count	56	40	50	50	196
		% within kebele of the HH	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Survey result, March, 2018

Table 4.8 Chi-Square Test of family number and coping mechanism

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.991[a]	6	.920
Likelihood Ratio	2.754	6	.839
Linear-by-Linear Association	.019	1	.891
N of Valid Cases	144		

a. 9 cells (64.3%) have expected count less than 5. The minimum expected count is .01.

As indicated by the above table from the total sample respondents 196, 2 (3.6%), 5 (12.5%), 2 (4.0%) and 3 (6.0%) of the households have family size ranges 1-4. About 137(69.9%) of the sample respondents have family number five up to eight. From these 42 (75.0%), 25 (62.5%), 31 (62.0%), 39 (78.0%) are found in deremo, Kanat, Meskel-Tsion and Semena kebeles respectively. Those households having family size range between 9-12 represents 12 (21.4%), 8 (20.0%), 13 (26.0%) and 7 (14.0%) of the target kebeles. Household heads with family size above 12 constitute 2 (5.0%), 4 (8.0%) and 1 (2.0%) in Kanat, Meskel-Tsion, and Semena. This indicates that in Deremo there is no any household heads having a family size above 12. Based on the above table majority of the respondents have family size ranges 5-8. This indicates that an increase of population number is among the major causes of land degradation. Because the increasing population leads to the requirement of more agricultural production which requires more land.

Getting new agricultural land is not a simple task and it can result in the expansion of farming activities to erosion-prone marginal areas, deforestation, a decrease of fallow period and continuous cultivation (Habtamu, 2006 & Hussien, 2006). The high population number made steep fragile areas to be cultivated. This accelerates the problem of land degradation (Betru, 2003).

On the other hand household heads with greater family number have positive implication to implement land management practices like terracing and to apply coping strategies like irrigation activities to overcome the effect of land degradation on livelihood. This is because of that household heads with greater family number are endowed with more labor access than household heads with small family number. So the family number of the household heads have a positive effect on land management as well as coping mechanisms and in other ways, it aggravates the problem of land degradation.

Table 4.9. Educational background of the respondent * kebele of the HH Crosstabulation

			kebela of the HH				Total
			Deremo	Kanat	Meskel-Tsion	Semena	
Educational background of the respondent	No formal education		37	23	37	32	129
		% within kebele of the HH	66.1%	57.5%	74.0%	64.0%	65.8%
	1-4		13	8	7	14	42
		% within kebele of the HH	23.2%	20.0%	14.0%	28.0%	21.4%
	5-8		3	5	3	4	15
		% within kebele of the HH	5.4%	12.5%	6.0%	8.0%	7.7%
	9-10		1	1	1	0	3
		% within kebele of the HH	1.8%	2.5%	2.0%	0.0%	1.5%
	other		0	1	0	0	1
		% within kebele of the HH	0.0%	2.5%	0.0%	0.0%	0.5%
			2	2	2	0	6
		% within kebele of the HH	3.6%	5.0%	4.0%	0.0%	3.1%
Total			56	40	50	50	196
		% within kebele of the HH	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Survey result, March, 2018

Table 4.10 Chi-Square Test of education and coping mechanism

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.474[a]	5	.132
Likelihood Ratio	6.697	5	.244
Linear-by-Linear Association	.199	1	.656
N of Valid Cases	145		

a. 8 cells (66.7%) have expected count less than 5. The minimum expected count is .01.

Education is an instrument for the socio-economic development of a nation. It is a basic parameter for any development activity particularly land management programs. This is because literate citizen can be better participants and involve in development targeted to land resource sustainability. Knowledge and technology transfer are also easier in a community that constitutes

educated peoples. Educated individual demands for better services and toward the improvement of their living condition (UNESCO, 2013)

As shown in the above table, out of the total sample respondents, 129 (65.8%) of the household heads were can not write and read. From these 37(66.1%), 23 (57.5%), 37 (74.0%), and 32 (64.0%) respondents were can not read and write from each target kebeles respectively and 13 (23.2%), 8 (20.8), 7 (14.0%), 14 (28.0%) of the household heads were grade 1-4. From the total respondents 3 (5.4%), 5 (12.5%), 3 (6.0%), 4 (8.0%) of the head of the household were grade five up to eight and 1 (1.8%), 1 (1.5%), 1 (2.0%), of the respondents of Deremo, Kanat, and Meskel-Tsion were grade nine up to ten. The remaining 6(3%) of the household heads were above grade ten and others like mergeta and priests. As shown in the result of the table the majority of the sample respondents were illiterate which constitutes 129 (65.8%) of the total sample household heads followed by grade one up to four. Education is the most important factor which determines the land management practices of the households and use of fertilizer to improve the productivity of crops. So as the result shows that most of the respondents were can not read and write which results in improper land management practices and this leads problems of land degradation which in turn affects their livelihood. In addition to land management practices, education enables the household to find out alternative income source from non-farm activities like government employment which may serve as an alternative option to overcome the effect of land degradation on livelihood. Educated household heads can easily know the problem of land degradation and its effect on livelihood and them able to apply coping mechanisms easily than household heads which cannot read and write. As shown in the chi-square test of education and coping mechanism there is a significant association between them.

4.1.2. Economic Activity of the Respondent

Table 4.11 Economic Activity of the household heads * kebele of the HH Crosstabulation

			kebela of the HH				Total
			Deremo	Kanat	Meskel-Tsion	Semena	
What is your Economic activity	Crop production		4	3	5	1	13
		% within kebele of the HH	7.1%	7.5%	10.0%	2.0%	6.6%
	Mixed		52	36	41	48	177
		% within kebele of the HH	92.9%	90.0%	82.0%	96.0%	90.3%
	Livestock production		0	1	2	0	3
		% within kebele of the HH	0.0%	2.5%	4.0%	0.0%	1.5%
	Trade		0	0	2	1	3
		% within kebele of the HH	0.0%	0.0%	4.0%	2.0%	1.5%
Total			56	40	50	50	196
		% within kebele of the HH	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Survey result, March, 2018

As shown in the above table 177 (90.3%) of the sample household heads depend on mixed economic activity to sustain their livelihood. From these 52 (92.9), 36 (90.0%), 42 (82.0%) and 48(96.0%) of the respondent engaged on mixed economic activity in Deremo, Kanat, Meskel-Tsion and Semena kebeles respectively. Farmers who depend on only crop production constitutes only 13 (6.6%) of the sample respondents. Those household heads depend on only livestock production constitutes only 3 (1.5%). This indicates that most of the farmers in each target kebeles engaged in small -scale farming using simple farming methods and production systems. Because of the simple farming tools and methods, they use and they produce very small yields. As the result of the table indicates that the main source of income for the household directly depends on land resource. Both crop and livestock production requires land and this aggravates the problem of land degradation in each target kebele. So, land resource and its degradation is the critical issue in the study area that directly or indirectly affects the livelihood of farming community.

Table 4.12 HHs total size of farmland in hectares * kebele of the HH Crosstabulation

			kebele of the HH				Total
			Deremo	Kanat	Meskel-Tsion	Semena	
HHs total size of farm land in hectares	<0.5 hectare	Count	15	10	6	23	54
		% within kebele of the HH	27.8%	32.3%	13.0%	46.0%	29.8%
	0.5-1 hectare	Count	38	11	19	19	87
		% within kebele of the HH	70.4%	35.5%	41.3%	38.0%	48.1%
	1-2 hectare	Count	1	9	20	8	38
		% within kebele of the HH	1.9%	29.0%	43.5%	16.0%	21.0%
	3-4 hectare	Count	0	0	1	0	1
		% within kebele of the HH	0.0%	0.0%	2.2%	0.0%	0.6%
	>4 hectare	Count	0	1	0	0	1
		% within kebele of the HH	0.0%	3.2%	0.0%	0.0%	0.6%
Total		Count	54	31	46	50	181
		% within kebele of the HH	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Survey result, March, 2018

Regarding the size of the farmlands of the sample respondents, the above table indicates that about 54 (29.8%), of the household heads, have farmlands less than 0.5 hectares. From these 15 (27.8%), 10 (32.3%), 6 (13.0%), 23 (46.0%) represents the sample respondents in each target kebeles. The household heads having farm land size ranging between 0.5-1 hectares represents 38 (70.4%), 11 (35.5%), 19 (41.3%), 19 (38.0%) of the total respondents. From the total respondents 1 (1.9%), 9 (29.0%), 20 (43.5%) and 8 (16.0%) of population have farmlands ranging between 1-2 hectares. Households having farmlands between 3-4 hectares and above 4 hectares represent the same 1 (0.6%) respectively. This indicates that there is a land shortage problem in each target kebeles. Shortage of land enforces them to farm frequently and puts more pressure on their farm lands and to cultivate a steep slope which aggravates the problems of soil erosion and reduction in soil fertility which leads to land degradation and insufficient crop production which affects the livelihood of the households. With regard to coping mechanisms

household heads that have more farmland land can produce enough crops and they are less affected by effects of land degradation than household heads that have small size of farm land.

4.2. Land degradation, extent, and its magnitude

This section of the study includes land degradation problem, when land degradation occurs, indicators for land degradation, its magnitude and extent and reasons for the increment of land degradation in the study area.

4.2.1. Land degradation

Land is an important resource for the majority of Ethiopia people, who directly or indirectly depends on agricultural production for the source of income and their subsistence (Addise E, 2014). But now a day it becomes very scarce and getting scarcer since the population is increasing in size.

Table 4.13 Land degradation * kebele of the HH Crosstabulation

			kebele of the HH				Total
			Deremo	Kanat	Meskel-Tsion	Semena	
Is there land degradation in farm land	No	Count	3	6	1	0	10
		% within kebele of the HH	5.4%	15.0%	2.0%	0.0%	5.1%
	Yes	Count	53	34	49	50	186
		% within kebele of the HH	94.6%	85.0%	98.0%	100.0%	94.9%
Total		Count	56	40	50	50	196
		% within kebele of the HH	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Survey result, March, 2018

Land degradation for farmer reduction of the productive quality of the land particularly erosion of soil or inability of the land to produce crop without fertilizer. Land degradation is high and recognized by the farmers in each target kebeles. About 186 (94.9%) of the sample household heads respond that there is a land degradation problem on their farmland. Among these 53 (94.6%), 34 (85.0%), 49 (98.0%) and 50 (100%) of the respondent in Deremo, Kanat, Meskel-Tsion and replied that there is a land degradation problem on their farmland. Household heads who replied there is no land degradation on their farmland represent only 5.1% of the total respondents. This indicates that land degradation is the main problem for crop production in each target kebele finally which affects the livelihood of the farming communities

Table 4.14 Occurrence of Land degradation * kebele of the HH Cros tabulation

			kebele of the HH				Total
			Deremo	Kanat	Meskel-Tsion	Semena	
When land degradation occurred in your farmland	In the last five years	Count	10	6	4	19	39
		% within kebele of the HH	18.9%	17.6%	8.2%	38.0%	21.0%
	In the last ten years	Count	18	9	12	12	51
		% within kebele of the HH	34.0%	26.5%	24.5%	24.0%	27.4%
	In the last fifteen years	Count	23	10	16	13	62
		% within kebele of the HH	43.4%	29.4%	32.7%	26.0%	33.3%
	In the last twenty years	Count	2	0	17	6	25
		% within kebele of the HH	3.8%	0.0%	34.7%	12.0%	13.4%
	Other	Count	0	9	0	0	9
		% within kebela of the HH	0.0%	26.5%	0.0%	0.0%	4.8%
Total		Count	53	34	49	50	186
		% within kebela of the HH	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Survey result, March, 2018

In Ethiopia land degradation has a long history. In the study area, respondents were asked when land degradation occurred in your farmland. As the above table shows that from the total respondent about 39 (21.0%) replied that the problem of land degradation occurred on their farmland in the last five years. And farmers who said that land degradation problem occurred on their farmland in the last ten years constitutes 18 (34.0%), 9 (26.5%), 12 (24.5%) and 12(24.0%) in Deremo, Kanat, Meskel-Tsion and Semena kebele respectively. Farmers who said land degradation occurred in the last fifteen years represents 23 (43.4%), 10 (29.4%), 16 (37.7%) and 23 (26.0%) in each target kebele respectively. About 2 (3.8%), 17 (34.7%) and 6 (12.0%) replied that land degradation occurred in the last twenty years in Deremo, Meskel-Tsion, and Semna. About 9 (26.5%) of the respondent reported that land degradation occurred on their farmland after Derg regime and for this, they listed out several reasons like that of population pressure, topographic nature of the area, inappropriate land management practices, frequent farming etc. This indicates that land degradation has a long history in the study area. As the participant of

FGD and key informant interview said that land degradation has a long history starting from Derg regime and its rate of change is increasing from year to year and it requires a greater attention for the future.

4.2.2 Perceived Indicators of land degradation

There are many indicators of land degradation. These include land productivity reduction, drying up of water bodies like springs, yield reduction from the cultivation of field lands, the impossibility of producing cereal crops without fertilizer etc. Regarding this issue, respondents were asked in the study area. Accordingly, 51 (96.2%) in Deremo, 33 (97.1%) in Kanat, 42 (85.7%) in Meskel-Tsion and 42 (84.0%) in Semena replied that crop reduction from year to year is the main indicator for land degradation in each target kebeles.

As shown in the table below about 51 (96.2%), 29 (85.3%), 43 (87.8%) and 48 (96.0%) of the respondent in each kebele replied that reduction of land productivity to give sufficient crop production is the main indicator for land degradation. Respondents who said livestock reduction as an indicator for land degradation constitutes 8 (15.1%), 6 (17.6%), 21 (42.9) and 33 (66.0%) respondents in each target kebeles. The result of this table shows that decreases in land productivity followed by crop reduction are the main indicator of land degradation in the study area.

As the participant of FGD expressed that previously before Derg Régime yield production from field land was sufficient beyond consumption purpose and the use of chemical fertilizer was not known or not common. But after Derg Regime gradually, it is impossible to produce sufficient yields from farmland because of land productivity reduction and the use of chemical fertilizer to increase yield becomes common. And also now a day it is impossible to produce a crop without chemical fertilizer.

Table 4.15 Perceived Indicators for land degradation

Type of indicators			Deremo	Kanat	Meskel-Tsion	Semena	Total
Crop productivity reduction	No	Frequency	2	1	7	8	18
		%	3.8%	2.9%	14.3%	16.0%	9.7%
	Yes	Frequency	51	33	42	42	168
		%	96.2%	97.1%	85.7%	84.0%	90.3%
Total		Frequency	53	34	49	50	186
		%	100.0%	100.0%	100.0%	100.0%	100.0%
Livestock productivity reduction	No	Frequency	45	28	28	17	118
		%	84.9%	82.4%	57.1%	34.0%	63.4%
	Yes	Frequency	8	6	21	33	68
		%	15.1%	17.6%	42.9%	66.0%	36.6%
Total		Frequency	53	34	49	50	186
		%	100.0%	100.0%	100.0%	100.0%	100.0%
Decrease in land productivity	No	Frequency	2	5	6	2	15
		%	3.8%	14.7%	12.2%	4.0%	8.1%
	Yes	Frequency	51	29	43	48	171
		%	96.2%	85.3%	87.8%	96.0%	91.9%
Total		Frequency	53	34	49	50	186
		%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Survey result, March/ 2018

4.2.3 Perceived Extent of land degradation

Because of the complex and interrelated problems, land degradation in Ethiopia is increasing at alarming rate. Ethiopia's complex topography, geographical position, rainfall, temperature and broad altitudinal variation contribute to the existence of the rapid rate of land degradation. Since the level of land degradation is already reached an alarming stage (MoARD, 2007; WB, 2007 & Desta, 2009). Land degradation becomes a chronic problem in Ethiopia and a lot of efforts have been made to alleviate the problem. However, the problem of land degradation is continuing at an alarming rate (Yohannes, 1999 & Genene, 2006).

Like the other part of the country, in the study area, land degradation is increasing at a faster rate by over-cultivation and soil erosion. As the table below indicated that 53 (96.3%), 30 (78.9%), 47 (94.0%) and 48 (96.0%) of the respondent in Deremo, Kanat, Meskel-Tsion and Semena respectively reported that land degradation is increasing at a faster rate over time. About 2 (3.7%), 8 (21.1%), 3 (6.0%) and 2 (4.0%) of the respondent in each target kebeles said that land degradation is decreasing over time. For this, they were listed out reasons like that of the implementation of land management practices like a terrace. And the remaining three respondents were didn't say anything on the magnitude of land degradation in the study area.

Table 4.16 Perceived Extent of land degradation * kebele of the HH Crosstabulation

			kebela of the HH				Total
			Deremo	Kanat	Meskel-Tsion	Semena	
How do you see the extent of land degradation	Decrease	Count	2	8	3	2	15
		% within kebele of the HH	3.7%	21.1%	6.0%	4.0%	7.8%
	Increase	Count	53	30	47	48	178
		% within kebele of the HH	96.3%	78.9%	94.0%	96.0%	92.2%
Total		Count	55	38	50	50	193
		% within kebele of the HH	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Survey result, March/ 2018

4.2.4. Perceived Reasons for Increment of Land Degradation

There are many factors which aggravate the problem of land degradation. These include deforestation, overgrazing, high population pressure, frequent farming, ineffective land management practices etc.(Yohannes,1999).Like the other parts of the country, land degradation in the study area upper gumara catchment aggravated by different factors. Accordingly, a significant portion of the respondent 93.4% of the respondent from the total said that deforestation is the main reason for an increment of land degradation in upper gumara catchment. About 47 (88.7%) in Deremo, 27 (90.0%) in Kanat, 41 (85.4%) in Meskel-Tsion and 42 (85.7%) in Semena replied high population pressure is the main reason for an increment of land degradation.

About 30 (63.3%), 13 (43.3%), 22 (44.9%) and 31 (63.3%) in each target kebele respectively replied that ineffective land management practices as the reason which aggravates the problem of land degradation in the study area. The respondents who justified improper farming practice as a reason for an increment of land degradation constitutes 17 (9.4%) of the respondent from the total respondents In addition to these, the majority of the respondent in each kebele said that frequent farming and topographic nature aggravates the problem.

Table 4.17 Perceived Reasons for an increment of land degradation

Reasons			Deremo	Kanat	Meskel-Tsion	Semena	Total
Ineffective land management practices	no	Frequency	24	17	27	18	86
		%	44.4%	56.7%	55.1%	36.7%	47.3%
	yes	Frequency	30	13	22	31	96
		%	55.6%	43.3%	44.9%	63.3%	52.7%
Total		Frequency	54	30	49	49	182
		%	100.0%	100.0%	100.0%	100.0%	100.0%
Improper farming practices	no	Frequency	45	29	42	48	164
		%	84.9%	96.7%	85.7%	98.0%	90.6%
	yes	Frequency	8	1	7	1	17
		%	15.1%	3.3%	14.3%	2.0%	9.4%
Total		Frequency	53	30	49	49	181
		%	100.0%	100.0%	100.0%	100.0%	100.0%
Deforestation	no	Frequency	5	2	3	2	12
		%	9.4%	6.7%	6.1%	4.1%	6.6%
	yes	Frequency	48	28	46	47	169
		%	90.6%	93.3%	93.9%	95.9%	93.4%
Total		Frequency	53	30	49	49	181
		%	100.0%	100.0%	100.0%	100.0%	100.0%
Population pressure	no	Frequency	6	3	7	7	23
		%	11.3%	10.0%	14.6%	14.3%	12.8%
	yes	Frequency	47	27	41	42	157
		%	88.7%	90.0%	85.4%	85.7%	87.2%
Total		Frequency	53	30	48	49	180
		%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Survey result, March/ 2018

Table4.18 Chi-square test of reasons for increment of land degradation

Reasons	**Chi-square Asymp.sig.(2-sidd)**
Ineffective land management	.327
Inappropriate farming practices	.708
Population pressure	.00
Deforestation	.007
Frequent farming	.996

Moreover, the participant of FGD replied that high population pressure and deforestation are the main factors which increase the magnitude of land degradation. High population pressure leads distribution of farmland and also forced the households to expand farmlands on marginal areas and expansion of farmland at the expense of vegetation and forest. So population pressure is the main triggering factor for the increasing magnitude of land degradation in each target kebeles.

Fig 4.1 Topographic nature and frequent farming which aggravates land degradation (source, survey result march, 2018)

4.2.5. Perceived Magnitude of land degradation

As the graph and table below show that majority of the respondent replied that land degradation is a severe problem. About 41 (77.4%), 29 (58.0%) and 7 (14.3%) of the respondent in Deremo, Meskel-Tsion and Semena kebele respectively replied that their farmland is highly degraded and

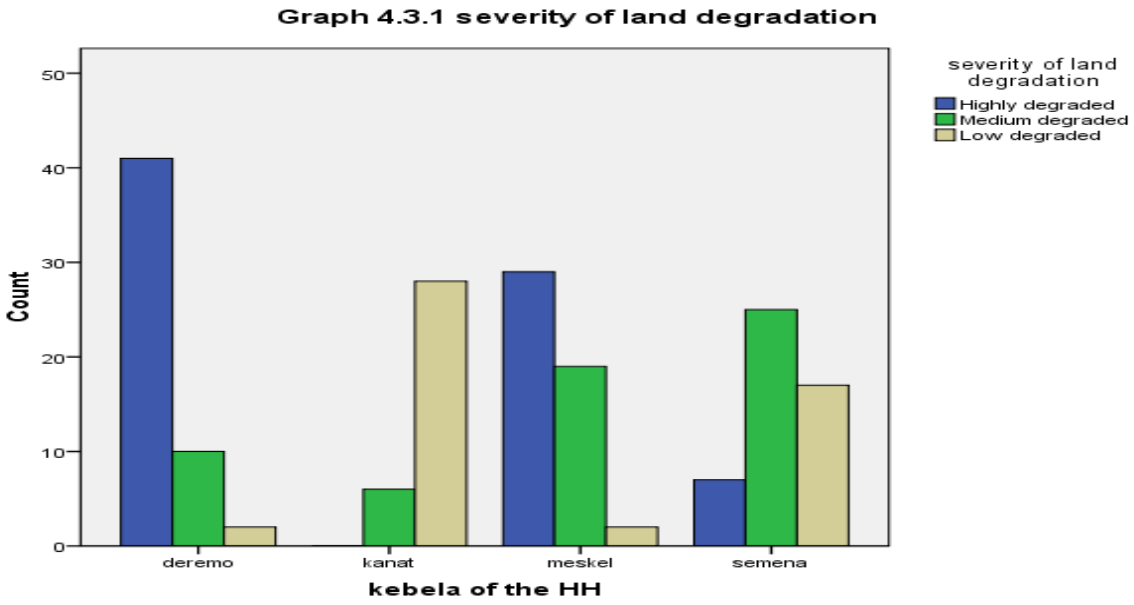
it affects their economic activity. In Kanat kebele there is no any respondent who replied as highly degraded. Respondents who said that their farmland is medium degraded constitutes 10 (18.9%), 6 (17.6%), 19 (38.0%) and 7 (14.3%) in each target kebeles respectively.

About 2 (3.8%), 28 (82.4%), 2 (4.0%) and 17 (34.7%) of the sample household heads reported that there is low degradation in their farmland. As shown in the above table there is low degradation in kanat kebele compared with the remaining three. As I observed the topography of this kebele is plain than the other study kebeles and results in low degradation. Furthermore, as the information obtained from FGD and key informant interview expressed there is high land degradation in Deremo and Meskel-Tsion kebeles, medium degradation in Semena kebele and low degradation in Kanat kebele.

Table 4.19 Perceived Magnitude of land degradation * kebele of the HH Crosstabulation

			kebele of the HH				Total
			Deremo	Kanat	Meskel-Tsion	Semena	
How do you see magnitude of land degradation	Highly degraded	Count	41	0	29	7	77
		% within kebele of the HH	77.4%	0.0%	58.0%	14.3%	41.4%
	Medium degraded	Count	10	6	19	25	60
		% within kebele of the HH	18.9%	17.6%	38.0%	51.0%	32.3%
	Low degraded	Count	2	28	2	17	49
		% within kebele of the HH	3.8%	82.4%	4.0%	34.7%	26.3%
Total		Count	53	34	50	49	186
		% within kebele of the HH	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Survey result, March, 2018



Source: Survey result, March, 2018

4.3. Perceived Impacts of land degradation on livelihood

Land degradation has a negative implication to household food security status and contributes directly to the reduction in livelihoods among the rural communities in Ethiopia. The immediate consequence of land degradation is lower crop yields, leading to higher poverty rates among agricultural households. According to National Review Report (2002), the country loses about 30,000 ha of agricultural land annually due to water erosion, and more than 2 million ha are degraded.

Land degradation has both on-site and off-site effects in the country. The most critical and urgent on-site impacts of land degradation particularly of soil erosion to the farmers a decline in both the current and potential crop and livestock yields—which translate into income loses. The consequences of soil erosion may also be viewed as the need to use more inputs to maintain soil productivity so as to attain the same level of yield (Wagayehu, 2003). The effect of land use change (such as the expansion of the agricultural frontier and the migration of households and communities towards pastoral land, fragile ecosystem) is the off-site effect of soil erosion (Kirui and Mirzabaev 2014).

Like the other parts of the country, the severity of the impact of land degradation is high in the study area. Because the livelihood of the community is highly depending on both crop and livestock productivity and sometimes on selling woods and wood products like selling charcoal.

The impact of land degradation on crop productivity, livestock productivity, water resource and natural forests are the predictors for the severity of its impact in the study area.

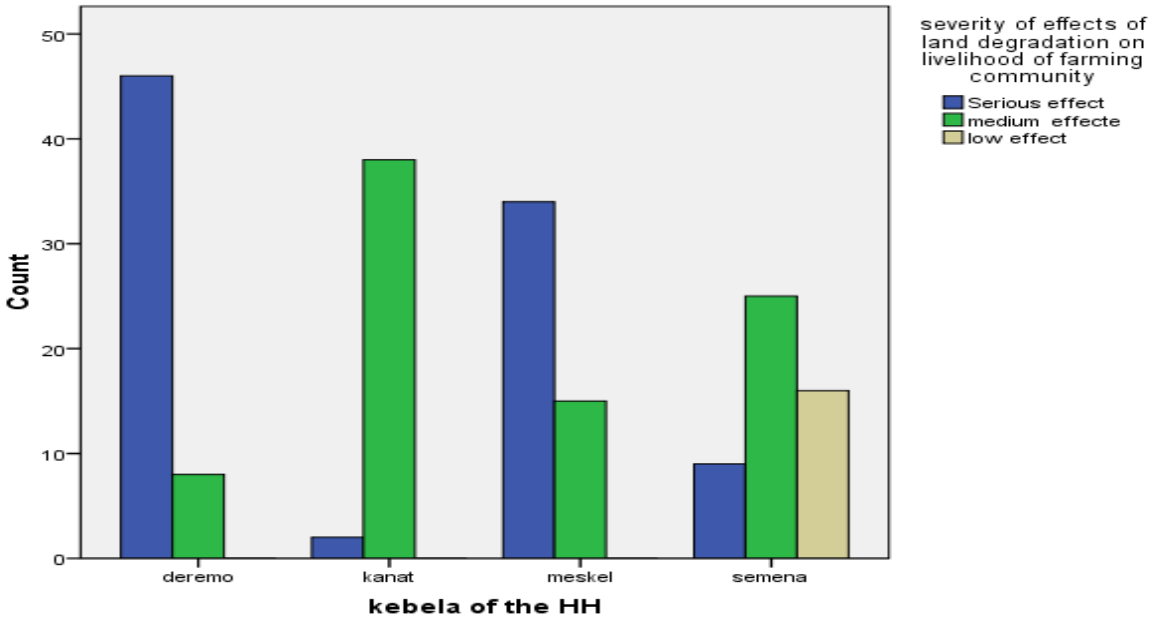
As shown in the below table from the total respondents about 97.4% of the respondent replied that land degradation affects their livelihood, and only 2.5% of the respondent replied that land degradation does not affect their livelihood. As the participant of focus group discussion and key informant interview expressed the livelihood of the community in the study area depends on crop and livestock production. So land degradation affects these activities and it forces them to sell their farm animal and labor. In addition to this, they said that the impacts of land degradation on crop and livestock productivity, its effect on water and firewood resource mostly leads to a reduction of a number of daily meals/eating frequency and sometimes it leads to reduce in quality of daily meals/ food quality and withdrawal of children from school and migration. As shown in the graph below the effect of land degradation on the livelihood of the study community is severe.

Table 4.20 Perceived Effects of land degradation on livelihood of farming community * kebele of the HH Crosstabulation

			kebela of the HH				Total
			Deremo	Kanat	Mesk el-Tsion	Semena	
Do you think land degradation affects the livelihood of the farming community	No		2	1	1	1	5
		% within kebele of the HH	3.6%	2.5%	2.0%	2.0%	2.6%
	Yes		54	39	49	49	191
		% within kebele of the HH	96.4%	97.5%	98.0%	98.0%	97.4%
Total			56	40	50	50	196
		% within kebele of the HH	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Survey result, March, 2018

Graph 4.4.1 Severity of effects of land degradation on livelihood of farming community



Source: Survey result, March, 2018

4.3.1. Perceived Impacts of land degradation on crop productivity

In Ethiopia, about 85% of the population depends on agricultural production to sustain their livelihood. In the country, a large portion of the agricultural land, which mainly located in the high land areas, is affected by severing to moderate land degradation (Kruger et al., 1997). Development of agricultural sector largely depends on land productivity. However, this resource is seriously threatened by land degradation and aggravates the problem of food insecurity in the country through its adverse impact on crop yield.

In many rural areas of the country the livelihoods of the households mainly depend on crop production. Crop production is determined by different factors in Ethiopia. But these factors vary from one area to the other because of topographic nature, climatic condition, etc. Crop production in Ethiopia is challenged by different factors. These factors include degradation of land and other natural resources, recurrent drought, land shortage, crop diseases and pests, lack of farm inputs (Yenas K, 2006).The availability and fertility of land is the major determinant for the livelihood of the farming communities in the study area. Because the quantity of productive land determines the amount of crop available for the households consumption. The major type of crops produced in the study area includes barley, wheat, Teff, potato, maize, chickpea, and lentil.

In addition to these there are perennial crops like buckthorn. The types of crops are varying from kebele to kebele because of climatic variations. For instance in addition to the above listed crops dagusa, chickpea, vetch, are very common in Semena and Meskeltsion. Peppercorn is common in semena kebele. But the productivity of these crops is declining as a result of land degradation. As shown in the table below 193 (99.0%) of the respondent replied that land degradation affects their crop productivity. Next to land degradation, less access to farm input, land shortage, snow/ beredo are the main challenges for crop productivity in the study area. Furthermore, the participant of FGD and key informant interview said that land degradation affects all types of crops, but the magnitude of its effect is vary from crop to crop. For instance, Teff and Bean are the crops seriously affected by land degradation. They were justified reasons for this. Teff is cultivated mostly in summer season and this aggravates the erosion rate and finally it affects its productivity. Now a day's cultivation of bean is impossible as a result of reduction of soil fertility. As the participant of FGD and key informant interview said that the current status of crop production is insufficient to support the livelihood of their family livelihood. As a result of this farmers are forced to use fertilizer in order to increase crop productivity. As they expressed the use of chemical fertilizer becomes common in the last ten years and currently there is no any type of crop variety cultivated without fertilizer. The price of chemical fertilizer is increasing from year to year it becomes beyond their buying abilities. This negatively affects the net income from production. Additionally, as shown in in the annex part B crop productivity in each target kebele starting from 2001 up to 2009 is declining as a result of land degradation. But it does not mean that land degradation is the only reason, there are other factors contributing to this like pests and disease, Beredo/snow in addition to land degradation that contributes to the decline of crop productivity.

Table 4.21 Perceived Effects of land degradation on crop productivity * kebele of the HH Crosstabulation

			kebela of the HH				Total
			Deremo	Kanat	Meskel-Tsion	Semena	
Dose land degradation affects crop productivity	No		2	0	0	0	2
		% within kebele of the HH	3.6%	0.0%	0.0%	0.0%	1.0%
	Yes		53	40	50	50	193
		% within kebele of the HH	96.4%	100.0%	100.0%	100.0%	99.0%
Total			55	40	50	50	195
		% within kebele of the HH	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Survey result, March, 2018

4.3.2. Perceived Impacts of land degradation on livestock

Livestock production is an integral part of the economy and it is considered as an asset. Because it is important to overcome the problem of food shortage during crop failure and land cultivation is undertaken by using animals like oxen. In the study area livestock production is the major economic activity on which households depend on it next to crop production. There are different types and kinds of livestock owned by households. The major type of livestock in the study area includes ox, cow, calf, sheep, and donkey. The number of livestock is the major determinant factor for crop production because it provides the power for land cultivation. But the productivity of livestock is declining over time as a result of land degradation. As shown in the table and graph below the trend in livestock productivity is declining over time because of different reasons next to land degradation. As shown in the table about 54 (96.45), 35 (87.5%), 45 (90.0%) and 48 (96.0%) in Deremo, Kanat, Meskel-Tsion and Semena kebele respectively replied that the productivity of livestock is declining from time to time. Sample household heads replied that the productivity of livestock is increasing over time constitutes 1 (1.8%), 5 (2.5%) and 1(2.0) in Deremo, Kanat and Semena kebele respectively. About 1 (1.8%), 5(10.0%) and 1 (2.0%) of

respondent replied that the productivity of livestock does not show any change over time. The respondents were listed reasons for declining of livestock productivity like shortage of grazing land, population pressure and diseases. In addition to the response of survey result, the participant of FGD and key informant interview reported that there is livestock change from traditional type in to a small number within better quality livestock. Now days, there is the introduction of cattle with better quality rather than having a large number of cattle in each target kebeles. Based on the view of the FGD participant and key informant interview land degradation affects all types of livestock but its effect varies from cattle to grazing animals. As they expressed sheep and donkey are seriously affected by land degradation, because both of them are grazing animals. As the participant of FGD and key informant interview expressed the productivity and size of grazing land is declining over time as a result of the expansion of farmland on grazing to compensate crop productivity loss and area enclosure for rehabilitation purpose are the main reason for declining of grazing land. Based on the view of them the declining of grazing land as a result of population pressure is the other factor which affects the productivity of livestock in the study area.

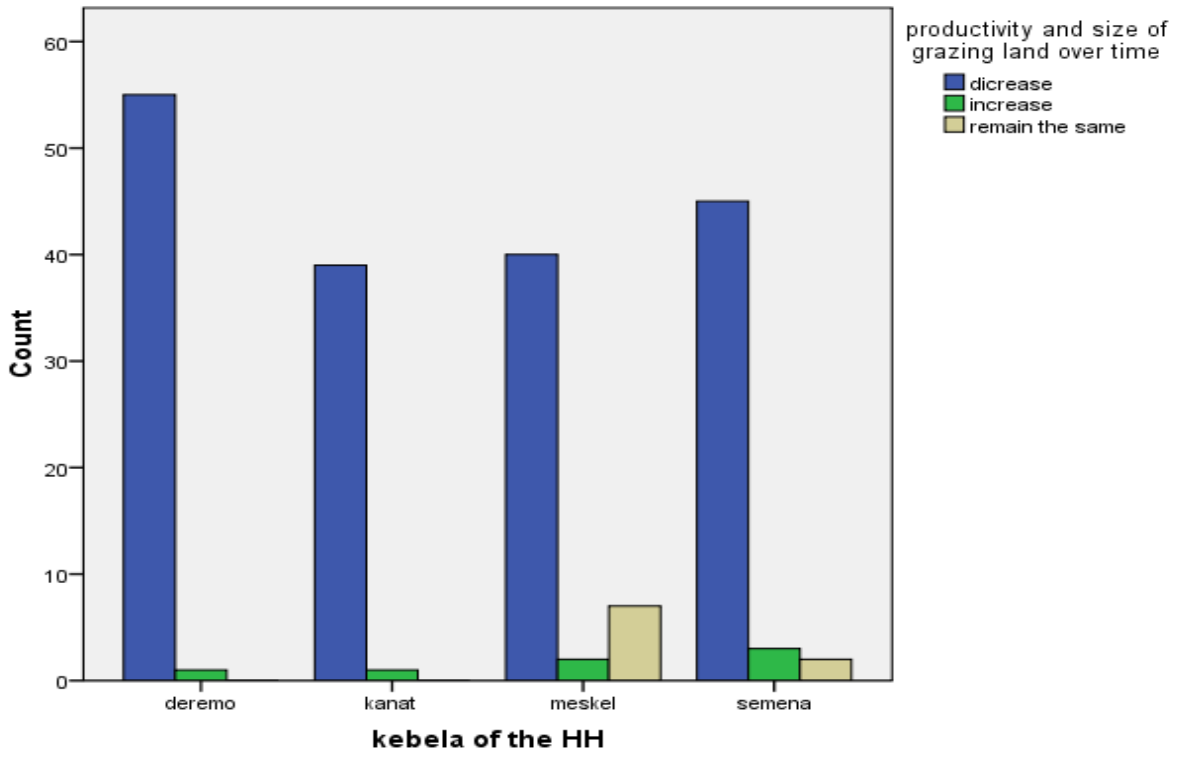
Table 4.22 Perceived Trend of livestock productivity * kebele of the HH Crosstabulation

			kebele of the HH				Total
			Deremo	Kanat	Meskel-Tsion	Semena	
What looks like the trend of livestock productivity over time	Decrease		54	35	45	48	182
		% within kebele of the HH	96.4%	87.5%	90.0%	96.0%	92.9%
	Increase		1	5	0	1	7
		% within kebele of the HH	1.8%	12.5%	0.0%	2.0%	3.6%
	Remains the same		1	0	5	1	7
		% within kebele of the HH	1.8%	0.0%	10.0%	2.0%	3.6%
Total			56	40	50	50	196
		% within kebele of the HH	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Survey result, March, 2018

As shown in the graph below the productivity and size of grazing land is declining over time as a result of land degradation. This is the main reason for decreasing of livestock productivity in the study area. Based on personal observation during data collection area enclosure is the main land management practices to rehabilitate the degraded area and this is the main reason for declining of grazing land.

Graph 4.2.2 Productivity and size of grazing land



Source: Survey result, March, 2018

4.3.3. Perceived Impacts of land degradation on water resource

In Ethiopia, land degradation not only impacts crop and livestock productivity but also water resources on which welfare of human life depends. Many activities, both good and bad, have been practiced in the watersheds of lakes, reservoirs, rivers, and streams due to an increasing human population. As a result of extensive deforestation, overgrazing and poor crop and soil management practices in the watersheds over long periods, large sediment loads have accumulated in river channels, lakes, and reservoirs. Movement of soil by water as a result of land degradation in the highlands actually ends up in rivers and causes the problem of siltation.

Siltation along river valley has led to the disappearance of perennial streams (Bezuayew,T et.al,2002).

In the study area, respondents were asked regarding the effects of land degradation on water resource in their surroundings. Accordingly, 54 (96.4%), 35 (87.5%), 39 (78.0%) and 47 (94.0%) of the respondent in Deremo, Kanat, Meskel-Tsion and Semena kebeles respectively said yes land degradation affects water resource. And the remaining 2 (3.6%), 5 (12.5), 11 (22.0%) and 3 (6.0%) in each target kebeles replied no land degradation don't affect water resource. In addition to the survey result, the participants of focus group discussion expressed that natural springs are drying up and currently the community faces a serious problem of water resources. There is lack of water for household consumption purpose and for livestock drinking in the study area.

Table 4.23.Perceived Eeffects of land degradation on water resources * kebele of the HH Crosstabulation

			kebele of the HH				Total
			Deremo	Kanat	Meskel-Tsion	Semena	
Dose land degradation effects water resources	No		2	5	11	3	21
		% within kebele of the HH	3.6%	12.5%	22.0%	6.0%	10.8%
	Yes		54	35	39	47	175
		% within kebele f the HH	96.4%	87.5%	78.0%	94.0%	89.2%
Total			56	40	50	50	196
		% within kebele of the HH	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Survey result, March, 2018

4.3.4 Perceived Effects of land degradation on firewood resource

In all rural parts of the country, the source of energy is highly dependent on biomass energy. Fuelwood is used for cooking and lightning. But land degradation affects this source of energy. Due to the high degree of land degradation important natural resources forests used as source of energy are highly deteriorated. Land degradation has a negative impact on forest resource. This is because of that degradation of agricultural land causes deforestation of natural forest in order to compensate the degraded croplands. Currently, indigenous trees are replaced by exotic trees

like eucalyptus. Indigenous trees are found only in protected areas like churches and inaccessible steep slopes.

Like the other parts of the country, fuelwood is the main source of energy in the study area. As shown in the above table about 51 (91.1%), 21 (52.5%), 20 (40.0%) and 13 (26.0%) in Deremo, Kanat, Meskel-Tsion, and Semena replied land degradation affects their source of firewood. And from the total respondent, 91 (46.4%) replied that land degradation doesn't affect firewood resource. As the result of focus group discussion and key informant interview shows that currently there is no any type of natural trees which serve as a source of energy but they shifted to the use of eucalyptus as a source of energy because of this the effect of land degradation on firewood resource is compensated by eucalyptus tree in the stud area.

Table4.24 Perceived Effects of land degradation on firewood resources * kebele of the HH Crosstabulation

			Kebele of the HH				Total
			Deremo	Kanat	Meskel-Tsion	Semena	
Dose land degradation affects fire wood resources	No		5	19	30	37	91
		% within kebele of the HH	8.9%	47.5%	60.0%	74.0%	46.4%
	Yes		51	21	20	13	105
		% within kebele of the HH	91.1%	52.5%	40.0%	26.0%	53.6%
Total			56	40	50	50	196
		% within kebele of the HH	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %

Source: Survey result, March, 2018

4.4. Strategies applied by the community to overcome the effect of land degradation on their livelihood

To avoid the negative impacts of land degradation on the livelihood of rural households several options need to be applied to tackle the problem. But these options may be positive or negative. From the negative way of overcoming the problem is cutting down trees and making charcoal to sale and cutting down trees for expansion of farmlands. This idea is supported by the result of LULCC analysis of the watershed in the above parts. In this part, a huge amount of vegetation and forest lands were changed into agricultural land between 12 years of interval. For instance, vegetation cover in 2006 was 29% but it declines up to 7% in2018 and forest resource in 2006 was 13% but it declines up to 4% in 2018. In the study area the positive way of overcoming the problem including daily labor, farm animal sale, handcraft, and irrigation. So the majority of the respondent 194 (99.0%) said that there are options to overcome the effect of land degradation on livelihood. As the participant key informant interview expressed and as I observe these options vary from kebele to kebele. For instance, irrigation is more common in Meskel-Tsion; handicraft is more common in Deremo and Semena kebele.

Table 4.25 Options used by the household to overcome the effect of land degradation on livelihood * kebele of the HH Crosstabulation

			kebele of the HH				Total
			Deremo	Kanat	Meskel-Tsion	Semena	
Is there any type of options used by the household to overcome the effect of land degradation on livelihood	No	Count	2	0	0	0	2
		% within kebele of the HH	3.6%	0.0%	0.0%	0.0%	1.0%
	Yes	Count	54	40	50	50	194
		% within kebele of the HH	96.4%	100.0%	100.0%	100.0%	99.0%
Total		Count	56	40	50	50	196
		% within kebele of the HH	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Survey result, March, 2018

4.4.1. Type of options applied by the community to overcome the effects of land degradation

Land degradation puts a negative effect on the livelihood of a farming community like reduction income. So to overcome these problems several strategies need to be applied. In the study area, the community uses a different type of strategies to overcome the problem. About 42 (77.8%) in Deremo, 26 (65.0%) in Kanat, 30 (60.0%) in Meskel-Tsion and 35 (70.0%) in semena apply daily labor as a means of tackling the problem. Sample respondents who use farm animal sale as an option to overcome the problem constitute, 41 (75.9%), 33 (82.5%), 43 (86.0%) and 17 (34.0%) in each kebele respectively.

About 18 (34.0), 6 (15.0%), 16 (32.0%) and 40 (80.0%) of respondent in each kebele respectively applied handicraft as an option and 13 (24.1%) in Deremo, 7 (17.5%) in Kanat, 10 (20.0%) in Meskel-Tsion and 5 (10.0%) in semena applied trade as an option to overcome the problem. As the participant of FGD and key informant interview expressed the application of these strategies vary from kebele to kebele. For instance, handicraft is more common in semena kebele than the others and daily labor and sale of farm animal are common in each kebeles. Based on personal observation during data collection planting of Buckthorn and selling it, eucalyptus planting and selling it to buy cereal crops and irrigation activities are the most commonly applied strategies in each target kebeles. As they expressed that daily labor particularly temporal migration to Mettema during the summer season is the main strategy applied by the community. In addition as I observe selling of charcoal to nearby towns is the main option applied in each target kebeles.

Table 4.26 Type of options to overcome the problem of land degradation on livelihood

Type of options			Deremo	Kanat	Meskel-Tsion	Semena	Total
Farm animal sale	No	Frequency	13	7	7	33	60
		%	23.2%	17.5%	14.0%	66.0%	30.6%
	Yes	Frequency	43	33	43	17	136
		%	76.8%	82.5%	86.0%	34.0%	69.4%
Total		Frequency	56	40	50	50	196
		%	100.0%	100.0%	100.0%	100.0%	100.0%
Daily labor	No	Frequency	12	14	20	15	61
		%	21.4%	35.0%	40.0%	30.0%	31.1%
	Yes	Frequency	44	26	30	35	135
		%	78.6%	65.0%	60.0%	70.0%	68.9%
Total		Frequency	56	40	50	50	196
		%	100.0%	100.0%	100.0%	100.0%	100.0%
Trade	No	Frequency	42	33	40	45	160
		%	75.0%	82.5%	80.0%	90.0%	81.6%
	Yes	Frequency	14	7	10	5	36
		%	25.0%	17.5%	20.0%	10.0%	18.4%
Total		Frequency	56	40	50	50	196
		%	100.0%	100.0%	100.0%	100.0%	100.0%
Handcraft	No	Frequency	37	34	34	10	115
		%	66.1%	85.0%	68.0%	20.0%	58.7%
	Yes	Frequency	19	6	16	40	81
		%	33.9%	15.0%	32.0%	80.0%	41.3%
Total		Frequency	56	40	50	50	196
		%	100.0%	100.0%	100.0%	100.0%	100.0%
Any type of aids from the government	No	Frequency	56	40	50	50	196
		%	100.0%	100.0%	100.0%	100.0%	100.0%
	Yes	Frequency					
		%					
Total		Frequency	56	40	50	50	196
		%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Survey result, March, 2018

Fig 4.2 Irrigation activities applied by the community to overcome the effect of land degradation on livelihood (survey result march, 2018)

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Land resource degradation is the major environmental problem negatively affecting economic development in general and livelihood of the farming community in particular in Ethiopia. So the study tried to investigate the effects of land degradation on the livelihood of farming communities in Upper Gumara catchment in Northern, Ethiopia. Questionnaires were distributed to 196 randomly selected household heads. The age of most of the sample respondents was found between15-65. Sample respondents were both male and female and the majority of the respondents were illiterate. Family size of the majority of the respondent ranges between5-8. As the finding of the study indicates the livelihood of all sampled household heads depend on mixed farming activity both crop production and livestock rearing (90.3%) of the sample respondents. As the result of this study indicates that like the other parts of the country land degradation is the serious problem which negatively affects the livelihood of the farming community.

The average size of farmland owned by the households heads range between 0.5-1 hectare and this limits crop production in the study area. As the finding of the study indicates crop and livestock productivity of the household heads are declining over time because of land degradation. In addition to land degradation snow, land shortage, less access to farm inputs are the main challenges for crop production and expansion of farmland on grazing land to compensate the loss of crop as a result of land degradation and area enclosure for restoration practices are the main challenges for livestock production. As the finding indicates in the study area, about 94.9% of respondent replied that there is land degradation and it was started in the last fifteen years. The magnitude of land degradation in the study area increases from time to time. As the finding indicates from the four selected kebeles Deremo and Meskel-Tsion are highly degraded, semena kebele is medium degraded and Kant kebele is low degraded.

The Large size of farmland is damaged as a result of land degradation in each target kebeles. As the finding indicates high population pressure, topographic nature of the area, frequent farming and land use land cover change are the main factors aggravating the problem of land degradation in the study area and the quality of farmland productivity become decline. As the

finding indicates livelihood of the farming community is seriously affected by land degradation. About 97.4% of the respondent replied that their livelihood is affected by land degradation. The main effects that the community face as a result of land degradation on livelihood includes reduced in a daily number of meals, reduced in quality of food, withdrawal of children from school and health problem. But the major problem resulted from land degradation is reduced in a daily number of meals. Regarding the strategies applied by the community to overcome the effect of land degradation on livelihood, there have been types of options undertaken in the study area by the farming community. The common strategies applied in the study area includes farm animal sale to buy cereal crops, daily labor, handcraft, planting perennial crops like buckthorn and selling it, irrigation activity and deforestation of vegetation and forest to expand farmlands.

5.2 Recommendations

The finding the study indicates that there is a serious land degradation problem and it seriously affects the livelihood of the farming community in the study area. Different land management practices have been implemented but these practices were not effective. So, based on the finding of the study, the following points will be important for the future in order to reduce the problem and to make the environment suitable in particular in the study area and generally in the country.

- There should be a technological advancement in order to increase agricultural productivity and to disseminate information regarding land management practices.
- Area enclosure is the main technique for rehabilitation of degraded lands. So there should be active participation of local community to make it sustainable.
- Training should be given to the farmers regarding the use of compost and its preparation in order to increase crop productivity on their farmland.
- Focus should be given on searching of alternative soil and water conservation rather than focusing on terracing.
- It is better to create awareness about the negative effects of land degradation on livelihood. Knowing the negative effect of land degradation on livelihood enables the farmer to manage their farmland effectively.
- Irrigation activity is the main option applied by the community to overcome the effect of land degradation on livelihood. It is better to provide modern instruments like pumps to the farmer to make irrigation more effective
- It is better to give emphasis on modern crop seeds to increase crop productivity.
- The livelihood of the farming community in the study area directly depends on the land resource for both crop and livestock productivity but the sustainability of their livelihood is affected by land degradation. So, focus should be given on introduction of non-farm incomes source rather than depending on the land resource.

FUTURE RECOMMENDED RESEARCH AREAS

Any measurement like applying the use of GIS to classify the area as high degraded, medium degraded and low degraded, soil analysis to test the soil fertility were not the focus of this study. So, these issues may be future research areas for others.

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Appendixes

Appendix A

House hold survey questionnaire

Dear Sir/ Madam

This questioner is prepared to assess the impacts of land degradation on livelihood of the farming community in the case of Upper Gumara catchment in Northern Ethiopia. The information is specifically for study purpose and is highly confidential. Your positive response is highly appreciated.

Annex I

Part I background information

1. Kebele _____
2. Age
   A. 1-14
   B. 15-64
   C. Above 65
3. Sex
   A. Male
   B. Female
4. Marital status of the respondent
   A. Single
   B. Married
   C. Divorced
   D. Widowed
5. family number including yourself
   male_____ total_____
   female_____
6. educational background of the respondent
   A. illiterate
   B. 1-4
   C. 5-8
   D. 9-10
   E. 10+2
   F. Others specify _____

Part II economic activities

1. Economic activity of the respondent(multiple answers are possible)
   A. Crop production D. trade
   B. Livestock production E. others, specify
   C. Mixed farming
2. Do you have your own farm land?
   A. Yes
   B. No
3. If your answer is yes for Q 2 what is the total size of your farm land in hectares?
   A. Less than 0.5 hectare D. 3-4 hectares
   B. 0.5 to 1 hectare E. above 4 hectares
   C. 1-2 hectares
4. What types of crops do you grow in your farm land? (multiple answers are possible)
   A. Barely C. Teff D. Potato
   B. Wheat E. bean
   F. others specify_____
5. How do you see your current crop production to support your family?
   A. Sufficient
   B. Insufficient
6. If your answer is insufficient for question no 5 what are the options you use to sustain your family livelihood? (multiple answers are possible)
   A. Crop rotation C. clearing forest D. day labor
   B. Contract land E. others specify _____
7. What are the challenges for crop production in your farmland? (Multiple answers are possible).
   A. Less access to farm inputs D. Drought
   B. Land shortage E. land degradation
   C. Crop disease and pests F others specify _____
8. Dou you have your own livestock?
   A. Yes B. No

9. If your answer is yes for question No 8, what type and number of livestock you have?

Livestock type	**Number**
Ox	
Cow	
Calf	
Sheep	
Goat	
Horse	
Mule	
Donkey	
Others specify	

10. How do you see the trend of your livestock number?
    A. Increasing
    B. Decreasing
    C. Remain the same
11. If your answer is decreasing for Q No 10 what is the reason(multiple answers are possible)
    A. Shortage of grazing land due to crop land degradation
    B. Population pressure
    C. Diseases
    D. Drought
    E. Others specify_____
12. How do you feed your livestock? (multiple answers are possible)
    A. Grazing on communal lands
    B. Own grazing land
    C. Cut and carry from communal pasture land
    D. Crop residue
    E. Others specify _____
13. How do you see the productivity and size of grazing land over time?
    A. Increasing
    B. Decreasing
    C. Remains the same

14. If your answer is decreasing for Q No 13 what are the reasons? (multiple answers are possible)
    A. Expansion of farm land to compensate loss of productivity due to degradation
    B. Erosion of grazing land
    C. grazing land distribution among people
    D. others specify_____
15. . Are there any types of new grasses that grow as a result of land degradation?
    A. Yes

Part III Land degradation

1. Do you think that there is land degradation in your farm land?
    A. Yes B. No
2. If your answer is yes for Q no 1 how do you express the indicators?(Multiple answers are possible)
    A. Crop reduction C. Decrease in land productivity
    B. Livestock reduction D. Others specify
3. If your answer is yes for Q1when land degradation occurs in your farm land?
    A. In the last five years C. In the last fifteen years
    B. In the last ten years D. In the last twenty years
4. Do you think that there is crop productivity difference before land degradation and after land degradation?
    A. Yes B. No
5. If your answers is yes for Q4 what are this differences?

    _____

    _____

6. If your answer is yes for Q no 1 how do you express its magnitude?
    A. Increasing B. Decreasing
7. If your answer is increasing for Q no 6 what is the reason?
    A. Ineffective land management practices
    B. Improper farming practices

C. Deforestation

D. Population pressure

E. Others specify_____

8. If your answer is increasing for Q no 6 how do you express the severity of land degradation?

A. Highly degraded

B. Medium degraded

C. Low degraded

9. How much of your farm land is damaged because of land degradation in hectares?

A. Above 4 hectare of land

B. 3 hectare of land

C. 2 hectare of land

D. 1 hectare of land

E. Others specify____

10. Do you think that land degradation affects your crop productivity?

A. Yes

B. No

11. If your answer is yes for Q no 10 what is the reason for this? (multiple answers are possible)

A. Decrease in land productivity

B. Soil erosion

C. Over grazing of farm lands

D. Others specify_____

12. If your answer is yes for Q no 10 which type of crop is seriously affected by land degradation?

A. Teff

B. Wheat

C. Barely

D. Potato

E. Others specify--

13. Do you start the use of chemical fertilizer to increase crop productivity?

A. Yes

B. No

14. If your answer is yes for Q no 13 is yes when did you start to use artificial fertilizer?

A. In the last five years

B. In the last ten years

C. In the last fifteen years

D. Others specify_____

15. Does land degradation affect livestock Productivity in your locality?

A. Yes

B. No

16. If your answer is yes for Q no 15 what are the reasons for this? (multiple answers are possible)
    A. Shortage feed due to expansion of farm lands into grazing lands
    B. Parasites and diseases
    C. Deterioration of grazing lands
    D. Others specify_____
17. If your answer is yes for Q no 15 which type of livestock is mostly affected by land degradation?
    A. Ox C. Horse E. Donkey
    B. Cow D. Sheep
    F. Others specify____
18. Do you think that land degradation affect water resource in your locality?
    A. Yes B. No
19. If your answer is yes for Q no 18 what effect do you observe on water resource?

    _____

    _____

    _____
20. Does land degradation affect your fire wood resource?
    A. Yes B. No
21. If your answer is yes for Q no 20 how land degradation affects your fire wood resource?

    _____

    _____

Part IV effects of land degradation on livelihood and copping strategies to overcome the problem

22. Do you think that land degradation affects your livelihood?

    A. Yes B. No

23. If your answer is yes for Q no22 how do you express its effects on your livelihood?

    A. Seriously affected my livelihood
    B. It has medium effect on my livelihood
    C. It has low effect on my livelihood

24. If your answer is yes for question no 22 what type of effect you face as a result of land degradation?

    A. Reduced number of daily meals
    B. Reduced in quality of meals
    C. Withdrawal of children from school
    D. Poor health
    E. Others specify

25. If your answer is no why?

    _____

    Is there any type of options to overcome the effect of land degradation on your livelihood?

    A. Yes B. No

26. If your answer is yes for Q no 26 what are the options? (Multiple answers are possible and rank based on their importance).

    A. Farm animal sale
    B. Daily labor
    C. Trade
    D. Hand craft
    E. Any type of aids from the government
    F. Others specify____

27. Which options are dominantly used?

_____

_____

_____

Annex II Check lists for focus group discussion

1. Is there land degradation in this kebele?
2. What are the indicators of land degradation?
3. How do you explain the extent and magnitude of land degradation in this kebele?
4. Do you think that land degradation affects the economic activity of the community?
5. If your answer is yes which type of activities are seriously affected by land degradation?
6. What are the major livelihood impacts of land degradation in this kebele?
7. What measures have been taken previously to reduce this problem?
8. Do you think that the measures that have been taken previously are satisfactory?
9. If not what has been done to the future to halt the problem?
10. Which type of the copping is most dominantly used by the community?

Annex III Questionnaires for key informant interview

1. How do you explain the economic activity of the community?
2. Are there any challenges for these economic activities?
3. If your answer is yes what are these constraints?
4. Are there any changes in land holding size over time in the community?
5. If your answer is yes what are the indicators for these changes?
6. Do you think that there is land degradation in this kebele?
7. If there is land degradation, what are the indicators?
8. How do you explain the status and magnitude of land degradation in your kebele?
9. What factors aggravate the problem? (order based on their level of seriousness)
10. Do you think that land degradation affects crop productivity of the community?

11. Do you think that land degradation affects the livestock productivity in the community?
12. What are the impacts of land degradation on livelihood of the community?
13. Which type of activities mainly influenced by land degradation? (order based on their level of change)
14. Do you think that land degradation affects water resource in this area?
15. What are the options used by the community to sustain their livelihood?

Appendix B

Crop productivity difference from 2001 to 1009 in each target kebeles

Crops produced in quintal in each target kebele				
	Target Kebeles			
Years	**Deremo**	**Kanat**	**Meskel-Tsion**	**Semena**
2001 to 2002	**76,920.94**	**84,952.75**	**80,603.14**	**82,550.34**
2002 to 2003	**74,520.75**	**81,186.84**	**78,450.5**	**80,340.23**
2003 to 2004	**73,580.23**	**81,143.03**	**77,980.40**	**80,270.25**
2004 to 2005	**65,370.16**	**7903.28**	**70,540.45**	**75,170.49**
2005 to 2006	**62,720.45**	**74,673.45**	**69,420.32**	**70,550.54**
2006 to 2007	**60,420.35**	**72,196.65**	**65,450.12**	**70,240.15**
2007 to 2008	**59,240.25**	**66,723.19**	**60,450.1**	**62,605.21**
2008 to 2009	**38,720.5**	**52,485.15**	**40,970.10**	**45,420.23**
2009 to 2010	**30,760.5**	**46,077.90**	**34,450.32**	**38,508.2**

Source: agricultural office of the woreda 2010