INDRA GANDHI NATIONAL OPEN UNIVERSITY

SCHOOL OF CONTINUNIG EDUCATION

ASSESSMENT OF FARMERS' ADOPTION OF LAND REHABILITATION PRACTICEs: THE CASE OF MANASIBU DISTRICT, WEST WOLLEGA ZONE, OROMIYA REGIONAL STATE, ETHIOPIA

By

DAWIT OLANA WAYESSA

NOVEMBER 2014

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ATHESIS SUBMITTED TO INDDIRA GANDHI NATIONAL OPEN UNIVERSITY SCHOOL OF CONTINIUNG EDUCATION IN **PARTIAL FULFILIMENT OF THE REQUREMENT OF DEGREE OF MASTERS OF ARTS IN RURAL DEVELOPMENT (MARD)**

NOVEMBER 2014

Addis Ababa, Ethiopia

DECLARATION

I hereby declare that the Dissertation entitled ASSESSMENT OF FARMERS' ADOPTION OF LAND REHABILITATION PRACTICEs: THE CASE OF MANASIBU DISTRICT, WEST WOLLEGA ZONE, OROMIYA REGIONAL STATE, ETHIOPIA, submitted by me for the partial fulfillment of the M.A. in Rural Development to Indira Gandhi National Open University, (IGNOU) New Delhi is my own original work and has not been submitted earlier to IGNOU or to any other institution for the fulfillment of the requirement for any course of study. I also declare that no chapter of this manuscript in whole or in part is lifted and incorporated in this report from any earlier work done by me or others

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Place: ADDIS ABABA Signature:_____

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CERTIFICATE

This is to certify that Mr. Dawit Olana Wayessa, student of M.A.(RD) from Indira Gandhi National Open University, New Delhi was working under my supervision and guidance for his/her Project work for the courses MRDP-001.His Project Work entitled "ASSESSMENT OF FARMERS' ADOPTION OF LAND REHABILITATION PRACTICEs: THE CASE OF MANASIBU DISTRICT, WEST WOLLEGA ZONE, OROMIYA REGIONAL STATE, ETHIOPIA" which he is submitting, his genuine and original work

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BIOGRAPHICAL SKETCH

The author was born in Boji District in West Wollega Zone of Oromia Regional State, at a village called Amuma Hena. He attended his primary education at Kiltu Kara and Mendi Makane Yesus Elementary and Junior Secondary schools. He attended secondary school at Mendi Senior secondary and completed his high school education from Nejo Senior Secondary school in 1986. After successful completion of high school education, he joined Addis Ababa University, College of Social Sciences and graduated with Bachelor of Arts degree in Geography in June 1990.

After his graduation, he was employed in the Ethiopian Evangelical Church Makane Yesus, Western Synod (EECMY-WS) and served in the Development and Social Service Department as an Emergency Relief and Rehabilitation project Coordinator, Child and Youth Development Program Director, Western Synod Project Officer, and the Western Synod Development and Social Services Director for a total of 17 years altogether. Since January, 2009 he has been serving as a Coordinator of EECMY-DASSC Western Cluster Area Capacity building. He joined Indira Gandhi National Open University School of Continuing Education in January 2010.

DEDICATION

I dedicate this thesis manuscript to my late wife Yadani Abera her generous support, care and love she provided in our partnership.

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LIST OF ACRONYMS

DADO	District Agricultural Development Office
EECMY-DASSC	Ethiopian Evangelical Church Mekane Yesus Development and Social Services Commission
EFAP	Ethiopian Forestry Action Program
FAO	Food and Agriculture Organization
FRDE	Federal Republic Democratic Ethiopia
GDP	Gross Domestic Product
GO	Government Organization
GTP	Growth and Transformation Plan
FAD	International Fund for Agricultural Development
ICRA	International Center for development oriented Research in Agriculture
LRPs	Land Management Practices
MDARDO	Manasibu District Agriculture Development Office
MEDAC	Ministry of Economic Development and Cooperation
MIFSP	Manasibu Integrated Food Security Project
MOARD	Ministry of Agriculture and Rural Development
NCSS	National Council for Social Studies
NGO	Non-Governmental Organization
SPSS	Statisticla Package for Social Sciences
SWC	Soil and Water Conservation
TLU	Total Livestock Unit
UNCCD	United Nations convention to Combat Desertification
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
WB	World Bank
WS	Western Synod

ABSTRACT

In Ethiopia, land degradation has become a serious problem affecting all spheres of social, economic and political life of the population. It is one of the major challenges to agricultural development and food security in the country. In order to combat the problem of land degradation, a lot of efforts have been made since 1970s.

This study was undertaken in Manasibu district of West Wollega Zone of Oromia Regional State with the objective of assessing land rehabilitation practices (LMPs), identifying factors affecting practicing of Land Rehabilitation activities in the area. In order to achieve the objective of the study, both primary and secondary data were generated from 120 randomly selected households from four Rural Kebeles of the district based on probability proportional to size. Purposive and random sampling methods were used to select sample rural kebeles and respondents respectively. Both quantitative and qualitative collected and the qualitative data were discussed to substantiate the study. Descriptive and inferential statistics were used to analyze the data. Moreover, perception index was employed to examine smallholder farmers' perception with regards to land rehabilitation practices. The study therefore, revealed the important factors that influence the Land rehabilitation practices in the study area and suggested possible solutions that may help to ameliorate the situation. Thus study has identified area closure and combined with physical soil and water conservation as the major activities strategies of land Rehabilitation, based on the respondents' identification criteria. The result of the study also depicted that from the 120 sample households, 52 sample households were participating on the major different strategies to rehabilitate the degraded land while the remaining 68 of sample households were not participation on the major rehabilitation practices strategies option available during the survey period due to different predicaments. The descriptive analysis output showed that, farmers' decision on choice of land Rehabilitation strategy is influenced by: farm size; slope of the plot; livestock holding and Non/off-farm income. Similarly, the result of the study showed farmers' participation on LRP is influenced by: education level of the household heads; farming experience; slope of plot; livestock holding; off-farm income and extension contact on conservation strategies of land management. Farmers' decision choice of soil bunds conservation strategy is influenced by farm sizes; farmer's perception on soil erosion; livestock holding and off-farm income of households. Future land rehabilitation policies should focus on targeting farmers with large livestock holding, creation of awareness towards soil erosion problem, increasing the coverage of extension services on strategies of land management, focusing on activities which targeted both the complementarities of off-farm activities and conservation strategy of land management to encourage land management activities. The study indicated that, involvement in off-farm activities, increase in size of human population, lack of credit to embark upon land rehabilitation practices, low assistance gained from neighbor-hoods, less access to extension service are the major challenges encountering the implementation of land rehabilitation practices in effective way. Awareness creation and continuous training, creating opportunities for alternative means of livelihood and promoting NGOs effort to involve in land rehabilitation practices help solve the problem encountering land rehabilitation practices in the study area

Key Words: Land Degradation, Indigenous Land Management, Improved Land management, Alternative livelihood, Rural Energy, Vulnerability,

CHAPTER ONE

I. INTRODUCTION

1.1. Background of the Study

Ethiopia is the second populous country in Africa, after Nigeria, with a population of 73.9 million (CSA, 2007). The country has total area of1, 127, 127 sq km and a great geographical diversity, with high and rugged mountains, flat-topped plateau with deep gorges and rolling plains. Its altitudes range from 4620 meters above sea level on Rasdashen, and 116 meters below sea level at Dallol depression (Anonymous, 1988). It is one of the Sub- Saharan countries well-endowed in terms of its natural resources. Its location in the tropics, combined with wide altitudinal variations, allows the country to enjoy both temperate and tropical climates. This gave also the country a wealth of bio-physical resources including rich agricultural biodiversity, relatively fertile soils, and good fresh water resources (Gete et al., 2006).

Agriculture supported the livelihood of the country's population for the last hundreds of years and even the current economy of Ethiopia is heavily dependent on agriculture which provide more than 40% of the country's' GDP.

Ethiopia's economy and the well-being of 83.9 percent of its citizens living in rural areas depend on natural resources, principally on land, water and vegetation for their livelihoods, economic development, and food security (CSA, 2007).

Regardless of its enormous land resources, the country has been experiencing a declining agricultural productivity and continued food insecurity. The agricultural sector has been affected by multifaceted environmental problems. Land degradation is one of the major environmental challenges facing Ethiopia. The level of productivity of renewable natural resources such as land, water, and forests, which are the key resources in meeting basic needs, have now deteriorated. Soil erosion by water has become the most widespread and a critical problem, and itis among the diverse forms of land degradation processes that pose threat to the food security of the population and the future development prospects of the country (Hurni, 1988; Woldeamlak, 2003, L. Berry etal., 2003).

The process has been accelerated over the past one hundred years owing to political disturbances, inappropriate land management practices and, high population growth that has brought with it more deforestation and environmental changes. Deforestation for expansion of agricultural land and cultivation of marginal lands for crop production made the land susceptible to severe erosion (Sisay& Tesfaye, 2003).

According to the World Bank (2007), the average annual soil erosion rate nationwide was estimated at 12 tons per ha, giving away 1493 million tons. The erosion is sever on land under crops as compared to that of grazing, perennial crops, forest and bushes. The area under annual crops accounts only for 13 percent of the country's area and yet annual crop land contributes about 45% of the estimated total soil loss from the country (WB, 2007).Recent studies have estimated that one billion tons of top soil is lost each year taking with it soil nutrients equivalent to 30kg/ha of nitrogen and 15-20 kg/ha of phosphorus (WB, 2001; UNDP, 2002; World Bank, 2007). Obviously, in recent years this endangered the livelihoods of rural farmers and of the whole population, as well as the country's ability to produce crops, livestock, and other products (Aklilu, 2006, Sisay and Tesfaye, 2003).

The trees and forests of Ethiopia are under tremendous pressure because of the drastic decline in mature forest cover and the persistent population pressures, rudimentary farming techniques, land use competition, land tenure, and forest degradation and conversion (Ethiopian biodiversity and tropical forest 118/119 assessment, August 2008). The current rate of deforestation is estimated at 150,000 ha per year by the Ethiopian Forestry Action Plan, while it is estimated to be 62,000 ha/yr., according to World Bank, (2007). Forests in general have shrunk from covering 65% of the country and 90% of the highlands to 2.2% and 5.6% respectively since 1970s (L. Berry et.al, 2003). The status of the forest resources of the country is considered to be at risk and Ethiopia is considered as one of the environmentally degraded countries in the world.

According to the USIAD (2008) assessment report prepared by the Biodiversity Analysis and Technical Support Team half of the population lives in poverty and is classified as undernourished and continuous resource depletion will have major consequences for the health and food security of the people and the economic development of the nation.

The causes of land degradation are complex and have diverse nature and dimensions, depending on peculiarities of different countries. A number of studies show that a mix of political, natural and economic and social factors has contributed to the process of land degradation in Ethiopia. They argue that population pressure; unfavorable land tenure system, inappropriate agricultural practices, overgrazing, deforestation and soil erosion have been responsible for the deterioration of land productivity in Ethiopia. Hence, land degradation in general is a multi-dimensional problem that occurs as a result of the interplay of various forces and its socio-economic consequences are likely to be very complex (Amede, 2003). Although it is influenced by natural and socio-economic factors, the heavy reliance of some 85 percent of Ethiopia's growing population on an exploitative kind of subsistence agriculture, forced by their legitimate need for survival, has greater influences on the current state of land degradation (Gete et al., 2006).

In Ethiopia, where a rapidly growing human population exists, yet all livelihood and economic development are based on agriculture and land resources, reversing land degradation through rehabilitation of the degraded ecosystems and viable land management are very crucial to bring about sustainable development. Hence, land conservation and reclamation is not an option in Ethiopia, where agriculture still remains to be the sources of livelihood for majority of its citizens and more than 40% of its GDP (Tekle, 1998, as cited in Alemayehu, 2009).

However, the issue of land conservation and reclamation had been largely neglected policy makers land until 1970s (Bekele and Holden1999, Berihanu, 2004) and the problem attracted policy attention only after the devastating famine of the years 1973/1974 (Bekele and Holden, 1998). This moment, it is considered as a milestone for government attention and commitment towards conservation activities. Since then, several Soil and Water Conservation (SWC) and land reclamation projects were initiated with the support of donor agencies. Efforts have been put in place in order to rehabilitate degraded areas, and stop further degradation through better control of soil lose and run-off as well as through improved soil fertility management and reforestation. Various SWC measures were introduced (Aklilu, 2006,; Gete*et al*., 2006).

The study area (Manasibu district) has experienced settled agriculture dominated by mixed farming and the large portion of its areas is highly degraded due to mismanagement of natural

resources (overgrazing, deforestation, etc.),inappropriate agricultural practices and the heavy termite invasions that aggravated the situation (ICRA 1998).Based on its findings, ICRA, (1998)recommended integrated approach to combat soil degradation and enhance productivity of the land, The GOs and NGOs (mainly Ethiopian Evangelical Church Mekane Yesus) have exerted efforts to combat land degradation in the district by undertaking land rehabilitation and management activities to enhance productivity of land .The Ethiopian Evangelical Church Mekane Yesus (EECMY) Western Synod launched a land rehabilitation project in May 1999 integrating termite control, soil and water conservation, crop and livestock management and other related practices with the objective of bringing the land to its previous productive state by applying the recommended strategies. Obviously, the integrated project activities have reduced soil erosion, improved vegetation cover, and productivity of the degraded land (MIFSP, annual report, 2012).

Moreover, for the last many years, the MoARD-District Office has also been engaged in diverse activities related to Land rehabilitation and management to ameliorate the situation. Despite In the various efforts that have been made by the different actors in the study area for the last many years, many studies show that the result obtained so far is not satisfactory to reverse the land degradation in the study area. The success to date has been limited to smaller area intervened by the EECMY-DASSC- Western Synod and the pace of reclamation process is much slower than that of the land degradation. Obviously, controlling soil erosion and protecting land resources through effective management and rehabilitation of land resources are imperative to feed more people and for economic development of the country. Hence, a thorough study is required to assess the indigenous and improved land management and rehabilitation practices, and identify the factors that affect farmers' adoption of the rehabilitation and thereby draw conclusions that might help to provide viable information for design and improve the implementation of appropriate conservation practices in the study area in particular and for informed policy decisions in general.

1.2. Statement of the problem

Despite Ethiopia's enormous biophysical potential, land productivity of the country is seriously constrained by land degradation in most parts. Pressure on the physical environment are

increasing inexorably, as the forest cover, grazing land, soil fertility and rainfall are decreasing in many areas. The majority of smallholder farmers cultivate on impoverished soils on steep and marginal lands highly susceptible to soil erosion. The agricultural sector is increasingly confronted with pressure from a rapidly growing population and diminishing natural resources, and this hampers sustainable agricultural development in the country (EFAP, 1994; Bojo and Cassels as , 1995;). The interlinked and reinforcing problems of land degradation has posed treat to the base of the long-term economic development policy and strategy of the country that has been planned and stipulated as "Agricultural Development Led Industrialization" (Stefan Dercon and Andrew Zeitlin, 2009).To mitigate the problem the widened degradation of its agricultural land, Ethiopia has taken some measures since early 1980s soil and water conservation have been introduced in some degraded land and food deficient areas of the highland, mainly through food-for-work programs supported by World Food Program (WFP).

The Western Oromia, including Manasibu District, agriculture is the main economic activity and basis of livelihood for the people and more than 85 % of the population resides in rural area. Nevertheless, land degradation is a major problem and affected agricultural production and productivity. The district faces a multitude of complex food production and supply problems, mainly due to inappropriate land management practices, which are caused by both natural and human intervention problems. The human intervention problems include overgrazing, over cultivation, deforestation and inappropriate agricultural practices. The widespread termite infestation aggravated the situation and has threatened the livelihood of the community in the study area- in general and that of the farming households in particular.

Farmers are putting excessive pressure on the land by adopting inappropriate technology for the sake of exploiting short-term benefits. This has led to degradation of the environment and depletion of resources (ICRA, 1998).The severe soil erosion resulted in formation of gullies, landslides, and the shrinking of farm and grazing lands. The situation of the vegetation, forest in particular, also demonstrates similar trends in the study area. As a result, more and more land is becoming unproductive and abandoned and the farmers are migrating to the nearby low lands. In Mena-Sibu District alone, 66,000 hectares of productive land have been taken out of production and 33,367 farmers have abandoned their lands (Alemayehu D, 2009). The land

degradation in the area has brought food insecurity, the main causes of which are low productivity of crop and livestock, limited income, and inability to develop skill and knowledge. As a result a significant number of farmers migrated to the neighboring low lands in search of fertile farm land for growing crops and feeding their livestock. Similar problem is being observed in newly settled lowlands and this is becoming a source of conflict over land resources.

To solve these problems, GOs and NGOs have long been involved in various land management and rehabilitation activities. The Evangelical Mekane Yesus Church–Development and Social Services Commission (EECMY/DASSC-WS) is a Faith based organization that has been involved in land rehabilitation activities in the area for more than a decade. Although there are some achievements in the area where the project intervened, large portion of the land in the district to date remains degraded as the intervention is limited to a small part. The practices have not been replicated further and there are farmers who do not use the practices to rehabilitate their land and were considered inadequate even if it has been practices. This indicates that there are issues that need to be investigated and more targeted guidance would be very helpful to see where particular land rehabilitation and management approaches are likely to be successful (Gebregziabher and Gebrehiwot, 2011).However, to date, thorough study has not been conducted on the problem of land degradation and the land rehabilitation and management practices in Manasibu District, while the problems are still pressing. Thus, a systematic assessment is very fundamental to know the current status and identify main factors that influence the farmers for adopting or not adopting land rehabilitation practices. To understand soil erosion and combat land degradation, we must be aware of the political and economic factors affecting land users' and preventing soil erosion requires political, economic and technical changes.

Thus, this study mainly focuses on the role of socio-economic circumstances (factors), farmers' perception, and land tenure system in land management and rehabilitation and attempts to fill the knowledge gap by identifying the factors that influence the land rehabilitation in the study area. The study could help to provide specific policy recommendations for that particular area and to develop viable strategies of land rehabilitation and ensure sustainable land management.

1.3. Objectives of the Study

1.3.1. General objective

The overall objective of this study is to identify farmers' participation and identify factors (biophysical, socio-economic and institutional) that affect farmer's decision to use land rehabilitation/ management practices in the study area.

The specific objectives

1. To identify the major factors (biophysical, economic, social and institutional) that affect a farmers' adoption of land rehabilitation practices in study area
2. To understand the existing land rehabilitation and management practices in the study area
3. To assess the participation of farmers on land rehabilitation activities

1.4. Research Questions

To accomplish the above objectives, the research will attempt to address the following research questions:

1. What are the biophysical, economic, social and institutional factors that affect the land rehabilitation efforts of the community in the study area?
2. What is the existing indigenous and improved land rehabilitation/management practices used in the study area?
3. To assess the farmers' perception of the land rehabilitation practices?

1.5. Significance of the study

Currently, land degradation is among the major problems that is critically threatening agricultural production and productivity of Ethiopia and that of the study area in particular. It is due to this fact that the government of Ethiopia has given due attention to land resources management as one of the developmental issues to alleviate poverty and bring about improvement in the livelihoods of the people (GTP of the FRDE). The document states that agriculture will continue to be the major source of economic growth while small holder farming will be the major source of agricultural growth. Moreover, the overall goal of the Ethiopian Environmental Policy is the promotion of sustainable social and economic development through the sound management and use of natural resources.

Nevertheless, Empirical studies on land resources degradation and land rehabilitation practices there have not been conducted in western part of Oromia including the study area. Addressing such multi-dimensional and complex problems of land degradation and sustainable land resources management require area specific and thorough study. Hence, this study will help to address the knowledge gap regarding land degradation in the study area and identify the good practices for land rehabilitation activities. Moreover, it is important to inform concerned development planners/actors and policy makers for to develop locally acceptable and feasible land rehabilitation and Management strategies to minimize the problem of land degradation in the study area so as to ensure sustainable land management and development.

1.6. Scope and Limitation of the Study

The study is designed to assess the land rehabilitation practices and the biophysical, socio-economic and institutional factors that affect farmers' participation on land rehabilitation in the study area. It is limited to one district, Manasibu, from the Western Wallega Zone. Four sample peasant associations (PAs) will be covered owing to resource constraint such as time, personnel and budget to cover the whole District. Therefore, the scope of the study is limited in terms of coverage. Although generalization is not attempted beyond the district, the recommendations and policy implications of the study can be relevant for other areas that have similar socio-economic and agro-ecological conditions.

1.7. Organization of the Thesis

The thesis has seven chapters. This introductory chapter is followed by chapter 2 which deals with definition of concepts of land degradation, land rehabilitation and management practices ,reviews empirical studies on factors influencing land rehabilitation and management practices and analytical framework. Chapter 3 deals with description of the study area, describes, sources and methods of data collection, sampling techniques and methods the data analysis definition of explanatory variables. Chapter presents the results of the study and chapter 5 deals with discussion and interpretation of the findings. Chapter six is devoted to summary and conclusion of the study and recommendations for further research and policy.

CHAPTER TWO

2. LITERATURE REVIEW

2.1. Conceptual Framework

The concepts underlying the use of the terms such as land, land degradation, soil erosion, degraded land, land rehabilitation and reclamation require definition to understand the subsequent discussions.

2.1.1. Concept of Land Degradation

Land, in a broad sense, refers to climate, water resources, landforms, soils and vegetation (FAO, 1976; FAO 1980). Land resource is comprised of the earth's surface, including all elements of the physical and biological environment that influence land use (Wit and Verheye 2000; cited in Berhan, undated). Thus, land resource refers not only to soil but also to landforms, climate, hydrology, vegetation and fauna, together with conservation practices such as terraces, agro-forestry and drainage works. It is an environmental, social and economic asset and is a key resource for the realization of development opportunities (UNEP, 2006).

Land degradation refers to the temporary or permanent reduction in the productive capacity of land as a result of human action according to Oldeman et al. (1990). According to UNCCD (1996), "Land degradation is: a reduction or loss of the biological or economic productivity and complexity of rain-fed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from land uses or from a process or combination of processes, including processes arising from human activities and habitation patterns. It is the deterioration of the physical, chemical and biological or economic properties of soil; and long-term loss of natural vegetation". It is the aggregate diminution of the productive potential of land including its major uses (rain fed, irrigated, range land, forestry), its farming system and its value as an economic resources. It refers to decline of the biological productive potential of land, namely the entire geo-ecological systems that include soils, water, climate, vegetation, topography, and land use (Martin J Haigh undated).

It is the process of progressive deterioration of biological (flora and fauna) and physical (soil, water, microclimate, etc.) lead to declining productivity of land resources and unsustainable

yield. It is deterioration or the total loss of land productivity through one or more processes, including soil removal due to wind and water erosion, acidification, salinization, water logging, soil nutrient depletion, and soil contamination/ pollution resulting in reduced soil biological diversity and activity, and the loss of soil structure (FAO, 1980, Singh .P, 1995).

Many studies revealed that the main forms of land degradation are soil erosion and deterioration of soil structure due to heavy grazing, clearing of vegetation, and cultivation on steep slopes. The removal of protective vegetation cover coupled with, heavy grazing leads to soil compaction due to livestock trampling. The compacted soil Surface increases runoff, and excessive loss of top soil. This loss of top soil is also influenced by intensity of rainfall, soil texture, slope and amount of organic matter the soil contains (Kebrom , 1999).

A review of literature reveals a wide range of definitions of land degradation. All the provided definitions indicate a state of the land losing its capacity to provide the services required. It is also important to note that the relative extent of degradation defined in terms of reductions in land productivity and it is classified as light, moderate, strong and extreme according to Oldeman et al. (1990).

Among the various forms of land degradation, soil erosion is the most serious problem, which results in soil nutrient depletion and loss of fertility of farm land. Soil erosion is a three-stage process, the removal of soil particles (detachment), the transportation of those particles and their deposition in other areas. Soil erosion takes place when particles of soil are detached and then transported to a different place (Sfeir-Younis and Dragun, 1993). The agents for this detachment and transportation are wind and water. According to Ayalneh (2002), Soil erosion accounts for the major forms of land degradation in developing countries, and at the same time, it is difficult to isolate and measure its impact on productivity even when the means and resources are available.

A degraded land is the land that lost its productive potential through the process of soil erosion, deforestation, pollution and related incidents and no more able to provide the service it is supposed to give. It is the land that lost its capacity to provide ‘goods’ productive land uses, Environmental reactor and social goods (D G Rossiter, 2001). It is estimated that 65% of SSA's

agricultural land is degraded because of water and soil erosion, chemical and physical degradation. Of the total degraded area, overgrazing, agricultural mismanagement, deforestation and overexploitation of natural resources are said to account for 49, 24, 14 and 13% respectively (Oldeman et al. 1991; Batjes 2001, as cited in B. S. Waswa, 2012).

2.1.2. Land degradation problem in Ethiopia

Ethiopia is one of the Sub-Saharan African countries where soil degradation is widespread mainly due to erosion and nutrient depletion being the most important environmental problem. Many studies show that Land degradation is most severe problem in the most part of the country, especially in the northern half of the country which in turn has contributed to the reduction of yield and at times to a complete loss of land productivity and human suffering (Nurhussen , 2002). The cause, level, and pattern of land degradation are not uniform among different regions and zones. If we take the western part of the country, for instance western Wollega, termites were thought as a number one agent for land degradation than the facts of inappropriate cultivation, over grazing, deforestation, and acidity (ICRA, 1998). Thus, it is wise to say causes of degradation in different areas have different nature and require different treatments.

Soil erosion is severe on cultivated land, where the average annual loss is 42 tons/ha, compared with 5 tons/ha from pastures. According to Hurni, (1990), the highest average rates of soil loss are from formerly cultivated lands, which are currently unproductive because of degradation and have very little vegetative cover to protect them. The loss of soil and the deterioration in fertility, moisture storage capacity, and structure of the remaining soils, all reduce the country's agricultural productivity. There is a vicious cycle of natural resource degradation and food insecurity driven by absolute poverty and population growth in Ethiopia, (Shibru and Kifle, 1998). In general, the Land degradation, coupled with poverty, fast growing population, policy failures and social problems have threatened the national and household food security (Bekele and Holden, 1999).

2.1.3. Causes of Land Degradation

Causes of land degradation are the agents that determine the rate of degradation and include biophysical (land use and land management, including deforestation and cultivation methods),

socio-economic (e.g., land tenure, marketing, institutional support, income and human health), and political and political (e.g., incentives, political stability) (Eswaran et al. 2001).

The FAO classifies the causes of land degradation into natural hazards, direct causes, and underlying causes into physical factors and human factors (1994). The physical factors include topography, climate, and soil. The Natural hazards are the conditions of the physical environment and it is exogenous to land managers, and rain and wind being the agents that cause the removal of soil and eventual deterioration of the land. Direct causes are inappropriate land use and land management practices. Underlying causes are the reason why these unsuitable types of land use and management practiced. Human factors such as high discount rates and low agricultural output prices have been blamed for discouraging farmer incentives for soil conservation according to some literature. Another human factor is the tenure system which may dishearten the adoption of innovative soil and water conservation measures and encourage resource depletion, (Griffin, K.)

2.1.3.1. Population growth

Malthusians and Neo-Malthusians argued that population growth negatively affect natural resources management and hampers social and economic development of a given society (Corbridge, 1995). In the last few decades, a Neo-Malthusian has emphasized the role of population on environmental degradation in developing countries. According to this perspective, population growth is the main cause of the socio-economic problem including environmental degradation.

Among other supporters of Malthus, Ehrlich and Ehrlich (1968, 1990) in their books population Bomb and Population explosion have mentioned what support the idea of Malthusians. According to this view, pollution, desertification, deforestation and other environmental problems are the product of population growth (Rahman, 1999). Overpopulation and poverty lead to uncontrolled use of resources which results in environmental degradation. According to McCann (1999), the population growth in the northern part of Ethiopia has affected and changed the natural resource base and landscape.

The demographic pressure will force people to intensify their agricultural activities on the land already in use and or use the land extensively. Moreover, demand for fuel, building materials; land for crop livestock husbandry also increases. This leads to removal of the original vegetation and less fertile and more fragile land that is prone to soil erosion is brought under agricultural production to support their households. This will eventually end up with poor soil which is unproductive as there is less chance of fallowing that give less recovery time for the land under cultivation.

Optimistic Perspective

There is other view which looks at population positively. According to this view, the increase in population pressure contributes to the development of agricultural technology and productivity (E. Boserup ,1981). In this view, population growth seems to be an asset rather than a burden for the balance of environment. The Boserupian view population as an independent variable in explaining agricultural development and as a precondition, for it to take place. She argue that population is not a problem rather a solution and as land becomes increasingly scarce, farmers adapt by changing agricultural practices and their use of inputs in order to preserve and improve the productivity of their land. She underscored that technological changes (tools and farming techniques) would not have come about without demographic pressure. There are also others scholars who support her view (Rahman, 1999, Sarre and Blunden 1995)

Further, the Marxist schools of thought do not see population as a problem in itself, but rather the societal socio-economic and political system - issue is one of how resources are distributed and used (Mortimore, 1998). They argue that developing countries will solve their population problems as they pass through social changes. According to this third view, population growth is not the cause of environmental degradation rather pattern of consumptions, distribution of resources, different social organizations and pattern of ownerships represent different sate of environment. And fundamentally, pollution and environmental degradation of contemporary third world countries can be explained in terms of their incorporation with the capitalist world (Rahman, 1999:258 as cited Alemayehu, 2009)

With regards to Ethiopian, between 1960 and 1990, the population doubled from 23 to 48 million, while per capita landholding shrunk from 0.28 to 0.10 hectare, and per capita food output collapsed by 41% from 240 to 142 kg According to the CSA population projection, the population of Ethiopian reached 94,351,001 in 2014. There are perception among some observers that a 'Malthusian crisis' has been perceived as rapid population growth (almost 3% per annum) is associated with steadily falling landholdings and per capita food production. (Befekadu and Berhanu 2000). With population growth estimated at more than 2.2 percent per year, and with 85 percent of the population relying on farming for their livelihoods, population growth puts greater pressure on the land and resources to meet the immediate human needs.

2.1.3.2. Deforestation

Deforestation beings one of the main direct causes of land degradation, has been persistent and widespread in Ethiopia. The forest cover in the late 19th century was about 30%, and it went down to less than 4% of Ethiopia's total land at present, with an estimated natural deforestation rate of 8 percent per year as of 2000 (World Resources Institute, 2003) and this rate put it among the highest in the world .The conservative estimate of deforestation is 62,000 hectares per year.

On the other hand, despite over a century of reforestation activities in Ethiopia, the total area of plantations of the country does not exceed 200,000 ha (Melaku, 2003a). This is only approximately equivalent to the area of natural forest deforested in a single year in Ethiopia. These lands are mostly converted into cropland with a greatly reduced vegetative cover and accelerated soil erosion, (World Resources Institute, 2003).The reasons for this deforestation are both direct, such as the production of charcoal and timber for construction materials, and indirect, such as lack of management capacity and population pressures. The clearing of land for agriculture use is also among the main reasons for deforestation (USIAD, 2008).

Deforestation accelerates land degradation in many ways. Firstly, deforested land is very susceptible to erosion; both wind and water, and hence cause a considerable nutrient movement. Secondly, the amount of nutrient that contribute to maintaining the soil organic matter is considerably reduced. Thirdly, deforestation, in most part of the country, caused lack of fuel wood, and hence farmers use manure and crop residue as cooking fuel, which otherwise

could have been used for soil fertility replenishment. Deforestation has led to the depletion of soil nutrients, contributing to low agricultural productivity and limited domestic food supplies in Sub-Saharan Africa (Mekonnen and Köhlin 2008).

Despite over a century of reforestation activities in Ethiopia since the last four decades, the total area of plantations of the country does not exceed 200,000 ha (Bekele, 2003a) although many reports show that millions of trees have been plated per year during the last many years .But due to poor management capacity and little effort that has been made to link the reforestation program to ecological restoration/land rehabilitation the impact was not as such significant. This is only approximately equivalent to the area of natural forest deforested in a single year in Ethiopia.

2.1.3.3. Overgrazing

Ethiopia's livestock population is the largest in Africa, with 30,000,000 cattle; 24,000,000 sheep; 18,000,000 goats; 7,000,000 equines; 1,000,000 camels and 53,000,000 poultry. About 70 percent of the cattle and sheep and 30 percent of the goats are in the highlands above 1,500 meters. (Alemayehu, M. 1998a**).** The livestock sector is a very important component of the system both as an economic buffer in times of crop failure and economic crisis and as a supportive enterprise for crop production.

Livestock are considered a sign of wealth and prestige and also as insurance for bad years; peasants wish to have as many animals as possible even if they mean low or no economic return However, there is a considerable concern that the number of animals per household is much higher than the carrying capacity of land resources and caused overgrazing which eventually believed to contribute most to land degradation (Alemneh, 1990).

2.1.3.4. Inappropriate land use and agricultural practices

Inappropriate agricultural practice is one of the important problems that contributed to increased soil erosion and degradation of agricultural land. This includes overexploitation of land resources without returning the basic nutrients to the soil that contributed most for soil fertility decline in the country. The inappropriate agricultural practices cause of degradation for a period of 25 years (1992-2014) are estimated to be about $2500 million and this would mean

a substantial decrease of per capita income (by a mean of 30 %) in the Ethiopian (Constable and Belshaw, 1989).

2.1.3.5. Land tenure

Land policy has remained controversial in Ethiopia mainly since the fall of the Derg regime in 1991. Observers note that the debate is influenced by ideological considerations rather than being based on substantive empirical data (Jemma, 2001). There are studies that argue that land management in Ethiopia is affected by lack of appropriate land policy (EEA/EPRI, 2002, Deininger et al. 2004 and Dessalegn. 2004. cited in Wibke C. & Benedikt K., 2008). According to them, the absence of by laws that guarantee community level interventions is one of the important factors that contributed to poor land management and one of the major land-related problems in Ethiopia is insecurity of tenure. It could also be hard to differentiate whether land degradation was a consequence of poor resource management or a policy intervention, and hence difficult to convince policy makers about the causal factors.

The Ethiopian land policy gives the farmers the right to use the land, and the land is owned by the government. Although the government argues that there are good reasons to believe the appropriateness of the current land policy of the government (only the right to use and transfer to their children), there are convincing data showing that farmers/communities may not be willing to invest on their land for long term benefits unless they have the ownership card (Zeleke, 2003). According to Amede ,(2003), this discouraged the farmers to apply technologies like planting trees on their farms, the construction and maintenance of soil conservation measures, the medium and long term fallowing of their lands and so on. Given the absence of any contractual or lease agreement with the government and the general belief that the next round of land redistribution may take place any time, the incentive to invest in land improvement is often minimal. However, under certain circumstances extensive investment in land improvements have occurred (Mitiku et al, 2001). Many scholars argue that land tenure insecurity is one issues that have been responsible for over-cultivation. Further, because farm households do not own and hence cannot sell their land, they do not necessarily benefit from any increases in land value (Kibret , 2005).

Broadly speaking, we can distinguish two antagonistic political discourses on the land question: (1) the discourse of fairness and state protection that is arguing for state ownership, and (2) the discourse of privatization and efficiency. The former is the position of the government that remains critical of privatizing land holdings. The government expects privatization to foster the concentration of land ownership in few hands by crowding out poor, destitute farm families from their land. Critics of the government's position, such as the Ethiopian Economic Association (EEA), argue that state ownership of land prevents the development of a land market and thereby keeps down productivity (EEA/EPRI, 2002).

2.1.3.6. Termite infestation problem

Termites are abundant and widely distributed throughout tropical regions of Ethiopia (Wood, 1991, as cited Alemayehu, 2009). Termites are serious agricultural pests in several parts of Western Ethiopia including in the study area. They attack all the major annual crops grown throughout their growing season and trees mainly at early stages of their development, i.e. at-seedling stage.

The damage caused by termite is very serious in the area. Termites attack crops, forestry trees, grasses (range lands) and domestic houses, thus pose a serious threat to the overall livelihood of the people in western Wollega zone. Manasibu is among the most affected district, with 66,000 hectares of land put out of production and more than 33,367 farmers have abandoned the area due to termite damage (Alemayehu, 2009). According to OADB (1996), the total number of termite mounds counted in Western Ethiopia was 1298627 (306083 on farmland, 624325 on grazing land, and 368219 on forest and bush lands). The total areas of 446853 hectares of land have been severely damaged by termite, as cited by Alemayehu, (2009). The effect of termite problem in the study area and other neighboring districts is exacerbated by the degradation of soils, as well as poor crop and animal production.

The termite situation in the area is complicated due to its inter-relationship with other factors such as the farming systems, climatic, agro-ecological factors and socio-economic environment(human interference) and contributed to the disturbance of the agro-ecology (ICRA, 1998). Mismanaging the natural resources, lack of an integrated and participatory

approach to research and extension (lack of support in technology) works has complemented the problem (Ibid).

2.1.4. Concept of Sustainable land management

Sustainable land management:-refers to the use of land resources for agricultural and other purposes to meet individual and community needs while simultaneously maintaining the long-term productive potential of the resource and maintenance of environmental services through systematic use of indigenous and scientific knowledge and technologies (World Bank, 2008).It involves more than the use of physical soil and water conservation (SWC) measures. It includes the use of practices for soil fertility and agricultural water management, forestry and agro-forestry, as well as the application of these measures in a more integrated manner to satisfy present local community needs while solving ecological problems and maintaining the land in the condition for supporting future generation (Gete et al., 2006).

According to Senait, (2002), sustainable soil management means cropping, pasture and forestry use of the limited and only partially renewable resources such as soil, water and plant nutrients to safeguard soil productivity also for future generations and prevent or reverse degradation process. The objective of sustainable land management is to harmonize the complementary goals of providing environmental, economic and social opportunities for the benefit of present and future generations, while maintaining and enhancing the quality of the land (soil, water and air) resource (ibid).

There are various approaches and technical solutions recommended for managing land towards sustainability. Techniques aimed at erosion control, among others, include contour tillage, minimum/zero tillage, construction of physical soil conservation measures, etc. Soil nutrient replenishment could be achieved through application of organic and inorganic fertilizer. Traditional erosion control and moisture conservation practices, for instance; mulch application and long-term fallowing are important practices. But they are no longer applicable due to the increasing frequency of land use. Stabilization of the soil by stone lines, terraces, grass strips and various forms of agroforestry measures, for example; planting and management of trees, shrubs and windbreaks hedges are also traditional conservation methods. However, these technical solutions alone are not the remedy for the problem. Land management measures need

to be adapted to specific soil and landscape characteristics such as soil texture or terrain slope and also to socio-economic circumstances of the largest population (Gete et al., 2006, Senait, (2002)).

Land Rehabilitation is a broad term and it refers to any effort exerted for repairing or restoring a damaged ecosystem, without necessarily attempting a complete restoration to any specific prior conditions or status .However, rehabilitation contains little or no implication of recreating the original ecosystem (Harrington, 1999; Kumar, 1999; Bradshaw, 2002). It is enhancing the productive capabilities of land in cropped, grazed areas—that is, upland areas, downslope areas, and flat and bottom lands; reforestation of deforested areas and maintain the integrity of watersheds for water supply for different uses and restore the capability of valuable land resources to serve farm and other productive activities. It is an actions to stop and reverse degradation—or at least to mitigate the adverse effects of misuse,(David Sanders, undated*).*

The soil bunds are earth embankments constructed across the slope of the ditch on their upslope side and the earth material excavated thrown down slope**.**

Check dams are structure that are established across gullies to provide a physical barrier for flowing water and initiate the process of sedimentation. Check dams encourage the growth of vegetative cover in gully floors, providing protection against further erosion and establishing it (Woldeamlak, 2003).

Reclamation: - denotes rehabilitation work carried out on severely degraded sites, such as sites disturbed by opencast mining large-scale construction or in a sense of reclaiming land from the sea. The term has also used in connection with conversion of degraded grasslands to fast growing forest plantations in Asia (Lamb and Tomlinson, 1994)

2.1.5. Empirical Studies on Land rehabilitation Approach

There are many theories that recommend some methods for accelerated rehabilitation of degraded land and their biodiversity. The choice of methods for restoration may depend on a wide variety of social, economic, cultural, and biological, topography, climate and other environmental factors (Miller et al., 1995; MacDonald et al., 2002). Noticeably, the choice of

method will have significant effect on the speed at which the restoration process proceeds. Actions to restore degraded lands may comprise the nurturing of helpful aspects and the removal of unfavorable conditions (MacDonald et al., 2002). Some studies classify ecological restoration into two categories, 'passive' and 'active', depending on the degree of human participation (Allen, 1995; McInvar and Starr, 2001, as cited in Alemayehu D., 2009).

Passive Restoration Strategy: A passive approach seeks to restore the ecosystem by leaving the land resources alone, with the anticipation that it will regain appropriate structure and function through natural succession, i.e. depending on the self-regenerating potential of ecosystems following the removal of degrading agents. Passive approaches are less effective for restoring highly degraded ecosystems and thus active restoration methods are often necessary (Laycock, 1995).An example of a passive technique is area closure (Tekle, 1998). In such a case, the land is kept away from human and livestock interference for a given number of years.

Active Restoration Approach: According to Lemenih and Teketay (2004), most degraded landscapes in the highlands of Ethiopia have been observed to have very low potential in many aspects such as soil status and seed dispersal for self-regeneration. This approach involves active human intervention to complement and reinforce the self-regenerating potential of the natural environment. An example of this kind of restoration is grass establishment, tree planting and other biological and physical conservation. Severally degraded lands have a very limited self-regenerating potential that are rarely enough to initiate and expedite the restoration processes alone (passive approach), and thus there is a need for human action to achieve restoration. An active restoration approach involves active human intervention to complement and reinforce the self-regenerating potential of the natural environment. An example of this kind of restoration is grass establishment, tree planting and other biological and physical conservation.

There is now ample empirical evidence from wide geographical areas that proves the potential of reforestation or afforestation in restoration of the biophysical resources of degraded tropical lands (Lugo, 1997; Parrotta et al., 1997; Lamb, 1998; Harrington, 1999; Cannel, 1999), while providing diverse socio-economic and ecological services (Lamb, 1998; Montagnini, 2001;

Otsamo, 2000). Reforestation/afforestation of degraded lands is often seen as the most sound rehabilitation technique in the tropics (Parrotta et al., 1997), and particularly in Africa including Ethiopia In order to address the problems of soil degradation, biomass scarcity and loss of biodiversity, (Chatterson et al., 1989; Lemenih and Teketay, 2004).

2.1.6. Impact of land degradation of Ethiopia

The cost of land degradation for Ethiopia is enormous. It has both direct (on-site) and indirect (off site) impacts. On-site cost is those that happen at the site where soil degradation occurs whereas off-site effects are those that occurs outside the confines of farm boundary. Loss of top soil and plant nutrients, deforestation, declining carrying capacity of livestock and crop land productivity are some of the direct impacts (WB, 2007). Poor soil quality as a result of water erosion harms the capacity of soil resource to perform its multiple functions imposing on-site cost to individual farmers and off-site to society. Low and declining agricultural productivity, food insecurity and poverty are among the major problems emanate from land degradation.

The principal off-site effects of soil erosion includes siltation of irrigation land, crop failure at low laying areas due to flooding, diminished storage capacity and damage to physical plant in hydro electrical power generation schemes, and water quality deterioration affecting drinking water supply (Bishop, 1995; cited in Chilot, 2007). Nevertheless, not all off-site impacts of land degradation are negative. For instance soil erosion may lead to beneficial movement of soil and nutrients to areas in the downstream, (Mahmud and Pender (2005) cited in Brehane , undated). Hundreds of years of exploitive traditional and use of natural resources, aggravated by human factors lead to the extraction of the natural capital, mainly through farming of uncultivable steep lands and overexploitation of slowly renewable resources.

Estimates of the magnitude and on-site costs of land degradation vary substantially across studies. The outcome is that a quarter of the highlands are seriously eroded, of which 15% are so seriously affected that it will be difficult to reverse them to be economically productive in the near future (SCRP, 1996). According to FAO (1986) and Highland Reclamation the Study cited in Mesfin, (2009) it is estimated that the gross soil loss due to erosion on crop land to be

about 130 tons per hectare per year .Moreover, of the 53.5 million ha of the Ethiopian highlands, 28%, are very severely affected by accelerated water erosion and 24% are moderately affected but still to a serious degree. These left only 48% the area less affected by erosion problems of which more than half (58%) is at risk owing to high susceptibility to the accelerated erosion if conservation agriculture is not practiced (Ibid).

Sutcliffe (1993) estimated soil erosion on crop land to an average only about 9 tons per hectare per year. According to Kappal, (1996), the soil erosion reduces food production in Ethiopia at least by 2 %. Estimation of FAO (1996) indicates that agricultural soil degradation will cost Ethiopia about U.S $7246.4 million over the next 25 year of which this annual averages loss at U.S $290 million; nearly 80% the losses are attributed to the reduced crop production and the rest to reduced livestock production. This will mean a substantial decrease in per capita income (30%), and, hence, increase mass poverty. It increases farmers' vulnerability to drought by reducing soil depth and moisture-holding capacity. The combined effects of low productivity and ecosystem degradation lock the poor in a vicious cycle of poverty and environmental degradation (Holden et al., 2005).

All in all, land resource degradation is considered one of the major threats to food security and natural resource conservation in different areas of Ethiopia although its magnitude varies from region to region. Eventually, this poses significant threat to the development prospects of the country (Wagayehu, 2005).

2.1.7. Determinants of Land Management

It is becoming very clear that, alike land degradation problems, the issue of land management practices complex as they influenced by an interplay of different factors operating at varying scales. These factors include government policies, and institutions at many levels. Infrastructure development, agricultural and natural resources conservation extension services , land tenure policies, and rural credit services, opportunities, and constraints at the village or household level which may further influence land management (Pender, Ehui & Place, 2006). There are also household-level factors such as households' endowments of physical assets, human capital, social capital, financial capital and natural capital that could determine households' land management practices (ibid).

Recent empirical studies on sustainable land management practices further highlight this complexity. A study conducted in part of Ethiopian Highlands by Aklilu, (2006) identified factors that could influence adoption of different sustainable conservation techniques. According to him, farmers' age, farm size, perceptions on technology profitability, slope, livestock size and soil fertility to have an influence in the adoption of stone terraces. It further indicated the decision to continue using the practice was influenced by actual technology profitability, slope, soil fertility, family size, farm size and participation in off-farm work. Factors such as perception of erosion problem, land tenure security and extension contacts were identified to have no significant influence.

Another study done by Habtamu (2006) on the adoption of physical soil and water conservation structures identified perceptions about soil erosion problem, farmers' attitude to adopt new technology, participation on conservation training, plan of a farmer to continue in farming career in the following five years and farmers' perception about effectiveness of the technology in arresting soil erosion to have significant positive influence on farmers' decision to retain conservation structures. Farmers' contact with development agents, educational attainment of the household head and land tenure security were identified to have weak and positive influence on the farmers' decision to retain the introduced structures. Age of the household head and land holding size were identified to have significant negative influence, whereas variables such as livestock holding, off-farm employment and distance from farm plots were identified to have weak negative influence. This study complements these and other studies devoted to addressing issues related to sustainable land management practices in Ethiopia. It focuses on a district that has not been previously studied, the Manasibu District in West wollega zone of Oromia Regional State, Ethiopia.

2.1.8. Land Management practices and their sustainability in Ethiopia

2.1.8.1. Land management practices in Ethiopia

In Ethiopia, since the 1970s, substantial efforts have been made to reverse the problem of land degradation by the Ethiopian government, Non-governmental organizations (NGOs) and

donors. Land management practices such as soil and water conservation, soil fertility management, controlled-grazing and other land management practices were introduced.

A number of soil and water conservation measures were introduced in the early 1970's to improve land management practices being supported by donors namely USAID and the World Food Program (WFP). The main activities under those projects were reforestation and soil and water conservation in the drought prone areas of the country. In the 1980s, rehabilitation of forest, grazing and agricultural lands were undertaken with a support of the WFP. The government's also embarked on land management activities mainly using the watershed development approach as a key strategy. The major elements of the soil conservation activities were a range of physical structures such as farmland and hillside terracing, cut-off drains and waterways, micro-basins, check dams, water harvesting structures like ponds and farm dams, spring development, reforestation, area closure and management and gully rehabilitation (Betru, 2003).

However, the impact those efforts made to promote soil conservation and environmental rehabilitation in the country up to the early 2000 were considered inadequate and did not curb the impact of land degradation in a meaningful and sustainable manner . They covered only 7% of the total land area that needed treatment, and at that rate, it was estimated that treating all the remaining land could take seven decades. Evaluations of efforts made concluded that the interventions were ineffective, insufficient and unsustainable (EEA/EEPRI, 2002; Woldeamlak, 2003). Various reasons are often given for the lack of success. Among these the most commonly cited factors include top-down interventions, failure to consider indigenous land management practices including inadequate consideration of farmers' perspectives, constraints and local conditions, limited options provided to farmers, high initial costs which are not affordable to poor farmers and also trying to apply uniform techniques in different agro- ecological regions (Aklilu, 2006; Bojo and Cassels 1995; Shiferaw and Holden 1999).

2.1.9. Analytical framework of the study

Land management is a complex process and it is not only the result of an action of land users. The problems and achievements go further than the household sphere of operation. It takes account of actors in the surrounding environment who also affect the decisions of the land

users. These actors operate at various levels and affect farmers' land management decisions (Biot, et al., 1995; Tesfaye, 2003).

The conceptual framework of this study was formulated adopting from Livelihood framework of Chambers, R. and G. Conway (1992) Sustainable rural livelihoods based on literature review including empirical studies, discussion with professionals and personal judgment. The framework assumes that land management is determined by household and village level factors; and institutional factors among others. Household factors include physical, human and social capital, whereas village level factors include population pressure, access to markets, agricultural potential, local markets, presence of programs and local institutions.

The framework generally shows the complex interplay of these factors and how they influence land management practices which in turn affect agricultural production. According to this framework, the independent variables include demographic, socio-economic, cultural, biophysical, and institutional factors, which are expected to influence the dependent variables, namely the land management and rehabilitation practices as indicated in Figure 1.

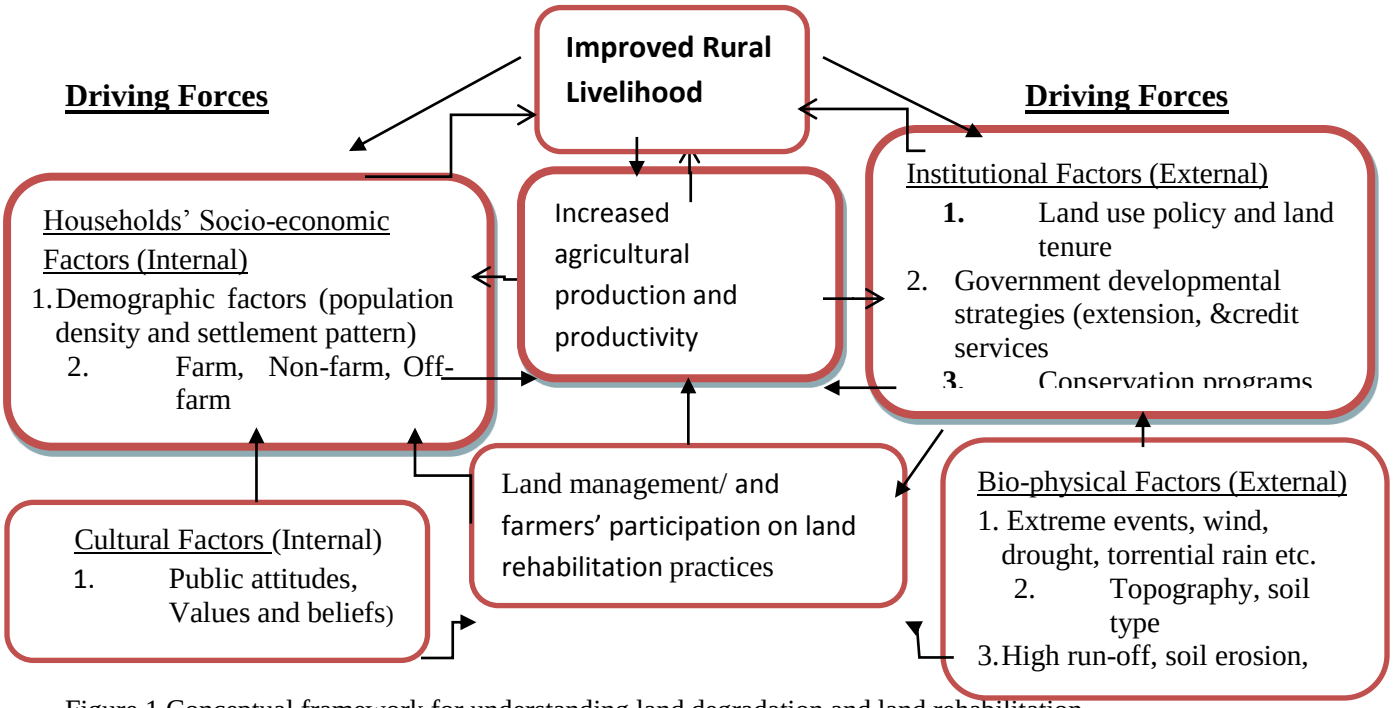

Figure 1 Conceptual framework for understanding land degradation and land rehabilitation
(Adapted from Livelihood framework of Chambers, R. and G. Conway (1992) Sustainable rural livelihoods)

CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1. Description of the study area

3.1.1.Location:

Mana sibu district is one of the 21 districts of West Wollega Zone, Oromia National Regional State (Figure 1.1). With total land area of 166,810 hectares the district shares boundaries with Kondala and Babo Gambel districts and Kiltu Kara districts of west Wollega Zone of Oromia regional state in the South West and in the East, respectively and Beni-Shangul Gumuz Regional State in the West and North West.

The district capital, the town of Mendi is located 567 kilometers to the west of Addis Ababa and 150 kilometers from Ghimbi. the Zonal town West Wollega on the high way to Assosa- the capital of Beneshngul Gumuz regional state. Administratively, tl e district is divided into 47 rural kebeles (Peasant Associations); and has four kebeles in the towns. Kebele Adminstration is the lowest administrative unit of the government of Ethiopia

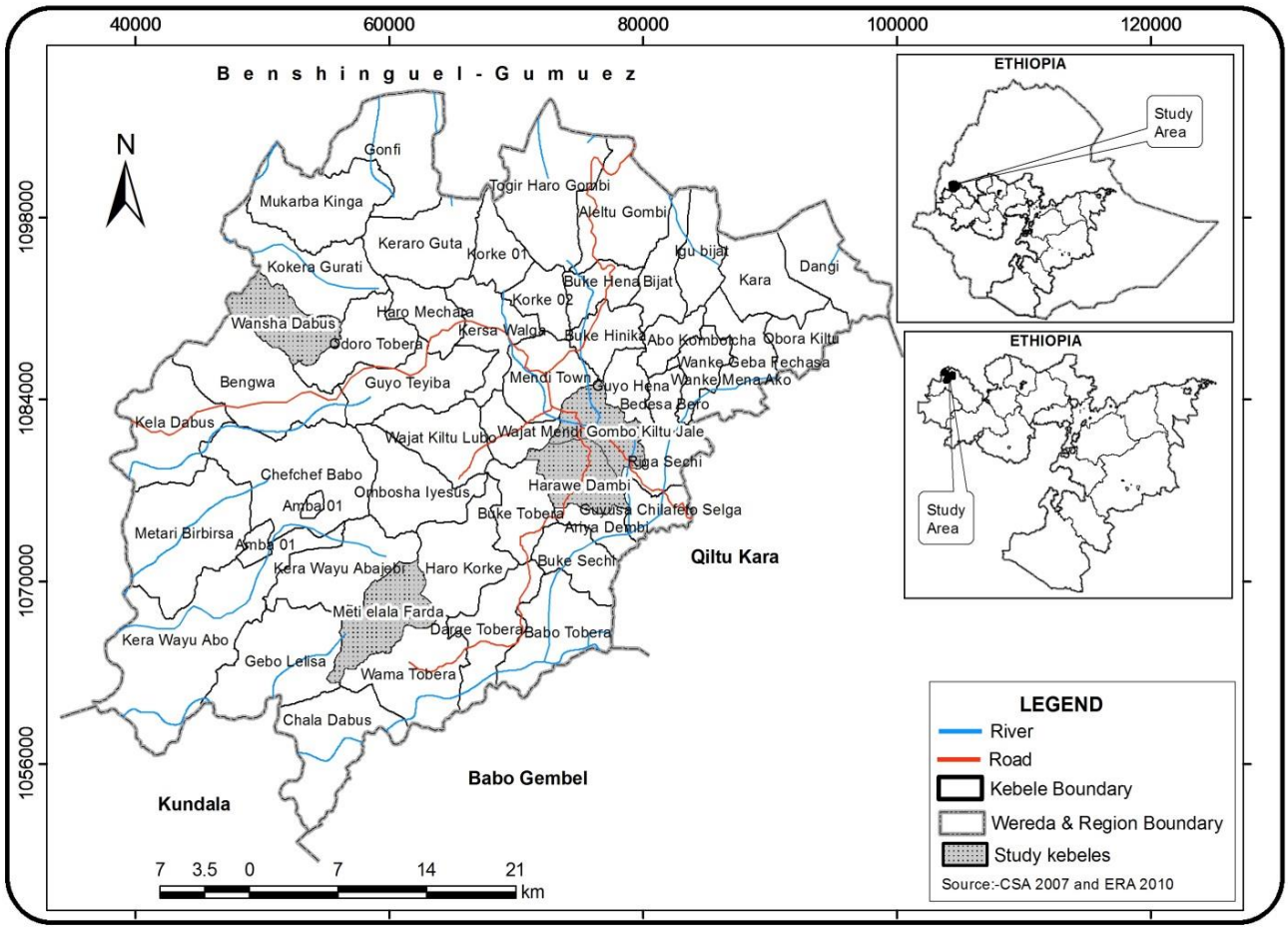

Figure 2 Map of the study area and study site covered during for data collection

3.1.2. Climate

According to the Manasibu District Agricultural Development office, agro-climatically, the study area lies within two agro-ecological zones (AEZ): *Woyina Dega* (mid altitude) and *Kola* (lowland), which constitutes for 68% and 32% of the total area, respectively. The annual temperature of the district varies from 24 ^{0} c to 29 ^{0}C with annual average temperature of about 26 ^{O}c, and the annual rainfall ranging from 900- 1800 millimeters. The district gets mean annual rainfall of about 950 mm. The rainy season usually starts in April and extends up to October, with the highest rainfall concentration between June and August. The dry season is from November to March. In general, Manasibu district has favorable weather conditions for various agricultural productions both in the mid altitude and lowlands, (Manasibu-WoARD, 2013).

3.1.3. Topography /Relief

According to information from the Manasibu District Agricultural Development Office, the districts have varied landforms. The topography of the area is mainly characterized by gentle slopes (40%), a few undulating hills steep/slopes (15%) and moderate lowlands/ plane (45%) and swamps. Out of the total land area of the district, 91% of the lad has gentle slope, surrounded by ragged and undulating plateaus in the eastern part (7%) and plane (2 %). The altitude of the district varies from 1,249 to 1,760 meters above sea level.

3.1.4. Land Use patterns

The main land use patterns of the district, according to the agriculture office of the district, is classified in to Cultivated land (annual and perennial crops) of which 706 ha under irrigation, Cultivable land (of which 9,268.3 ha is irrigable land), grazing land, forest land (with 230 ha of wood land and 482 ha Shrubs), degraded land marshy areas and others (settlement, road, etc.)

Table 1: Land use Pattern in Manasibu District, 2009/2010 Crop Production Year

No	**Land use type**	**Area coverage**	**Per cent**
1	Cultivated land	69156 ha	41.5
2	Cultivable land	30376 ha	18.2
3	Grazing Land	27109 ha	16.3
4	Forest land	9712 ha	5.8
5	Degraded	8035 ha	4.8
6	Marshy Area	1476 ha	0.9
7	Others	20951 ha	12.6
8	**Total**	166815	100

Source: Manasibu District Agriculture and Development office **(2011)**

Although the data from the District the size of degraded land is not as such compared to the others the actual degraded land will be much more than the amount categorized as degraded .because most the area under cultivation, grazing land and forest lands are observed to be highly degraded. The land resource, if rehabilitated, could be put for agricultural and other purposes, including crop and livestock production, and agro-forestry development, inter alia.

3.1.5. Soil Type

Most of the farmers in the study area were able to identify the soil in their area based on its color as red soil (*Biyyoo Diimtuu*) and black soil (*Biyyoo Gurraacha*). Based on texture, they categorized as clay (Biyyoo *Suphee*), loam, sandy (*Biyyoo Cirrachaa*) and silt according to data obtained from the District Agriculture and Rural Development office (2006 E.C.) and the depth of the Soils ranges from 30cm to 15 cm. Sixty percent of the soil is reddish brown Nitosols with PH range of 5.0-5.31 (Ahmed and Abraham , 2014).

3.2. Demographic Characteristics

3.2.1. Population and settlement pattern

According to the CSA 2013, the total population of the District is about 152,958 (Female 75,106 and Male, 77,852) of which the urban populations is 13,631 19,623 (11%) and rural population is 133,335 (89 %). According to the data from District Administration Office, there are 19,476 conventional households in the District out of which 9.5% is female-headed households during the year 2013. The population growth rate of Manasibu is 2.9 and its average family size is sex (Manasibu District Administration Office, 2013 EC.).

3.2.2. Religion and Ethnic group

According the data from the district Administration office, the inhabitants in the study area are followers of protestant (60%) and Orthodox (22%) Christians and Muslim are 16% of the population. With regards to ethnic composition, 90% of the population is Oromo while Amhara and Gurage constitute about one percent of the total population (Manasibu District Administration Office 2003 E.C.).

3.3. Major Economic Activity

Agriculture is the main economic activity and a basis for the livelihood of population in the Manasibu District. Mixed Agriculture is practiced in the district and it is classified as cereal and and livestock as major and minor activities respectively. The majority of the rural households are small scale farmers involved in subsistence agricultural production, which relies entirely on household labor. On the other hand, cattle, goats, sheep, equines, and chickens are important livestock species reared by the farmers. Small scale farmers of Manasibu are living in a farming system highly infested with termite. Land degradation, termite infestation

and livestock diseases are some of the major problems that are adversely affecting the livelihood of the people in the District *(*Manasibu, District Agriculture Development Office, 2013*).*

3.3.1.1. Crop production

Crop production is an important agricultural activity and source of livelihood for the farming households of the District. The major crops grown in the area are cereals such as maize, *teff*, sorghum, finger millets, wheat & barley and these crops occupy the largest proportion of the cultivated land. Pulses such as haricot bean & field peas, and oil crops such as Niger seed (*noug*) and sesame are also among the important crops in the area. Besides, farmers in the district produce significant amount of horticultural crops (vegetables and root crops). From the vegetables, tomato, potato, onion, pepper, sweet potatoes, yam, taro and cabbage are widely grown in the area. Fruits such as mango and banana are also grown. Coffee is the cash crop grown by some households in the District (Manasibu District Agriculture Development Office, 2013*).*

3.3.1.2. Livestock production

Livestock is one of the important resources for the farming households of the district. It provides food (milk, meat, egg and etc.), drought power, and manure for fertilization of land for crop production and serves also as security and saving. It also serves as a means of production and one of the main sources of income and also serves as security and saving for farmers. Moreover, livestock are kept for prestige, as an indication of status and wealth in the society. The major types of animals kept are cattle, goat, sheep, donkey and chicken. According to the data obtained from the Agricultural Development Office of the District, the number of livestock available in the District in the year 2013 is 565,937 heads of which cattle accounts for 39 % of the total livestock population .Bee keeping (traditional and Modern types) is also an important activity being practiced in Manasibu district (Manasibu District Agriculture Development Office, 2013*).*

3.4. Basic Social Services

3.4.1. Education

Education is one of major social services that play a great role in ensuring socio-economic development of a given community and a country. It facilitates dissemination of information regarding modern agricultural technology including utilization of inputs for increasing agricultural productivity and production, and for sustainable natural resources management. According to the data obtained from the administration of district, currently, the district has one high school, 32 first cycle primary schools, and 34 (32 public & 2 private) and 37 second cycle primary schools and one preparatory school. Currently, there are 622 (421 male and 201 female) teachers serving in the schools found in the district. The proportion of female student is about the same with that of male students for both primary and secondary schools showing little or no gender disparities in school enrolments (Mana-Sibu District Administration Office, 2006E.C).

According data obtained from Education Bureau of Oromia, the gross enrolment ratio for primary schools (grades 1-8) is 80.6% in 2011 indicating that about 19.4%t of primary school aged children have not got access to schooling in the district. Although improvement have been observed since a couple of decades, a lot still remains to be done in terms of provision of quality education .betterment of the education could create better opportunity for socio-economic progress of the population of the district in general and improve the land management of the district

3.4.2. Health service

Health service is one of major services required for ensuring sustainable human development. It is considered as one of the important facility that poly vital role foe enhancement of the wellbeing and productivity of individuals and communities. Access to quality health care and its utilization helps to improve the livelihood of people and to ensure sustainable development. The health service coverage of the district is 83.3% in the year 2013 according to the health office of Manasibu District. The district has 6 health centers and 47 health posts; and one major clinic run by NGO and there are 198 (64 male and 124 female) health workers engaged

in rendering health services for the community in the district serving (Manasibu District Health Office,2013)

3.4.3. Water supply

Potable water supply is one of the main problems that the community in the district are facing According to the data collected for the district water resource office, the safe water coverage of the district is only 56.1% of the population dwelling in the district has got access to potable water (Manasibu Water resources office, 2013).

3.4.4. Road network

The district town of Mendi is accessible by all-weather road, while significant numbers of rural kebeles of the district lack a well-developed road network connecting kebeles to each other and to the district town. The district's road density for all weather roads is 47.2km per 1000 km^2. This is way behind the minimum required length of about 100 kms per 1000 km^2. According to data obtained from the Administration Office, the present road network of the district totals about 641.4 kms of varying quality. This includes 273.4 kms of all-weather road of which 56 km sasphalt road that passes through the district town of Mendi and connecting rural kebeles to the towns along the road, including Mendi and312kms of dry weather roads. (Mana-Sibu District Administration Office, 2014)

3.5. Research Design

3.5.1. Universe of the Study

The study was conducted in Mansibu District of West Wollega Zone, in Oromia regional state. In all, our rural kebeles namely: Mexi-Ilalafarda Wanasha- Dabus, Gombo-Kiltutale and Harawe-Dambi were taken for the study. In the selection certain important features were taken into consideration. The magnitude of land degradation and the level of the participation of the community in the land rehabilitation activities and road accessibility of the area were taken into consideration. All the rural households of Manasibu districts are the universe of this study

3.5.2. Sampling

It is often not feasible to study the entire population because of the physical impossibility of checking all items in the population in addition to the costly nature of such a study. On the

other hand, a systematically and objectively chosen sample provides a better option as it addresses the survey population in a respectively short period and produces a comparative and equally valid data. In the first instance, a non-probability purposive sampling method was used and out the 21 districts of west Wollega zone, Manasibu district was purposively selected as it is one of the districts where land degradation problems is very prevalent and serious.

The Manasibu district has 47 rural kebeles and out of the 47 rural kebeles four rural kebele were selected randomly selected applying random sampling method, after categorizing the kebeles in to two groups taking in to account the level of participation in land rehabilitation and distance from the center of the town. Then, a total of 120 sample households from four rural kebeles of the district were randomly selected from a total of 1656 farm households using simple random sampling technique based on probability proportional to size.

For this study a simplified formula provided by Yamane, (1967) was applied to determine the required sample size at 90% confidence level with degree of variability = 0.5 and level of precision (e) = 9 % (0.09).

$$\boldsymbol{n = N/1 + N(e)2}$$

Where $\boldsymbol{n}$ is the sample size, N is the population size (total household size), and e-is the level of precision. Based on this formula the total sample size required is 114 sample households but to make use of the opportunity of larger sample size this study used 120 sample households, considering financial constraints, time shortages, lack of transportation and other facilities. The total sample households from each sample KA is given in Table 1 below.

Table 2 Distribution of sample households in the study area

Name of Kebeles	Total number of households	Percentage from each KA	No of household in the sample
Mexi IlalaFarda	562	7.12	40
Wanasha Dabus	376	7.18	27
Harawe Dambi	298	7.05	21
Gombo KiltuJale	420	7.6	32
Total	1656	7.25	120

Source: Own survey data, (2014) and Manasibu DADO (2013).

In addition, qualitative data were collected, in order to get additional information. Two FGD (8-15 people in each of the FGD) for each KA, 10 key informants' interview and informal discussion with subject matter specialists of the district and development agents were administered to supplement and fill the gaps inquired during the individual household survey. The participants of these exercises were selected purposely based on their roles in relation to land management practices and their knowledge and experience on the subject of the study for the qualitative survey.

3.5.3. Data Collection: Tools and Procedures

In this study, a wide range of data set on household, socio-economic, demographic, institutional characteristics, technology adoption practices and other related factors were generated through household survey, qualitative field work and desk review. Both primary and secondary data were collected and used. As any single data collection tools is believed to have limited adequacy and relevance to achieve the objectives of the study, different tools were employed to collect data to have better and adequate information for analysis.

The primary data mainly quantitative ones were collected from sample farm households selected using an interview schedule from January to March, 2014. The questionnaire used contains close-ended questions in most cases and some open ended ones, and before the entire data collection process the interview schedules were pre-tested, re-designed and standardized by incorporating the feedback of the pre-test administrated on 15 non-sample respondents. To facilitate the primary data collection process, three enumerators were recruited based on their education level in addition to their ability to speak and write the local language (*Afaan Oromoo*). Then training was offered to enumerators on how to approach the respondents, selection of appropriate place, time and how to control the interview situation and record the information accurately; and collected the data with the close supervision of the researcher.

The qualitative data were obtained using checklists prepared for this purpose. Focus group discussion, key informants' interview and informal discussion with farmers, subject matter specialists of the district, and development agents were among the tools that were incorporated in this survey. To generate sufficient qualitative data, two focused discussions were carried out in each KA with the maximum 10 persons for each. The participants of FGD were selected

from different groups of the community consisting of elders, youth, women and men. The in-depth interview was administered to obtain data from key in formats namely from government officials, professionals and kebele administrators.

Moreover, secondary data were collected from relevant sources of different governmental and non-governmental, District and Zonal Agriculture Development Offices, and local administration offices. Desktop review of reports and statistical documents was also made for the study. Through this survey, information about the agro-ecological, socio-economical, institutional and physical features of the study area in general and plot characteristics in particular, which includes levels of soil degradation, slope aspects and soil type were gathered, to mention but a few.

3.5.4.Method of Data Analysis

3.5.4.1. Specification of the Model

Both qualitative and quantitative analysis techniques were employed for data analysis. The surveyor employed descriptive statistics such as mean; standard deviation, frequency of appearance. In addition, all biophysical and socio-economic data from the study sites were organized and Statistical Package for Social Sciences (SPSS-version 20) was used for analyzing the data. Qualitative data obtained from interview and discussion were analyzed and described through concepts and opinions, by sorting out, grouping and organizing in order to supplement the quantitative data of the survey result.

Descriptive statistics

Descriptive statistics was used to describe farmers' response on their perceptions' and participation towards the object. On the other hand, both descriptive statistics and econometric models were employed for the study and examined the relationship between the dependent and explanatory variables of land rehabilitation practices. Using descriptive statistics the mean, range, percentage, minimum as well as maximum values of variables were indicated. Different categories of the variables have been compared with respect to the desired characteristics .The result obtained was used as an indicator of the relationship between explanatory variables and

the dependent variable. Data are completed and analysed by using t-test and chi-square ($\chi 2$)-test, by using SPSS computer software 20 version programs.

3.5.5. Explanatory factors used in the study and working hypothesis:

Several studies made on farmers' adoption of land Management (conservation measures) adoption theories provide long list of factors that influence farmers' decision. According to these studies, wide range of social, demographic, socio-economic, physical and institutional factors influence the adoption of soil conservation measures. Hence, based on the findings of these studies and experience, potential explanatory variables that can influence decision of farmers to adopt land management /conservation measures are identified. The independent variables that were expected to influence farmers' adoption decision could be many. In this study, the variables hypothesized to affect participation of farmers on Land Rehabilitation practices (LMPs) are physical characteristics, such as slope, Size of farm plot, distance of plot from farmers' home, and the socio-economic and demographic characteristics of the household such as sex, age, family size, and labor, education, and institutional supports (extension services, access to credit and tenure arrangement and etc.).

Education level of the household head: It is expected that those farmers with better educational attainment perceive the problem better and make decision to adopt and retain conservation structures. Therefore, it is expected that land management and rehabilitation practice is positively correlated with educational level of farmers. Therefore, education was hypothesized to have a positive influence on farmer's decision to participate in land rehabilitation practices. The education level of the household head may have either positive or negative influence on his/her attitude and behavior towards in relation to LRPs.

Age of the household head: This is a continuous independent variable indicating the age of the household head. This is number of years of the household head since birth at the time of the survey. Age is also used as an alternative for measuring farming experiences. The Experience of the household, indicated by age of the household head, is likely to have a range of influence on adoption. The effect of farmer's age can be taken as a composite of the effect of farming experience and planning horizon. While longer experience has a positive effect, young farmers on the other hand may have longer planning horizon and hence may invest in conservation

(Paulos, 2002). The household's previous experiences may have either positive or negative influence on the adoption of land rehabilitation practices. For this study, it is hypothesized that age and adoption of land Conservation structures have positive correlation.

Sex of household head: This variable is included in order to differentiate male from female or vice-versa on the adoption of land rehabilitation practices/technology. Male-headed households were expected to adopt the practices than female-headed households. Therefore, is hypothesized that maleness is positively correlated with decisions to adopt land rehabilitation practices.

Family size: This is the number of family members in the household living together. The Influence of household size may go either way. Land rehabilitation practices are mostly labor intensive. It is anticipated that large family, have more labor force would be available for production and consequently make decision to carry out land rehabilitation practices. On the contrary, the larger the family size, the more the food requirements by the family, and the family labor may be used for food generate activities to for consumption and thus fail to make decision to engage in land rehabilitation practices. Therefore, family size is hypothesized to have either positive or negative impact on the adoption of land rehabilitation practices.

Farming experience of the household head: This refers to the number of years since the household head started farming. Many literatures underline the impact of farm experience in adoption of agricultural technologies. Farmers with longer farming experience are supposed to have better competence in assessing the features and potential benefits of new technologies than younger farmers with shorter farming experience. Previous studies show that, farmers with longer farming experiences are expected to be more knowledgeable and skillful in managing their land (Million, 2001 Yishak (2005) and Melaku (2005). In this study, it is hypothesized that this variable will positively affect land rehabilitation practices.

Family Labor: it is the total number of economically active members between 15 and 64 years of age in a family. Labor shortage is quite often mentioned as one of the limited resources that influence the choice of conservation strategies of land management (Senait, 2002).In this study. The number of household members who participate actively in agriculture positively

influences the adoption of SWC practices (Million and Belay, 2004). Land conservation activities demand labor, which is a critical problem in peak periods of crop production and livestock rearing. Hence, the availability of labor is expected to affect adoption of SWC practices positively.

Slope of the farm plot: This is slope category of cultivation field according to how farmers in the study area categorize slope of the farm land. Steep lands are subjected to more rapid run-off surface water. Empirical studies in different parts of Ethiopia reported a positive and significant effect of the slope of a plot on the decision on conservation strategies of land management (Bekele and Holden, 1998; Tesfaye, 2003; and Aklilu, 2006). This variable is expected to have a positive influence on farmers' decision to adopt land conservation strategies of land management.

Size of farmland: It refers to the total area of a farmland in hectares owned and cultivated by farmers measured in ha. Available empirical studies have shown a positive and significant effect of area of farmland on the decision to use conservation measures (Bekele and Holden, 1998; Wagayehu and Drake, 2003; Million and Belay, 2004; Aklilu, 2006). According to these studies farmers with larger farm size can bear risk of loss of cultivation land from conservation structures and are likely to have more cash to hire labor to invest on their land investments and hence expected to influence adoption of structures positively. Therefore, farm size is hypothesized to influence the adoption of land rehabilitation practices positively.

Distance of plots from home: This refers to how far the plot is situated from the farmer residence, measured in minutes. According to most of literatures, farmlands situated near the residence receive better attention of farmers. They indicate distance from homestead has negative relationship with the implementation of SWC. Farmers whose plots are close to their residence use soil conservation measures because time and energy spent is relatively less than for plots far from home. Therefore, it is hypothesized that distance influences farmers' decision on adoption of SWC practices negatively.

Perception of farmers on land rehabilitation technologies: This is measured by the knowledge and opinion of the farmers on rehabilitation technologies such as SWC, i.e. whether

the farmer feels that conservation structures help to mitigate soil erosion and increase productivity of land or not. Thus, framers' perception of SWC technologies is hypothesized to positively affect the usage of soil and conservation practices.

Livestock holding: It is the total number of livestock owned by farmers measured in tropical livestock unit (TLU) based on the conversion factor developed for Ethiopia (ILCA, 1990). Livestock are important sources of income, food and draught power, and generally considered to be an asset indicating the wealth status of the household. Previous studies came up with mixed results and in this study farmers' decision to adopt conservation strategies may go either way.

Off-farm and Non-farm income: this refers to activities undertaken by household members out of their farm land to earn income for their family. Previous studies came up with mixed results Majority of the studies reported positive contribution of off-farm and non-farm income to household's adoption of improved agricultural technologies (Kidane, 2001; Birhanu, 2002; Degnet, 1999; Mulegeta, 2000). On the other hand, farmers who have better off-farm and non-farm income may be more interested in running their business and tend to be unwilling to practice land conservation(rehabilitation) a as these activities may share their resources(time and money) which otherwise could be invested in other off-farm activities to bring more additional income in the short-run. (Ervin and Ervin, 1982).Therefore, it was hypothesized that off-farm/non-farm income affects the decision on land conservation activities both ways.

Land Tenure security/arrangement: it refers to the feeling of farmers (whether they are sure to pass on land they cultivate to their children. Plot acquisition includes transfer from parents or inherited, allocated by local government, sharecropping or rented in. Farmer's expectation of farmland ownership influences the planning horizon of a farmer and affects his/her decision on rehabilitation strategies of land management. If a farmer feels that the land belongs to him/her, it is very likely that she/he invests on land management and rehabilitation. Owner operated or inherited plots were expected to have a higher probability of adopting the land rehabilitation practices.

Access to credit: Several studies have shown that access to credit plays a significant role in enhancing the use of conservation strategies of land management (Ervin and Ervin, 1982; Bekele and Holden, 1998). Therefore, it is hypothesized that access to credit will have positive influence on the land conservation/rehabilitation strategies.

Frequency of extension contact: This refers to the number of contacts made between the household head and extension agent on land management activities in a given production year. The effort to disseminate new natural resources management technologies is mainly successful if there is frequent contact between development agent and the farmer. The households with access to extension services and information have better understanding of the land degradation problem and soil conservation practices and hence may perceive land conservation/management practice to be profitable (Bekele and Holden,1998; Senait,2005; Yitayal et al., 2006). Therefore, it is hypothesized to have a positive relation with farmers' decisions and participation on conservation/rehabilitation strategies of land management. This variable takes the number of contact between extension agent and household heads within the production year 2012/2013.

The dependent variables

In this study, the dependent variable is existence of land rehabilitation/ Conservation practice on farmer plot of the sample households. To be an adopter of land rehabilitation practices the household should close its degraded land and practices at least one of the following rehabilitation/conservation activities (soil band, grass establishment/ Grass strip, cut off drain, micro basin, termite control measures etc.). Non adopter is a framer who has degraded land that is not delineated and has not practice SWC activities on the degraded land of the household.

CHAPTER FOUR

4. RESULTS AND DISCUSSION

This chapter is dedicated to the results and discussion part of the study. It presents the results of the study and discusses it with results of other studies giving due emphasis to purpose of study. The results presented in this chapter are based on data gathered from different sources and descriptive and econometric analyses. The descriptive analyses such as mean, percentage, standard deviation, frequency distribution, minimum as well as maximum were used. In addition, tests of mean and proportion differences between adopters and non-adopters in terms of different explanatory variables were conducted using t-test and chi-square test.

The result was based on 120 sample households of which 42% were adopters and the remaining 58 % were non-adopters of the LRPs. Even though different land rehabilitation practices were introduced by government and NGOs in the study area in recent years, this study mainly focused on closure of the degraded land and at least adopts one of LMPs (e.g. soil bunds, grass strip ,check dams) on his degraded land. Therefore, in this study adopters are households who adopted at least one of these practices while non-adopters are those who did not adopt any of these land rehabilitation practices. All the information gathered were analyzed and pooled together to present results and discussion.

This chapter mainly deals with the analyses and interpretations of major findings of the study. Section 4.1 presents the general Demographic characteristics of sample households; Section 4.2 presents physical farm characteristics of sample households and Sections 4.3 present institutional support. Discussions on major land management practices in the study area are covered in section 4.4. Farmers' perception on soil degradation is presented in section

Descriptive statistics of continuous variables

Descriptive and inferential statistics of continuous variables hypothesized to affect adoption of LMPs are presented Table -3

Table 3 Continuous variables affecting Rehabilitation strategies of land management decision

Variable	Adopters(N= 52) Mean (SE)	Non-adopters (68) Mean(SE)	t-value
Age	44.1923(1.73032)	44.0588 (1.61681)	-0.14
Experience	29.1731(1.60920)	13.5735 (.19912)	16.53***
Education	2.4423 (.13844)	2.0147 (.12125)	-1.01***
Family size	(4.8269). (.30792)	5.3088 (26441)	-7.02
Family labor	2.9808 (.21534)	3.0441 (.20360)	-0.66
Farm size	3.1250 (.31996)	2.5603 (.20319)	-8.58***
Extension contact	8.1923(.25473)	8.5735(.19912)	-6.00***
Livestock holding	6.5985 (.75985)	4.7946 (.86207)	7.71***
Plot distance	27.4423 (6.63896)	22.5735 (5.04250)	7.71***
Total	52	68	

Source: Own survey result (2014) ***,** and * are just to describe significances level of variables at less than 1% ,less than 5% and less than 10% probability level

Mean comparison between adopters and non-adopters show that there is a statistically significant mean difference between adopters and non-adopters in terms of education, distance to market, farm size, extension contact, plot distance and livestock owned. Results show that adopters are more educated, have large family labor, have large farm size, have frequent contact with extension agents, located near their plots and have large herd size. The discussion of each of the continuous variable is given below.

4.1. Demographic Characteristics of Sample households

4.1.1. Age of the household heads

Age is one of the demographic factors that is useful to describe households and provide indication about the age structure of the sample population. Age is also used as an alternative for measuring farming experiences. The Experience of the household, as indicated by age of the household head, is likely to have a range of influence on adoption. It is an important factor for technology adoption because aged household heads are assumed to be resistant to new technologies compared to young farmers which are most likely educated.

The age of a family is also worth mentioning as it is a characteristic that has implication on the availability of labor for the various activities undertaken by the family. With regard to age structure of the respondent household heads, 20.8% are above 55 years old, 76.7 % between the ages of 25 and 55 years, while only 2.5% are below 25 years old. The mean age of the household head is 44 years, with minimum and maximum ages of 20 and 70 years, respectively. The mean ages of adopters and non-adopters of LRPs were 44.2 years and 44 years respectively. However, the mean difference between adopters and non-adopters of LRPs in terms of age of the household head is found to be statistically non-significant (t= -0.14).

As for the age structure of the total sample members, 17.9 % are below the age of 10; 16.6 % are in the age group 10-14; 63.54% in the age group 15-64; while 1.94 % are in the above 64 years age group. It worth mentioning here that 63.54 % of the sample household members are in the productive age group and this may indicate that the household have labor forces that can be actively involved in the land rehabilitation activities.

Table 4 Age category of sample households

Age category by years	N	percentage	Mean	SD
Children less than 10 years	111	17.9	0.93	1.19637
Children 10 to 14 years	103	16.62	0.85	.92264
Men 15 to 64 years of ages	197	31.00	1.60	.95618
Female 15 to 64 years of age	197	32.54	1.66	1.14125
Above 64 years of age	12	1.94	0.10	.30126
Total	620	100		

Source: My Own Survey (2014)

With regard to the sex composition of families, the economically important age group, 15-64 is composed of more or less comparable equal proportion of females (32.54%) and males (31%).

4.1.2.Education Level of the sample household Heads

This variable represents the formal and non-formal and the formal years of schooling completed by the household head. The assumption was that land management and rehabilitation practice is positively correlated with educational level of farmers. In fact,

education level of farmers is believed to be an important aspect that helps in raising the level of farmers' awareness and the ability to obtain process and use agriculture related information and use technologies in a better way. It determines the readiness of the household head to accept new ideas and innovations assumed and increase the ability to obtain process and use agriculture related information and innovations in a better way (Paulos et al. 2004; Yitayal et al. 2006). It is expected to have significant positive influence on adopting different land rehabilitation practices. In the study area, the education level of farming community is relatively low similar to the national literacy level. In this study education level of the household heads were analyzed as continuous and categorical variables. Results presented on Table 8 indicates that the mean education level attained by the total sample households was 2.2285 while it is 2.4423 and 2.0147 for adopters and non-adopters respectively with a statistically significant mean difference between the two groups at 1% probability level (t= 16.53). This may be explained by the reason that those farmers who were more educated are likely to use land rehabilitation practices than the non-educated farmers in the study area.

This is because; educated farmers could easily understand the problem of land degradation and easily decide to take part in conservation strategies of land rehabilitation practices. This is attributable to the fact that education reflects acquired knowledge of environmental amenities and educated farmers tend to spend more time and money on land management practices (Ervin and Ervin, 1982; Bekele and Holden, 1998; and Paulos et al., 2003).

Education level of the sample household heads was also categorized into illiterate, grade 1-4, grade 5-8 and grade 9-12 and compared between adopters and non-adopters of LRPs and the results presented in Table 5. Results show that from the total sample household heads, 30 (%) were unable to read and write (illiterate), 32.5(%) were first cycle level (grade 1-4), 28.3 (%) were second cycle level (grade 5-8) and (9.2%) were secondary high school level (grade 9-12) based on the old Ethiopian curriculum. The result also shows that from the total illiterate farmers, only 27% households adopt land management practices in the study area. This implies that literate farmers are in a better position to get information and use it in such a way that it contributes towards adopting LRPs. Based on results presented on Table 6, one can easily compare the difference in education levels between adopters and non-adopters of degraded

land rehabilitation practices. From the total sample household heads that adopt degraded land rehabilitation practices (52 farmers), (80.78 %) attended first cycle to secondary school levels education while from the total sample household heads which are categorized as non-adopters of the practices (68), 42(61.76%) attended formal schooling. From these results, one can conclude that adopters were relatively more educated than non-adopters taking into account the relative proportion of the sample households in different education categories.

Table 5 Educational status of the sample households

Educational status	Adopters		**Non adopters**		**Total**	
	N	%	N	%	N	%
Illiterate	10	19.23	26	38.24	36	30
Grade (1-4)	17	32.70	22	32.35	39	32.5
Grade (5-8)	18	34.62	16	23.53	34	28.3
Grade (9-12)	7	13.46	4	5.88	11	9.2
Total	52	100	68	100	120	100

Source: Own survey result (2014), *** Significant at <1% probability level

4.1.3.Family size of the households

Family size is another factor that influences conservation decision. Nevertheless, decision to adopt conservation is ambiguous. In this study it is anticipated that households having large family size participate in land rehabilitation practice than those with smaller family size. Large family size is normally associated with a higher labor endowment that will enable a household to accomplish a various agricultural activities on time bases. On the other hand, a household with large family size may be forced to divert part of labor force to off-farm activities in attempt to earn income to ease consumption pressure induced by large family size (Chilot, 2007). Different studies conducted in various parts of Ethiopia revealed that negative relationship between family size and conservation decision (Bekele and Holden, 1998; Wagayehu and Drake, 2003). On the other hand, Million and Belay (2004); Paulos et al. (2004) showed positive relationship between family size and conservation practices. On the contrary, Tesfaye (2003) pointed out that the negative correlation of labor availability with adoption does not reflect farmers' practices. The same source revealed that what farmers do or do not do is dependent on motivational factors, among others, rather than a mere presence of labor in the

household. In the same line, Woldeamlak and Sterk (2002) reported that availability of labor is necessary but not sufficient condition to invest on SWC practices.

Family size and composition affect the amount of labor available for farm, off-farm and other household activities. It also determines the food requirement of the family. The survey results show that the average family size was 6.1 with the standard deviation of 2.201 for sample households during the survey year (Table 6). The maximum and minimum family size was 2 and 9 person, respectively. The mode of the family size was 6 persons in the sample households.

Table 6 Distribution of sample households by family size

Family size category	n	%	Mean	SD	T-test
1-4	43	35.8	3	.8165	1.01***
5-8	66	55	6.4	1.3490	
9-11	11	9.2	9	0.000	
Total	120	100	6.1	2.201	

Source, Own survey 2014

An independent sample t-test was conducted to assess if there is significant mean difference between adopters and non-adopters of land rehabilitation practices with the respect to family size. The result shows that, the mean difference between adopters and non-adopters in terms of family size is statistically insignificant (t=-1.01). However, Dagnet (2002) and Tesfaye (2004) have reported different results on the adoption decision of improved agricultural practices. Implying that, large family size leads to re-orient towards intensification in order to feed their offspring's or family. Therefore, this variable found to be statically significant at less than 1% probability level.

4.1.4.Number of Economically active members of the Households

Households with larger number of economically active labor are supposed to be better in undertaking different land rehabilitation practices, since they are less likely to have shortage of labor which is required to do land rehabilitation activities. This variable is found to be statistically non-significant.

Table 7 Numbers of economically active household members

Economically Active HH members	N	%	Mean	SD
0-2	55	45.8		
3-4	35	29.2		
5-6	24	20.0		
7-9	6	5		
Total	120	100	3.0420	1.6018

Source: own survey, 2014, n- number of SHHs

The average economically active household member and standard deviation for the sample household were found to be 2.8 and 1.2 persons, respectively. The maximum and minimum of economically active households' members varies from six to nothing, respectively. Of the total sample respondent 45.8%; 29.2%; 20.0%; 5%; have 0-2 and 3-4, 5-6 and7-9 economically active family members respectively.

4.1.5.Family labor force among sample households

Labor is one of the major resources owned by farm families. The number of household members who participate actively in agriculture positively influences the adoption of SWC practices (Million and Belay, 2004). In this study, it is the total number of economically active members between 15 and 64 years of age in a family All activities undertaken by the farmer's families need labor and it is quite often mentioned as one of the limitations to choice decision of conservation rehabilitation strategies of land management as land conservation activities demand labor. Therefore, analysis of the family labor availability and demand for it in various areas such as the farm, off-farm, household routine, marketing activities and to meet other social obligations and duties is a vital importance (Senait, 2002). Hence, the availability of labor is expected to affect adoption of SWC practices positively.

The amount of labor availability in a family is shown using a calculated parameter known as man-equivalent. This parameter has advantage over a mere number of household members in that composition among families is possible since it takes the age and sex composition of the families into account. Following Storck, et al (1991) the man-equivalent for both sex children less than 10 years of age was taken to be 0 and for both sexes between 10-14 years of age was

taken to be 0.35. That of adult women (15-50) was 0.8 and for the adult man (15-50) was 1 and older men and women greater than 50 years of age were 0.55 (Table 8).

Table 8 Distribution of sample household heads by Man-equivalent category

Man-equivalent category	N	**Percentage (%)**	Mean	SD
1.00-2.00	2	1.7		
2.05-3.00	39	32.5		
3.05- 4.00	23	19.2		
4.05-5.00	19	15.8		
Above 5.00	37	30.8		
Total	120	100	4.24	1.71

Source: Own survey result (2014)

Average man-equivalent per family for the total sample household heads was 4.24 with Standard Deviation of 1.71 (Table 8).The absolute value of man equivalent in the families does not necessarily show the amount of labor available for farming and land management activities since the farm family has other tasks to accomplish. In addition to agricultural activities family labor is required for household and off-farm activities, marketing and social obligation. Besides, cultural and religious values of the society have influence on the families.

4.1.6.Farm experience of sample household heads

Many literatures underline the impact of farm experience in adoption of agricultural technologies. Farmers with longer farming experience are supposed to have better competence in assessing the features and potential benefits of new technologies than younger farmers with shorter farming experience. Moreover, farmers with longer farming experiences are expected to be more knowledgeable and skillful in managing their land (Million, 2001). This in turn enables them to use various strategies of management earlier than farmers with short farming experience. In a similar manner, Yishak (2005) and Melaku (2005) have reported the same result at 5% significant level. In this study, it is hypothesized that this variable will positively affect land rehabilitation practices. The farm experience of sample households ranges from 4 up 55 years. The average years of farm experience was 26.85 years with the standard deviation of 12.15 for total sample household heads. The average farm experience for adopters and non-adopters of LRPs were 29.1731 and 25.0735years respectively with slightly higher farm

experience for adopters. Only about 5.8 % of the farmers have less than 10 years farming experience. The most frequent year of farming experience was 40 years and followed by 20 years of farm experience (Table. 9)

Table 9 Distributions of sample household heads by farming experience

Farming experience	Adopters		Non-adopters		Total sample households	
	No	%	No	%	No	%
<10 years	2	3.84	5	7.3	7	5.8
10-20 years	14	26.92	28	41.2	42	35
20.01-30 years	14	26.92	17	25	31	25.8
30.01-40years	17	32.69	12	17.6	29	24.2
>40 years	5	9.62	6	8.8	11	9.2
Total	52	100	68	100	120	100
Mean(SE)	29.17(1.6092)		25.01(1.5096)		26.77(1.1231)	
SD	11.6041		12.4486		12.3039	

Source: Own survey (2014)

The t-test was used to see if there are significant differences between adopters and non-adopters in terms of experience. Results show that the difference is not statistically significant ((t= -0.66)

4.1.7.Household Land holding/farm land size

Land is one of the most important factors of agricultural production in the country in general and the necessary resources for the farming households in the study area - Manasibu district, in particular. The newly established households have no option to get their own farmlands elsewhere except sharing from their parents. Sharing of the farmland for the young farmers causes the problem of farm fragmentation and made difficult to practice land management practices. This makes it difficult to undertake land rehabilitation activities on small size plots, (Senait, 2002) and forced them to farm the degraded land other than rehabilitating it.

Own observations show that, the livelihood of the study population is almost entirely depend on land. The quality and the size of land available for farm households largely determine the amount of production per annum. In the study area, farm land is scarce mainly due to the

population pressure and land degradation by different factors. Which in turn resulted in expansion of farm land to fragile forest land and this has aggravated the degradation problem. Land holding sizes of sample households varies from 0.25 and 12 hectares with mean of 2.84 hectares. Since the land is unproductive the farmers keep on cultivation of the land in order to get produce that sustain their family. As a result, farmers do not fallow land is now almost none which may be taken as closing land for a year or more that might be known as rehabilitation practices as indigenous in the community. Results show that 39.2% of the sample households own less than 2 hectares (Table 10).

Table 10 Distributions of sample household heads by farming experience

Land Holding	Adopters		Non adopters		Total		t-value
for eg.	№	%	№	%	№	%	-8.58***
<0.5	1	1.9	4	5.9	5	4.2	
0.5-1.0	6	11.5	16	23.5	22	18.3	
1.01-2.5	19	36.5	17	25.0	36	30.0	
2.51-5	19	36.5	28	41.2	47	39.2	
5.01-7.5	4	7.7	2	2.9	6	5.0	
> 7	3	5.8	1	1.5	4	3.3	
Total	**52**	**100**	**68**	**100**	**120**	**100**	

Source: Own survey result (2014), *** Significant at <1% probability level

Farmers with larger farm sizes are expected to practice better land management practices; because when farmers have larger farm sizes, they can plan and apply different rehabilitation practices on their farm land on part of their land. In this study, there is a significant relationship observed between farm size and land rehabilitation practices. This is consistent with initial assumptions. The average landholding of non-adopters and adopters of land rehabilitation practices were 2.56 and 3.125 hectares, respectively (Table 11). The test was applied whether there is a mean difference or not, between the non-adopter households and users of different conservation strategies of land management. The result showed that there was a mean difference on farm size among the non-adopters and users of land rehabilitation strategies of land rehabilitation (t=8.58). Earlier studies conducted by EEA/EEPRI (2002) indicate that farmers with larger farm size were less likely to be engaged in long-term land management practices. Another previous study indicates farm size to have positive and significant influence on adoption of introduced conservation methods, but the same study identified farm size to

have significant negative influence on continued use of introduced stone terraces (Aklilu, 2006).

4.1.8.Distance of farm plots from home

It refers to the average distance of the farm plots from dwellings in hour. The walking distance of plots from the farmer residence, measured in minutes, is expected to influence the decision of the farmer. In this study, the distance of plots from home was assumed to have a negative relationship with the adoption of SWC practices. Studies conducted in Ethiopia by Bekele and Holden (1998) in central highland and Wagayehu (2003) in the eastern highland noted a negative relationship between distance of a plot from dwelling and SWC decision. Distance between farm plots and a homestead are important in which a considerable amount of time can be lost in walking long distances. The closer the farm is to the residence the regular the supervision and attention it will get from the family. Chilot (2007) and Wagayehu and Drake (2003) argued that distance of plots from home stead may influence household investment in time lost traveling to and from a plot and plots located far from farmers' residences are high-risk investment as the chance of losing these plots is higher in the event of land distribution.

In the study area the Focus group discussants reveal that, it is easier for the farmers to care their farm and to construct and maintain physical soil and water conservation practices and protect area enclosure from interference by livestock (grazing) on the fields near their homesteads than fields that are far away. The distance between fields and homesteads in minutes of walking ranges from 3 to 150 minutes in the area. Results presented on Table 12 show that the average distance to the farm plots for the whole sample is 24 minutes (2.5kms) while it is 27 .5 minutes (2.85) kms for adopters and 22.6(2.35Kms) for non-adopters with a statistically significant mean difference at 1% probability level (t=7.71). Previous researches found a positive effect of this variable (distance of the farm plot) on adoption of land management practices and conservation structures as the main driving force of degraded land rehabilitation (Bekele and Holden, 1998; Wegayehu, 2003;Pender *et al*.,2004).

Table 11 Distance of the farm plot from Farmer's Home

Sample household Category	N	Minimum	Maximum	Mean	SE	SD
Adopters	52	3.00	300.00	27.4423	6.63896	47.87419
Non-Adopters	68	3.00	300.00	22.5735	5.04250	41.58154
Total	120	3.00	300.00	24.68	4.04311	44.29010

Source: My own Survey (2014)

4.1.9.Livestock holding of the sample households

It is the total number of livestock owned by farmers measured in tropical livestock unit (TLU) based on the conversion factor developed for Ethiopia (ILCA, 1990). Livestock are important and generally considered to be an asset indicating the wealth status of the household. Livestock, particularly oxen, are used as working assets to perform farm operations, including conservation strategies of land management (Senait, 2002; Wagayehu, 2003).

Alike the other parts of the country, livestock are an important component of the farming system in the study area. Livestock holding size is one of the indicators of wealth status of the households in the study area. The dominant domestic animals reared in the area include cattle, donkey, sheep, goat and chicken and they use them use as sources of income, food items (milk, meat, eggs), and draft power, and for transportation activities. Moreover Oxen provide draft power for crop production and animal dung is used as fertilizer for crop production. The live stocks are also perceived as a symbol of prestige among the community.

It was hypothesized that the size of livestock holding positively affects land rehabilitation decisions and strategies of farmers. The study result shows that there is a significant relationship between livestock holding and land rehabilitation. This is congruent with a previous study which indicated farmers' livestock holding size to have significant negative influence on the adoption of SWC (Aklilu, 2006). Using the odds of the land rehabilitation practices among farmers with no livestock holding as a reference, farmers with livestock holding have a higher chance of undertaking land rehabilitation. Hence, greater livestock holding is expected to have positive influence in farmers' behavior to improve their land management practices.

To assess the livestock holding of each household in terms of total livestock unit (TLU), the TLU of each of the household was calculated. Conversion factor used into TLU was 1 TLU was equivalent to 1 camel, 1.43 cattle, 10 sheep/goats, 1.25 horse/mules and 2 donkeys ILCA (1990). Survey results indicate that 31.7% of the respondents have 0.01 to 2.00 TLU; 12.5% have 2.01 to 4.00 TLU; 21.7% have 4.01 to 6.00 TLU; 15.8% have 6.01 to 8.00; 5. % have 8.01 to 10.00 and 13.3% have more than 10 TLU (Table 17).

The average livestock holding in TLU for the whole sample is 5.57TLU while it is 6.59 TLU for adopters and 4.79TLU for non-adopters with statistically significant mean difference at 1% probability level. The average livestock holding for adopters is higher than non-adopters in the study area. This could perhaps be due to the fact that such assets may further motivate adopters to improve their well-being through employing intensive land rehabilitation practices. According to the respondents, the communities perceive having large number of livestock as disadvantageous because of the shortage of livestock feed and one of the major course of land degradation.

Table 12 Average size of livestock of sample households by TLU

TLU	Adopter	Non-doter	No sample households	Percentage	Mean	SD
0.00-2.00	14	24	38	31.7		
2.01- 4.00	3	11	15	12.5		
4.01-6.00	13	14	26	21.7		
6.01_8.00	7	12	19	15.8		
8.01-10.00	4	2	6	5.0		
10.01-20.00	10	3	13	10.8		
Above 20	1	2	3	2.5		
Total	52	68	120	100.0	5.57	6.49

Source: Own Survey (2014)

4.2. Descriptive statistics of categorical variables

Descriptive and inferential statistics of categorical variables hypothesized to affect adoption of LRPs are presented in table.13

Table 13 Descriptive and inferential statistics of categorical variables

Variable	Adopters(N=52)		Non-adopters(N=68)		χ^2-value
	Users	%	Users	%	
Off/non-farm	15	28.85%	24	35.3	0.68
Termite infestation	46 (Severe)	88.5	58 (Severe)	85.3	69.79***
Tenure arrangement	+ve (51)	98.1	+ve 67	98.53	90.63*
Perception on LRPs	+ve (51)	98.1	+ve 66	97.1	70.87***
Slope (Steep)	Steep (5)	9.62	High 7	10.3	0.21

	Adopters(N=52)				Non-adopters(N=68)				
	Male		Female		Male		Female		X^2-value
	Users	%		%	Users	%			
Sex	49	94.2	3	5.77	63	92.6			3.24*

Source: Own survey result (2012)

***, ** & *: significant at <1, <5 and <10 probability level.

4.2.1.Sex of the household heads

Most of the land management practices require more labor force. Women are often faced with more labor constraints than male farmers and male-headed households. Hence, male headed households are expected to adopt the practices than female-headed households and undertake different land management practices, as better endowed with labor. The women household heads in the study area shoulder multiple responsibilities at household level and have limited opportunities to participate in public meeting where they can get information that help to raise their awareness and motivate them t0 participate in Land rehabilitation . In addition, women are usually busy in household activities and their prime responsibility is usually child rearing. In this research too, negative and significant

Women are also sometimes inhibited from making decisions about land management practices while their husbands are away (Benin, 2006). Most of the time, they are not part of the decision making body at household and the community level to get the extension services on agriculture and land management (rehabilitation). Moreover, most of women of the sample households are illiterate and could not read written information pertaining to the agriculture, land management /rehabilitation and other areas that are important for the improvement of their livelihood, have no access to radio and other media to get information that support them to manage their land and have few contacts with the extension workers. The survey results indicate that out of the

120 sample household respondents, the majority (93.3%) is male and the remaining (6.7 %) are female

Relationships between sex of household heads and Land rehabilitation practices is observed and the result is statistically significant at less than ten probability level (<10 %). The finding is in conformity with the assumption that men are more likely to undertake land rehabilitation practice than women. The finding is in conformity with the assumption that men are more likely to undertake land rehabilitation practice than women.

4.2.2.Off/Non-farm Activities

It is an employment of the farmer specially to create access to food in food for work, employment generating schemes, off-farm employment, petty trading and etc. Since these activities share most of farmer's time, it was hypothesized that it affects decision on conservation negatively. On the other hand, access to such activities may enable the farmer to get additional income in such a way that it enables the farmer to acquire purchased inputs or income to invest on degraded land for rehabilitation. Participation in off/non-farm activities is believed to have an impact on the income of households. Additional income earned through participation in these activities improves farmers' financial capacity and increases the ability to adopt new technology.

On the other hand, farmers who have better off-farm and non-farm income may be more interested in running their business and tend to be unaware of the problem of soil degradation and less interested to practice land conservation and rehabilitation activities. These activities share most of farmers' time. Furthermore, they may not be interested to invest in conservation strategies of land management as the investment may share their resources which otherwise could be invested in other off-farm activities, which could bring more additional income in the short-run (Ervin and Ervin, 1982). For this study, it is hypothesized that this variable negatively affects farmers' decision on conservation strategies of land management.

Of the total sample households, 67.5 % participated in off/non-farm activities while 71.2% and 64.7 % adopters and non-adopters participated in off/non-farm activities respectively. The χ^2-test was employed to see the proportion difference between adopters and non-adopters in terms

of participation in off/non-farm activities. Results show that it is statically insignificant (χ^2= 0.68). This result is in line with the studies carried out by Mesfin (2005), Mulegata (2000) and Degnet (1999) who found positive but insignificant association between off/non-farm income and adoption of agricultural technologies.

4.2.3.Slop of the farm plot of the sample household

Slope is one of the farm attribute that aggravate land degradation. Erosion potential is determined by the slope of farm land and other factors such as, soil type and land use practices. A steeper slope is said to have a positive effect on the decision of conservation strategies of land management (Ervin and Ervin, 1982). Farmers whose farm lands are steep are more prone to soil erosion are more likely that they expected to experience more soil erosion and therefore recognize the impact of top soil loss due to erosion more easily than farmers with farms located on flat areas. Empirical studies in different parts of Ethiopia show that, the slope of a field is believed to be an important indicator for erosion potential and influence the decision of farmers to adopt land rehabilitation practices. Bekele and Holden (1998) and Wagayehu and Drake (2003), in their adoption decision studies in the highland of Ethiopia, respectively, reported that a positive relationship between slope and likelihood of using conservation measures. Bekele and Holden (1998) argued that farmers are more likely to keep conservation practices in steeper slopes where they perceive higher erosion problems than on lower slopes.

Hence, it was assumed that erosion potential of farm plots is likely to enhance farmers' decision to use of soil and water conservation practices. The slope of each farm land of sample households in the sample study are classified by sample households as flat, gentle slope, steep slope. According to sample households' perception, from a total of 120 sample households 10.84 % while 89.17 % have plots located on gentle and flat slops. With regards to the slope of the study area, out of the total of the district (166,815.10 ha), 15% 40%, 45% is categorized as steep (having slop of >30 %), slop, gentle and plain respectively, according to the District Agricultural and Rural Development Office (MDARDO, 2010).

The sample respondents classified their farm (Plot) slope of the sample households in the study area as steep and flat slopes.The percentage of respondents from the total respondents who categorized their farm land as steep slope were 13(10.8%) household heads, while 107 (89.2%) households farm lands were categorized under relatively flat slope type in the study area. Based on the result, the slope characteristics of land rehabilitation adopters and non-adopters were 90.4% and 88.2% were relatively flat type and while 9.6 % and 11.8% were steep type slope respectively in the study area.

T-test was conducted to see whether there is a significant difference on plot slope characteristic between adopters and non-adopters of land management practices. The result showed there is no statically significant proportion difference on plot slope between adopters and non-adopters of land management practices. Similar results were found by (Bekele and Holden, 1998; Tesfaye, 2003 and Paulos*et al*., 2004).

Table 14 Slope status and physical characteristics of land

Description of slope type	Adopters		Non adopters		Total sample		χ^2-value
	№	%	№	%	№	%	
Relatively flat	47	90.4	60	88.2	107	89.2	
Steep	5	9.6	8	11.8	13	10.8	0.21

Source: Own survey result (2014)

4.2.4.Land Ownership (Land tenure arrangement)

Plot acquisition includes transfer from parents or inherited, allocated by local government, sharecropping or rented in. As far as the influence of tenure arrangement was concerned, both rented-in and transfer plots seem to have lower probability of being selected for fertilizer use compared to owner-operated plots (Fitsum, 2003). Farmer's expectation of farmland ownership affects his/her decision on conservation and rehabilitation strategies of land management. If a farmer feels that the land belongs to him/her, it is very likely that she/he invests on land management and rehabilitation. Owner operated or inherited plots were expected to have a higher probability of adopting the land rehabilitation practices.

For farmers to be able to carry out long or medium term investment, they require security of tenure. This does not necessarily mean that they have to have individually documented proof of title rather need the feeling of ownership to make sure that the land will be theirs to work in the foreseeable future, and not unpredictably taken away and reallocate to somebody else.

Local kebele administration allocated land, sharing land for one or two seasonal production and temporary access to land are the tenure arrangements practiced in the study area. Households who only have large farm give some of their land to their relatives or fellow friends freely to use for limited period of time. Those who have been given the land are expected to voluntarily help the donor households when they face labor shortage. Most of the households also shared their land to their children when they reach marriage age.

There are different arguments on the impact of tenure or property right on the decision to adopt degraded land rehabilitation practices. Some argued that individualized ownership right to land (right to sale or to use as collateral to secure credit) could increase tenure security and provides incentives to invest on LRPs and thereby improve land productivity. On the contrary, others argued that individualized land rights would not have impacts on decisions on conservation strategies of degraded land rehabilitation or promoting environmental conservation (Feder*et al*., 1988; Tegegne, 1999; Paulos*et al*., 2004).

In the study area, sample farmers were asked to state their perception with regard to the security of land holding. Based on the survey result, 76.7% of the total sample households acquire their land inherited or relatives, from their parents and received as gift while 16.7% received it from KAs in the study area. Of those who acquire land from the local government (Kebeles administration) 39% and 61% were adopters and non-adopters of degraded land rehabilitation practices in the study area respectively. While about 89.5% and 83.6 % adopters and non-adopters respectively acquired land as a gift/inherited. The result show there is statistically significant difference with respect to land tenure system between adopters and non-adopters of land rehabilitation practices ($\chi^2 = 90.63$) at less than ten probability level (<10 %). However study conducted by (Bekele and Drake, 2003) were found significant at less than one probability level which not congruent with this study.

4.2.5.Perception and attitude of the farm households

This is measured by the knowledge and opinion of the farmers on rehabilitation technologies such as SWC, i.e. whether the farmer feels that conservation structures help to mitigate soil erosion and increase productivity of land or not. Thus, framers' perception of SWC technologies is hypothesized to positively affect the usage of soil and conservation practices. Sample households were asked to indicate their general perceptions of land rehabilitation practice change with some indicative parameters of land degradation and precipitation.

Table 19 shows the direction and magnitude of land degradation using five point Likert scale. Results presented on Table 19 show that of the total sample households, 55.5% have good perception about LMPs while 44.5% of the sample household heads did not have positive perception about the technology. The majority (91.36%) have positive perception about the technology while only 31.09% of non-adopters have positive perception about the technology.

Table 15 Sample households' LMP perception index of the past 10 years

LMPs indicators and level of accepting by HHs	Level of perception (N=120)					Mean
	1	2	3	4	5	
	N (%)	N (%)	N (%)	N (%)	N (%)	
Increase rehabilitation of degraded land	30(25)	24(20)	8(6.7)	46(38.3)	12(10)	3.90
Increase soil fertility	3(2.5)	9(7.5)	4(3.3)	74(61.7)	30(25)	3.99
Decrease land size	2(1.7)	4 (3.3)	13(10.8)	79(65.8)	22(18.3)	3.95
Difficult to adopt the technology	3(2.5)	3(2.5)	3(2.5)	89(74.7)	22(18.3)	4.79
It require big budget	3(2.5)	4(3.3)	5(4.17)	48(40)	60(50)	4.81

Key: 1=strongly disagree, 2=disagree, 3=neutral, 4= agree and 5= strongly agree
Source: Own survey result, 2013

The $\chi 2$-test was conducted to see if there are significant differences between adopters and non-adopters in terms of their perception about the LMPs. The results show that the difference is statically significant at less than one percent probability level ($\chi 2$ =70.87) at less than ten probability level (<1%). The statistically significant difference between the two groups may indicate that if the head of the household has positive perception about LRPs, the probability of

adopting the technology will be higher. The detailed discussion about this variable will be given in the next section

4.2.6.Termite infestation

Termite infestation is one of the major problems of the study area. Termites are abundant and widely distributed throughout the study area. The first report of severe damage, in 1938 from Kiltu Kara (30 kilometers from Mendi –the district town of the study area , and a later report from Mendi indicated that farmers were abandoning "desert without any vegetation and moving to the lowland, searching for new land"; denuded hillsides were heavily eroded and "the termite problem "was said to have worsened. The source of the problem was seen to be the numerous, large termite mounds (constructed by Macrotermes sp.). Some species cause serious damage to certain crops, young forestry plantations and wooden buildings, (Abdullahi, A. and Haile, A. 1986). Regular rebuilding of wood/straw thatch buildings leads to excessive clearing of native woodlands and forest, which is particularly obvious in many human resettlement at areas in Western Ethiopia,: one estimate gave a life expectancy of 5-6 years for thatched roof houses and 8-9 years for corrugated iron roof houses with wooden supports (T.G. Wood, 1991).

The farm land of (95 farmers) 79.2% of the sample households is severely invaded by termite while the termite invasion is low on the farm land of (14 farmers) 11.7% of the households. The termite problems on the remaining (11 farmers) 9.3% of the farmers land is moderate. In the study area significant relation is observed between termite infestation and land Management practices degradation. Most of the adopters have practiced soil band on their farm lands to reduce its damage on their crops.

4.3. Institutional Supports

4.3.1.Access to extension service

Agricultural extension service is one of the major institutions operating in the rural area of Ethiopia. It is very instrumental to provide information and enhance the knowledge and skills of farmers, and other institutional changes. The information (message and contents) obtained and the knowledge and skills gained through extension accelerates farmer’s decision on conservation strategies of degraded land rehabilitation. The more the farmers gain important

messages on land management, they become more initiated to do conservation activities and may be interested to invest on land management activities (Million, 2001; Paulos et al., 2004).

The households with access to extension services and information have better understanding of the land degradation problem and soil conservation practices and hence may perceive land conservation/management practices to be profitable (Bekele and Holden, 1998; Senait, 2005; Yitayal et al., 2006). In this study, farmers with access to extension services are expected to have better access to information which could play a significant role in improving land management practices.

The mean extension contact in the production seasons of the year 2012/13 is 10.2 for the whole sample and 10.5 and 10 times for adopters and non-adopters respectively with a significant mean difference at 5% probability level (t= -0.93. Results also show that about 5.8 % adopters and 8.8% non-adopters had made contacts with the development agents once every fourteen days. Generally speaking, about 6 % adopters and 8.8 % non-adopters had contact with extension workers at least once in the production season. However, no farmer that had no contact with the extension agents at least once in the production year (Table 20).The results in general show that there is no significant difference between adopters and non-adopters in terms of contact with extension agents to get extension services to adopt LRPs. This is inconsistent with initial assumptions and the findings of previous research which found participation in extension to contribute positively to farmers' behavior to adopt land management practices.

Table 16 Households' frequencies of contact with development agents

Frequency of DA visit	Adopters		Non adopters		Total sample	
	№	%	№	%	№	%
No contact	-	-	-	-	-	-
Once every fourteen days	3	5.8	6	8.82	9	7.5
Once a month	36	69.2	43	43	79	65.8
Quarterly	10	19.2	5	5	15	12.5
Sometimes	3	5.8	14	14	17	14.2

Source: Own survey result (2014), *** Significant at <1% probability level.

4.3.2.Access to credit service

Resource availability is generally expected to positively influence farmers' land management practices. Hence, access to credit is expected to have positive relationship with farmers' management and rehabilitation of degrade land. However, the analysis indicates that farmers' access to credit services is negatively associated with application of terracing. Farmers with access to credit services are found to be statistically different from farmers with no access to credit in their practice of terracing and the relationship is highly statistically significant at less one percent.

With regard to the relationship between farmers' access to credit services and manure application, no significant relationship is observed. The observed relationship could be due to the fact that those farmers that are commonly taking credit are the poor ones, with less land holding and other resources. For this group of people the priority is in feeding their families than planning for long term benefits. The group discussions conducted show that most of the sample households knew the existence of Soil conservation strategies for rehabilitation of degraded land and used for the improvement of their fertility rate of land in the study area. The attributes of the strategies are considered as one of the factors influencing farmers' decision on degraded land rehabilitation practiced.

4.4. Major land management practices in the study area

4.4.1.Indigenous land management practices

The major indigenous land management practices are practices, which have been developed and/or adapted by farmers since long time ago as different from the newly introduced or modern practices spread through extension and communication. Indigenous land management practices are the results of gradual learning process and emerge from a knowledge base accumulated by people from observation, experimentation and a process of handling people's experience through generations. In the study area, fallowing, animal manure application, burning to prepare the field, cut of drain, termite mound destruction by flooding etc. are among the indigenous land management practices.

In order to do an in-depth analysis, it was found reasonable to reduce the practices to a manageable number based on the popularity of the practice, in the study area. Towards this end, burring of crop residue on farm, cut-off drain/water way animal manure and termite mound destruction are found to be the popularly used land management practices

Table 17 Major indigenous land management practices in the study area

Major indigenous land rehabilitation practices	Adopters				Non-adopters			
	Users	%	Non users	%	No. Users	%	No. Non users	%
Manuring	46	88.46	6	11.5	58	85.5	10	14.7
Fallowing	38	73.1	4	26.9	39	80.9	29	19.1
Crop rotation	48	92.31	14	7.6	55	52.9	13	47.1
Intercropping	38	73.1	14	26.9	36	57.4	29	42.65

Source: Own survey result (2014)

4.4.2.Improved land management practices

The major improved land management practices are practices, which have been developed and/or adapted by farmers from the newly introduced or modern practices from outside .Improved land management practices are the results of extension and communication emerge from information, a knowledge base accumulated by people from observation, experimentation and a process of handling people's experiences.

According to the respondents, before 15 years ago farmers were not aware of area closure to be used as degraded land rehabilitation practice. Creating awareness/knowledge of using the practice was found to be an important means for its wider utilization. In the study area, about 90 of the 120 farming households used area closure as land rehabilitation until present. But the practice has been limited to very small portion of their degraded land and its importance is very questionable. At the same time the practice of area closure has become a difficult due to the high livestock population in the area that interfere the rehabilitation efforts through area closure. That limited the expansion of the area closure further to wider degraded area in the study district according to the group discussants.

From the total sample households' adopters of land rehabilitation practices 86.5 %, and 100%, 100%, 44.2%, 19.2% have practices Grass strips, Area closure, Soil bund Check dam and micro basin on their degraded land while from the non-adopters 57.3 , 36.7,8.8%, 10.3% of them were participated on Grass strips, soil bunds, check dam, and micro basin respectively. This result shows that that farmers in the study area give due attention more on indigenous land management than recently introduced practices. This may because of most of the introduced land rehabilitation practices were not well familiar with farmers perception.

Table 18 Improved Land Rehabilitation Practices of the Households on their degraded land

ILMP in the study area	Adopters			
	Users	%	Non users	%
Grass strips	45	86.5	7	13.4
Area closure	52	100	0	0
Soil bund	52	100	0	0
Check dam	23	44.2	29	55.8
Micro basin	10	19.2	42	80.8
Contour tree planting	20	38.4	32	61.5
Agro-forestry	38	73.1	14	26.9
Cut off drain	49	94.2	3	5.8
Compost	32	61.5	20	38.4
Commercial fertilizers	49	94.2	3	5.77
Tree plantations	48	92.3	4	7.69

Source: My Own Survey (2014)

CHAPTER FIVE

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary and Conclusion

Land degradation and desertification are taking place in Ethiopia in general and the same is true for Oromia The degradation pace is going at alarming rate due to climatic change, overgrazing and inappropriate agricultural practices and population pressure. Farmers are putting excessive pressure on the land, by adopting inappropriate technologies and intensive cultivation for the sake of maximizing short-term benefits.

Efforts to reduce poverty and promoting economic growth can have large payoffs for the environment as well, because poverty and environment are often strongly linked. In the face of rising rural population density, emerging climatic change, and ever intensifying land degradation problems of Ethiopia, the importance of degraded land rehabilitation practices is not only an important issue, but also a survival strategy.

Obviously, land rehabilitation technology is the appropriate intervention for improve the resource base and for attaining food security in Ethiopia .Although there is huge potential to apply the strategy, only a fraction of the potential is utilized so far. On the other hand, the low agricultural productivity, poverty and land degradation are critical and closely related problems that are still facing the people of Ethiopian in general and the study area in particularly. These problems exist in Manasibu district of the Western Wollega zone, and on top of these multifaceted problems; termite infestation has worsened the severity of land degradation. Even if the cereal crops are the dominant crops grown in the study area, its yields on average is less than one ton per hectare due to less fertility of the soil and sever land degradation rate in the study area. The average land size is 2.8 hectare, and population is growing rapidly. Most of the households subsist on income of less than one dollar per day (Pender *et al*., 2004). Given these problems, the regional government of Oromia has been undertaking a massive land conservation program since 1995.

However, returns from such investment, in terms of achieving sustained increase in farm productivity, have not been materialized as expected. The effort made so far to enhance the

productivity in the agricultural sector has been hampered mainly due to the land degradation, improper use of land and less adoption of improved land rehabilitation practices. An investigation made by a number of studies revealed, for the very specified and known high population growth rate and continued degradation of natural resources by different causative agents, the chance to increase production through area expansion in Ethiopia and particularly in western Wollega particularly in Manasibu district is very limited. The greatest potential for increasing agricultural productivity is likely to come from increasing yields through efficient and widespread application of integrated improved agricultural inputs, degraded land rehabilitation practices and related innovations. However, the vast majority of farmers in the country continue to use traditional production techniques and the land degradation have remained as critical problems in the study area.

This study was conducted in Manasibu district which is one of the 19 districts of West Wollega zone where there is serious land degradation problems. The study tried to investigate the status of adoption and factors (socio-economic, institutional, physical and other related) influencing farmers' adoption behavior with regard to degraded land rehabilitation practices in the study area. In the absence of such location specific studies; it is difficult to fine-tune interventions towards achieving sustainable land management to the local circumstances.

In this particular study, primary data were generated from 120 52 adopters and 68 non-adopters) randomly selected respondents through personal interview schedule conducted by well-trained enumerators and from group and individual discussions, as well as the researcher's personal observations. The respondents, involved in the interview were selected randomly and proportionally from four sample kebele administrations (KAs). Secondary data were also collected from various zonal and District concerned sources to supplement the primary data obtained during the survey. Data were analyzed, and presented quantitatively using different statistical methods such as percentage, frequency, tabulation, chi-square test for dummy/discrete variables and t-test for continuous variables.

In general land rehabilitation practices were perceived negatively by most of sample households (68) in the study area. This is in line with the fact that socio-economic, institutional characteristics of the household; and environmental risk perception of farmers and physical

characteristics of the household's area specific are due factors in influencing adoption of land rehabilitation practices in Manasibu district.

To overcome the land degradation problem specifically soil fertility loss, land users have been employing indigenous land management practices. Moreover, the concerned government agencies and NGOs have been making efforts to reverse the situation in terms of promotion of better land management practices particularly rehabilitating degraded land since the last couples of years

Descriptive analysis results showed that, adopters of degraded land rehabilitation practices were average in age, better educated, and have access to extension services of all kinds than non- adopters. Moreover, descriptive results also show that education level, farm experience, land ownership right, extension contact, distance to farm plot, farmer perception and farm size were found to be indispensable variables in differentiating adopters from non-adopters.

Moreover the size of livestock owned by the farmers, access to credit , availability of non-farm and off farm income alternative and family size of the household are also important variables in differentiating adopters from non-adopters of land management practices in the study area even if they are not statistically significant.

5.2. Recommendations

Generally, Natural resource degradation and land resource scarcity, which threaten the sustainability of smallholder farmers' livelihood in West Wollega Zone ,Oromia regional state, Manasibu district, alike other in developing areas, is currently, the global concern . Although researchers develop natural resources conservation technologies, of which LRP is one, adoption rates by small farmers have been low. Removing the potential limitations and maximize the adoption of LRP as a strategy for rehabilitation of degraded land to reverse the land degradation problems and increases production and productivity of land call for modification of strategies for resolving the biophysical, socio-economic, institutional, and attitude related constraints.

To reclaim the degraded land resources of the area and improve the socio-economic, situation of poor farming households and equipping them with improved land management technologies is very essential decision .To this effect, any development policy and program intervention should take into account the above the aforementioned variables namely, biophysical, socio-economic and farmers behavioral factors through promoting land management practices particularly rehabilitation activities in order to enhance the agricultural productivity of the area and to improve the livelihood of the farming community and, bring sustainable development in the area Innovative and flexible approaches and intensive institutional support that fits to the farmers' preference is very indispensible.

Extension services on LRP based on training, farmer's field day, field visits, visits to other villages and other degraded land rehabilitation experiences should be given priority agenda to improve farmers' perception towards the combat of land degradation problems. To accomplish this, government has to first equip the pertinent experts who are working specially at KAs and district levels with the necessary skills as they are basic actors and instrumental for diffusion of the technology under discussion.

Adoption among households was found to be influenced, among other, by education, farmers' perception, and frequency of extension contact, landownership right, livestock holding and farm size of households. As a result of these, farmers (male and female headed households) could not adopt LRP as compared to the size of degraded land of HH in the study area. Therefore, treating these all variables at households' level will improve and encourage farmers to adopt land rehabilitation practices in the study area.

Rehabilitation of degraded land and appropriate land management requires the concerted efforts (commitment) of all the concerned development actors and active participation of the farmers. Therefore strategy that encourages active participation of the community participation need to be designed for the entire extension systems in the study area in general and for the land rehabilitation in particular as LRP labor intensive and time taking venture. Hence, participatory technology development, evaluation and adaptation should be given due attention by both technology developers/planners and development agents, so that sustained natural resources management adopted could be achieved particularly through LRP.

Availability of different grass and different forest seedlings for land conservation are crucial for effective adoption of land rehabilitation practices. This calls for coordinated effort of the district Ministry of Agriculture and Rural Development and input delivery agencies with the integration of community at large.

The reality in the ground indicates that there have been indigenous/ traditional LRP practices still operating in the study area. Therefore, trying to modify the cultural practice to make them breathe with in to the existing socio-cultural, economic and biophysical setting is homework to be done from the community to the level of .regional development planers

As plots vary in various biophysical factors, the adoption decision of farmers to land rehabilitation practices also varies following the variation in characteristics of plots. Therefore, experts in the area should consider developing and promoting land rehabilitation practices focusing on the characteristics of a particular area and locality as well.

Degraded Land rehabilitation interventions that overlook inter household and inter plot variation and the importance of farmers' perception are unlikely to be effective. Hence, land rehabilitation intervention should consider difference in the above factors in the design and promoting of land rehabilitation practices. Since, the efficiency of degraded land rehabilitation practices on productivity is varying by agro-ecology types so that a one-size-fits-all approach is not an advisable approach for developing and promoting technologies. It is important to develop and disseminate LRPs or technologies that are appropriately adapted to agro-ecological zones instead of making blanket recommendations that promote similar practices or technologies to all farmers at different areas.

In general, the adoption level of land rehabilitation practices in the study area the participation of community to reverse land degradation problems is relatively low. Hence, researchers, extension agents, policy makers and farmers should interact to bridge the current knowledge gap and to develop multiple of technologies that could be appropriate to the farmers' situations in particular area. According to the results of this study, farmers have differing viewpoints on LRPs that most of the sample farmers have low level of knowledge and know how to adopt the introduced practices so that further effort will be required by agricultural development actors to

raise farmers' awareness to use LRPs at household level. Hence, there is a need to popularize the practices throughout the community. Towards this end, organizing extension field days and tours for farmers to learn from each other may be a promising step in that direction on sustainable base.

Thus, there is a need to make concerted effort to raise awareness throughout the community through education and training on environmental hazards and its impact. Towards this end, policy makers should allocate sufficient resources to extension, education, if need be thought generate from NGOs. Moreover, extension agent should exert concerted effort to promote natural resource conservation and development. However, sustainable agricultural development is not only rehabilitation of degraded environment but also adopting and practicing different land management practices. Hence, more effort should be made to enhance these all interrelated cases in the study in particular.

At last, degraded land rehabilitation practices is being a labor-intensive activity which requires profound expenditure of households' physical labor seldom adopted by few and physically weak household groups. So introducing labor saving technologies and assisting local institutions through farmers groups need to be considered. Under the current accelerated land, degradation has become the major threat to rural livelihood in the country as a whole and similar in the study area; crop farming system, an adequate (surplus) volume of food grain could be grown, when the degraded land rehabilitation practices is fully implemented.

Finally, the author recommends further research to be done on examining the extent of adoption and the extent to which socio-economic and other factors affect the intensity of adoption decision using time series data.

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Annexure: 1 Questionnaires for Sample Household Survey

Annex 1.Questionnaire for Household Survey: This questionnaire is designed to collect data for purely academic purpose, in connection with MA research project entitled "Study on degraded land Rehabilitation and Management practices in Manasibu District of West Wallaga Zone, Oromia, Ethiopia." The data will not be used for any other purpose and the identity of respondents will be held confidentially. Thus, respondents are encouraged to feel free in providing the required data.

Instructions for enumerator/interviewer

1. Upon arrival, greet the respondent and others who are with him/her. Introduce yourself (name, Profession, etc.), and clearly explain the purpose of the study before you begin the interview. Ask one question at a time, patiently and politely, and try to make sure that the respondent understands the question.

2.For open questions, write the respondent's response clearly. For closed questions, circle the number(s) of the answer(s). Allow respondents to ask questions throughout the interview and at the end. It would be greatly appreciated if all the questions are answered and the tables are completed as accurately as possible. Your genuine effort is very essential for the success of this study.

Date of Survey	_____
Name of Enumerator (interviewer)	_____
Starting time	_____
Signature of interviewer	_____

Identification Number (Code):_____

Section A. Background information of the respondent (Household Details)

1. Name of Kebele : _____
2. Name of the Village:_____
3. Name of the interviewee (respondent) _____
4. Sex of household head? 1= Male 0= Female ((; if male =1, if female =0)
5. Age of the respondent: _____ _____
6. Role in the household __ 1.Household head 2. House wife 3. HH members 4. Other(Specify
7. Marital Status of the household head 1. Married 2.Single (never married) 3. Divorced 4.Widowed
8. Ethnic group of respondent 1.Oromo 2. Amahara 3.Tigre 4. Other (specify) _____
9. Religion of respondent_____ 1. Christian (Protestant) 2. Christian (Orthodox) 3. Muslim 4. Other (specify)_____
10. What is the level of education of the household head?

1=Not read and write 2=1-4 grade 3= 5-8 grade 4=9-12 grade and 5=above 12 grade (specify____)

11. For how many years are you living in this locality (period of your stay in the locality)? ____ years
12. What is the social position / role of the household head in the KA._____ 1. No position at all 2.KA executive member 3.KA Cadre 4.Religion leader 5. Elder 6. Edir & other Social

committee leader

Section B: Characteristics of the household (demography and other information

1. Would you please indicate the details of your family members (the household members permanently currently living with you)? _____

no	Name	Position in the HH	Sex	Age	Education (Grade)	Literacy
1.						
2.						
3.						
4.						
5.						

Remarks. **Position in the HH-**1 = Husband, 2 = Wife3 = Son/Daughter 4 = other relative 5 = Non-relative **Sex** 1 = Male 2 = Female **Literacy** 1 = Read only 2 = Write only 3 = Read and write 4 = neither

2. What is/are the source(s) of your household's livelihood?

Occupation(s)	Tick	rank	Occupation(s)	Tick	Rank
1= **Farming (own farm)**			3= **Non-farm**		
a) Crop production			a) Petty trading		
b) Livestock production			b) Mineral Mining		
c) Mixed farming			c) Construction (carpentry, masonry etc.)		
2= **Hired farm worker**			d) Hand crafting		
			e) Food aid		
			f) Other (specify)		

Section C. Family labor capital

1. Did your household members engaged in work full-time and/or part-time outside your farm during the last year (2005 E.C)?_____ 1 = Yes 0 = No

2. How many of your family members are economically active (involve in economic activities) ?_____. Please, indicate in the table below.

	Age category	No of family members					
		who work full time			who work part time		
		M	F		M	F	
1	Children < 10						
2	Children 10-14						
3	Youth/Adults (15-64)						
4	Elderly > 64						

Section D. Off farm and Non-Farm Activities

1. In comparison with that of the previous years (5 years) , off-farm and Non-farm employment opportunity during this year (2005 E.C) has: 1 = Improved 2 = Improved somewhat 3= Deteriorated 4 = Not changed

2. Would you tell me the annual income you get from off and Non-farm activities _____

3. What is number of your Household members participated off and Non-farm activities during the year 2005 E.C

4. How much did you earn from off- farm activities during the year 2005 E.C (ETB) _____

5. How much did you earn from non-farm activities during the year 2005 E.C (ETB)_____

Section E. Land holding, land use, crop production and livestock husbandry

1. Are you a farmer? _____ 1= Yes 0=No
2. If yes to question no. 1, how long have you been in farming (farm experience)? ___ Years.
3. Do you possess farm land_____ 1= yes 0= No
4. If you have farm land, what is your total land holding. _____ hectare (Sanga) _____
5. For how many years did you cultivate the land? _____ years._____
6. Indicate the types and size of land you have? 1. Farm land__ 2. Grazing land__ ha 3. Forest land __ ha
7. How did you get the land? 1. Inherited 2.Received from KA 3. Received as gift 4. Rented in____
5. Sharecropped in 6. Other (specify) _____
8. Indicate the situation of your land :
   1. How much of your agricultural land is fertile? ____ sanga____ hectare. _____
2. How much of your agricultural land is infertile? ____ sanga____ hectare. _____
3. How much of the land is currently cultivated/ under crops -? __sanga____ hectare____
   4. How much of your land is currently abandoned due to degradation? sanga___hectare___
9. Do you think that the land you have is enough for your family 1. Yes 0. No

10. Please indicate how you utilize the land for household and its income during the last cropping season._

Description	Size (sanga)	Income earned
1= Cultivated by the household		
2 = Rented out		
3 = Sharecropped out		
4 = Rented in		
5 = Sharecropped in		
6 = Other (specify)		

11. If you rented/sharecropped in, who is responsible for maintaining the quality of the land? __
1. The owner 2.Me 3. Both of us 4. None of us
12. If you rented out, who is responsible for keeping the quality of rented land? _____
   1. The cultivator 2. Me 3.Both of us 4.None of us

13. If you sharecropped in, who is responsible for keeping the quality of rented land?

_____

1. The owner 2.Me 3.Both of us 4. None of us

14. If you sharecropped out, who is responsible for keeping the quality of rented land?

_____

1. The owner 2.Me 3.Both of us 4. None of us

15. What is the total area you cultivated the last cropping seasons including 'Bone " land (in 'sanga')_____

16. Would you please indicate the nature of your farm land (area, distance from home, slop and ownership and fertility situation of your farm land)?

Plot .no	Ownership		Crops grown		Area (in sanga)		slop of the plot		Soil type		Fertility		Conservation measures applied		Termite problem		Distance from home	
P1																		
P2																		
P3																		
P4																		
P5																		
P6																		
P7																		
P8																		
P9																		

Remark*Ownership: (Situation of plot acquisition): 1) Rented in 2) Borrowed 3) Inherited 4) Received from KA/own 5) Share cropping

Crops grown: 1) Teff 2) Maize 3) Sorghum 4) millet 5) Chickpeas 6) Beans 7) Wheat 8) Barley 9) Pepper 10) oil seed Crops,

* **slop** 1) very Steep (susceptible for soil erosion) 2) gentle slop (Less susceptible to soil erosion) 3) flat

* **Soil type =** 1) red soil 2) black soil 3) brown soil 4 other (specify) ____

* **Fertility** = 1) Fertile 2) Moderate 3) Not fertile

* **Conservation Measures** 1.soil band 2. Check dam 3.Grass strip 4. Cut of drains

***Termite infestation problem** = 1) High 2) Medium 3) Low

17. Who participate in agricultural activities from your family members (form land preparation to harvesting time) 1. Husband 2. Wife 3. Boys 4. Girls 5. Husband & wife 6.All

18. Have you faced labor constraint at certain times/season of the year (2005 E.C)? _____ 1. Yes 0. No

If yes, mention the season_____

19. Would you please estimate money invested on land management in the year 2005 E.C) by your household. _____ _____

20. As compared to that of former years, crop production during the last cropping season(2005 E.C) has:

1 = Increased 2 = No change 3 = Decreased

21. If production has increased or decreased, indicate the productions during the last cropping seasons and that of the former years._____

	Major crops	**Production (yield) in kg per *Sangaa***		
		Year 2005 E.C (Last cropping season)	Year 2004 EC	Year 2003
1	Maize			
2	Sorghum			
3	Teff			
4	Millet			
5	Coffee			
6	Oil seed crops			

22. What are the major problems of crop production(Rank them in there decreasing importance)

	Types of agricultural problems	Tick	Rank
1	Infertility of land		
2	Termite infestation		
3	Animal disease		
4	Shortage of input		
5	Labor shortage		
6	Lack of extension service		
7	Others (specify)		

Draft power

23. Did you have enough oxen to plough your land last year (2005 E.C)? 1. Yes 0. No

24. If your response to question 23 is no, how did you cultivate your land? 1. Hire oxen 2. Oxen for labor exchange 3. Oxen sharing 4. Sharecropping 5. Others (specify)

_____

25. How much of farmland did you plough with your own oxen? _____

1. All ___ 2.¾ of the land 3.½ of the land 4.1/4 of the land 5. Less than ¼

Livestock Husbandry

26. Do you have livestock? _____ 1. Yes 0. No -

27. If yes to question no 24, please indicate the number of your livestock during the years (2005/13/).

	Type of animal		Number of livestock owned by your family		
			During 2005 E.C)	Year 2004	Year 2003
1	Cattle	Oxen /Bull			
		Cows			
		Calves			

2	Sheep			
3	Goat			
4	Donkey			
5	Mules			
6	Chicken			
7	Other (specify)			

28. For what purposes are you keeping the livestock? 1. Household consumption (Milk and milk products and meat) 2.Manure 3.Income source 4. Draft 5. Means of Transport 7. Prestige
29. Do you sell livestock products? 1. Yes 0. No
30. If you sell livestock, would you estimate your last year (2005) earning from sell of livestock products._____?
31. What is/are the major source(s) of feed in your area? 1. Natural pasture 2.Crop residue 3.Improved fodder crops 4. Agro-industrial by-products 5. Other specify _____
32. Do you have your own pasture land? _____1. Yes 0=No
33. If yes, how did you obtain it? 1. It was my arable land in the past 2. Bought 3.Farm boarder 4.Rented 5. Others (specify)_____
34. What is the size of your pasture land .____ _____, _____(Sanga/ hectare)
35. How do you use the pasture land for your livestock? 1. Free grazing 2. Cut and carry system
3. Other (specify) _____

36. How do you see the quality of feed available now when compared to that of the 5 years back?
1. The Same 2. Now it is better (improved) 3.Declined or deteriorated.

37. If the quality of feed is improved, why? _____
If it is declined, Way? _____ _____
38Is there enough feed available throughout the year? _____ 1. Yes. 0. No
39.If no, in which season(S)/Month(s) the feed shortage is critical?_____
1._____"Ganna" 2. _____"Birraa"_ 3_____ "Bona" 4._____ "Arfasa"

40.What is (are) the cause (s) of this feed shortage/decreasing grazing land? And rank them.

	Cause of feed shortage	Tick	Rank
1	Shortage of rain		
2	Increased livestock population(over grazing)		
3	Cereal-crop encroachment		
4	Expansion for coffee cultivation		
5	Population pressure (human)		
6	Termite infestation		

36. Is there any kind of supplementary feed that you give to your livestock at the time of feed shortage? ____ 1. Yes 0. No. If no, why? 1. Not available 2.I can't afford 3. No feed shortage 4.lack of concern 5. Others specify)_____.
37. What measures have you taken to alleviate the feed shortage problems so far? _____

1. Pasture enclosure (kaloo) 2.Seasonal movement of Animal (darabaa) 3.Sale of animals (destocking) 4.Renting pasture 5. Cultivated improved forage crops 6. Others (specify)_____

38. Have you ever used improved crops and animal forage seed/plants? _____1. Yes 0. No

39. If no, why? ____ 1. Lack of seed 2.Lack of money 3.Lack of land 4. Lack of extension agents advises 5. Lack of knowledge

40. What are the alternative uses of grasses other than animal feeds? _____

1. Used for house roof making 2.Sale (income source) 3. Other (specify)_____

41. What are the major problems of livestock production of your household?

	Problems	Rank	Reason
1	Shortage of feed (grazing land and forage plants)		
2	Lack of credit		
3	Drought		
4	Livestock Disease and pests		
5	Poor breed		
6	Other (specify)		

42. Do you see any relation between livestock population and land degradation in your area? _____1. Yes 0. No

43. If Yes to Q 47 what is the relation?

_____

44. Have you ever provided extension services with regards to livestock production/management?

1. Yes 0. No

45. If yes to Q 47, from where did you get it? _____.1 .Government extension workers 2. NGO workers

3. Both 4. Other (Specify) and list the services you have got from: them_____

Section F. Land rehabilitation, management practices, and land quality

1. What are the direct causes of land degradation on your land?

1. Production on steep slopes and fragile soils 2.inadequate investments in soil conservation or vegetative cover 3. Erratic and erosive rainfall patterns, 4.declining use of fallow, 5.Limited recycling of dung and crop residues to the soil 6. Deforestation 7.overgrazing

2. What are the underlying factors for and degradation in your area? (E.g. Population pressure, poverty, limited access to agricultural inputs, fragmented land holdings insecure land tenure, farmers' lack of information about appropriate alternative technologies).

3. For what agricultural activities have you been using your land since early time you remember? 1.annual crops 2.perennial crops , trees, etc. 3.other(specify) _____

4. For what purpose you use your land at present?_____

5. Do you practice indigenous (traditional) land management practice (2004/2005) on your land? 1. Yes 0. No 1. If yes, what is/are the practice(s) that you use on your farm land?_____
6. Do you use manure? _____1. Yes 0. No

7. If yes to Q 5, for what purpose did /do you use manure _____1. Grassland fertilization 2. Crop land fertilization 3. Coffee field fertilization 4 Vegetables crop production 5.feul consumption

8. What is the indigenous knowledge you have for land management practice, list them in terms of their
importance?_____

Introduced Land rehabilitation and Management practices

9. If the productivity of your land is decreasing, what do you think is/are the major cause(s) of land degradation on your farm plot (rank in their decreasing order)? _1.Deforestation 2. Soil erosion 3. Overgrazing 4. Over cultivation 5. Poor agricultural practices

10. If it is due to improper land use, mention the reasons/uses (inappropriate uses)_____
11. How do you perceive the level of soil erosion in your farm plots? _____
1. High 2.Medium 3. Low 4.No opinion

12. How much of your farmland is affected by erosion? _____ (Sanga)?
13. What (indicate) are the poor agricultural practices?
_____
14. Indicate all the natural factors you think have contributed to the progressive land degradation and reduced Productivity of the land _____ 1. Termite infestation 2. Excess rainfall 3. Topography4. Others (if any) _____

15. What are the changes you observed on your land as a result of land degradation (rank)?
___
1. Decreased land productivity (yield) 2.Reduced top soil depth 3. Change in type of crops grown 4. Land preparation becomes difficult 5. Reduced size of farm plot 6. Other (if any)_____
16. If your land is degraded, how did/does the degradation manifest itself on your land?
_____
1. Formation of gullies and Land slide 2.Compact soil 3. No vegetation covers
4. Siltation/sedimentation on the bottom land 5. All
17. Did you ever migrated to other area and settled there? 1. Yes 0. No , If yes what is the distance from your home ?_____ KMs/_____ hours walk
18. If Yes to Q 17, would you please mention the major cause for migrating and settling in other area?
_____
19. What are the major problems you encountered due to migration_____

20. If no to Q 17, have you ever thought of moving to other area due to LD and related problems?_____ 1. Yes 0. No
21. Do you think that degraded land could be rehabilitated? _____ 1. Yes 0 No
If yes, how? _____
If no, why? _____
22. Have you ever practiced land management / rehabilitation activity (ies) on your land?____ 1. Yes 0.No

23. If you did not apply conservation strategies of land management (such as agro-forestry, strip grasses soil bund and others), what is your reason? _____ 1.Lack of extension service 2.Shrtage of labor to adopt 3. I have no soil erosion problem 4. Other (specify if any) ___
24. If yes to Q 22, what are the activities you have undertaken to rehabilitate the degraded lands?
1.Physical measures 2.Biological conservation measures. 3. Agronomic measures 4.Combination of1and 2 5. All

25. What are the physical SWC activities you have undertaken on your farm land? 1. Soil band 2.Water retaining pits (Micro basin) 3.Cut off drains (water way) 4.Check dam(Vegetative barriers)

26. If you have constructed soil band on your farm land, since when, how many kilometers have done so far?_____
27. What do you think are the purpose of constructing soil bands?_____ 1. Reduces soil loss/runoff 2.Increases soil fertility (Reduces Fertilizer purchases) 3.Make steep land cultivation easier 4. Reduce termite attack 5. Other (specify if any) _____
28. Are there problems/disadvantages related to Physical SWC activities? _____ 1. Yes 0. No
If yes what are they? _____

29. If you practice biological conservation measures, indicate the type of conservation measures you practiced on your plots so far? 1. Grass trips /establishment 2. Contour tree planting 3. Check dam with life tree cuttings (vegetative barriers) 4. Area Closure 5. Others (specify if any) _____
30. Did you /are you using/ agro forestry as a land management /conservation strategy? ____ 1. Yes 0. No
31. If yes, what do you think are the purpose/advantages of agro forestry practices? ___1. Reduces soil loss / erosion 2. Increases soil fertility/add nutrients/ 3. Increases land productivity (yields) 4. Used to keep the land and pass for future generation 5. Other, specify_____
32. Do you use intercropping as a conservation strategy of land management? ___1. Yes 0. No

33. If yes, what are the crops used for intercropping?
_____
34. Did/do you use crop rotation as land management strategies ?____ 1.Yes 0.No
35. Do you practice fallowing? _____ 1. Yes 0. No
36. If yes, mention the purpose and the number of fallow years?
_____

37. Do you use composting to improve the fertility of your farm land? _____ 1.Yes 0.No

38. Did/do you use tree plantation as rehabilitation strategies? _____ 1.Yes 0.No

39. Do you have degraded lands that are abandoned? _____1. Yes 0. No

40. If yes to Q 39, have you ever closed your plot of lands for rehabilitation? ____ 1. Yes 0. No

41. If no way did you not have Area closure

_____

42. If yes to Q 40, when did you start area closure in your plots of land?

_____

43. What is the purpose of having area closure?_____1.For grazing land 2.To improve crop land productivity 3.For rehabilitation of degraded land 4. For tree planation 5.To secure land ownership right

44. Who participate in the conservation/rehabilitation activities from your household? 1. Household head 2.Wife 3.Youth in the family 4.Both husband and wife 5.All family members

45. How do you compare the problem of land degradation in your farmland after conservation measures were done on the plots? _____ 1. Aggravated 2. Reduced 3. No change

46. What types of changes have you observed on your land after the rehabilitation/conservation activities were undertaken? 1. Soil erosion reduced 2.Increased crop production 3. Availability of Animal feed improved 4.Host of wild animals 5. Increased vegetation covers 6. conserving soil moisture

47. What advantages you acquired from rehabilitation activities? _____
1. Availability of Wood 2.Improved availability of grass for animals' 3.Improved soil fertility 4. Degraded land reclaimed and put under cultivation 5.Other (specify) _____

48. Do you believe that investment in conservation strategies of land management is profitable in at least within the coming five years? 1. Yes 0. No.

49. In your understanding, what are the problems related to each land management and rehabilitation strategies?

	Land management/conservation practice	Problems/constraints	Advantages
1	Soil band		
2	Micro basin		
3	Check dam construction		
4	Cutoff drain		
5	Grass strips		
6	Manu ring (livestock)		
7	Composting		
8	Crop rotation		

9	Inter cropping		
10	Agro forestry		
11	Tree plantation		
12	Mulching		
13	Area closure		
14	Crop residues		
15	Chemical fertilize		

50. Do your household members have better understanding of about land degradation and benefits of land rehabilitation activities 1.Yes 0.No 3 .I do not know

51. Who supported you to be involved in the land management / rehabilitation work? _____
1. GO 2.NGO 3. Local community 4.CBOs 5.Others (specify) _____

52. Did you experience labor shortage on LM related activities? _____ 1. Yes 0. No.

53. If yes, how do you solve the problem of labor shortage?___
1. Hiring labor 2. Debo 3.Others, specify _____

54. Did your household members participate in the rehabilitation of communal land 1.Yes 0.No

55. If your response to Q 54 is not, why?
_____

56. Is there any problem/challenges you faced while undertaking and after rehabilitation activities were undertaken?_____

57. Do you think that the farmers adequately consider future generation in their decision on land management practices?

58. Do you agree that it is possible to use differentiated land use taxation system suitable to reverse the crucial land degradation problems? 1. I agree 2. Strongly agree 3. I disagree 4. Strongly disagree

59. Do you agree that it is possible to encourage conservationist farmers who are adding worth to the land through tax exemption and relief? 1. I agree 2. Strongly agree 3. I disagree 4. Strongly disagree

60. Do you agree that it is possible to discourage land mismanagement through levying high level of land taxes? 1. I agree 2. Strongly agree 3. I disagree 4. Strongly disagree

61. What are your view points on each of the following land management practices_____1? I agree on adoption of Commercial fertilizer, 2.compost 3.Area closure, 4. Manure and other agronomic practices 5.All 6.I am non adopter of all practice

62. **Farmers' Perception on ILMP and Indigenous LMP, (perception direction)**

	Description		**Description**	
1	ILMP technology helps in increasing crop production		Indigenous LMPs useful for increasing maintaining land fertility	
2	ILMP technology reduces the farm		Indigenous LMPs reduces the farm land	

	land size		size	
3	ILMP technology is easy to adopt		Indigenous LMPs is easy to adopt	
4	ILMP need high qualification standard		Indigenous LMPs need high qualification standard	
5	ILMP technology is cheap		Indigenous LMPs is cheap	
6	ILMP reduces loss of soil through erosion		Indigenous LMPs reduces loss of soil through erosion	
7	ILMP technology increases animal production		I Indigenous LMPs increases animal production	
8	ILMP technology is labor demanding		Indigenous LMPs is labor demanding	
9	ILMP reduce land degradation problems		Indigenous LMPs reduce land degradation problems	
10	ILMP good methods for rehabilitation of degraded land		Indigenous LMPs good methods for rehabilitation of degraded land	
11	ILMP technology needs large area		ILMP technology needs large area	

Remark* Fill their response indicated below in the column heading-Households' perception on LM practice 1. Agree 2. Strongly agree 2. Disagree strongly disagree 5. I do not know

63. Do you use ILMP? 1. Yes 0. No .If no, why don't you use LMP? 1. I have no information
2. I thought that LMP is not useful 3.Due to shortage of labor 4. Other (specify)_____

64. Do you believe that the cost of ILMP can be covered by individual households, without external support? 1. Yes 0. No
65. Are you willing to participate in ILMP practice/s covering all cost? ____ 1. Yes 0. No
66. Are you willing to participate in ILMP practice/s on you plot covering part of the costs?_____ 1. Yes 0. No
67. Is there fertility problem on your land? _____1. Yes 2. No
68. What is the quality of your farm land) 1. Not good 2. Medium 3.Good 4. Not option
69. **Perceptions and opinions on the specific land rehabilitation/ management practices**

	Land management Practices	Responses to each item number (of ten years)									
		1	2	3	4	5	6	7	8	9	10
1	Crop rotation										
2	Manure										
3	Composting										
4	Commercial Fertilizer										
5	Area closure										
6	Soil bunds										
	Micro basin										
7	Check Dam										
	Grass strip/establishment										
8	Agro forestry										

9	Fallowing										

1.The practices have potential in terms of fertility maintenances. 1. Agree 2.Strongly agree 3. Disagree 4.strongly disagree 5. Don't know.
2.The practices have effective in terms of protecting soil erosion1. Agree 2.Strongly agree 3.Disagree 4.strongly disagree 5. Don't know
3.The practices have potential to increase productivity.1. Agree 2. Strongly agree 3. Disagree 4.strongly disagree 5. Don't know
4.The practices are difficult to adopt in an integrated manner 1.Agree 2.Strongly agree 3 Disagree 4.strongly disagree 5.Don't know
5.The practices are difficult to transport. 1. Agree 2. Strongly agree 3. Disagree 4.strongly disagree 5. Don't know
6.After you used the practice you household livelihood improved 1. Agree 2. Disagree 3. Don't know
7.After you applied the practice your economy has been deteriorated. 1. Agree 2. Disagree 3. Don't Know/
8.The practices are labor intensive 1. Agree 2. Strongly agree 3. Disagree 4.strongly disagree 5. Don't know
9.It is capital intensive 1. Agree 2. Strongly agree 3. Disagree 4.strongly disagree 5. Don't know
10. The practices affects my healthy and of my family negatively. 1. Agree 2.Strongly agree 2. Disagree 4.Strongly disagree 5. Don't know

Section G: Termite Related Questions

1. Is a termite problem on your plots of lands? _____1. Yes 0. No
2. What type of vegetation termites attack? _____ 1. Crop 2. Grass 3. Tree 4. All
3. List relatively crops and vegetation susceptible to termite attack

No.	Cereal crops	Root crops	Vegetables	Grass species Shrub	Trees
1					
2					
3					
4					
5					

List relatively crops and vegetation that are relatively tolerant to termite attack

No.	Cereal crops	Root crops	Vegetables	Grass species Shrub	Trees
1					
2					
3					
4					
5					

4. When does this termite invasion started to occur in this area_____ and what is the effect of termite on farm land 1.

	Land use	Before infestation	After infestation
1	Grazing land		
2	Farm Land		
3	Forest land		
4	Other		

Key: 1.Not degraded (good) 2.slightly degraded 3. Highly degraded 4 No change

5. How do you control termite invasion in your land? __1.Culturally 2. Through introduced methods 3. Both
6. Tell us the type of ILMP you adopt on your plots of land to mitigate termite infestation _____ 1. Soil band and Micro basin 2.Grass establishment 3. Chemical application 4.Mound flooding. 5. Mound smoking 6. Other (specify)_____

Section H: Land Tenure

1. Did your household register your land and got land certificate?_____ 1.Yes 0.No
2. If you have got land registered and certificate, what are the benefits you get from registering your land in your opinion? _____
3. Do you feel that the land belongs to you and that you will use the farm land throughout your lifetime because you have the certificate? 1. Yes 0. No
4. If yes, do you think your children have the right to inherit the land? ____ 1. Yes 0. No
5. If you feel that the land does not belong to you, what do you think will happen to your land? _____
6. It will be redistributed by the government for other farmers 2. I expect my plot of land can be taken any time by the government for other investment 3. Others, specify

__

7. What if the government brings change in existing land tenure (allows the farmers to sale their land)? 1. Agree 2.Disagree 3.Difficult to decide, 4. No opinion
8. If you agree or disagree why?

_____

9. Do you believe that the current land tenure system is a constraint to use different land management practices to improve your land? 1. Yes 0. No 3. No opinion. Please justify your rsponse_____
10. Do you feel that land certification and registration do bring any change on land management of Individual households? 1. Yes 2 yes 3.I do not know
11. What are, in your opinion, the problems and challenges related to rural land administration and management?

_____

Section I. Credit Market facilities/ Services

1. Are there credit services for land rehabilitation and management? _____ 1.Yes 0. No
2. Do you need credit for conservation strategy of land management at present? _____ 1.Yes 0. No
3. Do you have access to credit for land management practices in this cropping season?___ 1. Yes 0. No

4. Have you used credit for specific land management practices during the last three years? ___1. Yes 0.No

5. For what purposes you mainly borrow money and where are the sources?_____. Mention the amount of credit for you received in 2005 E.C in the table below (the last cropping season)?___

	Purpose of credit	Source of credit	Amount in Birr	In kind (specify)
1	Credit for Livestock rearing			
2	Household Consumption (basic necessity goods)			
3	Purchase seeds/Improved seed credit			
4	Purchase fertilizes/credit			
5	For investment on land management/fertility improvement/ hiring laborers/			
6	For health service (family)			
7	To pay other loans			
8	Other activity, specify			

1. Is the credit services available sufficient (loan size) to use for Land Management/and rehabilitation activities?

2. Is the existing credit interest rate ceilings (increasing borrowing costs) repayment of loan are conducive for using the services?

3. In comparison with that of previous years your access to formal credit in 2004/2005 E.C has: 1 = Improved 2 = Not changed 3 = Deteriorated

Section H. Institutional (Extension) service and related questions

1. Have you ever participated in government agricultural extension package program or got general agricultural extension service_____ 1. Yes 0. No

2. If yes to question 1, complete the following table_____

	Year (E.C.)	Did you participate/ Are you participating in GO extension program 1=Yes 0=No	If yes what were the services you participated in
1	2001		
2	2002		
3	2003		
4	2004		
4	2005		

3. Are there other organizations other than government that provide agricultural extension service in your area? 1.Yes 0.No, If yes to Q3 is yes, Specify the name and service(s) provided by the organization(s) _____

4. Did you get extension services on land management practices in the last year? _____1. Yes 0. No

5. If yes, from where did you get the information on introduced land management practices?

1) From neighborhoods 2) From radio 3) In meeting 4) From model farmers 5) Contact farmers

6) From demonstration 7) from visiting other areas.

6. How many times you have obtained extension education/ advice /Message/ on land management (conservation strategies) last year? _____ _____

7. Have you ever received training on conservation strategies of land management, such as agro forestry, strip grasses, soil bund or others, in the last two years (2004 and 2005 E.C)? _____ 1. Yes 0. No

8. If yes, on which conservation strategy of land management and for how many days?_____ days

9. If yes, do you think the training was helpful for your practical problem? ___1. Yes 0. No

10. Would you please tell me the kind of land management practices that you adopted? _____

11. If no to Q9, why? _____

12. Did you get extension services on land management practices from elsewhere, other than the GOs extension service providers? _____ 1. Yes 0. No

13. From whom did you get most frequent farm advice on LMP technologies?

1. Government DA 2.District experts 3.Opinion leaders' 4.NGOs workers 5. Others, specify_____

14. What are the media used in your area to convey information on agricultural issues including LMP? 1. Radio 2.Television 3.Newspaper 4.Posters/Leaflets 5. Others, specify __

15. Do you have a radio? _____ 1. Yes 0. No

16. Do you listen to radio programs transmitted on agricultural matter?_____ 1. Yes 0. No

17. If yes to Q 16, how often do you listen to farm programs? _____/days/_____per/week_____ / Month

18. If you are able to read, have you had any access to written materials containing agricultural issues? _____ 1. Yes 0. No

19. Did you get written materials about ILMP technologies?____ 1.Yes 0.No If no, why? _____

20. Have you ever been a model farmer? 1. Yes 0. No. If yes, mention when and for how long _____

21. Did you get extension services on improved Livestock Management Practices?

1. Yes 2. No if your answer to the Q21 is yes, fill in the following table

	Type of the Services	Price (if any)	Sources
1			
2			

3			

22. Imperfect information: Is the information you obtain on land management practices are sufficient 1.yes 0 no.

23. Did you use commercial fertilizer for soil fertility maintenance? _____1. Yes 0. No

24. How do you evaluate the effect of the extension services on your productivity and income

_____

25. Do you think that the extension services provided is sufficient and efficient_____
1. Yes 0. No

26. If no to Q 24 what are the major reasons for insufficient delivery of services

_____

27. In your opinion what are the major challenges /constraints to reverse Land Degradation problems and improve the land management? Please list and explain (policy, Agri. Extension/information, natural, social etc.)

_____

28. Do you see any opportunity for the future to improve the land degradation situation in the area? Please list them and explain

_____

Any comment/suggestion you would like to give to improve the land resource management in your village and reverse the land degradation etc.? _____

Close the interview thanking the respondents for their response and cooperation

Name and address of the Investigator:

……

……

Annex 2. Check list for Focused Group discussions and Key informant interview

The questions are produced to understand what the local people's perceptions on land degradation and identify the land management and rehabilitation practices in the area as well as the challenges and opportunities for reversing the problems.

Land degradation, land rehabilitation and management practices

1. What are the major natural resources available in your area?
2. It there land/natural resources (e.g. Forest, soil water) degradation problem in your area (its trend/magnitude)?
3. If yes, what are the major factors for land degradation and there consequences?
4. How do you see the soil fertility status (**land quality)** in your area/?
5. Did the land/natural resources degradation affected agricultural productivity and production
6. What are the measures taken so far to mitigate the land/natural resources degradation?

6.1. By Individual farming households
6.2. By the community –collectively
6.3. By the government
6.4. By NGOs

7. Do you have access to Extension services regarding natural resource managements?
8. Have ever obtained training on land rehabilitation and management practices?
9. What are the methods used to improve the fertility of the soil?
10. What are the indigenous methods used to rehabilitate degraded land
11. Are there introduced land rehabilitation measures?
12. What are the challenges and opportunities with regards to land rehabilitation efforts?
13. Are members of your community aware of the natural resources degradation, causes and its consequences, and its remedies?
14. How many of your households involved in soil and water conservation activities (%)?
15. What is the Perceptions and opinions on the land rehabilitation/ management practice?
16. Is there termite infestation problem in your area and what are its impacts?
17. What are the methods used to mitigate the termite problems in your area?

Land holding and land use Pattern

1. What is the average household land holding size in your area?
2. Are there communal land holding in your area and if yes how did/ do you utilize it and for what purpose?
3. How is responsible for management of the communal land
4. What is the trend regarding the size of land holding in your area?
5. If there is change in the size of land holding, what are the causes for the change?
6. How many of the households in your village have (own) land?
7. Do you think that there are problems that hinder the farming households to invest on their land?
8. If yes, List the problems?

Crop and livestock production

1. What are the major crops grown in your area ?
2. What are livestock types found in your area and for what purpose do you keep them?
3. What is the highest, average and the lowest size of livestock holding your area?
4. What is the trend you observed in the agricultural productivity in your area?
5. If the Agricultural productivity in your area is decreasing, what are the major reasons?

5.1. For Crop production

5.2. Livestock husbandry

6. It there lack /shortage of feed for your livestock and if yes why and what are the causes?
7. Is there enough grazing land for your livestock?
8. Did you get agricultural extension services on crop production?
9. Did you have access to and used agricultural extension services on livestock husbandry?
10. From where do you get agricultural inputs and what are the inputs?
11. Is there shortage /lack of agricultural inputs in your area and if yes why?
12. What are the major problems with regards to crop production?
13. Are there rivers that can be used for irrigation in your localities?
14. Are there irrigation facilities in your area and how many of the HHS uses the facilities?
15. What are the majors grown on irrigation land?
16. What are the agronomic practices used in the area for maintenance of soil fertility in your area?
17. How often the households visit Development agents and what is the distance to the service center?
18. What type of extension services and supports did you get and who provided it for you?
19. What are the responses of the farming households to the agricultural extension service?
20. Are you satisfied with the Extension services provided?

Food security situation

- How is the Food security status of your area and its trends?
- If it is decreasing ,what are the main causes and the consequences of food insecurity
- The most vulnerable members/groups of the community; reasons ?
- Intra-house hold situation, incase of female house headed
- Food sources, and proportion from each sources; seasonal characteristics
- What are Cropping strategies of food insecurity?
- Have you ever received food aids (relief, FFW, EGS, etc)in your area?

Credit facilities/ Services

1. Is there credit services in your area for the farming households
2. How provide the credit service for you?
3. For what purpose did/do you the credit?
4. From where do your community members get credit services?

Markets

1. Are there local markets in the area and what is the distance from your PA on average?
2. Are different inputs for agriculture and natural resource management such as crop grass and tree seeds and fertilizer etc., available on the local markets?
3. How do you compare the price of inputs and services you get with that of your agricultural produces?
4. How do you transport your agricultural produce to the market?

Off Farm and Non-Farm activities

1. What are the main Nonfarm activities in your area?
2. What are the main Nonfarm activities in your area ?
3. What is the percentage of the household involved in full time nonfarm activities in your area?
4. How many households are involved in part time nonfarm activities in your area?
5. How many households participate in off farm activities in your area
6. Who are involved in Nonfarm activities from the household members?
7. What is the trend of the involvement of the households in off farm and nonfarm activities, its reasons?
8. Is the income they earn from off farm and nonfarm enough to earn their livelihood?
9. Why the household involved on nonfarm and off farm activities?
10. If not involved, why are they not involved in nonfarm activities?

Questionnaire for Key informant interview

1. What are the major problems with regards to crop and livestock production in your district?
2. Is there land degradation problem and if yes what are the causes identified so far?
3. Is there termite invasion in your district what do think are the causes of the termite infestation?
4. What are the measures taken to reverse the land degradation problems?
5. Who are involved in the land rehabilitation activities and as of when did they start?
6. How did you observe the perception and participation of the farming household in the land conservation/management activities
7. What are the major land rehabilitation activities undertaken so far?
8. What is the support your office has been providing for the farming community to avert the land degradation?
9. What type of agricultural extension services and inputs your office provided for the farming HHs on natural resource management?
10. Do you think that the service provided were and are sufficient to improve the land degradation problems?
11. Do you have policy with regards to land/Natural Resources management and what is the extent of its implementation what extent?
12. Is there communal land ownership in your district?
13. What are the major problems related to management and utilization of communal lands?
14. What is the trend of cattle population in your district?
15. What are the major problems related to livestock husbandry?
16. Do you think that people are replicating the land rehabilitation practices to their neighboring PAs?
17. If they are not replicating the land rehabilitation practices what hiders them to do so?

18. What are the challenges with regards to mitigation of land degradation?
19. Do you see any opportunity that can be utilized to reverse the situation?
20. If you have more comments and remarks you are welcome

Thank you for cooperation and responses!!!

Annexure 3: Definition of Variables Affecting Farmer's Decision on Land Rehabilitation Practices.

Variable	Type	Definition	Measurement	Hypothesis
Dependent variable				
Land Rehabilitation practices (LRP)	Dummy	Adoption of improved LRPs		
Explanatory variables				

Education	Continuous	Formal schooling of the household head	Grades completed	+
Sex	Dummy	Sex of the household head	1=male, 0=female	+
Age	Continuous	Age of the household head	Years	+
Family size	Continuous	Total family members of the household	Number	+/-
Family labor	Continuous	Economically active members between 15 and 64 years of age in a family	Number	+
Experience	Continuous	Farming experience of the household head	Years	+
Off/non-farm income	Dummy	Participation in off/non-farm activities	1= yes, 0=no	+/-
Farm size	Continuous	Land holding of the household	Hectares	
Slope of farmland		Slope of the Land as perceived by the farmer	1=steep, 2=gentle , 3=flat/plain	+/-
Distance	Dummy	Distance of the plots from home	1=close, 2=far	+
Livestock holding	Continuous	Livestock holding of the household	TLU	+
Termite	Dummy	Level of termite infestation as perceived by the farmers	1=high 0= low	+/-
Land tenure	Dummy	Feeling of tenure security	1= yes, 0=no	+
Credit	Dummy	Access to credit service for LMP/LRPs	1=yes, 0=no	+
Extension contact	Continuous	Contact with extension agents during the survey year	Number	+
Perception	Dummy	Perception about LMPs	1=positive0=negative	+