FARMERS AWARENESS ABOUT LAND DEGRADATION AND THE PRACTICES OF SOIL AND WATER CONSERVATION MEASURES IN HADIYA ZONE: THECASE OF DUNA WOREDA, ETHIOPIA

A THESIS SUBMITTED TO SCHOOL OF GRADUATE STUDIES,

ADDISABABAUNIVERSITY

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR DEGREE OF

MASTERS OF ART IN GEOGRAPHY AND ENVIRONMENTAL STUDIES

(WITH THE SPECIALIZATION OF NATURAL RESOURCE MANAGEMENT)

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JUNE, 2015

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Declaration

I the undersigned declare that this Thesis is my original work and has never been presented for any degree in any university and all the sources of materials used for the Thesis have been appropriately acknowledged.

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Acknowledgments

Primarily I would like to thank holy God who helped me to come to this end. I like to express deep gratitude to my adviser K.N Singh (PhD) for his commitment and tireless help in conducting this study. My work wouldn't come to this end without his tireless assistance and availability whenever I needed him for his constructive critical and valuable comments throughout the study.

I would like to express my special thanks and appreciation to my wife Gebeynesh Awano baby, mittu and to my sister Salamawite Adimasu who encouraged my study through their unlimited financial and moral support besides of me from beginning to the end of the study.

My heartfelt thanks also goes to my father Ato Admasu Shamore and to my Mother W/roAmarach Olamo for their essential moral and financial support during the conduction of the thesis. Also my heartfelt appreciation goes to Tsedeke tadesse MA at AAU, Commander Kebede Awano, Ato Alemu awano, Ato Tamirat hundamo, Ato Eyob Gebure, Ato Demeke Gedebo and to my brothers and sisters for their moral and financial support throughout my study.

My Special gratitude also goes to farmers in the study area who were sources of data, for the time and valuable information during interview, discussion and observation. My frank thanks also go to development agents for their support while collecting the data and in need for materials.

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Lists of Acronyms

ADLI	Agriculture Development Led Industrialization
BMP	Best Management Practices
CSA	Central Statistical Agency
DA	Development Agent
DWFED	Duna Woreda Finance and Economic Development
EPA	Environment Protection Agency
EHRS	Ethiopian Highland Reclamation Studies
FFW	Food for work
FAO	Food and Agricultural Organization
FSS	Food Security Strategy
GDP	Gross Domestic Product
GLASOD	Global land assessment of soil degradation
HH	House Hold
HZPEDD	Hadiya zone planning and economic development department
HZFED	Hadiya Zone Finance and Economic Development
KPA	Kebels Peasant Associations
MOARD	Ministry of Agriculture and Rural Development
NRC	Natural Resources Conservation
NGO	Non governmental organization
SSA	Sub-Saharan Africa
SPSS	Statistical Package for Social Science
SWC	Soil and Water Conservation
SNNPR	Southern Nations Nationalities and Peoples Region
UN	United Nations
US	United States
UNEP	United Nations Environment and Protection
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Program

ABSTRACT

In Ethiopia land is a source of income and means of production on which the livelihood of 85 percent of the population depends. The main objective of this study is to assess farmers' awareness about land degradation and the practice of soil and water conservation measures in Hadiya Zone: the case of Duna Woreda, Ethiopia. Different data analytical techniques were applied including chi squire test and descriptive analysis. The result indicates that about 75% of the respondents were aware of causes of land degradation by indicating population growth, over cultivation, over grazing, soil erosion, rugged topography, poor farming practices and poverty are pointed out by the farmers as the main causes of land degradation respectively. Also the results shows that most of the respondents were aware of consequences of land degradation indicating loss of agricultural productivity results from land degradation 90.6%, followed by difficulty of farming and loss in livestock productivity as consequence of land degradation. There are respondents who were not aware of Desertification, migration and landlessness as effects of land degradation. But the implication is that correct awareness about the problem of land degradation may be necessary but not sufficient condition for farm-level to practice different effective activities of awareness in the study area. Moreover, about 72.5% of the respondents indicated that land degradation on their farm-field was Severe and mentioned that there is land degradation risk on their farm-field. The result shows that major sources of information for farmers on the conservation practices were friends and relatives indicated by 80% of respondents as the most significant source of information and there is poor or no contact with development agents of the study area. Moreover, the practice d soil and water conservation measures in the study area include: -cutoff drains 51.7%, contour farming 44.2%, waterways 35.3%, check dams 30.1%, fallowing16.6%, application of manure12.6%,soil bunds5.5% and fanyajuu3.6% respectively. The importance of soil and water conservation practices likely found to be too lower poor. Thus, conservation measures have been influenced by many factors. These factors include:- Age, sex, marital status, house-hold size, educational qualification, farm-size (ha), farmers' experience, distance from homestead, household income, and physical factors were observed which obstacle to apply the soil and water conservation measures. The findings also showed that there was a significant association between these factors.

CHAPTER ONE

1. Introduction

1.1 Background

Land degradation remains a major threat to the world's ability to meet the growing demand for food and other environmental services. It is complex and involves the interaction of changes in the physical, chemical and biological properties of the soil, water and vegetation NRC (1994).Land degradation is a decline in land quality caused by human activities, has been a major global issue during the 20th century and will remain high on the international agenda in the 21st century Eswaran *et al*(2001). It is a serious problem in worldwide with its most severe negative implication on the rural communities annually $42 billion income and 6 million hectare of land are lost globally due to land degradation and causes a decline in agricultural production Oldeman *et al*. (1991.

In Ethiopia, efforts towards soil conservation were started since the 1970s and 1980s Hurni (1993). Since then a huge amount of money has been invested in an attempt to introduce soil and water conservation measures particularly in the areas where the problem ofsoilerosionisthreateningandfooddeficitiswidespreadMitchel(1991). The conservation measures were in most cases physical measures and undertaken through campaign using Food-for-Work or Cash-for-Work as an instrument to motivate farmers to putting up the conservation structures both on communal holdings as well as on their own plots Eshatu (2004).

According to Eswaran *et al*., (2001) causes of land degradation are the agents that determine the rate of degradation and which are grouped include biophysical (land use and land management, including deforestation and tillage methods, socio-economic (e.g., land tenure, marketing, institutional support, income and human health), and political (e.g., incentives, political stability).The need to produce more food for the rapidly increasing human population has led to the rapid expansion of agricultural land and the shortening of the fallow periods in traditional, extensive land-use systems, which have reduced the regeneration of soil fertility through natural processes. The main consequences of land degradation which negatively affect human

livelihoods and the environments are shortages of firewood, shortages timber, loss of biodiversity, climate change and desertification Gebremedhin (2003). Natural resource base (land, water and forest) is essential to the survival and livelihood of the majority of the people in Ethiopia Getachew (2000). The reason is that there is a strong and direct link between the most basic needs of human beings such as food and shelter and natural resources in least developed countries like Ethiopia Michel (1991).

Deforestation presents a major problem in Ethiopia, since it is one of the main causes of the prevailing land degradation via facilitating soil erosion Teferi (1999). The decline in overall stability and productivity of the country's natural resources is the result of a complex and interrelated series of processes that were triggered by the loss of forest cover in critical watershed Tumcha (2004). Despite, the seriousness of the problem in the study area, understanding the current status, causes and consequences of land degradation and the practices soil and water conservation are very important. For environmentally sustainable development, there is an urgent need to promote perception and awareness of understanding the interdependence of natural, socio-economic and political systems at local and national levels Girma(2001).

1.2 Statement of the problem

Land degradation is a serious global environmental problem. However, wide disparity exists on the extent, depth, type and drivers of the problem. The main consequences of land degradation which negatively affect human livelihoods and the environments are shortages of firewood, shortages timber, loss of biodiversity, climate change and desertification Gebremedhin (2003). Land degradation is severe in developing countries, particularly in Africa, where almost all inhabited lands in Sub-Sahara Africa (SSA) are prone to soil and environmental degradation. Similarly, the natural resource and land degradation in Ethiopia is exceedingly high Hurni (1993). The Ethiopian highlands are most vulnerable to the land degradation problems Holden (2002).

The Ethiopian highlands have a long history of settlement and sedentary agriculture, and as a result the density of the human and livestock population is high Sonneveld (2003). A global assessment of human-induced soil degradation (GLASOD) indicated that globally about 560millionhectares (36%oftotal)of farm lands are degraded at an annual rate of 5to6millionhectaresScherr(1999). The highlands, which account for 45% of the total area of the country land mass, support about 85% of the human and 75% of the live stock population. In order to secure their livelihoods and feed their livestock, people have exploited the natural resources to a maximum and also used marginal lands for cultivation and grazing Hurni (1993).This has resulted in rapid deforestation, severe soil erosion and alarming environmental degradation. The Ethiopian population has been growing at a fast rate from 12million at the beginning of the1900sto74millionin2007, at a rate of<1.3%before1950 and 2.6% between 1994 and 2007 (CSA 2008). The land degradation problem has had serious consequences in Ethiopia, such as occurrence of persistent agricultural losses and various environmental hazards such as recurrent drought and desertification.

In Ethiopia, efforts to conserve soil and water resources and prevent land degradation date back to the mid 1970s and 80s Bekele and Holden, (1998).Since then many public organizations and NGOs have been involved in addressing the wide spread problem of land degradation. The conservation measures were in most of the cases physical structures namely stone or soil bunds. The conservation works have been carried out through campaign. Incentives like FFW or Cash-

for-Work were used as instruments to stimulate farmers to put up the structures even in their own fields. However, the efforts put towards the promotion of the technologies so far seem to have had limited impact in increasing the sustained use of conservation measures Eshatu (2004). The limited success of the efforts highlights the Need to better understand the factors that encourage/discourage the adoption and the sustainable use of conservation practices. In the adoption literature, many factors are indicated as restraining or enhancing adoption. Adoption of improved technology is for the most part affected by farmer characteristics, farm-specific conditions, technology characteristics and institutional set up in which production takes place Bekele and Holden (1998).

The major conservation measures were construction of soil bunds, check dams; fanaya juu, fallowing, application of manure and water ways are very low. Despite the massive mobilization, very few studies have been done to analyze the impacts of the soil and conservation measures with respect to degraded lands. For example, Bewket (2001) reported that SWC measures were inefficient in reducing soil erosion and restoring soil fertility. Similarly, Eshatu (2004) reported that planted forest did not result in significant changes in organic carbon, nitrogen and soil-organic matter inputs and did not improve soil fertility. This is essential as the planning of effective and efficient technologies that should be accepted by farmers require empirical understanding of diverse socioeconomic and demographic variables affecting farmers' awareness on causes and consequences of land degradation and conservation decision. This study therefore, undertaken to assess farmers' awareness about land degradation and the practice of soil and water conservation measures in *Hadiya* zone: the case of *Duna woreda*, Ethiopia.

1.3 Objectives of the Study

The general objective of the study is to assess farmers' awareness about land degradation and their response to the practice of soil and water conservation measures in the study area.

1.3.1 Specific objectives

1. To describe influences of farmers' socioeconomic and demographic attributes on soil and water conservation practices in the study area.
2. To understand farmers' awareness on the causes and consequences of land degradation in the study area.
3. To examine farmers' source of information about land management and soil and water conservation practices in the study area.

1.4 Research Questions

Understanding farmers' awareness of land degradation and its impact are very important for Promoting Structural soil and water conservation measures. Therefore, these studies will attempts to answer the following research questions:-

1. How farmer's socioeconomic and demographic factors of farmer's that influence soil and water conservation practices in the study area?
2. What are the farmer's awareness on the causes and consequences of land degradation in study area?
3. What are the sources of information about land management and soil and water conservation practices in the study area?

1.5 Significance of the Study

The study was carried out for academic purpose and it is confined to a single Woreda. The findings will contribute to deepen the knowledge of farmers' towards land degradation and the practices of soil and water conservation in general and the study area in particular. Therefore the outcomes of the study will be used in formulating future environmental and land use policies

and strategies at the local level. So that it may be used to stimulus for further research to refine the conceptual and methodology of the present study.

1.6 Scope of the Study and Organization of the thesis

The study is based on micro level analysis of the response of farmer's awareness on land degradation and soil and water conservation practices introduced in *Duna Woreda Hadiya Zone* of SNNPR. The findings of the study can be extended to other areas exhibiting similar agro-ecological and socio-economic situation with certain level of adjustment. Nevertheless, generalization to wider areas requires precaution and further investigation as most of factors are related to implementation of conservation differently in different areas.

The thesis is organized in five chapters. The general introduction, which includes background information, statement of the problem, objectives of the study, research questions, Significance of the Study, Scope and organization of the thesis and Limitation of the study are given in chapter one. A literature review and description of the study area including general methodology are given in Chapter two and three. The analyses, conclusion and recommendations are covered in chapter four and five respectively.

1.7 Limitation of the study

The limitations encountered the researcher while conducting the study includes money, lack of time for some officials and experts to provide the required time but the researcher get the data when they are available in the offices.

CHAPTER TWO

2. Review of Related Literature

2.1. Land Degradation

2.2. Land Degradation in Africa

At a global scale, agricultural land lost due to degradation is estimated at about 40% out of which agricultural land in developing countries accounts for the larger portion FAO(2004). According to FAO (2004), out of the total land of Africa, 47% is too dry for rain fed agriculture and only 16% of the land has no serious fertility limitation, while the remaining 37% is affected by land degradation. According to the United Nations Convention to Combat Desertification (UNCCD), land degradation is defined as a natural process or a human activity that causes the land to be unable to provide intended services for an extended time FAO (2004). The history of land degradation is as old as the human civilization, and has resulted in irreversible impacts in some cases.

In SSA's about 65% of agricultural land is degraded because of water and soil erosion, chemical and physical degradation (Oldeman*et al.* 1991; Scherr 1999). Of the total degraded area, overgrazing, agricultural mismanagement, deforestation and overexploitation of natural resources are said to account respectively for 49, 24, 14 and 13% (Oldeman*et al.* 1991; Batjes 2001).

The spread and extent of soil degradation depends on different factors, such as soil, relief, climate and farming systems (intensity of use). Annual depletion of soil fertility in SSA was estimated at 22kg N, 3kg P and 15kg K per hectare (Mitiku, *et al*., 2006). Although there are few long-term experimental studies of land degradation in Sub-Saharan Africa those that are available show that under continuous cultivation using low external inputs, soil fertility rapidly decreases, yields decline, and a combination of inorganic and organic source of soil fertility is necessary to sustain crop production (Bationo*et al*., 2011). Generally, this sever land degradation in Africa has threatened the agricultural productivity and livelihood of the poor (Nkonya*et al*., 2011).

2.3 Land Degradation in Ethiopia

Ethiopia is among the poorest of countries and poverty and land and resource degradation appear to feed off each other Paulo (2001). The irony is that Ethiopia is a country with high biodiversity and distinctive ecosystems and the natural resource base is critical to the economy and the livelihood of a high percentage of the population.

All physical and economic evidence shows that loss of land resource productivity is an important problem in Ethiopia and that with continued population growth the problem is likely to be even more important in the future (UNDP, 2004). There are several studies that deal with land degradation at the national level in Ethiopia(FAO, 2003). In addition "Land degradation means reduction or loss of the biological or economic productivity and complexity of rain fed cropland, irrigated crop land, or range, pasture, forest and wood lands, resulting from land uses or from a process of combination of processes, including processes arising from human activities and habitation Pattern, such as: (UN, 1996).

Mostly, land degradation which manifested in the form of soil erosion, soil nutrient depletion and soil moisture stress is a major challenge facing in Ethiopia. In the last several decades one of the most challenging issues Ethiopia is the problem of environmental degradation Hurni (1993). The problem has been highly pronounced in the highland parts of the country. Ethiopia is losing 1.5 to 2, billion tones of top soil annually which is equivalent to a monetary value of US $1to2 billion per year by erosion. If this soil is conserved, it could have produced 1to1.5 million tons of grain that can be added to the country's harvest (Girma 2001). Generally this severe land degradation is a direct outcome of unwise agricultural activities in the past. Especially soil erosion taken as one of the major of all environmental degradation processes that severely threaten the survival of life in Ethiopian high lands (Zelealem, 2007).

2.4 Causes of Land Degradation

2.4.1. Nature Induced Causes

Environmental (natural) factors that have aggravated the problem of land degradation in the highland of Ethiopia include the nature and characteristics of the terrain, rainfall and type of soil. Within the highlands of the country the terrain is characterized by high relief, high slope angles exceeding 30% in more than 70% of the highlands and long slope length. These have made many parts of the highlands prone to soil erosion once the natural vegetation cover is removed. The natural factors that causing land degradation is high intensity of rainfall and steep relief are the major ones (Okoba 2005).

2.4.2 Human Induced Causes

2.4.2.1. Arable Land Management

Ethiopian farmers still continuing implementing unscientific way of cultivation, wind and rain are eroding the top soil. As a result of erosion water could not percolate into the soil instead it is wasted as run-off. Therefore, the soil cannot maintain the required amount of soil moisture. As a result of depletion of soil moisture and soil nutrients, the soil cannot sustain plant growth (Tilahun and Eylachew, 2002).

Berry (2003) indicated that most arable land (70%) in the highland is in cereals, with wheat and barley in the higher ground and sorghum and maize in the lower elevations. All these crops leave bare areas of soil during some or all of the growing season exposing soil to erosion. 20% of the cultivated area is in perennial crops including coffee, enset (similar to banana), oil seeds, fruit trees and cotton. Pulses occupy the remaining ten percent. Enset (found only in Ethiopia) in the southern region in particular provides good ground cover, needs manure, and is a good crop to maintain fertility.

There are annual crops that are mainly planted after the rains begin, allowing early rains to directly impact the soil contributing to high erosion levels. Additionally, as a population grows more fragile marginal lands are used. A further result of population growth is the reduction in fallow periods in some areas from a five-year rotation to a two-year or even short periods. In

Ethiopia, a continuous cultivation of the land without any improvement in land management and farming practice has led to severe land degradation. It is widely believed that land degradation is mainly caused by cultivation. The Ethiopian highland reclamation study stressed the Condition of land prior to sowing during the short rainy season (belg) or during the first month of the growth is important in averting land degradation. According to Hurni (1986) study, soil loss on cultivated land is estimated to be 4-10 times higher than grazing land, and 80% of the eroded annual soil loss occurs in month of plowing in the first month after planting.

2.4.2.2 Rapid Population Growth

Though there are many arguments about the population growth being the cause of land degradation in Ethiopia it has undoubtedly direct consequences for the environment; growing demand for more land, for crop production, for fuel wood, shortening of fallow cycles and contribution to over cultivation. Moreover, because of high population growth, the size of individually owned plots is shrinking in the relatively fertile highland and medium altitudes. This diminution will lead to intensive cultivation, which will inevitably result in a loss of soil fertility. In the absence of modern techniques for enriching the soil, and with dung being increasingly converted into a source of fuel, the reduction in soil fertility is imminent. This diminishing land degradation lead to reduced soil fertility and subsequently a decline both the capacity soil to produced food and to it's in capacity to resist drought. Population pressure can also have positive impacts on land improvement and soil management. By increasing the value of land relative to labor, population growth may induce farmers to make labor-intensive investments in land improvement and soil management, such as planting trees, constructing terraces, composting and mulching Tiffen *et al*.,(1994).

2.4.2.3. Land Tenure Right Insecurity

The current land policy in Ethiopia is based on the notion that land is both a factor of production, contributing to growth, and the essential element in providing for the welfare of the population. Under the 1994 constitution, land is the state property and farmers have use rights over the plots they farm. Land cannot be sold or exchanged. Land is heritable, but with conditions in some regions. Private property on land is prohibited in all regions. Land is transferred through periodic redistributions with each person reaching the age of 18 being entitled to land (MOARD,

2005).The proportion of land rented by a farmer has been found to be significantly and negatively related to conservation expenditures Norris(1987) demonstrated that farmers managed their owned land differently than their rented land. Rented land tended to be of lower quality and more in need of ameliorative practices, yet less likely to receive upgrading practices. They concluded therefore, that land rental has a negative effect on soil conservation and leads to land degradation.

In Ethiopia, insecurity of tenure has been strongly accused of leading to resource degradation. The insecurity prevailing prior to the Revolution is believed to be "one of the main factors responsible for the widespread degradation that occurred in the past" Aklilu (2001).The effects of land tenure on the adoption of land management practices are mainly to the transferability of property rights, which in turn affects the reversibility of land investments and the ability to use land as collateral. The arrangements by which tenure is granted to the land user can influence attitude towards soil conservation techniques. Where farmers own the land, they are more likely to consider the long-term consequences of their actions and adopt soil protection measures unless the need for short-term survival dictates otherwise Morgan(1995).

2.4.2.4. Livestock Resources

According to the Conservation Strategy of Ethiopia, production from cattle has been estimated to be 620,000 tons of milk, 244,000 tons of meat, 24 million tons of manure, and 2.4 million hides annually Delgado *et al*., (2001). The nation's protein intake is one of the lowest in the world, in which the estimated per capita milk and meat consumption is only 19 liters and 13.9 kg/year; respectively. Increased attention to livestock-environment interactions is of critical importance in sustaining the resource base. Finding balance between increased food production and preservation of the natural resources remains a major challenge. Globally, demand for meat and milk is increasing and the livestock sector is growing at an unprecedented rate. For example, Delgado *et al*., (2001) estimates the annual demand for meat in the developing world to grow from 111 million ton in 1997 to 213 million ton in 2020. Over the same period, milk consumption would grow from 194 million ton to 324 million ton per year in the developing world. As in other parts of the world, livestock are essential for the livelihoods of rural poor in Ethiopia. The rural people depend on crop farming and livestock production.

2.4.2.5 Farmer's Awareness about Land Degradation

Farmers thus may not observe ongoing erosion or nutrient depletion problems, or perceive them as immediate problems. While they do observe low or declining yields, farmers often attribute deterioration of crop yields to declining rains. But soil degradation may also have affected the water holding capacity and thereby reduced the soil's ability to overcome situations of water stress, thus contributing to the decline of yields country side.

According to the study of (Ervin, 1982) farmers were often more acutely aware of the condition of their land than is sometimes assumed by experts, they may not be fully aware of land degradation, its causes, or consequences. As a result they are reluctant for adoption of soil conservation technologies. Farmers' awareness and attitudes can have a major relevance to land management and land use. Researchers argue that local people's perception of environment, their interests and priorities constrain their action to prevent land degradation. (Lynne *et. al* 1988) the effects of land degradation were famine, drought, reduced yield, and poverty. Soil and water conservation activities undertaken by farmers prior to the food-for-work projects were mainly construction of drainage canals and ditches as well as soil stone bunds check dams and water ways. Farmers also practiced fallowing, mulching and crop rotation (Okoba 2005).

According to Hurni (1991), "low perception of local peasants" about the problem of land degradation is a problem that needs to be circumvented for SWC efforts in the country. On the other hand, in his study in southern Ethiopia, Belay (1992) concluded that farmers have a good perception of the problem of soil erosion, but a "wrong perception of topsoil depth" (farmers thought that it was deeper than it actually was). It is also believed that there has been some level of awareness of the problem of land degradation throughout the country and, so, a range of traditional conservation measures were in place. Past top-down technology transfer approaches to address the problem were mostly based on physical measures, such as creating mechanical barriers to land degradation Habtamu (2006).

2.5. Factors Affect Farmers' Awareness towards Land Degradation and Soil and water Conservation measures

2.5.1 Age:

Culver (1986) concluded that younger farmers were more likely to perceive that land degradation was a problem, that conservation measures are profitable and that the risk associated with adopting new practices is therefore justified. This conclusion was supported by the findings of (Bultena, 1983) discovered that younger farmers were more likely to adopt conservation tillage than older ones. In another study, Carlson(1986) found that early adopters of no-till were either younger or older than nonusers of no-till. Thus, they posited that this anomaly was related to the larger financial constraints faced by younger farmers. Green(1987) found that age was positively related to adoption, but negatively related to a farmer's perception of the extent of land degradation. Others have found age to be significantly, but negatively related to the effort put into conservation tillage, but not significant for the effort put into other conservation practices Norris(1983).

2.5.2. Education

Education may increase households' access to credit as well as their cash income, thus helping to finance purchases of physical capital and purchased inputs. This may help to promote production of high-value crops and as well as promoting greater use of such capital and inputs in producing traditional food crops (Feder, *et al.*,1995). Education may also promote changes in income strategies and technologies by increasing households' access to information about alternative market opportunities and technologies, and hence households' ability to adapt to new opportunities. On the other hand, more educated households may be less likely to invest in inputs or labor-intensive land investments and management practices because the opportunity costs of their labor and capital may be increased by education. Thus, the net impacts of education on land management are significantly important (Feder, *et al.*, 1995).

The majority of evidence suggests that, similar to age and educational level has a positive relationship on the use of soil conservation practices.(Earle *et al.*, 1979) for example, found that higher educational level was associated with stronger intentions to adopt soil conservation in general. Others have shown that better educated farmers were more likely to adopt conservation

tillage Bultena (1983) the early adopters of no-till had more education than nonusers Carlson (1986). It was concluded that education was positively related to the adoption for the control of land degradation. Lack of education was found to be one reason for indifferent or negative farmer attitudes toward soil conservation in southwestern (Sadler Richards, 1983). Lack of education limited farmer's knowledge and awareness of the concepts of soil conservation, thus they were unable to recognize land degradation problems when they existed. Finally, Ervin (1982) concluded that education was significantly related to the adoption of soil conservation.

2.5.3 Access to Information

Access to information (through media or extension services) is an important variable that shape farmers perception of soil fertility problem. The farmers who had a radio (who often listen to) were more aware of soil fertility problems than those who did not (Fitsum *et al*., 2002). It was indicated that information provision through extension channels increased farmers' awareness on land degradation and soil and water conservation problems and the adoption of composting techniques as soil fertility management. In western Kenya, access to information on land management technologies strongly determines adoption of technologies than many other factors commonly considered important, such as gender of the household head, household wealth, farm size, or participation in local organization (Okoba BO, 2005).

2.5.4 Topography and Climate

Slope of the field is the only indicator used as a proxy for the erosion potential. Although erosion potential depends on the rainfall pattern, soil physical characteristics and slope, the nature of the data collection does not permit the inclusion of other than slope. In addition, rainfall may not vary mach from field to field with in the study area. Steep slope are subject to more rapid runoff surface water and need large number of soil conservation technology; Drake(2003). Thus the slope of the plots is hypothesized to directly affect severity of land degradation. The types and intensity of the management practices to be implemented at a given farmland depends on the nature of the climate and topography where the farmland is located (Girmay et al., 2008). Climate and topography affect the types of crops to be produced at a given farmland.

Topography and climate have direct and indirect impacts on farmland management. The types and intensity of the management practices to be implemented at a given farmland depends on the nature of the climate and topography where the farmland is located (Girmay et al., 2008). Climate and topography affect the types of crops to be produced at a given farmland. For example, in Ethiopia most arable land (70%) in the highland is in cereals, with wheat and barley in the higher ground and sorghum and maize in the lower elevations (Berry, 2003). Legumes are special kinds of plants. They have the ability to hide bacteria in their roots, which form nodules (numerous rounded masses in the roots (Tacio, 2009).

Annual crops typically grow for shorter lengths of time each year and have shallower rooting depths and lower root densities, with most of their roots restricted to the surface foot of soil or less (Glover and Reganold, 2009). Even with crop management advances such as no-tillage practices, these traits limit their access to nutrients and water, increase their need for nutrients, leave croplands more vulnerable to degradation. These traits also make annual plants less resilient to the increased environmental stress expected from climate change (Glover and Reganold, 2009). Perennials are much more effective than annuals in maintaining topsoil. With their longer growing seasons and deeper roots, perennials can dramatically reduce water and nitrate losses. They require less field attention by the farmer and less pesticide and fertilizer inputs, resulting in lower costs (Glover and Reganold, 2009). Furthermore, Glover and Reganold (2009) additionally pointed that there are other benefits as well. Greater soil carbon storage and reduced input requirements mean that perennials have the potential to mitigate global warming, whereas annual crops tend to exacerbate the problem.

2.6 Consequences of Land Degradation

Of the world's 5.6 billion people, about 1.4 billion live in absolute poverty with a further 1.1 billion living at subsistence levels (Leonard 1993). A more sobering statistic is the 14.6 million children, or one in every five, who live in absolute poverty (UNEP 1995). Land degradation has already resulted in noticeable and wide ranging effects on the Ethiopian community-both rural and urban. The average soil loss rate for the whole country was predicated to be 12 tons per annum while the absolute total yearly, loss was estimated at 1.5 billion tons (Muluneh, 2003).

2.6.1 Unemployment and out-Migration

Perhaps Ethiopia may stand number one in Africa to witness the power of land degradation deriving people out of their homes. In 1984/85 more than half a million people were forced to leave their homes mainly in the highly eroded northern regions to the south-western parts which are less degraded so far. Where agricultural and livestock production reach very low levels are a result of reduced cultural land yields, a situation will be created where there is insufficient land leading to shrinkage of average farm size which, in turn, creates a disguised unemployment.

2.6.2 Loss in Livestock Production

Land degradation leads to decrease both in the quality and number of livestock; any change in livestock sectors has tremendous effects on the living standards of the rural people as a whole. Livestock play a number of vital roles in the rural and national economy but according to one estimate some 2 million hectares of pasture land will have been destroyed by soil erosion between 1985 and 1995. Land degradation is estimated to have resulted in an annual loss of livestock production in 1990 equivalent to 1.1 million tropical livestock units and, unless arrested, will rise to 2.0 million tropical livestock or to 10 percent of the current national cattle herd by 2010 (MoARD,2007).

2.6.3 Shortage of Food-Malnutrition

Dung is by and large the most readily available source of energy for cooking in rural Ethiopia. Its value as fuel is more appreciated and recognized than its use as fertilizers. It has been estimated that the burning of dung for fuel instead of using it as fertilizers causes an annual reduction in grain production by some 550,000 tons (Mekuria, 2005). This in turn leads to shortage of food and malnutrition.

2.7. Soil and water Conservation Measures in Ethiopia

Conservation practices have mainly been undertaken in a form of campaign and quite often farmers have not been involved in the planning process (Herweg, 1993). This shows that soil conservation projects implemented in the country failed to consider local people's economic, demographic, institutional and technical factors from their very inception. Obviously, the

awareness of soil and water conservation technologies considerably influenced by different factors. Among other influences, the characteristics of farmers such as age, education, household size, farm size and experience are some major influence for the decision of application of soil conservation. The age of a farmer is an important characteristic of a farmer that affects adoption of soil conservation technology.

2.7.1 Indigenous Method of Soil and water Conservation Practices

Indigenous soil conservation practices have very often been ignored or underestimated by development agents, researchers, soil conservationists and government staff. Although the objectives of knowing indigenous soil conservation practices give us an understanding of farmers' way of thinking about the measures (Hudson, 1992). Various soil and water conservation practices (*Indigenous* and improved) have been identified in the study area. Before the intervention through the Productive Safety Net Program, farmers in the area were exclusively practicing traditional methods and the use of improved methods of soil and water conservation measures are recent developments.

2.7.2 Factors for the Failure of Soil and water Conservation Efforts in Ethiopia

Studies conducted in different parts of the country came-up with different factors that explains the low level of success of conservation initiative. These studies attributed the low level of success of the initiative mainly to institutional and technological factors.

2.7.2.1 Institutional Factors

During planning soil and water conservation intervention, top-down approach was pursued where government officials tell peasant association (Kebeles) what to do to get the food aid. This approach gave local people little opportunity for discussion and participation on the initiative (Wood, 1990).

The conservation endeavor is linked to food-for-work payment. This made the conservation intervention to be concentrated in areas that are accessible (areas along the major roads). Hence the coverage by the initiative was limited. This made the initiative to be hardly able to address the problem of soil conservation. This in turn resulted in poor quality of conservation structures

constructed on the farmlands. Very often, farmers destroy these structures to obtain additional food for maintaining destroyed structures (Wood, 1990).

2.7.2.2 Technological Factors

Campbell (1991) introduced that the conservation measures through bund and terraces took up to 10% of the precious resource of farmers. The proportion these measures take increased rapidly with increasing slope of the field (Belay, 1992). Nevertheless, the benefit these structures increase from infiltration and reduced soil loss do not out weight the loss of land to conservation works and the reduced yields caused by vermin living in terraces, water-logging and disturbance of the soil profile (Wood, 1990). These structures also require frequent maintenance, which is high labor demanding. These all resulted in negative attitude towards conservation (Yeraswork, 1988). Conservation initiatives that have been launched mainly focused on physical conservation measures. Other conservation measures such as biological and agronomic conservation practices that could have potential to provide incentive for adoption have been overlooked. In addition to this, these conservation measures have not been linked to indigenous conservation measures for which the local people are well acquainted. The return from these measures was in general negative at least in the short term (Wood, 1990). They take large proportion of area out of production.

2.7.2.3 Policy Factors

During the feudal regime, prior to 1974 revolution, land tenure system made tenants to be subject to insecure land tenure, and expropriation of large portion of their product and labor by landlords. This created disincentive for adoption of soil conservation. The first two five year plans (1957-62 and 1962-1967) gave priority to large scale commercial farms and exportable crops (Dejene, 1990). The third five year plan (1968-1973) put much emphasis on high input package programs to be implemented in few high potential agro-ecological areas where quick return was expected (Dejene, 1990).

After over throw of the military regime in 1991, the current government has made changes in economic policy. Some regarded the change introduced by the current government as going in opposite direction compared to that of military regime. The government further strengthened the

changes that have been taking place following the announcement of mixed economy in March 1990, which includes, de-collectivization, dismantling of producers' cooperatives and liberalization of grain trade. Unlike in the previous governments, agricultural sector in general and smallholder in particular received policy attention in the current government from economic development strategy the country has been pursuing.

2.8Conceptual Framework

The farmer's awareness of land degradation and their adopted soil and water conservation measures are being influenced by their current status of demographic and socio-economic characteristics. The dependent elements that include the framework for this study are farmers' awareness about land degradation and the practice soil and water conservation measures. The demographic characteristics include household head, age, sex, household size, marital status, educational status, farm size, work status and household income of farmers are important socio-economic factors included in this model. Demographic and socio- economic factors are the independent variables, which are expected to have farmers' perception and require response to land degradation and soil and water conservation measures.

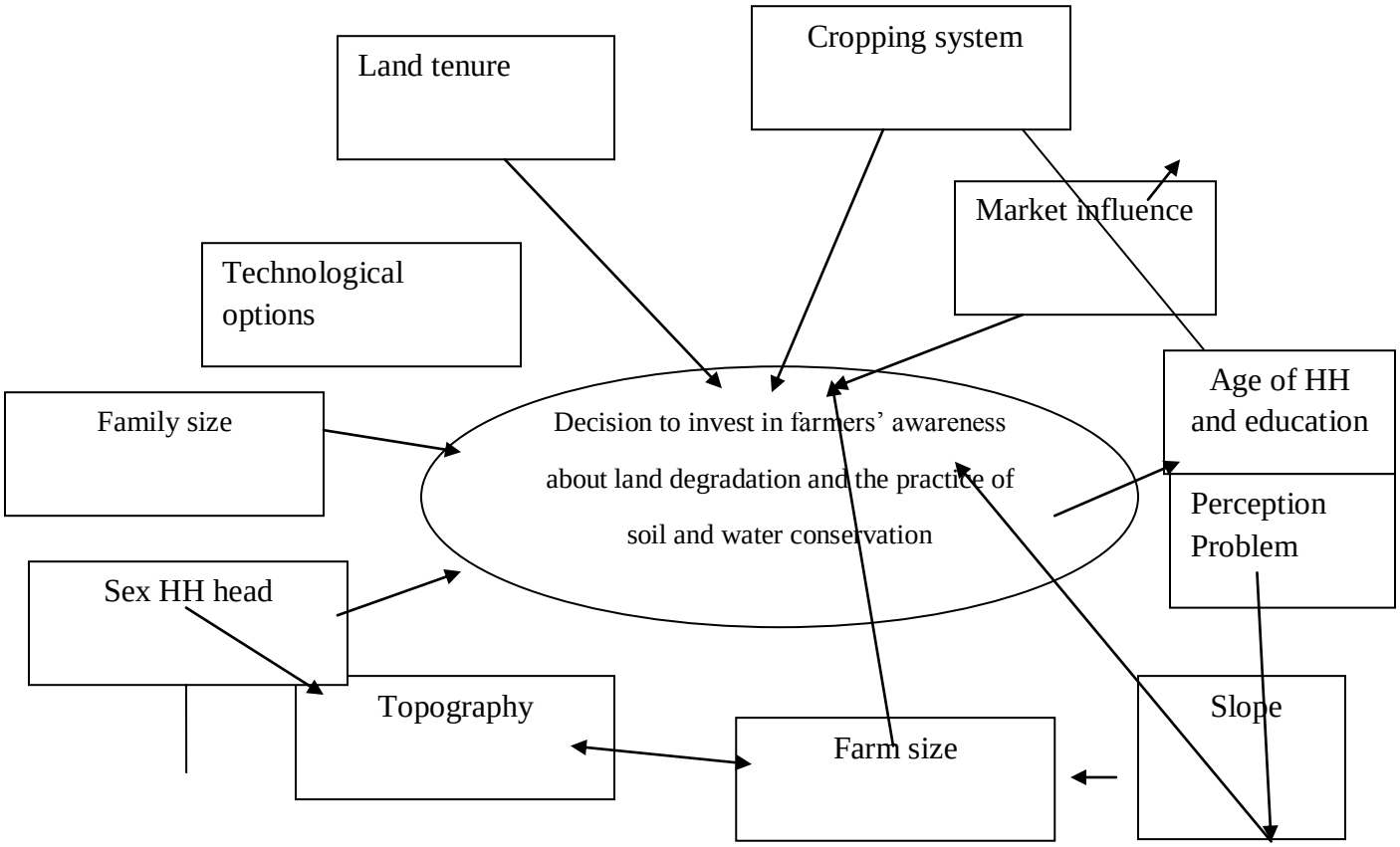


Fig .1.1 Conceptual frameworks

Source: prepared by researcher, 2015

CHAPTER THREE

3.1 Description of the Study Area and Research Methodology

3.1.1 Description of the Study Area

3.1.2 Location

Duna woreda is one of the 10 *woreda* found in southeast of *Hadiya* Zone in SNNPR. The *woreda* consists of 1 urban and 31 rural *kebeles*. The study area is 42km far from the Hosanna town and found south east of hossana and about 275km far from capital city of Ethiopia, Addis Ababa. The total population of the *woreda* was 148566 (*Duna woreda* finance and economic office *DWFEO*, 2015). Out of this 75383 were males and 73183 were females and the total area of the woreda was 222.57s/km and the population density is 619.58 per s/km. This shows that the population pressure on land was high in the study area.

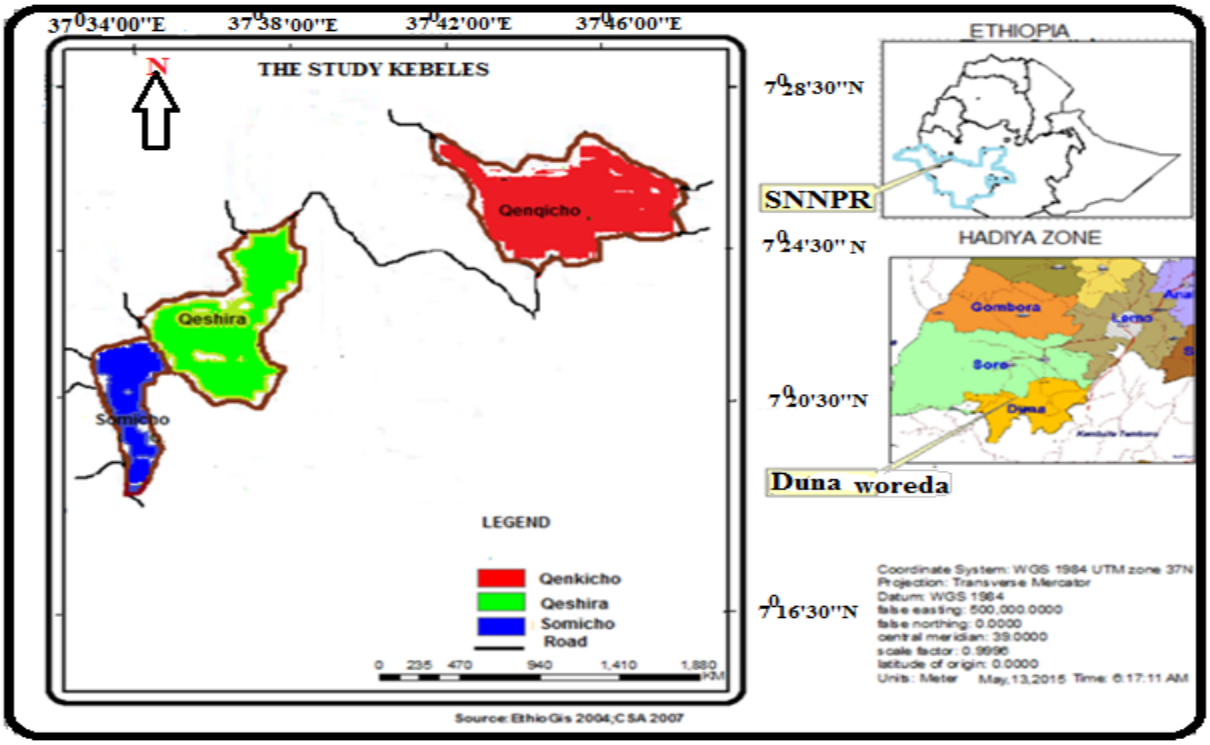


Fig 3.1 Map of the Study Area

Source Field survey, Feb 2015

Besides more than 85% of its population depends on agriculture for their livelihoods. The statistical evidence from (DWFEO 2015) shows that there was high proportion of young age population in rural areas with high demand for farm land. Regardless of the small proportion of the cultivable land in the study area, the population, particularly young population that demands the farm land is proportionally high. Like most of the highlands of Ethiopia, *Duna woreda* was also facing the problem of land degradation. In fact there are some conservation efforts taking place in the *woreda* mainstreamed with poverty alleviation strategy. The *woreda* and *kebele* have close responsibility in applying the conservation program.

3.1.3. Climate

The *woreda is* situated in the *Dega, woina-Dega* and *Qolla* agro-ecological zones. The mean annual rainfall range 1500mm-1896mm. The temperature range being from $10\boldsymbol{c}^{\boldsymbol{0}}$ to $15\boldsymbol{c}^{\boldsymbol{0}}$in a wet season and $15\boldsymbol{c}^{\boldsymbol{0}}$ to $25\boldsymbol{c}^{\boldsymbol{0}}$ in a dry season. The highest rainfall was recorded in June -August and the lowest is in between December and February. The district is a typical of the moist *weyna-dega* agro-ecological zone (50% *dega, 3*5% *weyna-dega* and 15% *kola DWADO 2015).* The mean annual total rainfall is about 1896mm and has average temperature of $19\boldsymbol{c}^{\boldsymbol{0}}$ (Behailu, 2009).The woreda experiences two rainy seasons, *Belg* and *Kiremt. Belg* is the short rainy season and lasts between March and May. The *Kiremt* season, which is the longest rainy season, lasts between June and September. More than 75% of the total rain falls during this season and the highest rainfall occurs in July and August. Rain that occurs during the *Kiremt* season is very intensive and, hence, the severity of soil erosion is high during these three months. Most of the crop production also takes place during the *Kiremt* season.

3.1.4. Topography

Duna woreda is located in the Northeast and southeast by the *kambata zone* and by the Northwest and Southwest by *soro woreda* of *hadiya zone*. The nature of topography of a particular geographic entity has multi dimensional implications up on the development of physical infrastructure, human way of life and the type of flora and fauna exists. The *woreda* was by large falls within the southeastern highlands of Ethiopia. Data obtained from *Hadiya Zone* planning and Economic Development Department (*HZPEDD,* 2001) reveals that the elevation of the study area ranges from1000m (caldera of *Wagabata)* to (2,970mmount

*Sangiye).*Consequently, the elevation difference in the study area is about 1970masl that demonstrate the existence of variegated agro climatic zones. This also creates the opportunity to have a varied flora and fauna.

3.2. Types and Sources of Data collection

Both primary and secondary sources were used. In this research, farmers were the major sources of primary data. In order to ensure the reliability and validity of the data collected, different methods were employed during collection of data. These methods include observation, focus group discussion, and interview with randomly selected farmers and other key informants. As part of the primary data, information was also collected from woreda agricultural experts, kebele leaders and soil and water conservation experts. Secondary sources of information were used for this study include published materials such as reports, plans, official records, census records, project reports, research papers and data files from internet/ web pages.

3.2.1. Sampling Techniques

In *Duna Woreda* there are 32*kebeles* and from this three of them are selected. They were selected because of they are relatively considered more degraded areas than the rest of PA'S.A multi-stage sampling technique applied to select the study subjects in the study area. The *Kebele* were selected by using purposive sampling techniques.

The selection was made through the severity of land degradation (rough estimation made by district agricultural office) and implementation of soil and water conservation practices and awareness of land degradation in the study area. Topographically, the quantification of slope in percent or gradient, rough field estimation and measurement of the slope classes was made as flat to gently undulating land (0 to 8%), moderate slope (9%-15%), and steep slope estimated to be (16-30%). This slope gradient measured using GPS is cross checked and matched with calculated contour map of the district. The researcher assumed that the awareness on land degradation and soil and water conservation measures might differ by slope categories and as well as the severity of land degradation problems. The sample households from three *kebele* were selected from the available list using systematic simple random sampling. The size of sample households head in

Qanqicho kebele is 64; 51 household heads in *Qashira kebele* and 44 household heads in *somicho kebele* was selected, respectively and the total sample size is 160.

Table 3.1 Distribution of study sample by slope in the study area, 2015

Kebele	Slope	Slope category of respondents				Total	%
		Flat	Flat/Gentle	Moderate	Steep		
Qenkicho	*20%*		10	14	41	65	40.0
Keshira	12%		10	25	17	52	32.5
Somicho	6%		30	8	5	43	26.8
Total			50	47	57	160	100.0

Source: Field survey, Feb 2015

Based on slope one can understand that the steepens of the slope has a great effect on life of the people in the study area indicating 40.0% steep slope found in *Qeniqicho,* 32.5%,moderately steep found in *Qeshira* and 26.8% flat/gentle undulating found in *Somicho* respectively. This slope gradient estimation shows that was *Qeniqicho,* was severely degraded than the others. Also discussion with Das and district agricultural officers was made to acquire information severity of the problem. Thus, the researcher assumed that awareness on land degradation and soil and water conservation measures might differ by slope categories and as well the severity of soil degradation problems.

3.2.2. Determination of Sample Size

Determining the size of the universe of the frame requires demarcation of the boundary in which this survey was conducted reasonably with the available time and financial resources. The basic sampling unit in this case was the farmers 'household who derive their livelihood entirely from agricultural activities. The sample households were selected from the sampling frame by using the simple random sampling methods. The total population was 1600 households living in these three *kebeles.* The researcher takes 160 out of total population because of their homogenous characters. The sample size was determined using statistical procedures. The estimation of population proportion, p = 0.118 were used, as this value gives sample size sufficiently large to guarantee an accurate prediction, at 95% confidence interval and 5% error of estimation**.** The following formula was used to decide the sample size (Naing*et al.,* 2007).

$$n = \frac{p\ 1-p\ z^2}{E^2}$$

Where:-

n = sample size

z = level of confidence = 1.96 which means 95%

E = maximum allowable error = 0.05 which means 5%

P = estimate of population = 0.1181

$$n = \frac{0.1181\ 1-0.1181\ 1.96^2}{(0.05)^2}$$

$$n = \frac{0.1181\ 0.8819\ 3.8416}{0.0025}$$

$$n = \frac{0.40011182142}{0.0025}$$

n= 160

Table 3.2 Distribution of Sample Household in the Study Area.

Kebeles	Total household	Sample size	Sampling Techniques
Qenqicho	644	64.4	Simple Random sample
Qeshira	515	51.5	Simple Random sample
Somicho	441	44.1	
Total	1600	160	

Source: Field survey, Feb 2015

3.2.3 Methods of Data Collection

3.2.3.1. Questionnaire

Researcher used questionnaires as major instrument to collect primary data from the sample identified households of the three *kebeles.* In this research, the researcher prepared open and close- ended types of questionnaire. The questionnaire consist different types which are related to the topics of the research. The questionnaire was pre-tested before administration some re-

arrangement, reframing and correcting in accordance with respondent awareness was done. The questionnaire was administered to the randomly selected household heads or representatives by a team of assistance trained and some orientation given by the researcher**.**

3.2.3.2. Focus Group Discussion

Focused group discussions were held with eight randomly selected persons from different backgrounds in two groups by dividing four in each group from the sample kebele. The elderly farmers, village leaders, developmental agents and socially respected farmers who are known to have better knowledge on the present and past environmental, social and economic status of the study areas, to substantiate the data collected. Selected questions from structured and unstructured questionnaire were used to focus group discussions.

3.2.3.3 Field Observation

Field observation was started while writing the proposal and continued onto the whole process of data collection to make sure the validity of acquired information. It was aimed on understanding the local condition of the community in terms of their socio economic condition, current condition of land degradation, farm practices and traditional way of land utilization and application of conservation measures, etc. During the walk, the researcher took notes on the land degradation and its severity, existing soil and water conservation measures, yield conditions and topography. Infrequently, informal interviews were carried out with farmers who were met along the path that was aimed on obtaining information to produce structured questionnaires which is the core instrument for collected information and were conducted in an informal and easy manner.

3.2.3.4 Structured and unstructured Interviews

Both structured and unstructured interview were used for data collection with carefully constructed structured and unstructured interview questions.

3.2.4. Methods of Data Analysis

The different analytical techniques that were applied are SPSS, descriptive analysis frequency percentage were used for the informal key informants, interviews and field observations and finally frequency were computed for different variables.

CHAPTER FOUR

4.1 Data Analysis and Presentation

In this study a total of 160 farmers were interviewed from the three *Kebeles* of *DunaWoreda* in Hadiya zone. All farmers who involved in agricultural activates in the selected three *kebeles* responded to the questionnaire.

4.2. Demographic and Socio-Economic Characteristics of the Respondents

According to farmers' application of conservation techniques could possibly be influenced by different factors. Among these factors some have negative influence on the practice of conservation measures whereas other factors affect the practice positively. This include age, household size, and income, educational status of farmers, land size, farmers' experience, and off-farm activities were the most important factors in determining the conservation practices. In addition, lack of information on benefit and cost of soil conservation measures, distance from the homestead, level of contact with DA's, lack of training on conservation techniques have significant influences on practicing conservation measures in general.

4.2.1 Age

The study revealed that about 12.5% of household heads were less than 18 years and about 62.5% were between 18-49 years and 25 % were above 50 years. The average age of participated farmers was 33, with a minimum age of 20 years and maximum of 80 years. They argued that, older farmers couldn't make activities which require hard work and they would not be accomplished by old aged persons which to reduce soil degradation such as soil bund. The aged farmers have troubles with practicing soil and water conservation on their fields. On the other hand, aged persons practice less labor demanding technologies such as simple cutoff drains, contour ploughing, planting grasses and use of other agronomic conservation measures. This supports the works of (Aklilu, 2006),(Bekele and Drake, 2003) states that younger farmers with longer planning horizons are likely to invest more in conservation.

4.2.2 Sex

Majority of the respondents 98 (61.5%) of the respondents suggested that there was a difference in sex by practicing soil and water conservation measures. Among this (105) 65.6% were males and (55) 34.3% were female farmers. Most of the female farmers are interested to construct soil bunds, but they need help from elsewhere. As a result, majority of female farmers' in their farm land, practiced soil and water conservation measures. They have been practicing cutoff drains, waterways, check dams; and biological and agronomic soil and water conservation techniques in combination and/or separately. As usual, 25% of females responded that they have much work load and home care in spite of involvement in farm activities that needs much effort and investment so as to increase production**.**

As the conservation is aimed in combating land degradation, desertification and its impact, it must be implemented on both individual and communal lands of the study area. According to Belay (1992), individual land is the land used for agricultural purposes with high scarcity. Here the conservation takes place through building small terraces across the farm lands, which is targeted in breaking the direct down streaming erosion and protecting the top soil. But the down streaming of the erosion in the study area was high. So that the soil was severely degrading and breaking of terraces. The figure below shows that breaking terraces of on individual lands how individuals apply to control the erosion.

Figure 4.1 Terraces of Individual Lands, Picture Taken From *Duna Woreda, Keshira Kebele.*Photo Taken by the Author.

Source: Field survey, Feb 2015

4.2.3 Marital Statuses

The marital status of respondents shows that about 71.2 percent of the respondents were married. Analysis of the data also indicates that 6.8 percent of the populations were unmarried, 5 percent were divorced and finally 16.2 percent of the populations were widowed. Majority of the respondents responded that the soil and water conservation practice were left for married household heads. Changes in the distribution of marital status have an important bearing on the size and structure of families and households.

4.2.4 Household Size

The household size is one of the determinant factor which affects soil and water conservation practices. The household with less than 4 members make up 6.8 Percent, households with 5-8 members constitute 56.2 percent; households with 9-10 make up 22.7 percent and household's above11 constitute the remaining 14.3 percent. The sample survey of households of *Duna woreda* implies that many rural households (85 percent) had at least household members of 5 persons per household head.

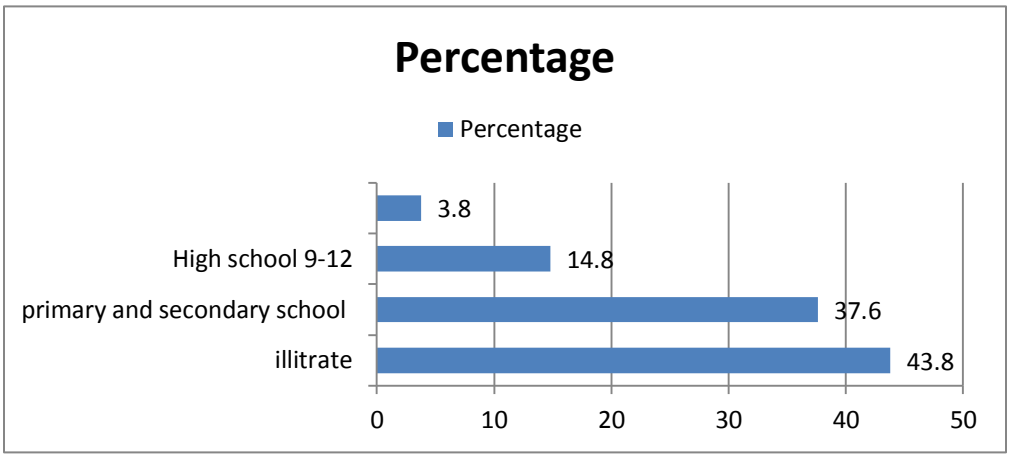
The study results revealed that 75% of respondents agree on having large number of children or large number of family size. The size of family members can be seen from two different angles. The first when there is large family size in which the majority of family members are capable of working and it is very important for soil and water conservation measures. On the other hand having small number of children requires additional labor to construct and maintain soil conservation and as the result of Shortage of working forces, they reject soil conservation measures. This supports findings of Drake (2003).

4.2.5 Educational Attainment

The study result indicates that 51.2% were of the respondents' illiterate, 38.9% of the respondents were attended primary and secondary school, about 9.8% of respondents attended secondary school (9-12) and above. Level of education is one of the demographic features of households which play crucial role to increase farmers' knowledge about land management practice and give awareness on the causes and Consequence of land degradation. This finding

supported by Shibru (2003), Education enables farmers to tackle land degradation using various ways of soil conservation practices.

In fact, higher literacy level of farmers could have brought differences among farmers in their awareness about degradation and has effect on soil conservation practices in general. As educational status of a household head increases, is assumed to increase the transfer of relevant information increase.



Source: Field survey, Feb 2015

Figure 4.2 Educational Attainments of the Respondents in the Study Area

4.2.6 Household Incomes

The data given in table 4.1 below indicates that the percentage distribution sample household heads by income. Accordingly, about 30 percent of the respondents had mean annual income of less than 5000 and about 32.5 percent of respondents had mean annual income between 5001 to 10000 birr. While, about 18.7 percent of the respondents had mean annual income of 10001 to 15000 birr. The remaining 18.7 percent of the respondents had mean annual income greater than 15000 birr.

According to respondents, income is one of the factors which affect soil and water conservation practices. As they responded that farmers' who faced labor shortage and no money to pay, reject construction of soil and water conservation measures. This indicates that even the construction of a single soil bund can cost much money and needs large number of labor forces and give better

role for large family members. This suggests that there will be lack of interest in soil and water conservation measures when there is lack of money and a shortage of labor.

4.2.7 Land Holding Size

Land size is an important factor which affects the practice of soil and water conservation measures. Land size and practices of soil conservation measures have strong relationship. According to the respondents who are holding large size of farm land it is positively related to soil conservation measures whereas those who are holding small size of farm have negative attitudes towards soil conservation measures. These farmers lack trust on soil conservation measures as they were poorly participated in the planning and designing of soil conservation program. Hence, farmers perceived to reject soil conservation methods because of more than half of the farmers have land below half hectares consider this as major reason to reject conservation practices. The most important reason is small size of their land which they believe that establishing conservation methods on small land is not advisable. This intention of farmers was realized by the finding of (Assefa 2009).

The land holding of farmers in the study area varied from less than 0.25 hectare to more than 2 hectare with an average holding of 0.43 hectare per households. As it can be seen from table 4.4, the households with less than 0.5 hectare make up to 48.1 percent, households with 0.51 hectare to 1.0 ha constitute 26.8 percent; households with 1.01 hectare to 1.50 hectare make up 15 percent. The household more than 2 hectare constitute 10 percent. Hence, pressure on land at household level has been increasing as long as the population growth was increases.

4.2.8 Farming Experience

There has been little discussion on the role of experience or years farming in the literature to date. About 62% of discussant responded that when the farming years increase the implementation of soil conservation measures are certainly increased as well. (Norris 1983) found that farmers with more experience were more likely to adhere to traditional practices. On the other hand, farming years are positively related to the adoption of conservation practices. Such evidence as exists is not conclusive and a more thorough investigation should be undertaken to determine the relative importance of this factor.

Table 4.1 Distribution of Respondents by Various Attributes

Attributes of respondents	Categories	Frequencies	
		No	Percentage (%)
Age	<18 years	20	12.5
	26-49 years	100	62.5
	≥50 years	40	25
	Total	160	100
Sex	Male	105	65.6
	Female	55	34.3
	Total	160	100
Marital status	Single	11	6.87
	Married	115	71.8
	Divorced	8	5
	Widowed	26	16.25
	Total	160	100
Family size	1-4	11	6.87
	5 -8	120	75.0
	9-10	16	10
	>11	13	8.1
	Total	160	100
Educational qualification	Illiterate	82	51.2
	primary school Education (1-4)	40	25
	Junior secondary school Education (5-8)	23	14.3
	High school Education (9-12)	15	9.3
	Total	160	100.0
Farm-size (ha)	<0.5 ha	87	54.3
	0.51-1.00 ha	39	24.3
	1.01-1.50 ha	24	15
	≥2 ha	10	6.2
	Total	160	100.0
Farming experience	<25	10	6.2
	26-49	110	68.7
	>50	40	25.7
	Total	160	100.0
Distance from homestead	Near	33	20.6
	Medium	40	25.0
	Far	87	54.4
	Total	160	100.0
Household income	<5000	48	30.0
	5001-15000	82	51.2
	>15001	30	18.7
	Total	160	100.0

Source: Field survey, Feb 2015

4.3Crop Production

The majority of farmers understood that steep slope and moderate steep slopes were landscape segments with high risk of land degradation and low levels of soil fertility resulting in low crop yields. Major crops grown in the study area include wheat, barley, maize, and potato and enset. Enset is the staple food in the area and almost always grown for consumption. Wheat and sorghum are usually grown for sale as income source. Major crops such as wheat other are grown once in a year during the long rainy season. Some crops such as maize, barely, enset, and potato are also grown during the small rainy season. The type of crop grown has important implication on soil degradation (Belay, 1992; Woldeamlak, 2003). These studies indicated that cultivation of cereal crops which requires fine-tilled soil bed and single cropping of fields encouraged soil degradation in the highlands of the country.

4.4LivestockProduction

Farmers in the study area pursue mixed agriculture in which livestock productions as important component. They are the major assets of the household and play an important role in crop production. Survey result showed that average holding of livestock in the study area was 3.5TLUand total livestock fall the sample households was 410 TLU. The composition of livestock was such that cattle accounted for 70%; sheep and goats 12% and horses, mulesa nddonkeys18% of the total. The percapita livestock holding in the study area showed a declining trend among the respondents, 80% of the indicated that the percapita livestock number declined tremendously in the past10 years.

Livestock are an important source of income for farmers in the study area. They sell livestock for different reasons. 66% of the interviewed farmers reported that they sell livestock to pay government tax and for other social obligations, 35% sell to purchase food, and17% to purchase input. They also sell to purchase oxen, remove livestock with low productivity, and to get good market but the proportion of farmers that sell livestock for these reasons are very few. Feed for livestock comes from communal grazing land, cultivated fields and private grazing land. The major source of feed is crop residue. 55% of the interviewees indicated that crop residue is the major source of feed implying that the total biomass of the crop goes out of soil harvest and crop residue. 46% of the respondents indicated the major source of feed for livestock to be free

grazing on cultivation fields during dry season, 33% respondents reported communal grazing land, and 26% indicated silage as the major source of animal feed. Private grazing land provides feed for small proportion of the household's andonly16% of respondents indicated the major source of livestock feed to be private grazing land. This is mainly due to smallness of the landholdings.

High contribution of free grazing on cultivated fields imply high contribution of livestock for soil erosion by trampling and releasing soil particles from soil body which facilitates easy transportation during the onset of rain. Feed obtained from communal grazing land is becoming smaller and smaller since most of grazing lands have been brought into cultivation and the remaining have been under serious threat of degradation from livestock. Livestock feed availability in the study area showed a declining trend. Respondents attributed the decline of the population increment (75%), degradation of grazing lands (30%) and drought (22%). The survey attempted to find out what farmers would suggest for improving animal feed availability. Large percentage of farmers (48%) opted for introducing controlled grazing system, 26% of the respondents for expanding grazing land areas and 15% reducing the number of livestock.

4.5. Soil and water Conservation Practices

During the collection of data in the study area, the researcher observed the Practiced soil and water conservation measures. Farmers of the study area were participated in different soil and water conservation measures in their *kebeles.* The costs and benefits of related soil and conservation measures have role on farmers' decision to practice them. Relatively soil and conservation measures are widely used in arresting soil erosion by water in the study area. Those farmers suggested things that expected from the government such as financial, material support, continuous training, experience sharing and incentives should be given for the community to understand and implement the SWC measures. Indeed, cooperation and participations are essential if progress on limiting soil degradation was to be made. Because many research findings appreciate this. (Adbacho, 1991) found that failure to balance land management interventions with the current level of land degradation is still a growing challenge to smallholder farmers on the hill slopes to meet both immediate economic objectives and sustainable environment. Therefore, soil conservation measures were introduced with the

objectives of conserving rehabilitating degraded agricultural lands and as well as increasing food security through increased food crop production (Adbacho, 1991). Some of widely used soil and water conservation measures are described in the following sections.

4.5.1. Cutoff Drains

The dominantly used soil conservation measures in the study area were cutoff drains 51.7%and Contour farming 44.2%with mix of another soil and water conservation practices. This structure is a graded channel constructed mainly in moist area to intercept and divert the surface runoff from higher slopes and protect downstream into cultivated land or village. It constructed during dry season to avoid barriers to land preparation for main cropping season. On the contrary cutoff drains in dry area are used to divert runoff and additional water into cultivated fields to increase soil moisture but there is limitation in practicing measures in the study area. The farmers construct such structures in order to prevent loss of seeds, fertilizers, and soil due to excessive run-off coming from up lands of the terrain and dispose the excess soil and water from the field**.** This structure are constructed mainly by oxen drawn plough, and reinforced by stones, wood blocks of soils with grass. Here the difference is that the structures are maintained by local materials and are not causing serious problem in the area.

4.5.2. Waterways

Waterways can be natural or manmade drainage channel to receive diverted runoff from cutoff drains in upper slope. In the study area about 42.0% of the respondents responded that they practice waterway in the study area with the integration of other conservation practices. The waterway carries the excess runoff to rivers, reservoirs, or gullies by creating more erosion damage.

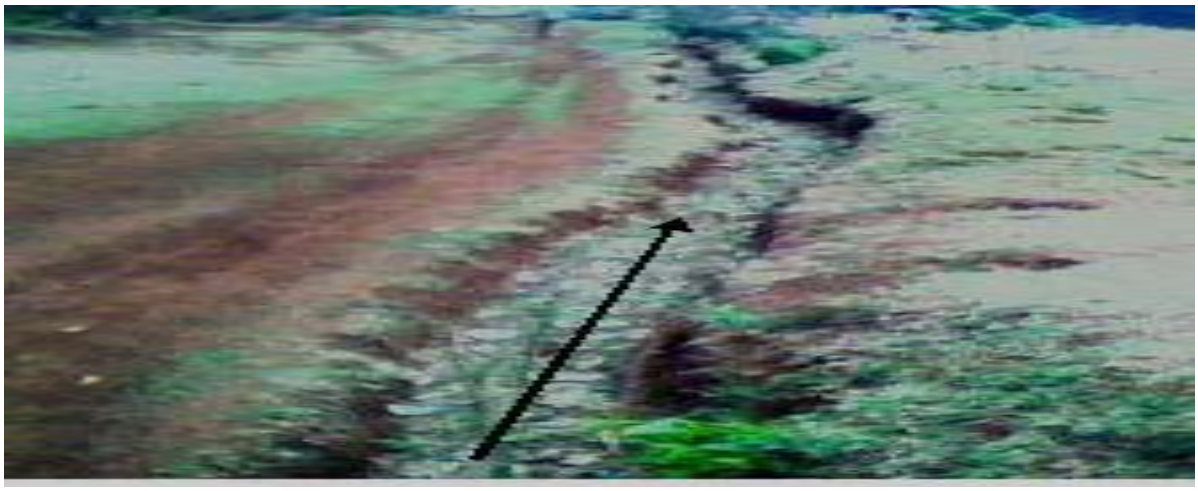


Figure 4.3 Waterways on Farmland

Photo Taken by Author, Source: Field survey, Feb 2015

A vegetative waterway construction has better attention where the stone was absent. This is applicable in all agro-ecological conditions, especially in moist area and area prone to water logging (Lakew *et al.*, 2005).

4.5. 3. Check Dams

Dominantly, the brush-woods and soils are used to construct check dams and about 29.6 % of the farmers use it with a mix ofanother soil conservation measures in the study area. Diverting runoff from cultivation field to the main and community road is very common in the study area. Tree branches and grassed soil are used traditionally, and effectiveness is constrained by erosive of rainfall and size of channel.

4.5.4 Contour Farming

Contour farming is a practice of cultivating the land along the contour line in order to reduce the run off on a steep slope area. The study shows that this type of conservation practices are most often used by the farmers. From the sample household heads 44.2% applied the Contour farming with mix of the other conservation measures including cut off drain, fallowing, water ways and application of manure in the study area. While the farmer ploughs the land along the contour for preparation of an appropriate seedbed for production, it serves the purpose of conserving the soil from erosion.

4.5.5 Fallowing

In the study area most of the land under this treatment is highly degraded to the extent of almost reaching a point of no return or no teas tore cover within a short period of time. It is a traditional practice of leaving the land out of production for 3-5 years for the purpose of restoring soil fertility and minimizing soil loss. Generally farmers leave the land or fallowing after all the soils removed from the land and the land is unable to produce under normal condition, and only stones are found exposed on the land. Only 16.6% of the respondents apply fallowing as a soil conservation measure. The farmers learnt that through time traditional fallow periods have become very short and rare in the areas as a result of the high population pressure and associated low agricultural productivity.

4.5.6 Application of Manure

Farmers were not used to apply manure on the soil, which was rather simply thrown near the homestead. During the survey, however, it was found out that since the last 4-5years the farmers used the manure in order to improve the fertility of soil. The main reason farmers shifted to this practice was attributed to the sky rocketing price of inorganic fertilizers which are unaffordable by the farmer. But currently only 12.5% of the respondents practice this measure, as there is a very critical shortage of fuel wood and not much livestock in the area.

4.5.7 Soil Bunds

Soil bunds are constructed during the dry season that do not interfere land preparation for cropping. It increases soil productivity by capturing moisture and crop yields over time. About 5.5% the household heads in the study area practice soil bunds. However, the disadvantage of this structure as explained by the farmer is that it requires a lot of maintenance in a short period due to being filled with soil immediately after heavy rainfall and did not allow oxen plough. It is mainly implemented on cultivated land with slopes in the range of 8% to25%, but also on grazing land with gentle slopes at wider intervals (Lakew *et al*. 2005). Since the beginning of introduced soil conservation measures in 2004, there was a continuous construction of soil bunds, yet there is interruption in implementation. In 2013 and 2014 the length of constructed, maintained and preserved soil bund in the study area was 108.42km, 95.5 km and 85.5 km,

respectively in *qanikicho*, *keshira* and *somoicho kebeles* (*Duna woreda* agricultural office, 2015).

4.5.8. Fanyaa Juu

This is a wall constructed by throwing the soil dug from basin to uphill and the term was coined from Swahili language; meaning "throwing up-hill (Woldeamlak, 2003). About 3.5% of the respondents responded that practice this conservation measure in their farm land. The aim is to reduce and stop erosion and increase water holding capacity of the soil so as to enhance crop yield. The main benefit of *fanya juu* is its capacity to become bench terrace within few years than soil bunds, yet it has breakages (Lakew *et al*. 2005). Moreover, it has a potential to increase/sustain soil productivity and environmental protection. To increase the efficiency of *fanya juu*, a group of 6-15 households work together. The construction of *fanya juu* takes less space than soil bunds and accelerate bench development thus, the construction of conservation structure were not bring promising results because of complaint and lack of training, support from government and lack of commitment construct structures in the fields.

The disadvantages of these structures as pointed out by the farmers were that it is more labor intensive and requires space; in other words competes with the cultivable land. This is consistent with the finding of earlier studies in southern Ethiopia; Tegne(1992)reported that the farmers considered the introduced soil bunds and fanyajuu as inappropriate technologies because they occupy cultivable area, harbor rats and other rodents.

4.6 Causes of Land Degradation

4.6.1 Human Induced Causes of Land Degradation

The table below indicates that the farmers awareness on the causes of land degradation problems. The result indicates that about 75% of the respondents were aware of causes of land degradation by indicating population growth 78.1%, over cultivation 75.6%, over grazing 73.7%, soil erosion 73.1%, rugged topography 60.6%, poor farming practices 54.3%, and poverty 51.2% are pointed out by the farmers as the main causes of land degradation respectively. This shows that relatively majority of the farmers were aware of the causes of land degradation. But the implication is that

correct awareness about the problem of land degradation may be necessary but not sufficient condition for farm-level to practice different effective activities of conservation technologies in the study area. It is worth that population growth may not be the cause of the land degradation but rather the land-use activities or practices adopted by that population. (Tiffen et al. 1994) observed that high population can be an incentive for soil conservation.

Table 4.2 Distribution of Farmers Awareness on the Causes of Land Degradation in the Study Area, 2015

Causes of land degradation	Aware		Not aware	
	No	%	No.	%
Human population pressure	125	78.1	35	21.8
Over cultivation	121	75.6	39	24.3
Over grazing	118	73.7	42	26.5
Soil erosion	117	73.1	43	26.8
Lack of fertilizers	-	-	42	26.2
Rugged topography	93	60.6	63	39.4
Poor farming practices	87	54.3	73	45.6
Poverty	81	51.2	78	48.7

Source: Field survey, Feb 2015

4.6.2 Nature Induced Causes of Land Degradation

From the sample of interviewed farmer's about 45% of the respondents indicated natural factors as a driver of land degradation. They singled out changes in rainfall patterns and intensity, mass movement, increased incidence of droughts and landslides are some of the natural events observed in the area. Whereas it was not possible to directly quantify the impacts of the natural phenomena on land degradation. Landslides cause mass movement of soil resulting in alteration of the landscape (Knapen et al. 2006).

4.7 Farmers' Awareness on the Consequences of Land Degradation

The results indicate that most of the respondents were aware of loss of agricultural productivity results from land degradation 90.6%, followed by difficulty of farming 86.2% and 75.6% loss in livestock productivity. Majority of the farmers indicated that Poor farming practices were not consequences land degradation. From this one can incur that the farmers were aware of the consequences land degradation but most of respondents were not aware of drought, desertification, migration and landlessness as a consequence of land degradation indicating 78.1%, 75.6%, 71.8%, %, 61.2% and respectively are the outcomes or consequence of land degradation.

Table 4.3Indicates Respondents' Awareness on the Consequence of Land Degradation.

Consequences of land degradation	Aware		Not aware	
	No	Percentage	No	Percentage
Loss of agricultural production	145	90.6	15	9.4
Difficulty for farming	138	86.2	22	13.7
Loss in livestock productivity	121	75.6	39	24.3
Drought	35	21.8	125	78.1
Landlessness	39	24.3	121	75.6
Desertification	45	28.1	115	71.8
Migration	62	38.7	98	61.2
Poor farming practices	-	-	76	47.5

Source: Field survey, Feb 2015

Similarly, the farmers were discussed the effects of land degradation on their living condition and its socio-economic indicator. The results revealed that most of the farmers living conditions are deteriorating from time to time due to decreasing in crop production, resulting from land degradation. According to the respondents previously, crop production mainly wheat, sorghum, beans, pea and *enset* were the source of income in addition to home consumption. But present days it is challenging for source of income and it is not sufficient to feed our family they

responded. Due to declining of crop yields, and the resulting income reduction and the progressive price increment of fertilizer the farmer inability to afford it. The finding can be realized by Moges A(2006) land degradation through soil erosion is a major cause of poverty in rural areas of developing countries. In many areas, farming populations have experienced a decline in farm income. The immediate consequence of land degradation is reduced crop yield followed by economic decline and social stress Moges A(2006).

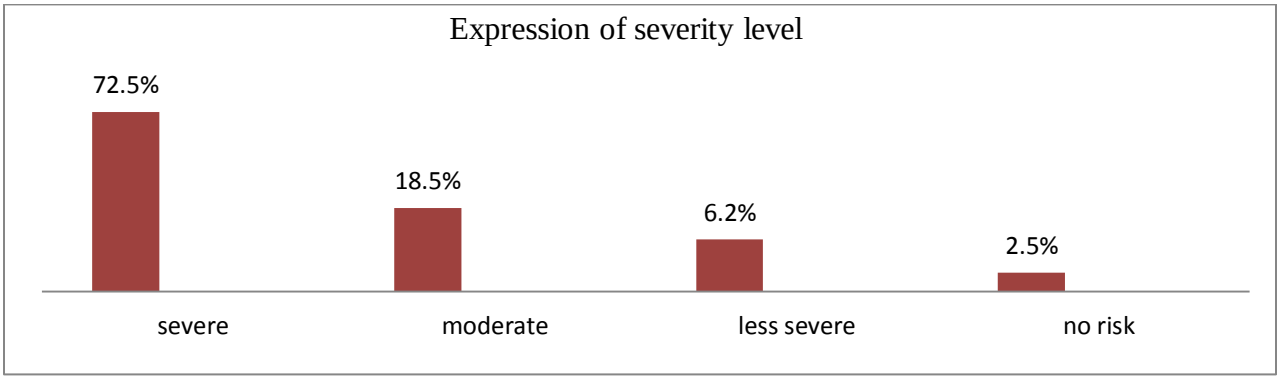
4.8. Farmers' Awareness on Severity Level of Land Degradation

Theoretically, those farmers who perceive land degradation as a problem having negative impacts on productivity and who expect positive returns from conservation are likely to decide in favor of practicing available conservation technologies Gebremedhin B(2003). On the other hand, when farmers do not acknowledge land degradation as a problem, they will not expect benefits from controlling degradation and it is highly likely that they will decide against any conservation technologies.

Farmers during focus group discussions they were asked about decline in fertility levels and crop production of their lands. They generally agreed that there had been a decreasing trend in soil fertility and crop production of their plots of land, but it was attributed to population growth, overgrazing, soil erosion, lack of fertilizers, rugged topography, poor farming practices and poverty was mentioned above. In general terms, it can be concluded that the farmers were aware of the severity of land degradation. This finding supports Tigist, (2009) in which land degradation is common in area were improper use and inappropriate conservation of natural resources were practiced. She found that development of degradation will start when the people and government have not commitment towards soil conservation practices. The opinion of the majority of farmers on the impact of land degradation on their farm production was almost evenly divided between severe and moderate.

Moreover, the study indicates that 72.5% of respondents mentioned that land degradation on their farm-field was severe and about 18.5% of respondent mentioned that land degradation on their farm-field was moderate. Among the sample 6.2% of respondents responded that land degradation on their farm-field was less severe and only about 2.5% of farmers indicated that there is no problem of land degradation on their farm. Bewket (2001) indicated that land

degradation as an important agricultural problem, yet the majority again was not willingly participating in the construction of different conservations practices. Tegene (1992) also reported that the majority of farmers were aware of the consequences of land degradation but they were less willing to utilize the introduced technologies. The implication is that correct perception of the problem degradation may be a necessary but not sufficient condition for farm-level. This clearly supports works of (Bekele and Holden 1998) who stated that vast areas of the highlands of Ethiopia could be classified as suffering from severe to moderate soil degradation. Increasing intensification and continuous cultivation on sloping lands without supplementary use of soil amendments and conservation practices poses a serious threat to sustainable land use.



Figure, 4.4 Expression of severity level

Source: Field survey, Feb 2015

4.9 Farming System

Farmers were asked why they preferred mixed farming and crop rotation. About 93.2% and 83.7% of the farmers' responded that they preferred mixed farming and crop rotation respectively in their farm was because of several reasons. The first reason is due to small land holding and large family size. Secondly mixed farming is important for soil fertility of the land. Finally those who have small size of land, mixed cropping is important to get different types of crops at a time. More over the study indicates that mixed cropping, crop rotation, contour plowing, fallowing, afforestation and terracing respectively are the farm management practices those going in the study area indicating always, some times and never respectively.

Table 4.4 Distribution of Land Management Practices in the Study Area

Farming System	Always		Sometimes		Never	
	No	%	No	%	No	%
Mixed cropping	150	93.2	10	6.2	-	-
Crop rotation	132	83.7	18	11.2	10	6.2
Contour plowing	124	77.5	24	15.0	12	7.5
Fallowing	15	9.3	27	16.8	118	73.7
Afforestation	20	11.8	50	31.2	90	56.4
Terracing	30	18.7	42	26.2	88	55
Organic manure	35	21.8	70	43.7	55	34.3

Source: Field Survey, Feb 2015

As peer practical observations, discussions and interviews have indicated that the other management practices are going in the study area. Some of the farmers prepared compost from animal manures, plant leaves as well as crop residues to maintain soil fertility. But it needs knowledge and training in order to prepare effectively according to the respondents. Therefore it requires trainers who are ready and have good knowledge regarding the instructions of better compost preparation. Some of the farmers used crop residues are used for maintaining soil fertility through shifting of animal feeding beds.

4.9.1 Factors that Limit Implementation of Land Management Practices

There are different factors that limit farmers to implement different land management practices. The major factors affecting them are lack of training, inefficient support from developmental agents, limited support from *woreda* agricultural office and lack of good relationship between farmers which constitutes 78.1%, 70.0%, 53.6% and 43.1% respectively. According to the respondents those farmers lack trust on conservation measures as they were poorly participated in the training, planning and designing of soil conservation program. Also there was inefficient support from developmental agents and limitation from *woreda* agricultural office result farmers' not to be committed towards soil and water conservation practices in the study area. According

to (Bekele Shifereaw and Holden 1998) the lack of attention on natural resources lead drought and reduced household in turn affect that farmers that entirely engaged on agricultural activities in the Ethiopian highlands.

Table 4.5. Factors that Limit Land Management Practices in the Study Area, 2015

Factors limit land management practices	Frequency	Percentage
Lack of training	125	78.1
Inefficient support from developmental agents	112	70
limited support from *woreda* agricultural office	86	53.6
Lack of good relationship between farmers	69	43.1

Source: Field Survey, Feb 2015

4.9.2 Distance from Homestead

Distance from cultivation land to homestead influence the practice of soil and water conservation measures. The feasible explanation is that the nearer the cultivation fields to the homestead, the frequent the land management and soil and water conservation measures and the higher will be practice of conservation measures (Assefa 2009). When runoff comes, farmers are ready to protect soil and maintain the damaged bunds and check dams in the nearer fields. It was indicated that farmers having land far from their residence usually do not visit to their cultivation field except during harvesting and planting season. Thus, if the farm field is located near the farmhouse, it becomes easier to manage and receives better attention (Chomba 2004). In other side of these, there were farmers whose land is here and there, but the field that exists far from homestead has been given for share cropping and left for grazing mostly without soil conservation measures. Only 20.6% and 25% of respondents had cultivation land near and moderate to their residence and 54.3% of respondent's cultivation land was far from their residence. It was observed that majority of the respondents farm land was far from their homestead.

Table 4.6 Indicates Distance from Farm Land to Homestead in the Study Area

Distance from farm land to homestead	Number of response	
Distance per hour	Frequency	Percentage
Near (10-30min)	33	20.6
Medium (31-35min)	40	25.0
Far (>45min)	87	54.4
Total	160	100

Source: Field Survey,Feb 2015

4.10 Farmers Awareness towards Land Degradation

A Likert – scale type of awareness was used to evaluate the knowledge and understanding of farmers about land degradation, management and soil conservation practices. The scale goes from 3. Agree 2.Undecided and 1. Disagree. For a positive statement and vice versa for negative statement. The knowledge or awareness of farmers on land degradation, land management and certain soil conservation practices commonly practiced in the study area. There are 11 statements have been divided into two blocks A1-A8 are farmers awareness regarding to land degradation and land management practices and B1-B3 was farmers understanding on soil conservation practices and then analyzed in detail.

Table 4.6 Likert Scale on Farmers Awareness about Land Degradation Soil and Water Conservation measures.

Cod	Statements
A1	Rapid population growth leads to land degradation.
A2	Land degradation is mostly affected rural population. *
A3	Land degradation has little effect on crop production *
A4	Over cultivation accelerates land degradation.
A5	Overusing the land means damaging the very basis of human life.
A6	Resource management should mainly be the responsibility of the government rather than the local community. *
A7	It is important to use animal dung and crop residue as fuel rather than using it as compost*
A8	It is far more important to care for the present generation than to think for the benefit of future generation*
B1	Land size is an important factor which affects the practice of soil conservation measures.
B2	Terracing helps us to reduce run-off and rate of soil erosion
B3	Distance to from homestead affect the practice of soil and water conservation measures

Source: Field survey, Feb 2015*Negative statements

The table below shows that farmers' awareness towards land degradation. An enormous amount of similarity was observed in the responses of the farmers' knowledge regarding to land degradation. The majority 91.2% of the respondents agree on statements A1, A4, and A5, "Rapid population growth leads to land degradation." When population growth increases the size of individually owned plots is shrinking in the relatively fertile highland and medium altitudes. This diminution will lead to intensive cultivation, which will inevitably result in a loss of soil fertility. Moreover, statement A4 and, A5, states that over accelerates cultivation land degradation and overusing the land means damaging the very basis of human life and the statements got the agreement of 81.5% and 79.3% of the respondents respectively. In contrast to this statements of disagreement areA2, A3, A6, A7, and A8 respectively States thatA2, Land degradation is mostly affected rural population A3,Land degradation has little effect on crop production, and A6

Resource management should mainly be the responsibility of the government rather than the local community, A7It is important to use animal dung and crop residue as fuel rather than using it as compost, and A8 It is far more important to care for the present generation than to think for the benefit of future generation respectively see table13 above.

Table 4.8 Percentage Distribution of the Farmers Awareness towards Land Degradation in the study area

Statements	Agree		Undecided		Disagree	
	Freq.	Percent	Freq.	Percent	Freq.	Percent
A1	146	91.2	-	-	14	8.7
A2	42	26.5	16	10	102	63.7
A3	28	17.5	-	-	132	83.5
A4	130	81.5	30	18.7	-	-
A5	127	79.3	33	20.6	-	-
A6	25	15.6	12	7.5	123	76.8
A7	27	16.8	23	14.3	110	68.7
A8	41	25.6	29	18.1	90	56.8

Source: Field survey, Feb 2015

4.11 Farmers' Awareness on Soil and water Conservation Measures

The result shows that the statements relating soil and water conservation practice. About 85.3% of the respondents agree the statement B1. Indicating that land size is an important factor which affects the practice of soil conservation measures. B2 states that terracing helps us to reduce run-off and rate of erosion and more than 61.8% of the respondent have good attitude about the statement. Statements B3 indicate thatabout53.1% of the respondents agree that distance to cultivation land from homestead affect the practice of structural soil conservation.

Based on this one can conclude that the level of farmers' knowledge about land degradation is relatively high. One can also assume that this may lead to favorable environmental attitude and responsible environmental behavior. Increased knowledge about the environment and its associated issues lead to favorable attitudes, which in turn lead to actions promoting better environmental quality (Palmer, 1998).

Table 4.9 Percentage Distribution of the Respondents towards Soil Conservation Practices

Statements	Agree		Undecided		Disagree	
	Freq.	Percent	Freq.	Percent	Freq.	Percent
B1	135	85.3	25	15.6	-	-
B2	99	61.8	21	13.1	40	25
B3	85	53.1	45	28.1	30	18.7

Source: Field survey, Feb 2015

4.12 Sources of Information about Land Degradation and Soil and water Conservation Practices

According to (Okoba, 2005) older members of households, having long-term interaction with their environment were able to compare past and present production trends when describing the patterns of land degradation. The result shows that friends and relatives were indicated by 80% of respondents' as a most significant source of information. About 62.5% of the respondents used *keble* leaders as a source of information. While about 59.3% and 53.7% of the respondents' are used the major the environmental sources of information which are extension agents or developmental agents and Electronic media(radio) respectively. Of this, 27.5% and 12.5% are few numbers of the respondents indicating training in SWC and the others that is respectively. Other respondents were aware of the problem of land degradation through interaction with neighbors and agricultural researchers and extension staff, listening to radio and television and reading books and newspapers.

The respondents commented that the solution for minimizing or stopping land degradation in the study area first to aware the society about the outcomes of degradation those activities depending

up on entire farming process who made agriculture as a main source of income for livelihood. Secondly, giving material and financial support to those depend up on these activities. Thirdly giving land for cultivation which they depend up on crop production and finally formulating and implementing polices to protect land degradation. This supports the works of (de Graaff, (2008) stated that the underlying cause for the excessive soil loss is unsustainable exploitation of land resource via poor practices of natural vegetation for fuel wood and other uses and expansion of cultivation and grazing lands. As the study area is more susceptible and relatively highly populated and increasing intensification and continuous cultivation on sloping lands without fallowing or conservation measures a serious threat to sustainable land use management.

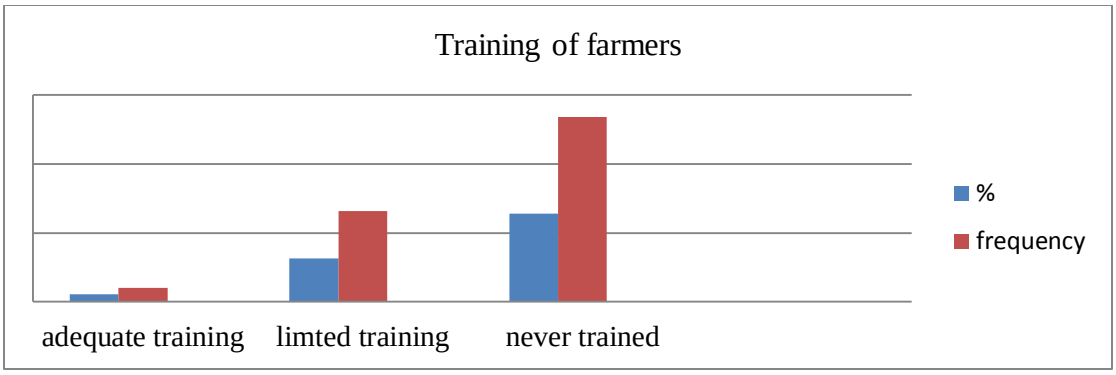
Table 4.10Respondents Sources of Information on Land Degradation and Soil and Water Conservation Practices.

Respondents Sources of Information	Frequencies	Percentage
Friends and relatives	128	80.0
Keble leaders	102	62.5
Developmental Agents (DA)	95	59.3
Electronic media (TV, radio, etc)	86	53.7
Trainings in SWC	44	27.5
Schools	20	12.5
Others	18	11.2

Source:-Field survey, Feb 2015

4.13 Training on soil and water conservation practices

In the study area more than half of the farmers didn't get training on soil and water conservation practices. About 63.5% of the sample households never get training on soil and water conservation applications and 31.9% have got only a limited training and only 5.6% have received adequate training. Farmers who have not accessed to training have gained experience from their neighbors and traditionally from their elders.



Figure, 4.5 Levels of Farmers Training

Source: Field survey, Feb 2015

According to focused group discussion farmers require training on soil and water conservation for enhancing soil fertility, crop production and yield maximization and land use. Training and education on soil conservation and land management practice need to be provided to create further awareness on resources conservation. The construction of soil conservation requires relatively frequent training and appraisal. Moreover, giving training on soil conservation measures improves the relationship between farmers and DAs and encourages them to implement new conservation measures.

4.14 Role of Institutional Factors for Soil and Water Conservation Practices

Access for information and contact with DA has a role on the practice of soil and water conservation measures. Having good relation with DA helps farmers in reducing hazard associated with soil erosion and conservation by providing information. This shows that it is not sufficient to have extension support but the aim or purpose of the extension service should also relate to the continuation of expressed satisfaction with the technical support are not more involved in the continued work. This is in line with the study by Chomba (2004) showed that a large proportion of farmers who had limited contacts with conservation work. Communication between farmers and extension agents in the study area was poor and not built up very much. The study revealed that about 37.5% of the farmers have contact with development agents. Of these farmers, 25% have good contact and practiced soil and water conservation measures on their land. About 11.8% of the farmers have practiced soil and water conservation measures on their fields with the assistance of DA. However, 62.5% of respondents have poor or no contact

with development agents. Furthermore the supervision of extension agent is poor which I could recognize during my field work.

Table 4.11Farmers contact with DA and practice of soil conservation

Contact with DA	Number of responses	
Contact	Frequency	Percent
Good	61	38.1
Very good	19	11.8
Poor	80	50.0
Total	160	100.0

Source Field: Survey, Feb 2015

4.15 Factors that Influence the Practice of Soil and water Conservation Measures

According to sample households in the study area, application of conservation techniques could possibly be influenced by different factors. These factors include age, sex household size, income, educational status; land size, farmers experience and distance from homestead were repeatedly mentioned by many surveyed respondents. In addition, lack of information on benefit and cost of soil conservation measures, distance from the homestead, level of contact with DA's, training on soil conservation techniques have significant influences on practicing conservation measures. Among these factors some have influence practice of conservation measures negatively whereas other factors affect the practice positively.

Table 4.12FactorsThatInfluencethePractice of Soil and Water Conservation Measures in the Study Area 2015

Variable	Do you practice soil and water conservation in your land?			Chi-square x^2	p-value
		Yes	No		
Age	>18 years 26-49 years >50 years Total	5 (3.1%) 90 (52.2%) 30(18.7%) 125	15 (3.1%) 10(6.2%) 10(6.2%) 35	171.752	0.000
Sex	Male Female Total	95(59.3%) 40(25%) 135	10(6.2%) 15(9.3%) 25	173.494	0.000
Marital	Single Married Divorced Widowed Total	8(5.0%) 100(62.5%) 3(1.8%) 16(10.0%) 127	3(1.8%) 15(9.3%) 5(3.1%) 10(6.2%) 33	183.104	0.023
Household size	1-4 5-8 9-10 >11 Total	6(3.7%) 100(62.5%) 13(8.1%) 4(2.5%) 125	5(3.1%) 20(12.5%) 3(1.8%) 7(4.4%) 35	164.763	0.000
Household income	<5000 5001-10000 10001-15000 >15001 Total	5(3.1%) 3(1.8%) 33(20.6%) 56(35%) 97	15(9.3%) 27(16.7%) 7(4.4%) 4(25%) 63	174.339	0.0503
Educational level	Illiterate Primary school Education Secondary school Education High school Education Total	30(18.5%) 15(9.3%) 20(12.5%) 10(6.2%) 75	52(32.5%) 25(15.6%) 3(1.8%) 5(3.1%) 85	187.180	0.0314
Farm-size (ha)	<0.5 ha 0.51-1.00 ha 1.01-1.50 ha ≥2 ha Total	27(18.8%) 18(11.2%) 14(9.0%) 12(9.3%) 71	50(31.2%) 25(15.6%) 10(6.2%) 3(1.8%0 89	181.030	0.0231
Distance from homestead	Near 10-30min Medium35-45min Far >46min Total	30(18.7%) 20(12.5%) 37(21.3%) 87	3(1.8%) 20(12.5%) 50(31.2%) 73	186.697	0.02035

Source:-Field survey, Feb 2015

4.15.1Association between Respondent's age and Soil and Water Conservation Measures

The chi- square test in the table 4.12 indicates that p- value 0.000, there is positive relationship between age and soil and water conservation practices. They argued that, older farmers couldn't make activities which require hard work and they would not be accomplished by old aged persons which to reduce soil degradation such as soil bund and fanayajuu. This supports the works of Aklilu (2006),Bekele S (1998) and Drake, (2003) states that younger farmers with longer planning horizons are likely to invest more in soil conservation. The younger the farmers use better soil and water conservation practices in their fields than the order farmers.

4.15.2 Relationship between Respondent's Sex and Soil and Water Conservation Measures

The chi - square tests in the table 12above show that there is a significant relationship between sex and soil and water conservation practices. Majority of the respondents (105) 65.6% were males and (55) 34.3% were female farmers. About 65.6% of male farmers were likely to practice soil conservation when compared to female farmers and significant at 0.05% confidence level of significance. Most of the female farmers have an interest to construct soil bunds, but they need help from elsewhere. As a result, in majority of female farmers' in their farm land, were not practiced soil conservation methods except few female headed women's. They have been practicing cutoff drains, waterways, check dams; and biological and agronomic soil conservation techniques in combination and/or separately. As usual, 25% of females responded that they have much work load and home care in spite of involvement in farm activities that needs much effort and investment so as to increase production.

4.15.3Associationbetween Marital Status and Soil and Water Conservation Measures

The chi- square test183.104 and the p-value 0.023 there is strong relationship between marital status and soil and water conservation practice is significant at 95% of confidence level. The marital status of respondents shows that about 71.2 percent of the respondents were married. This refers that the soil conservation practice were left for married farmers in the study area, but not we mean that the others do not care for soil conservation practices.

4.15.4 Affiliation between Respondent's Household Size and Soil and Water Conservation Measures

The chi- square test results indicate that there is a strong relationship between household size and soil conservation measures and p- value is0.00.Majority of the farmers agree on having large number of children or large number of family size. The size of family members can be seen from two different angles. The first when there is large family size in which the majority of family members are capable of working and it is very important for soil conservation measures. On the other hand having small number of children requires additional labor to construct and maintain soil conservation and as the result of Shortage of working forces, they reject soil conservation measures this supports finding of (Drake 2003).

4.15.5Association between Respondent's Household Income and Soil and Water Conservation Measures

The chi-square result reveals that there is significant relationship between income and conservation practices. According to respondents, income is one of the factors which affect soil and conservation practices. Accordingly farmers' who faced labor shortage and no money to pay, reject construction of soil conservation measures and then shifted their decisions towards the practice of biological soil conservation measures that might not compensate the benefit of soil conservation measures in controlling soil loss. This indicates that even the construction of a single soil bund can cost much money and needs large number of labor forces and give better role for large family members and it is significant at 95% of confidence level. This suggests that there will be lack of interest in soil and water conservation measures when there is lack of money and a shortage of labor.

4.15.6 Relationship between Respondents 'Educational Status and Soil and Water Conservation practices

The chi- square test shows in the table 4.12 that there is a positive relationship between educational status and soil and water conservation practices. As educational status of a household head increases, it is assumed to increase the transfer of relevant information increase. Level of education is one of the demographic features of households which play crucial role to increase

farmers' knowledge about land management practice and give awareness on the causes and Consequence of land degradation. This finding supported by (Shibru, 2003), Education enables farmers to tackle land degradation using various ways of soil conservation practices and it is significant at 95% of confidence level. In fact, higher literacy level of farmers could have brought differences among farmers in practicing soil conservation practices in general.

4.15.7 Relationship between Respondent's Farm-Size and Soil Conservation Practices

The chi- square test result depicts that there is significant relationship between land size and practices of soil and water conservation measures. The farmers who are holding large size of farm land it is positively related to soil conservation measures and significant with the chi-square test of0.0231 whereas those who are holding small size of farm have negative attitudes towards soil conservation measures. The most important reason is small size of their land which they believe that establishing conservation methods on small land is not advisable. This intention of farmers was realized by the finding of (Assefa 2009). Most farmers fear that loss of land for construction of soil bunds. Almost all farmers who have land up to 0.5 hectares consider this as major reason to reject soil bunds as conservation measures. The loss of farm land by constructing soil bunds increase when the number of bunds and years it stayed increase. This supports the findings of (Bekele and Holden, 1998).

4.15.8 Relationship between Respondent's Farm Distance from Homestead and Soil Water Conservation Measures

The chi- square test result indicates that there is positive relationship between distance from homestead and soil and water conservation measures. In the study area about 54.3% of respondent's cultivation land was far from their residence. This indicates that majority of the respondents farm land was far from their homestead. The feasible explanation of the study is that the nearer to the cultivation fields to the homestead, the frequent the management and the higher will be practice of soil and water conservation measures. When runoff comes, farmers are ready to protect soil and maintain the damaged bunds and check dams in the nearer fields. According to (Assefa 2009)reported that farmers having land far from their residence usually do not give visit to their cultivation field except during harvesting and planting season. Thus, if the farm

field is located near the farmhouse, it becomes easier to be managing and receives better attention (Chomba 2004). In other side of these, there were farmers whose land is here and there, but the field that exists far from homestead has been given for share cropping and left for grazing mostly without soil conservation measures.

4.16. Farmers Awareness on the Causes and consequences of Land Degradation

Causes of land degradation are the agents that determine the rate of degradation and whichare grouped include biophysical (land use and land management, including deforestation and tillage methods, socio-economic. The main consequences of land degradation which negatively affect human livelihoods and the environments are shortages of firewood, shortages timber, forest products, and loss of biodiversity, climate change and desertification.

Table 4.13 Farmers Awareness on the Causes and Consequences of Land Degradation in the Study Area

Variable	Is your farm land is degraded?			Chi-square x^2	p-value
		Yes	No		
Age	>18 years 25-49 years >50 years Total	14(8.7%) 90 (56.2%) 32(20%) 136	6(3.1%) 10(6.2% 8(5.0%) 24	171.852	0.000
Sex	Male Female Total	90(56.1%) 52(32.5%) 137	15(9.3%) 3(1.8%) 23	172.494	0.000
Marital	Single Married Divorced Widowed Total	9(5.6%) 110(68.7%) 5(3.1%) 17(10.6%) 141	2(1.7%) 5(3.1%) 3(1.8%) 9(5.6%) 19	181.104	0.023
Household size	1-4 5-8 9-10 >11 Total	6(3.1%) 90(56.2%) 10(5.9%) 11(6.1%) 117(73.1%)	5(3.01%) 30(18.7%) 6(3.1%) 2(1.6%) 43(26.8%)	163.763	0.000
Household income	<5000 5001-10000 10001-15000 >15001 Total	15(9.4%) 27(16.8%) 33(20.6%) 56(35%) 131	5(3.1%) 3(1.8%) 7(3.5%) 4(2.5%) 19	174.339	0.0501
Educational level of respondents	Illiterate	52(32.5%)	30(18.5%)	186.180	0.0346
	Primary school Education	25(15.6%)	15(9.3%)		
	Secondary school Education	3(12.5%)	20(12.5%)		
	High school Education	15(9.3%)	-		
	Total	95	65		
Farm-size (ha)	<0.5 ha 0.51-1.00 ha 1.01-1.50 ha ≥2 ha Total	57(35.6%) 28(17.5%) 6(3.1%) 7(4.3%) 98	23(14.3%) 12(7.5%) 18(11.2%) 8(5.0%) 62	180.030	0.0397
Distance from homestead	Near Moderate Far Total	10(6.2%) 20(12.5%) 50(31.5%) 93	23(14.3%) 20(12.5%) 37(23.1%) 67	187.697	0.0293

Source:-Field survey, Feb 2015

4.16.1 Relationship between Respondent's Age Group and Awareness on the Causes of Land Degradation

The chi- square test in the result indicates that there is positive relationship between different age categories and awareness on the causes of land degradation. A significant association means that young age farmers are better aware of the causes of land degradation than the counter parts. A Population pressure the chi square test 1.95637 at the significance level of 0.0025*was indicated by younger respondents Moreover young age group of 18 to 49 years farmers' seems better in their awareness than old age (≥50 years). A significant association means that young age farmers are better aware of the causes land degradation than old counter parts. (Blaikie and Brookfield 1987), which calls for understanding the role of land managers and their direct relations with the land, understanding the linkages and interactions among the land users, the land and the wider society, and how this is driven by the external market and economic factors

Table 4.14Chi-squareDistributionofRespondentsbyDifferentage categories and Awareness on the Causes of Land Degradation

Causes of land degradation	Age categories				chi-square	P-value
	18-49 years		>50 years			
	Freq.	%	Freq.	%		
Population pressure	116	96.6	34	85.0	1.95637	.0025*
Over cultivation	119	98.3	38	95.0	1.8265	.0146*
Over-grazing	118		36	90.0	3.6824	.0397*
Lack of fertilizers	12	75.0	28	70.0	11.938	3.035**
Poor farming practices	87	10	23	57.5	5.6736	.0029*
Rugged topography	77	72.5	21	52.5	4.2704	.0078*
Soil erosion	88	64.1	35	87.5	1.2573	.0034*
Poverty	74	73.3	30	75.5	5.1543	.0010*
		61.6				

Source:-Field survey, Feb 2015, statistically significant* statistically not significant**

4.16.2. Relationship between Farmer's Educational Qualification and Awareness on the Causes of Land Degradation

The chi- square test in the table 4.15 result reveals that there is strong relationship between different educational background and awareness on the causes of land degradation. Farmers who attend secondary school were found to be superior in awareness on the causes of land degradation compared to those of the farmers who attend primary education (1-8) and farmers who not attend formal education. The routine of farmers who attend primary education is better than that of farmers who did not attending official school. In fact, higher literacy level of farmers could have brought differences among farmers in practicing land management on their land and has effect on soil and water conservation practices in general. As educational status of a household head increases, it is assumed to increase the transfer of relevant information increase.

Table 4.15 Chi-square Distribution of Respondents by Different Educational Background and Awareness about the Causes of Land Degradation.

Awareness on the Causes of land degradation	Different Educational Qualification						Chi-square x^2	p-value
	Illiterate		Primary education (1-8)		Secondary education (9-12) and above			
	No	%	No	%	No	%		
Soil erosion	60	73.1	38	95.0	36	94.7	1.796	0.0273*
Human population pressure	50	60.9	37	97.6	37	97.6	7.269	0.0242*
Over grazing	40	49.5	33	84.4	34	85.0	10.682	0.0521*
Lack of fertilizers	55	34.3	13	8.1	-	-	3.093	0.17**
Poor farming practices	44	53.6	30	75.0	31	81.5	8.6736	0.002*
Rugged topography	50	60.9	28	70.0	30	75.0	2.274	0.037*
Over cultivation	56	68.2	27	67.5	29	76.3	14.23	0.0365*
Drought and Poverty	62	75.6	25	62.5	24	63.1	2.1543	0.0184*

Source field survey,Feb2015, statistically significant* statistically not significant**

4.16.3 Relationship between Respondent's Age Group and Awareness on Consequences of Land Degradation

The chi- square test in the result indicates that there is positive relationship between different age categories and awareness on the Consequences of land degradation of land degradation. A significant association means that young age farmers are better aware of the consequence of land degradation than the counter parts. A loss of agricultural production was indicated by all of the respondents in different age groups. Moreover young age group of 18 to 49 years farmers' seems better in their awareness than old age (≥50 farmers in indicating the consequence of land degradation. Regarding to the landlessness, P-value 0.8001**and desertification, the P-value is 0.9534** were found not significant relationship between them.

Table 4.16 Distribution of Respondents' Age and Their Awareness about the Consequences of Land Degradation in the Study Area**.**

Consequences	Age categories				Chi-square (X^2)	P-value
	18-49 years		>50 years			
	Freq.	%	Freq.	%		
Loss of agricultural production	120	75.8	40	25.0	10.956	0.0356*
Difficult for farming	90	56.2	38	34.7	3.6824	0.0170*
Loss in livestock productivity	87	54.3	33	45.6	12.938	0.0352*
Drought and famine	89	55.6	40	25.0	5.6736	0.02179*
Landlessness	120	75.8	15	9.3	2.7704	0.8001**
Desertification	117	73.1	20	12.5	1.2573	0.9534**
Migration	64	55.1	41	26.6	5.1543	0.0410*

Source: Field Survey, Feb2015 statistically significant* statistically not significant**

4.16.4 Relationship between Respondent's Educational Qualification and Awareness on the Consequences of Land Degradation

Chi- square reveals that there is positive relationship between educational qualification and awareness on the consequences of land degradation in the study area. Farmers who attend high school (9-12) have found superior understanding consequences of land degradation. Regarding to landlessness, the chi square test is 8.6736 and p- value is 1.201** and desertification the chi square test is 6.27 and p- value is 2.307**. This indicates that there is insignificant relationship between those of the farmers who attend primary education (1-8) and farmer's whodunit attend formal education. In fact, higher literacy level of farmers could have brought differences among farmers in understanding the problem on their land and has a positive effect on soil conservation practices in general. From this, one can easily assess that agricultural sector; especially farming is dominated by illiterate farmers in this area. Based on this fact, educational attainment of the farmers was examined whether it has significant impact or not in understanding consequences of land degradation.

Table 4.17 Respondents Educational background and Awareness on the Consequences of Land Degradation in the Study Area

Farmers Awareness on the Consequences of land degradation	Educational Background						Chi-square x^2	p-value
	Illiterate		Primary education (1-8)		Secondary education (9-12)and above			
	No	%	No	%	No	%		
Loss of agricultural production	80	97.5	35	87.5	37	97.6	1.996	0.0373*
Difficulty of farming	56	68.2	34	85.0	35	87.5	7.269	0.02742*
Loss in livestock productivity	60	73.1	32	80	34	85.0	10.68	0.00621*
Drought and poverty	30	36.5	20	24.3	34	79.5	9.256	0.0147*
Landlessness	36	43.9	23	57.6	36	94.7	8.673	1.201**
Desertification	33	40.4	19	47.5	31	81.5	6.275	2.307**
Migration	61	74.3	35	85.7	35	92.1	14.23	0.0305*

Source: Field Survey, Feb 2015 statistically significant* statistically not significant**

CHAPTER FIVE

5 Conclusion and Recommendation

5.1 Conclusion

The dominantly practice soil and water conservation measures such as cutoff drains, waterways, soil bunds, *fanyajuu,* fallowing, check dams and application of manure. Besides, other agronomic soil conservation measures have been practiced in the area. Based on the types of soil, slope, farm size, and training on soil conservation the breadth and length of structural soil conservation tends to vary. For example, the farm size has a great influence in practicing soil bunds as it takesa way parcel of plot in its construction.

Majority of farmers in the study area have not been clearly informed on the unique benefit of *fanyajuu*. Besides, practice of fanyajuu is limited and the importance is merged with soil bunds despite of their differences. The soil from the *fanyajuu* is thrown up and helps in making the slope flat gradually whereas the soils from the soil bunds thrown down the bund. However, trainings, schools and mass media, are believed to be among the most important tools for awareness rising in environmental protection and natural resource management. The extent to which this tools has been used and the result of such use has not been adequately investigated. But, the understanding of farmers in the importance of soil and water conservation practices like soil bunds, fanaya juu, water ways, cutoff drains, afforestation and fallowing are found to be too low. There is an opportunity to use mass media and training to raise community awareness but it has not been used properly.

Although the practice of soil and water conservation measures can be determined by different factors. The most important and considered factors include age, gender, education, household size, land size, off-farm activities, distance from home stead, slope, contact with DAs, and training on soil and water conservation measures. When the distance of farm field from homestead increases, the practice of structural soil conservation tends to decreases by far. Aged farmers preferred practice of cutoff drains and biological and agronomic soil conservation measures than soil bunds and *fanyajuu,* because it needs more labor and materials to practice. Higher educational level brings difference among farmers in practicing structural soil and water

conservation measures. Farmers who attained secondary level education have shown increasing practice of structural soil conservation measures than farmers who cannot read and write. Involvement in no farming jobs supports farmers in practicing structural soil conservation measures by equipping materials required for construction of soil bunds, *fanyajuu*,etc.

Respondents of the study area were characterized by poor socio-economic conditions. The living conditions of farmers were deteriorating from time to time due to decreasing in crop production, resulting from land degradation and poor soil conservation. Previously, crop production mainly, wheat, sorghum, pea, barley and enset were the source of income in addition to home consumption. But present days it is challenging for source of income and it is not sufficient to feed their family. Due to declining of crop yields, the resulting income reduction and the progressive price increment of fertilizer the farmers 'were inability to afford food for home consumption. So that, good soil and water conservation leads to enriched lands, better crop yields good financial returns and a balanced environment. Less degradation means the better soil quality, with the soil retaining the nutrients and chemicals added to it, and this naturally leads to better and more improved crop yields. People are well recognized the importance of soil and water conservation measures in controlling erosion so as to enhance soil fertility. Duet workload, crop cover and other reasons, the conservation structures were constructed most probably in a dry seasons.

The solution for minimizing or stopping land degradation in the study area first to aware the society about the outcomes of degradation those activities depending up on entire farming process who made agriculture as a main source of income for livelihood. Secondly giving material and financial support to those depend up on these activities. Promoting new technology for those which depend up on crop production and finally formulating and implementing polices to protect land degradation and soil and water conservation. Considering the complexity of land degradation, it was not possible to assign non measure for the problem; rather land users understood the problem by disaggregating it in to observable change. Based on the study results, the following are recommend

5.2 Recommendation

Based on the outcome of the study, the following recommendations are projected:

1. Farmers were aware of the cause and consequence of land degradation over time which they underline the causes with rapidly growing population, shortage of land, soil erosion, poor farming practices, overgrazing, and over cultivation. Therefore, it should be advisable to encourage farmers' awareness to use better family planning to repeal the problems of land degradation and adopt any other ways of livelihood. The farmers' responses revealed that low and declining agricultural productivity is mainly caused by land degradation problem and inadequate institutional supports on land degradation in form of soil erosion is the main problems observed into the study area. Thus, developmental agencies and police makers should give due to emphasis towards soil and water conservation activities and rising farmers awareness that aimed at maintaining soil productivity which this in return reduce vulnerability of land degradation and increase soil and water conservation practices of household in the study area. So that applying appropriate soil and water conservation practices and better understanding for the problem of land degradation helps for sustainable land management that improves and maintains soil productivity.

2. To adopt policy and programs about land resource and to give attention and priority in training and mobilizing farmers that help in raising their commitment regarding to the practices of conservation measures and the use of land resource in sustainable way. There is a need for more publicity on soil and water conservation practices which should be done mostly on mass media such as radio, Tv, News paper, trainings, schools are believed to be among the most important tools for awareness rising in environmental protection and natural resource conservation. The government officials of regional states, zones and *woreda* should play a great role for the implementation of this program.

3. Farmers training center in the study area was built, yet training is hardly provided. In most of farmers training center, there is no soil and water conservation structuretoshowfarmersasillustrationandeventhelandneartoFTCwasseverelyeroded.The

DAinrespective*kebeles*shouldprovidefarmerswithtraininganduptodateinformationon climate, slope, soil erosion, conservation measures, and land management as a whole.

4. As a final point, the relationship between development agents and farmers certainly increases the interest of the farmers in practicing soil and water conservation measures by providing useful information interns of where and when to construct them. However, farmers' contact with Das is very limited and irregular. It will be productive if the district agricultural and rural development bureau follows up the effectiveness and efforts of Das so as to improve closeness with farmers and enhance interest in soil conservation measures.

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The principal objective of this Questionnaire is to understand Farmer's awareness about land degradation and the practices of Soil and water Conservation Measures in *Hadiya* zone, the case of *Duna woreda*. So that such kinds of micro level studies are useful to the planners and decision makers to draw the most appropriate Socio-economic development plans, which are based on farmers' needs and priorities. You are kindly requested to give answers freely and openly. Any information you give is to be kept confidential. Thus, your cooperation is very necessary to achieve the desired goal of the study. Thank you!

Part-I: Demographic and Socio-economic Characteristics of Household Head

1. Age of household head:
2. Sex of household head: 1. Male 2. Female
3. Marital status 1. Single 2. Married 3 Divorced 4 Widowed
4. Size of household: 1. 1-4 2. 5-8 3. 9-10 4. >11
5. What is your household income per year? 1. <5000 2. 5001-10000 3. 10001-15000 4. >15001

6 What is educational level of household?

1. Illiterate
2. Primary school Education
3 Secondary schools Education
4 High school Education

7 What are the major sources of income?

1. Sales of crop production
2. Sales of animals feed
3. off farm income
4. Income from government 5 Income from NGO 6. Specify if other

8. How many hectares do you have?

1. <0.5 ha
2. 0.5 ha-1.0 ha
3. 1.01 ha-1.5 ha
4. 1.5 ha-2.0 ha
5. >2.1 ha

9 How do you perceive about the distance of cultivation field from your home?

1. Near 2. Medium 3. Far

10. Which land do you perceive more productive?

1. Flat 2. Moderately steep slope 3. Steeply sloping

11. What is the slope of your land?

1. Flat 2. Moderately steep 3. Steep slope

Part 2: Questionnaires on causes and consequence of land degradation

12 To what extent of your land is degraded?

1. Severely 2 Moderately 3. Littlie 4. No land degradation risk

13 Do you practice soil conservation in your land?

1Yes 2 No

14 Do you believe that the following are causes of land degradation in your locality?
1Yes 2 No

A. Soil erosion 1Yes 2 No
B. over cultivation 1Yes 2 No
C. Over grazing 1Yes 2 No
D. Rapid population Growth 1Yes 2 No
E. Rugged topography 1Yes 2 No
F. Poor farming practices 1Yes 2 No
G Poverty 1Yes 2 No

15 the following are possible consequence of land degradation in your locality?

A. declining in livestock productivity 1Yes 2 No B Drought 1Yes 2 No C. Desertification 1Yes 2 No

D. Landlessness 1Yes 2 No E. Migration 1Yes 2 No G. poor farming practice 1Yes 2 No F. reduction in agricultural production 1 Yes 2 No

16 How do you describe the contact you have with soil and water conservation experts (DAs)

1. Non 2. Limited 3. Good 4. Very good

17. How do you explain training on soil conservation technologies? 1. Adequate 2. Limited 3. Never trained

18 Which soil conservation practices do you use regularly? (More than one answer is possible)

1. Soil bund 2. Fanyaa juu 3 Cutoff drains 4. Waterways 5. Check dam

19 How frequently do you use the land management practices listed below?

No	land management practices	always	Some times	Never	
1	Mixed cropping				
2	Crop rotation				
3	Contour plowing				
4	Terracing of farm land				
5	Organic manure				
6	Fallowing				
7	Tree planting				

20. How do you perceive the productivity of your land?

1. Increasing 2. Decreasing 3. Constant 4. Do not know

21 What are your major sources of information for the land management and soil conservation practices?

A. Friends and relatives
B. Radio
C. Extension agents
E. Television
D. Trainings in SWC
E. Print media
F. Schools If any (specify) _____

22. Do you get training on land degradation and land management practices?

A. yes B. No

23 which of the following factors limit implementation of different land management practices in your land?

A Lack of training B Poor relationship between farmers

C Insufficient support from DA

D Limited of supervision from woreda agricultural office

24 Do you practice soil conservation in your land? 1 Yes 2 No

25 Observed change in land degradation severity over the past 5 years

A Has become more severe
B Has become less severe
C No change

26 In your opinion do you believe that land degradation can be controlled?

A Yes B No

Part Three Awareness Test

Instruction: Read each of the following statements very carefully and decide whether you

Agree, undecided, Disagree put (X) mark inside the appropriate box that indicates your opinion.

Cod	Statements
A1	Rapid population growth leads to land degradation.
A2	Land degradation is mostly affected rural population.
A3	Land degradation has little effect on crop production
A4	Over cultivation accelerates land degradation.
A5	Overusing the land means damaging the very basis of human life.
A6	Resource management should mainly be the responsibility of the government rather than the local community.
A7	It is important to use animal dung and crop residue as fuel rather than using it as compost
A8	It is far more important to care for the present generation than to think for the benefit of future generation
B1	Land size is an important factor which affects the practice of soil conservation measures.
B2	Terracing helps us to reduce run-off and rate of soil erosion
B3	Distance to from homestead affect the practice of soil and water conservation measures

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Appendix 1

Interview Guides Protocols for the farmers' house hold heads.

General back ground information of respondent

1. Name of Kebele ----------
2. Respondent Name of ----------
3. Sex Male ☐
   Female ☐
4. Age ☐
5. Marital status A. single ☐ B. Married ☐ C. Divorced ☐ D. Widow ☐
6. Family size ☐
7. Educational Status ☐

Questions:

2 Do you use some kinds of soil conservation practices to maintain soil fertility of your cultivated land?

3 Do you believe that land degradation was a problem in your farm?

4 Explain how natural factors are drivers of land degradation?

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Appendix 2

Focused Group Discussion Guiding Protocols for the farmers' house hold heads about land degradation and soil conservation

Questions:

1 What you expect from government to participate in SWC measures
2 How you aware about land management
3 Do male and female farmers equally participate in land management and soil conservation practice?
4 Discuss the role of institutional factors for soil and water conservation practices?