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THE ROLE OF INDIGENOUS LAND MANAGEMENT PRACTICES TO IMPROVE CROP LAND PRODUCTIVITY: THE CASE OF HALU WEREDA, ILUBABOR ZONE, OROMIA REGIONAL STATE

ARBA MINCH UNIVERSITY, COLLEGE OF SOCIAL SCIENCES AND HUMANITIES DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES MA THESIS

BY

LETA JIMMA DESTA

SUBMITTED TO ADVISERS: YECHALE.K (Ph.D)

TIRFU.K (MA)

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ARBA MINCH, ETHIOPIA

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A THESIS SUBMITTED TO THE DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES, ARBA MINCH UNIVERSITY, SCHOOL OF POST GRADUATE STUDIES

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As thesis research advisor, I hereby certify that I have read and evaluated this thesis research prepared under my guidance by **LETA JIMMA** entitled **"The role of Indigenous Land Management Practices To improve Crop Land Productivity"**: The case of Halu Wereda, Ilubabor Zone of Oromia Regional State. I recommend that it can be submitted as fulfilling the thesis research requirement.

Approval sheet

1. 1. Submitted by:

(PG candidate)	(Signature)	(Date)

2. Examiner

(Name)	(Signature)	(Date)

3. Advisor

(Name)	(Signature)	(Date)

4. Co-advisor

(Name)	(Signature)	(Date)

5. Head Department

(Name)	(Signature)	(Date)

DEDICATION

This thesis is dedicated to my wife **Bizunesh Kelifa** and my families and colleagues for helping me with affection and love and for their partnership in the success of my life.

STATEMENT OF THE AUTHOR

By my signature below, I declare this Thesis is my own original work. I have followed all ethical and technical principles of scholarship in the preparation, data collection, data analysis and completion of this thesis. Any scholarly matter that is included in the thesis has been given recognition through citation. This Thesis is submitted in partial fulfillment of the requirements for M.A Degree in Geography and Environmental Studies at Arba Minch University.

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Phone No. : + 251932025277, + 251954594220

Name: **LETA JIMA DESTA** Signature: **JESUS**

Place: Arba Minch University, Geography and Environmental Studies

Date: May, 2010/2018

ACRONYMS AND ABBREVIATION

ADLI	Agricultural Development Led Industrialization
ATA	Agricultural Transformation Agency
CFW	Cash-for-work
CSA	Central Statistics Agency
DAs	Development Agents
EEPRI	Ethiopian Economic Policy and Research Institute
ESAPP	Eastern and Southern Africa Partnership Program
FFW	Food-for-work
EthiOCAT	Ethiopian Overview of Conservation Approaches and Technologies
FAO	Food and Agricultural Organization
FGD	Focus Group Discussion
GDP	Gross Domestic Product
ILMP	Indigenous Land Management Practices
MOA	Ministry of Agriculture
MOARD	Ministry of Agriculture and Rural Development
NGOs	Non- governmental Organization
PASDEP	Plan for Accelerated and Sustainable Development to End Poverty
SWC	Soil and Water Conservation
WARDO	Wereda Agriculture and Rural Development Office
WOCAT	World Overview of Conservation Approaches and Technologies

BIOGRAPHICAL SKETCH OF THE AUTHOR

The Author was born on September 1, 1979 E.C in Kuyu Wereda, North Shewa Zone, and Oromia Regional State. He attended his elementary education at Dero Danisa Primary School from 19987-1994 E.C and secondary and Preparatory School at Gebre Guracha Senior Secondary School from 1995-1998 E.C. He had joined and attended his higher education at Haramaya University from 1999-2001 E.C regularly and he was graduated in Bachelor of Education in Geography and Environmental Studies in 2001 E.C (2009 GC). He has worked as Social Science Dep't head from 2004-2006 and Environmental Conservation Club Leader from 2007-2008. Presently, he has been working as Geography teacher and Head of Pedagogical Center in Ouka Secondary School, in Ilubabor Zone of Oromia Region. He has joined Arba Minch University, School of Graduate Studies in 2006 E.C to pursue his post graduate studies MA in Geography and Environmental Studies.

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ABSTRACT

Crop land productivity decline affects the livelihoods of rural farmers of Ethiopia as well as a country's ability to produce. Hence, this study attempts to identify the role of Indigenous Land Management practices to improve crop land productivity in Halu Wereda, Oromia Regional State. Samples of 114 respondents were taken using simple random sampling techniques. The both qualitative and quantitative approaches were used. Qualitative data's were analyzed in the form of narration whereas quantitative data were tabulated and the results were summarized in the form of tables, figures. The major finding of this study shown that farmers' decision on the adoption and use of indigenous land management practices can be influenced by a number of socio-economic and demographic characteristics of households, institutional and physical factors. The finding also shows that slope, distance of farm land, soil erosion, population pressure, and poor land management practices affected their crop land productivity. The findings of the study shows that 53.5 % said that their land holding extent was medium, and researcher concluded that most respondents 40.3 % respondents said they work on their land by family labor. About 71.9 % of respondents reported that the distance of farm land plays an important role in influencing farmers' decision to adopt land management practices, in cases a considerable amount of time can be lost in walking long distance. One can also conclude that most respondents (80.7%) said that continuous plowing of the same plot of land causes fertility decline and other 57 % of respondents said that plowing along runoff, 64% said soil erosion causes soil fertility decline. Similarly most respondents (88.6 %) said that continuous cultivation of their land cause yield decline. shows that most respondents and 47.4 % of them said that their agricultural land productivity was decreased over time. The result of the study also shows that 89.5 % and 78 % of respondents said population pressure and land degradation caused the scarcity of land in the study area respectively. So based on the findings the researcher forwarded the following recommendations:-contour farming practices should be practiced for improving water use efficiency of the crop and controlling run off by farmers. It is recommended that comprehensive studies to be undertaken focusing on diversity of the practices, its protection, transfer & integration of indigenous knowledge system in development.

Keywords: *Crop land productivity, factors, Households, Indigenous Land Management Practices, soil erosion.*

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the Study

Land is a very essential element of nature on which all living things directly or in directly depends. Human beings greatly depend on land to produce food, clothing and shelter. For the production of these basic necessities, the natural potential of the land is very important and the production level of land in other way depends up on the care we are giving to it. To provide food, clothing, shelter, transportation, and defense, we have cleared the land and replanted it, rechanneled water ways, and built roads, fortresses, and cities. In addition to this, we have mined the earth's resources, logged entire forests terraced mountainsides, even reclaimed land from the sea. The nature of the changes made in any single area depends on what was there and how people have used the land (Arthur, 2000).

In addition, indigenous knowledge is a valuable national resource to enhance sustainability of indigenous communities to develop and designate land use systems closely inter wined within their culture and well adapted to their ecosystem. There is a need to consider indigenous knowledge as a means to develop situation specific and sustainable soil and water conservation measure, and Studying indigenous knowledge system contribute to gain lessons on enological management, climate change adaption and lead to incorporated indigenous practices with natural resources development to ensure sustainability (Mitiku, 2006).

Natural environment consists of various valuable natural resources such as air, water, soil, forest, and other flora and fauna that are fundamental to the survival of the majority of people in the world. But, these resources are under intense pressure from population growth and poor management practices. Arthur also explained that land resources are becoming increasingly scarce and the quality of resources such as soil, water, plants and animals are decreasing usually because of land degradation and poor land management practices.

Indigenous knowledge is the local knowledge that is unique to a given culture or society. It is the information base for a society, which facilitates communication and decision-making. Indigenous information systems are dynamic, and are continually influenced by internal creativity and experimentation as well as by contact with external systems. It's basis for local level decision making in agriculture , health care, food preparation

,education ,natural recourses management and a host of other activities in rural communities (Warren 1991).

Studies show that, in the densely populated regions of Africa, intensification of agriculture is reducing fallow periods and increasing the farming intensity on cropland. On the other hand, limited access to knowledge of viable land management options, lack of capacity to invest in land especially in management practices, and having less ability to bear risk and wait for future payoffs from investment constrained farmers attempt to improve farmlands. As a result, a major part of agricultural land in Africa suffers from intensive cultivation, steep slopes, poor water control and land management, soil erosion and loss of soil nutrients, and is unlikely to support the growing population (FAO, 2011). Indigenous land management is the key entry point for improving land resource resilience and productivity within the context of the potentially devastating effects of climate change. It is bridging the needs of agriculture and environment, with the twin objectives of maintaining long term productivity and ecosystem functions and increasing productivity of goods and services including safe and healthy food (Tadesse, 2011).

Moreover, soil erosion, soil nutrient depletion and soil moisture stress, is a major problem confronting many East African countries. Several different types of direct economic incentives have been used to develop the ability and willingness of farmers to use soil conservation practices. The most widely used direct economic incentives have been compensation for labor and support with equipment. While the incentives have enabled the construction of massive soil conservation structures and the use of biological means for soil conservation (Gebremedhin, 2008). However, reports indicate that these conservation structures have not been as successful as they could be, because the farmers were not enthusiastic enough in accepting and maintaining the technology (Wood, 1990). The failure of conservation programs partly emerge from the fact that planners and implementing agencies ignore or fail to consider socio-cultural factors as key determinants of the success or failure of conservation programs (Belay, 1992)

Most empirical studies also indicated that, land degradation is particularly severe in the highlands of the East African countries of Ethiopia, Kenya, Tanzania and Uganda. These highlands have high agricultural potential but have been experiencing severe land degradation. Land degradation has been identified as the most severe environmental problem in these countries since the early 1970s (Jones, Gebremedhin 2000).

Similarly, the causes of land degradation in the East African countries can be grouped in to proximate and underlying factors. The proximate causes of land degradation include cultivation of steep slopes and erodible soils, low vegetation cover of the soil, burning of dung and crop residues, declining fallow periods. The underlying causes of land degradation include such factors as population pressure; poverty; insecure land tenure; limited farmer knowledge of improved integrated soil and water management measures; and limited or lack of access to credit. The proximate causes of land degradation are the symptoms of inappropriate land management practices as conditioned by the underlying factors. Hence, efforts for soil conservation need to address the underlying causes primarily, as focusing on the proximate causes would mean addressing the symptoms of the problem rather than the real causes (Jones, 2000).

Ethiopia is one of the countries of the African continent with highest agricultural potential. Its natural resources base is the foundation of any economic development, food security and other necessities of its people. Ethiopia is an agrarian country on which the economy mainly depends in rain fed agriculture. Agriculture provides 47% of the gross domestic product (GDP), 80% of the employment and 60% of the export commodity (World Bank, 2011).

Although Ethiopia has 112 million hectares (1,130,000 km^2) of land with favorable environment and suitable for agriculture, soil erosion which is the most visible form of land degradation affect nearly half of the agricultural land resulting in soil losses of 1.5 to 2 billion tons annually, equivalent to 35 tons per hectare and monetary value of USD 1 to 2 billion per year (Getachew, 2006). A large portion of the agricultural land, which is mainly located in the highland part of the country, is affected by severe to moderate land degradation (Hurni and Yilkal, 2007).

Land management practices in Ethiopia have evolved into various farming systems with different levels of intensification. Indigenous soil and water conservation measures, fallowing, crop rotation, animal manure, burning of crop residues, cut of drain are among the indigenous land management practices used by farmers to protect the soil from erosion and to maintain or restore soil fertility (Tesfaye, 2003; Wegayehu, 2003).

Land degradation in the Ethiopia has contributed to low agricultural productivity, food insecurity, extreme poverty and hunger, as evidenced by recurrent problems of famine and incomes of less than one dollar per person per day (Pender et al, 2001). Indigenous

Land management is then vital activity that required participation of individuals to meet the food requirement of ever increasing population of the country.

1.2. Statement of the Problem

Agriculture is the backbone of Ethiopian economy and it is fundamental instrument for poverty alleviation, food security, and fuelling economic growth of the country in general (Ministry of Agriculture, 2010). However, Ethiopian agriculture and the livelihoods of rural community have been affected by land degradation which is manifested by soil erosion, depletion of soil organic matter, loss of soil nutrient, soil acidification or salinization, deforestation, etc. Soil erosion depletes soil fertility and reduces land productivity which in turn reduces the farm level income of households. Reduction in fertility of soil results in poor water holding capacity of the soil and vegetative growth of crops are limited as a result of decrease in the amount of seasonal rain fall (Pender et al, 2006).

Similarly, soil nutrient depletion has become a major agricultural problem in central high lands of Ethiopia, due to improper land management practices. It is understood that, it is impossible to achieve food security in the region without overcoming the problem of soil nutrient depletion (Pender 2001). Lack of adequate nutrient supply, the depletion of organic matter, and soil erosion are the major obstacles to sustained agricultural productivity. In Ethiopia, the estimated rate of soil nutrient depletion is the highest among the Sub-Saharan Africa which reduces productivity and increases vulnerability to drought and food insecurity. In Ethiopia, agricultural land productivity is being seriously eroded by unsustainable land management practices both in areas of food crop production and grazing lands (Seyoum and De-Stoop, 2006).

FAO by 2005 has confirmed that land degradation is a serious problem in Eastern Africa; more than 14% of its total area suffers from severe to very severe degradation. The average annual rate of erosion on cropland is estimated to be 42 tons per hectare per year which is very much exceeding the soil formation rate of 3-7 tons (Gebremedhin and, 2003; Hurni, 1993 as cited in Behailu, 2009).

As a result, the productivity of land is declining because of inappropriate soil fertility management practices and this is causing great challenge in attaining food security in Ethiopia in general and in the study areas in particular. The potential of land productivity has been deteriorating from time to time due to runoff, topographic variation, and slope,

intensive farming and farming on steep slopes and deforestation which results in loss of soil nutrients and its productive capacity (Gebremedhin, 2008).

Since the 1920's, numerous reports have warned against the disastrous effects of increasing erosion, land degradation, desertification, mismanagement of natural resources due to increasing demographic pressure, and as a result, soil conservation emerged at the end of the 1930's as a central concern in East Africa (Anderson and Thampapillai,1990). In many African countries considerable efforts have been made during and since colonial times to conserve soil and water resources. Yet most soil and water conservation projects in sub-Saharan Africa have failed. A major argument is that what has been constructed often at great expense has seldom been rejected by the beneficiaries. Where adequate maintenance is lacking, conservation works quickly and accelerate erosion instead of reducing it.

As evidences indicates that, remarkable changes have not been taken in terms of sustainable agricultural production and development. According to Teshome (2010) the performance of Ethiopian agriculture has been poor over the last three decades. One of the root causes of this problem is poor and unsustainable land management practices. Similarly, Berry (2003**)** pointed out that the direct costs of loss of soil and essential nutrients due to unsustainable land management is estimated to be about three percent of agricultural GDP or $106 million and the loss of agricultural value between 2000-2010 could be $7 billion, even without taking into account of the indirect impacts of land degradation in Ethiopia.

It is nearly four decades since modern technologies of land management have been introduced in Ethiopia, and over 400 years since indigenous land management measures have been practiced in different parts of Ethiopia. The traditional as well as introduced practices, as matter of fact have been concentrated in the lowlands and mid highlands of the country, which are characterized by low and erratic rainfalls, degraded lands and recurrent failure of crop production (Ministry of Agriculture and Rural Development, 2010).

Ethiopian farmers have long been aware of the problems of soil degradation and have been conservation minded at the level of the farm. However, an extensive work on indigenous knowledge in land management by Kruger, Berhanu, Gebere Michael (1996) shows there is poor record and lack of appreciation of indigenous practices by soil

conservation experts and policy makers. This shows the less attention given to indigenous soil and water conservation by researchers and development agents in Ethiopia.

Studies show that despite the availability of many practices in land management they are highly localized, and are not being expanded to other areas, while land degradation due to soil erosion, forest clearing and burning are advancing at an alarming level. A number of projects and programs have been implemented and financed by local and international NGOs, development partners and various Government Organizations, with varying levels of successes and failures (Ministry of Agriculture and Rural Development, 2010).

To address the problems on the participation of use of soil fertility management practices some empirical studies were conducted. For example, Endrias (2013) conducted study on the determinants of farmers' decision on soil fertility management options for maize production in southern Ethiopia. Desta (2012), on other hand also had undertaken his study on the determinants of farmers' land management practices in south west Shewa zone. However, studies did not largely focused on indigenous land management practices used different soil fertility management practices. Rather they had focused on introduced land management practices. Hence, there was a need to identity what works as well as what determine indigenous and management practices to use different soil fertility management practices in the study areas.

In addition to these, ATA (Agricultural Transformation Agency) is also undertaking duties to improve soil productivity such as developing a digital soil map. For Ethiopia (EthioSIS), developing evidence based fertilizer application and recommendations and establishing fertilizer blending plants (ATA, 2014). In addition to these, it is important to identify socio-economic and demographic factors that determine participation in using different soil fertility management practices to achieve food self- sufficiency because still productivity increase is not as expected and with the pace of population growth rate. Hence, due attention is needed towards maintaining and improving soil fertility. Therefore, identifying indigenous land management practices in improving crop production is helpful for the stakeholders to intervene in the area and contribute towards achieving food security.

In Halu Wereda no concrete studies have been made as an empirical document on the efforts of indigenous land management practices employed by the local residents of the area. Thus sustainable land management in the future will be proved, if indigenous

knowledge and practices are seriously taken into account and integrated with modern measures. This is because establishing modern measures on indigenous knowledge and technologies will provide long lasting solution for the land degradation and soil erosion.
In general, most studies conducted in the country are inclined to introduce/ modern/land management practices. For example: A study conducted in Beressa watershed, by Aklilu (2006) identified those farmers' age, farm size, and perceptions on technology, slope, livestock and soil fertility to have an influence in the adoption of stone terraces.

Another study by Habtamu (2006) focused on the adoption of physical Soil and Water Conservation (SWC) structures in Anna watershed of Hadiya Zone and a few researchers explain importance of indigenous land management practices for carbon sequestration (Abebe, 2011), determinants of farmers' decision on soil fertility management options for maize production in southern Ethiopia (Endrias, 2013), factors affecting farmers land management practices (Mohammed) and Desta,2012 also conducted study on determinants of farmers' land management practices in south West Shewa zone. But what had made the work of the researcher unique here is that, the researcher had explored the various forms of Indigenous knowledge of land management practices in improving crop production generally without specifying on thematic areas of land management practices.
Lastly sustainable soil management technologies and practices, which have been supported by research finding, were not yet as such practical in the farming communities in the study area. Thus, it is important to conduct a research to assess how crop production will be improved through indigenous biological and physical land management practices in the study area.

1.3. Objectives of the Study

1.3.1. General Objectives

The general objective of this study was to assess the major indigenous soil conservation practices in the overall productivity of crop land in the Halu Wereda, Ilubabor Zone.

1.3.2. Specific Objectives

The specific objectives of the study are:

- ✓ To identify the status of indigenous land management practices undertaken by local farmers.
- ✓ To examine the role of indigenous land management practices in improving crop production
- ✓ Asses factors affecting farmers' decision to use land management practices.

1.4. Research Questions

Based on the above specific objectives, the following questions were proposed as basis for the study:

1. What is the status of indigenous land management practices undertaken by local farmers in the study area?
2. What are the roles of indigenous land management practices in improving crop production?
3. What are the factors that affect farmers' decision to use land management practices?

1.5. Significance of the Study

Generally assessing the roles of indigenous land management practices have paramount importance for the improvement of crop production of the study area. So the study will be significant for the followings:

- Increases the knowledge of farmers on the role of indigenous land management practices prevalent in the study area.
- Provides the basis /hint/for planning and role of indigenous land management practices in the district and serves the officials, extension agents, researchers, non-governmental organizations and policy makers to draw analysis on indigenous land management practices used by farmers and the determinants of using various soil erosion management practices to develop appropriate technologies and design effective policies and strategies that enhance soil fertility.
- Gives bases for other researchers who want to conduct studies for further advances in the study area.
- It enables the concerned body and land resources experts to take measures and fight the problem of poor land management practices.

1.6. Scope of the study

Due to financial and time constraints, it is not possible for the researcher to cover the whole aspects of the study area within the available time and resources. It is better to limit the study size and the scope of the problem to a manageable size. Hence, the study will be targeted to four Kebeles of Halu Wereda, (Kidane Mihiret, Yambo, Kersa, Hamuma**),** Ilubabor Zone, of Oromia Region. More specifically, the research explores the indigenous land management practices that the farmers employ in improving crop production

1.7. Limitations of the study

The researcher had encountered problems from different angles. These includes: shortage of time, financial constraints, and the unavailability of documents recorded (data) with regard to the socio economic and demographic data's, and the land management practices being practiced in the study area. The other limitations were farmers' reluctance to provide appropriate response about the size of their plot of land and problem of access to key informants such as head of the Wereda Agricultural and Rural Development office and Development Agents because they were usually engaged in various activities or workshops and trainings. So as to minimize the influences of these limitations, the researcher has tried to tolerate commuting many days to get the officers and as well explained to the farmers that their responses are used only for research purpose**.**

1.8. Organization of the thesis

This thesis was organized in five chapters. The first chapter gives overview of the background of the study, the statement of the problem and what is expected to be achieved by the end of the study. The chapter that follows presents literature review. In this chapter, previous works on the role of Indigenous knowledge on soil and water conservation management were dealt in depth. Chapter three deals with research methodology used in the thesis while chapter four gives data presentation, analysis and discussion of the results. The thesis ends at chapter five by presenting conclusion and recommendations drawn from the study.

CHAPTER TWO

2. LITERATURE REVIEW

2.1. Concept of Land Degradation

FAO (2011) defines land degradation as a reduction of resource potential by one or a combination of processes-including water erosion, wind erosion, a long-term reduction in the amount or diversity of natural vegetation, salinization acting on the land. The problems of land degradation are more serious in tropical regions, where communities' livelihood depend on land productivity (e.g., food production and products from forests) and land and soil resources are exposed to natural constraints (e.g., high annual rainfall and steep terrain conditions). Tropical regions are also home to the poorest communities in the world, where there is a downward spiral between poverty and land degradation: poverty and economic marginalization lead to land degradation and land degradation leads to further poverty (Scherr, 2012).

Land degradation is severe in African countries, particularly in Sub Saharan Africa, where almost all inhabited lands are prone to soil and environmental degradation due to poor land management resulting from population pressure, small farm sizes, land tenure insecurity, land redistribution, limited access to credit and education . The problem is accompanied by the lowest agriculture and livestock yields of any region in the world, while cereal production has grown marginally over the past two decades, more than 70 percent of this growth is due to crop expansion rather than yield increases (Shimeles, 2012).

Land degradation due to soil erosion and nutrient depletion, has become the most important environmental and economic problems in Ethiopia. Land degradation coupled with fast-growing population, falling per capita food production and worsening poverty, policy failures, and social unrest poses a serious threat to rural livelihoods and national food security (Shibru, 2010).

2.2. Nature and concept of Indigenous Land Management Practices

Indigenous knowledge is the local knowledge that is unique to a given culture or society. Indigenous knowledge contrasts with the international knowledge system generated by universities, research institutions and private firms. Its basis for local level decision making in agriculture, health care food preparation, education, natural recourses management and a host of other activities in rural communities. Indigenous knowledge is developed and adapted to gradually changing environments and passed down from

generation to generation and closely interwoven with people's cultural values. Indigenous knowledge is the social capital of the poor, their main asset to invest in the struggle of survival, to produce food, shelter or to achieve control of their own lives (Warren 1991).

Many indigenous people have extensive knowledge in management of natural resources in their farm land. Indigenous people have experimentation and ways of research of knowing, which allow the local knowledge to be innovated in the local practices and systems. Recognizing, empowering and incorporating indigenous knowledge in participatory rural development projects has been consider a means of ensuring socially, environmentally and economically sustainable natural resources management. There is trainable indigenous knowledge which has the potential to be applied to other site. There are transferable to be applied to other sites. Protection of indigenous people and their environment as potential resource managers in a solution towards the threatened ecosystems (Abebe, 2011).

Ethiopia is a tropical country with varied macro and micro climatic conditions in diverse ecosystems in habited with a great bio diversity and has over 80 ethnic groups with such diverse agro ecology,, richness of bio diversity and existence groups, each ethnic group has unique way of managing its ecosystem. Since past development effort in Ethiopia, less attention was given to indigenous practice and farmers competence to solve their problems (Mitiku at el 2006; 26). In Ethiopia, in spite of government and partner's conservation effort, the past decades have witnessed the severe ecological degradation in Ethiopian (EPAE, 1989). The role of indigenous knowledge system in land management practices and its contribution to eco system management has been undermined.

2.3. Approaches to soil conservation

In the course of history of soil and water conservation, in various approaches have been followed. A study carried out for the World Bank has identified *three main approaches* towards dealing with difficulties of land degradation in developing countries, which are neither strictly sequential in their historical development nor mutually exclusive. These approaches include; the classic (technical), populist and neo-liberal approaches (Biot et al., 1995). **The classic approach** takes for granted that the extent and solutions to the problems of land degradation are well known, but the problem is to get people to implement them. It identifies mismanagement of land by users, which are ignorant, irrational and traditional and their subsistence fundamentalism as the core problems in soil and water conservation (SWC) practice. Many SWC projects in developing countries

failed to take into account the factors determining resource users' land management decisions and collapsed shortly after special incentives and subsidies are no longer available. The typical to failures with this approach has been to find "escape hatches", blaming unfavorable weather conditions, lack of cooperation by different governments, lack of political will and lack of cooperation from farmers ((Biot et al., 1995, Million, 2001).

Contrary to the classic approach, the **populist approach** argues that the nature and extent of land degradation are imperfectly understood, that local people often reject conservation technologies for good reasons and in fact adopt their own individual resort to their own practices and adaptations. The idea of this approach calls for site-specific participatory study and design using a multidisciplinary approach by teams of specially trained and oriented natural and social scientists in combination with local farmers and resource users and organizations. Indigenous technical knowledge is being taken seriously and new forms of constructive dialogue between resource users and scientists, for example participatory rural appraisal (PRA) continued to be developed. However, the populist approach is not applied on a widely expanded basis and is unrealizable on a large scale (Ayalneh, 2003).

The **neo-liberal approach** shares some views with the classic with regard to soil and water conservation technology. While assuming problem definition unproblematic, this approach claims that incentive structures motivate farmers to adopt these technologies, through extension. These approaches have influenced a number of projects in several countries, including Ethiopia, by laying foundation for soil and water interventions (Tesfaye, 2003). Nowadays, rural development projects and soil and water conservation projects are mostly guided by the populist approach, with some elements of the neoliberal approach appearing in the process.

2.4. Factors Affecting farmers Land Management Practices

In the real world, there are numerous challenging factors determining the adoption and implementation of land management practices to prevent land degradation and to rehabilitate degraded land. Government policies and programs, socio-economic and institutional factors, farmers' local knowledge and practices, households' endowments of physical and human capital as well as topography, soil type and climate are the most important factors that could influence land management practices (Tadesse, 2011). A study conducted in Beressa watershed, by Aklilu (2006) identified those farmers' age,

farm size, and perceptions on technology, slope, livestock and soil fertility to have an influence in the adoption of stone terraces. Another study by Habtamu (2006) focused on the adoption of physical Soil and Water Conservation (SWC) structures in Anna watershed of Hadiya Zone. This study identified perceptions about soil erosion problems, farmers' attitude to try new technologies, 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 (Habtamu, 2006).

2.4.1. Socio-economic factors

In some studies, negative correlation between age and perception towards environment is observed. For instance according to the study conducted by Desta (2012), age of the household affects decision on land management practices and conservation strategies negatively. Another study conducted by Senait (2002), also shows that age has negative and significant influence on land management, indicating the reluctance of the older farmers to change their farming techniques.

2.4.1.1. Educational status

The literacy status of farmers has a great impact on the general awareness of the adverse effects of environmental degradation. Education increases a person understands of his environment and one's ability to acquire and process information about his environment and to detect changes in it. It also enhances one's ability to identify alternatives and to assess and compare the benefits and costs associated with each of the possible alternatives under different states of nature. The effect of farmers' educational attainment on practicing of structural conservation measures was significant. In fact, higher literacy level of farmers could have brought differences among farmers in practicing structural conservations on their land (Shibru, 2010)

2.4.1.2. Local knowledge and practices

The effect of livestock holding on management decision is difficult to hypothesize (ILRI, 2007). Where credit market is imperfect, livestock wealth may see ease capital constraints and provide security for land users, which may enhance conservation investments. More specialization in livestock away from cropping may, however, reduce economic impact of soil erosion and/ or increase the availability of needed to counter act the need for soil conservation (Keller, 2010). In relation to this Wegayehu (2006), suggested that livestock is generally considered as a measure of wealth and working assets to perform farm operations including conservations.

2.4.1.3. Family sizes

The study conducted by Wegayehu (2006) indicated that in the large families with greater number of mouth to feed, immediate food need is given priority and labor is diverted to off-farm activities that generate food items. However, the reality in terms of structural soil conservation reverses the conclusion, because the practice of structural SWC is optimistically tied with higher labor forces in the household. In other words, when the majority of family members are capable of working (between the age of 15 and 64), structural SWC measures tend to positively correlate with large family sizes. Hence, physical SWC technologies are positively associated with large household sizes significantly.

2.4.2. Institutional Factors

2.4.2.1. Access to information

Access to information and media is an important variable that shape farmers decision on land management and degradation problems. Farmers who had access to media were more aware of land degradation problems than those who did not. Information provision through extension channels increased farmers' awareness on land degradation problems (Aklilu, 2006).

2.4.2.2. Access to agricultural extension and credit services

In the Ethiopian Highlands, agricultural extension has strongly promoted increased use of external inputs such as fertilizer and improved seed and has provided credit to obtain these inputs. Credit is provided in kind and must be repaid immediately after harvest; failure to pay often brings harsh punishment, including expropriation of oxen and other property and imprisonment (Aklilu and Alebachew, 2009).

The results from community surveys in Tigray and Amhara, Pender *et al.* (2006) found that the impact of credit on land management depended on the source and terms of credit and type of technology promoted. Credit obtained from the Bureau of Agriculture was negatively associated with the use of fallow, manure, and compost but positively associated with tree planting (Pender *et al*., 2006).

2.4.2.3. Land tenure and security

The current land policy in Ethiopia is based on the notion that land is both a factor of production, contributing to growth, and an essential element in providing for the welfare of the population. Under the 1995 constitution of FDRE, land is state property and farmers have use rights over the plots they farm (Endris, 2006). Based on nationally

representative survey data, Belay (2010) found that the impact of tenure insecurity on adoption of land management technologies varied across types of investments.

Similar to these Ayalew *et al*., (2009) noted that farmers' lack of tenure security has given them insufficient incentives for sustainable land husbandry on their fields. Their research showed that higher tenure security would increase investment and agricultural growth. They recommended that the government significantly strengthen land tenure by: (1) allowing rights on a continuous basis for a long enough period to provide incentives for long-term investment, (2) removing the uncertainty of tenure by assuring the holder that rights will not be arbitrarily taken away, and (3) providing the holder freedom to use, dispose, or transfer the asset without interference from others, with support from the courts.

2.4.2.4. Government policies and programs

Government policies and programs at many levels may influence income strategies and land management and their implications for production, resource conditions, household income, agricultural extension, technical assistance programs, land tenure policies, and rural credit and savings programs affect awareness, opportunities at the village or household level (Pender *et al*., 2006).

2.4.2.5. Labor organization

A study by Wegayehu (2006), found a positive correlation between investment in labor organization and adoption of land management practices. Labor-sharing group pay a role in determining adoption on improved land management practices. Households who are member of labor sharing group are more likely to adopt improved land management measures than those who are not.

2.4.3. Physical factors

2.4.3.1. Farm size

Earlier studies conducted by EEPRI (2002) indicate that farmers with larger farm size were less likely to be engaged in long-term land management practices. Insecurity feeling of farmers with greater holding was presented to be justification for the negative effect of large farm size. Another previous study indicates farm size to have positive and significant influence on adoption of Introduced stone terraces, but the same study identified farm size to have significant negative influence on continued use of introduced stone terraces (Aklilu, 2006).

2.4.3.2. Slope of the land

Slope increases the probability of using improved soil conservation and land management technologies. It implies that farmers are inclined to invest conservation practices where their farm plots are located in higher slopes. This is due to expectation of more benefits from conservation and high rate of soil loss on steeper slope farm plots than others. This means that on sloppy plot the impact of soil erosion would be more visible to the farmers and this force them to construct appropriate measures and take remedial action. This suggests that conservation efforts should target areas where expected benefits are higher, like on the steeper slopes, in order to encourage use of conservation technologies (Asefa, 2009).

2.4.3.3. Climate

The types and intensity of the management practices to be implemented at a given plot of land depends on the nature of the climate and topography where the land is located. Farmers have a long record in adapting to changes in rainfall and temperature over time. Future changes in the climate could have significant impacts on agriculture that will challenge farmers to adapt to changes in land management practices, land use, commodity production and its location (Girmay 2008).

2.5. Adoption of the Soil Conservation Measures in Ethiopia

2.5.1. Vegetative or Biological Soil Conservation Measures

Biological soil conservation measures include; vegetative barriers, agronomic and soil fertility improvement practices, which help in controlling surface runoff, reduce soil losses and improve productivity. Agronomic measures are practiced as the second line of defense in erosion control exercise while mechanical/physical measures are primary control measure and are often considered as reinforcement measures (Ministry of Agriculture, 2001)

2.5.1.1. Strip cropping

The practice is useful for controlling soil erosion in areas where cropping system is dominated by row (sparsely populated) crops. If the first strip of crop is a row crop or a crop, which is susceptible to erosion such as sorghum and maize, the second crop should be a crop that effectively controls soil erosion. Hence, if the first strip is maize or sorghum, the second should be forage/food legume that forms dense ground cover. Maize and sorghum are soil depleting crops while the legume is soil enriching. Other crop that can effectively control the impact of raindrops and runoff can be grown in alternate strips with crops such as maize and sorghum. On poorly drained soils, it can result in water

logging. Strip widths vary with the severity of erosion, but are generally between 15 and 45 meters.

2.5.1.2. Intercropping

The aim of intercropping is to increase productivity of the land and to protect the soil against erosion. The intercrop stand makes better use of the available environmental resources. Intercropping reduces the problem of soil erosion. If properly applied intercropping could be a solution to low crop yield and soil erosion in row crops. Fodder legumes tend to produce more biomass than food legumes and the amount of nitrogen fixed is proportional to their biomass. The inclusion of forage legumes in intercropping increases the level of atmospheric nitrogen utilization. Nitrogen will be available to the main crop from root and nodule decay of intercropped leguminous crops (Ministry of Agriculture, 2001).

2.5.1.3. Crop Rotation

It is a valuable traditional practice, which plays an important role in maintaining ecological stability and improving agricultural productivity. If the same crop is grown on a piece of land year after year, the soil nutrient depletes sharply and as a result yield decreases. Nevertheless, if different crops are rotated, the depletion of soil nutrient and the decline in crop yields is minimized. Crop rotation maintains or improves productivity as a result of improved fertility of the land and reduced pest/diseases problems. Different crops vary in their response to different pests and diseases. Some crop are resistant to some pest and disease including weeds, while others are susceptible. Sorghum is more susceptible to the parasitic weed than leguminous crop (e.g. chickpea) and oil crop (Ministry of Agriculture, 2001).

2.5.2. Physical soil Conservation Measures

Soil management practices refer to the practices, which improve the physical, chemical and biological properties of the soil for enhancing germination, establishment and crop growth. Whereas the agronomic soil conservation practices contribute to the restoration and maintenance of soil properties. Soil organic matter management and conservation tillage practices are key tools in soil management practices (Ministry of Agriculture, 2001).

2.5.2.1. Contour cultivation

Contour cultivation and planting is a practice of plowing land and planting crops along a contour line. Carrying out cultivation and planting on the contour reduces soil erosion from slope. In dry areas, contour cultivation can be adjusted to standard ridge and furrow

system to make it effective in controlling soil erosion and moisture conservation in dry areas. The most effective way to reduce soil erosion and conserve soil moisture is by minimizing the rate of runoff (Ministry of Agriculture, 2001).

2.5.2.2. Mulching

Mulching is the covering of the soil with crop residues such as straw, maize or sorghum stalks or standing stubble. The cover protects the soil from raindrop impact and reduces the velocity of runoff. Maintain crop residues or mulches on the farm controls effectively soil erosion and have considerable potential for the restoration and maintenance of soil fertility**.** Mulching is one of the most effective methods to minimize erosion. A crop residue covering the ground intercept raindrop impact, preventing splash erosion, low down the water flows and increases the infiltration rate and worms to take holes into the ground, thus increasing the permeability of the soil (Ministry of Agriculture, 2001).

2.6. Overview of Conservation Approaches and Technologies in Ethiopia

Considering this, the Ministry of Agriculture and Rural Development in collaboration with the World Overview of Conservation Approaches and Technologies (WOCAT), CDE of the University of Berne, initiated the Ethiopian Overview of Conservation Approaches and Technologies (EthiOCAT) network. EthiOCAT was established on a National Workshop conducted in Nazareth, in 2001. The Ministry of Agriculture was given the responsibility by the workshop participants to coordinate the activities of EthiOCAT. EthiOCAT was established with a vision of supporting conservation planning and implementation by providing information on land management: needed by planners, extension workers, researchers, educationists and policy makers by establishing a database and producing reports, overview books and maps. The objectives of the Network are to: help realize sustainable soil and water management in making local experience available at other localities and provide data and information needed by various actors for planning and implementing sustainable land management practices.

Many organizations supported EthiOCAT's activities in providing financial, material and technical support. These included: The Eastern and Southern Africa Partnership Program (ESAAP), WOCAT and WFP. ESAPP has provided the biggest proportion of the project financing, WOCAT provided close technical support and backstopping and WFP provided computers to EthiOCAT coordination and permitted the use of the existing computer facilities in the regions. The Ministry of Agriculture and Rural Development

provided all the other supports including office, office facilities, manpower engaged in the coordination, data collection and management including transport facilities.

EthiOCAT's activities started in training regional facilitators in June 2002 from Tigray, Amahara, Gambela, Dire Dawa, Harari, Somali, Oromiya and SNNPR. Following this field practical training was given to 78 specialists and Sustainable Land Management Project SLM technical staff who participated in the actual data gathering in the field from 2002-2007. The information collected by various contributors was continually updated and checked for quality and coherence. The use of incentives for soil conservation has perhaps been most widespread in Ethiopia, a country where land degradation is also most severe among the East African Countries.

The Ethiopian policy makers had largely ignored the problem of land degradation until the 1970s, after which national efforts for soil conservation expanded rapidly. Compensation for labor, especially in the form of food-for-work (FFW), and in some cases Cash-for-work (CFW), has been the main direct economic incentives used for soil conservation in Ethiopia. Apparently, the 1974 drought provided the initial motivation for the mobilization of rural labor force for conservation in the country using FFW programs. In addition to FFW and CFW programs, tree seedlings distribution at minimal prices for private use, and free of charge for use in community lands, has been another direct economic incentive used for soil conservation in the country.

Despite the rich indigenous knowledge of soil conservation throughout Ethiopia, the FFW-based soil conservation programmes were aimed at promoting "new" or "improved" soil conservation practices, which were based on little prior research and scientific base. The programmes were fundamentally top-down, with little involvement of local beneficiaries. Moreover, the programs focused on promoting conservation practices on community lands, with minimal consideration given to individual farms. The lack of prior research and scientific base of the soil conservation programs was also manifested by the little consideration given to conservation needs at the watershed level. As a result most farmers considered the FFW projects as sources of employment with little connection to the objective of soil conservation in the long run.

The difficulties encountered by the Ethiopian programmes during their initial stage of implementation led to the realization of the need for beneficiary participation in the planning and implementation of conservation programmes and projects, including the

adaptation of conservation technologies to local conditions. As a result several participatory approaches were used for soil conservation. However, the extent of farmer participation and the impact of these approaches on adoption of conservation practices were limited, as real involvement and participation of farmers could not be realized.

Alongside the effort by the government organizations, NGOs have also been very active in the area of soil and water conservation in Ethiopia. About 42-58% of all NGOs operating in Ethiopia has been involved in soil and water conservation. However, the approach used by the NGOs has largely been based on compensation for labor and technical assistance, which is basically the same approach used by the government programmes. As in most government programs of soil conservation, beneficiary involvement and participation in the planning and implementation of the programs and projects run by NGOs has also been limited.

The use of indirect incentives for soil conservation in Ethiopia has been very low. Although the government extension service included sustainable natural resource management as one of its activities, in practice, the focus largely remained on improved crop and livestock production. The major bottleneck for soil and water conservation in Ethiopia has perhaps been the lack of land tenure security of farmers. Agricultural land in Ethiopia belongs to the state and farmers have only usufruct rights. Several researchers have documented that insecure land tenure is an important factor inhibiting farmer investment in soil conservation practices (Gebremedhin et al., 2003; Alemu, 1998). However, no significant efforts have been made to improve land tenure insecurity in Ethiopia until recently.

Another indirect incentive that has been used since about 1996, especially in the northern highlands, is the distribution of communal degraded lands for private tree plantation. This policy assumes that farmers would have better incentives to conserve the soil, and plant and care for tree seedlings, if the plantation is for private (rather than communal) use. The experience to date indicates that such policy can in fact produce encouraging results, perhaps reinforcing the argument of many researchers for the need to improve land tenure security of farmers as an incentive for farmers to invest in soil conservation (Alemu, 1998).

2.7. Policies towards soil conservation in Ethiopia

Polices related to land, the most important resource for the rural poor and of the national governments at different time played an important role in land management in Ethiopia

(Wagayehu, 2003; Bekele, 1998). During the feudal regime, prior to 1974 revolution, land tenure system made tenants to be subject to insecure land tenure, and expropriation of large portion of their product and labor by landlords. This created disincentive for adoption of soil conservation (Wagayehu, 2003). Furthermore, the agricultural sector in general and the peasant agriculture in particular did not get the policy attention it deserved due to the focus of the country's development plan on industrial development agenda.

According to Dejene (1990), the first two five year plans (1957-62 and 1962-1967) gave priority to large scale commercial farms and exportable crops. The third five year plan (1968-1973) put much emphasis on high input package programs to be implemented in few high potential agro-ecological areas where quick return was expected (Dejene,1990). Small farmers that cultivate almost all-agricultural land and who are complained to be agents of soil degradation, and areas that did not promise return in short term but susceptible to soil degradation, failed to get policy attention. Therefore, policy attention towards industry combined with complex system of land tenure variously dominated by absentee landlords, local administrators, church estates and forms of private and freehold tenure hindered the effort to conserve land (Campbell, 1991).

The military regime that took over in 1974 proclaimed land reform. The reform abolished feudal land tenure system and eliminated large holding, landlessness and absentee landlordism. Although this was expected to improve the situation and provide incentive for investing in soil and water conservation, it could not succeed triggering adoption of conservation practices. This was because, these reforms were later liquidated by misguided policies and ardent socialist orientation. For instance, until the late 1980s, agricultural input and output marketing remained under state monopoly while prices were fixed below the free market level (Wagayehu and Lars, 2003).

Policy support for credit, input distribution, output marketing, and extension was mainly targeted towards cooperatives and state farms that jointly accounted for only 10% of agricultural production (Bekele, 1998). Therefore, the economic system that was pursued focused on collectivization, nationalization of natural resources including agricultural land, coercive promotion of service cooperatives and producers cooperatives, the establishment of state farms, imposition of production marketing quota, state intervention in marketing and pricing, and forced villagization rather created disincentive and resulted

in opposite outcome by decreasing security of land tenure and the profitability of agricultural investment (Wagayehu, 2003).

Despite the fact that the reform policy enabled many landless peasants to gain access to land, the state ownership of land and insecurity of usufruct rights hindered utilizing the full potential of the reform. After overthrow of the military regime in 1991, the current government has made changes in economic policy. Some regarded the change introduced by the current government as going in opposite direction compared to that of military regime. The government further strengthened the changes that have been taking place following the announcement of mixed economy in March 1990, which includes, de-collectivization, dismantling of producers‟ cooperatives and liberalization of grain trade (Wagayehu, 2003).

Unlike in the previous governments, agricultural sector in general and smallholder in particular received policy attention in the current government from economic development strategy the country has been pursuing. Since mid of 1990s, the government has embarked on development strategy known as ADLI. The strategy revolves around agriculture mainly on the improvement of smallholder productivity and expansion of large-scale commercial farms. Along with this, different policies and strategies that favor proper use and management of agricultural land through use of different conservation and rehabilitation mechanisms and rational use of country's land resources have been embarked so far. These policies and strategies include Rural Development Policy and Strategy (MoARD, 2002), Food Security Strategy (MoARD-FSD, 2002), New Coalition for Food Security Program (MoARD, 2003), Natural Resource and Environment Policy, and Land Administration and Use, Forest Conservation and Development Policies. These policies and strategies are expected to restore incentives for improved land resource management.

Nevertheless, consistent with the military regime, land and other natural resources remained under state ownership but farmers‟ are granted only the right to usufruct and the option of periodic land redistribution remained open. This ADLI and other policies the country is currently pursing could not overcome cyclical famine, and starvation engendered by land degradation and drought. Because of this, land tenure arrangement has been topic of heated debate among scholars and politicians on whether the arrangement provides incentive or disincentive on increasing land productivity and land improvement (Wagayehu, 2003).

2.8. Theoretical Frame Work

Land degradation takes place at different scales due to poor management practices and population pressure. These can be soil erosion which is the most important components of land degradation. Soil erosion is a reduction in soil depth and fertility. It is caused by erosion (soil removal, loss of nutrients), reduced soil water holding capacity and excessive exploitative use of the land (cultivation of steep slopes, shallow soils, tillage, overgrazing, encroachment of forests closed areas, and others). In addition Land resources degradation occurs due to deforestation, reduction of water sheds, physical factors like topography, extent of rain and institutional factors such as land tenure, (Lakew D.2005).

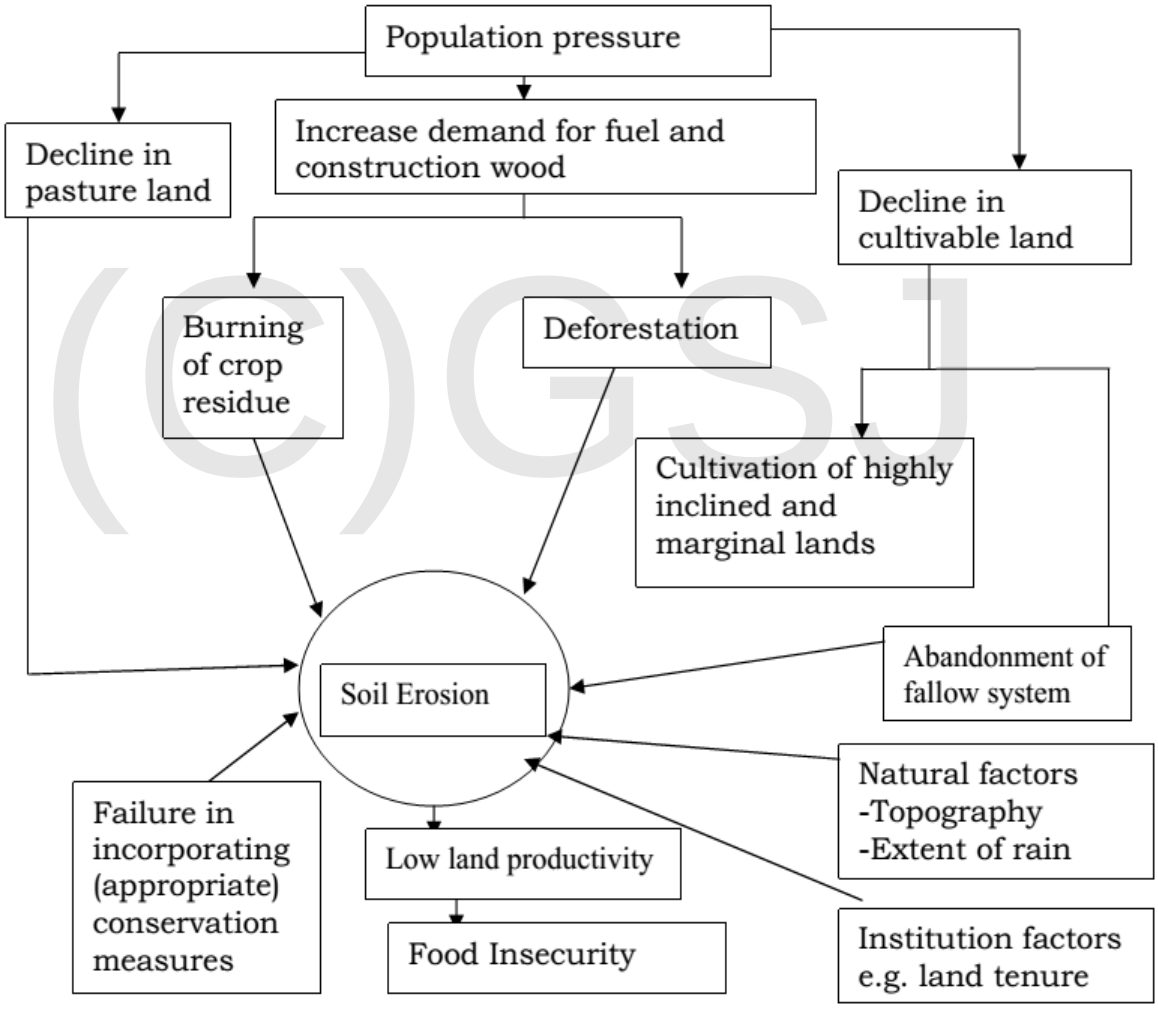

Fig. 2.1 Schematic Presentation of Cause and Effect of Land Degradation Due to Poor Land Management Practices

Adopted from: (Abera, 2003

CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1. Description of the Study area

3.1.1. Location

Halu Wereda is found in Ilubabor Zone, Oromiya National Regional State in South Western part of Ethiopia. It is located at about 645 km from Addis Ababa in South West direction on the way to Gambella regional state main road. Astronomically it is located at **8°0′00′′N__′8°21′00′′N** latitude and **35°8′30′′E__35°30′30′′E** longitude (Halu Wereda Agricultural Office).

Relatively Halu Wereda is located at west of Alle Wereda (Gore town), north West of Nono Salle Wereda, North of Didu Wereda, and East of Bure Wereda. Bure Wereda is the last Wereda bordering Gambella Regional state next to Halu Wereda. Some area of Baro low lands lies in the area and Baro River crosses the region.

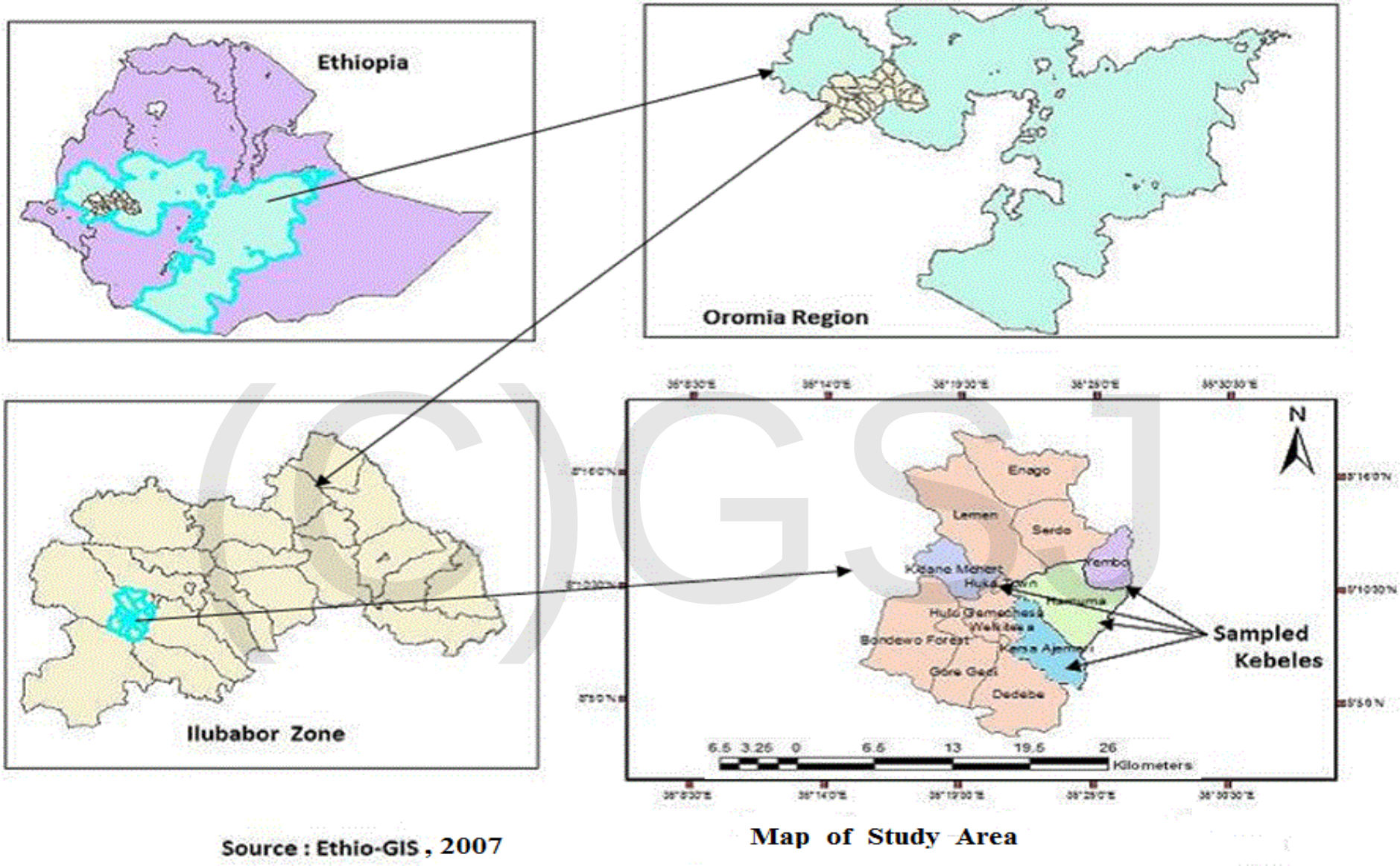

Fig.3.1. Map of Study Area

3.1.2. Ethnic Background

There are different ethnic groups living in the region including those who come from different regions by resettlement programs made by the past and the current ruling party of the country. The resettlement programs were strongly made by the Derg government due to the environmental hazards like drought and others took place in their mother/ heart lands/.

The Ethnic groups of the region are: The Oromos, Amhara, Tigre, Agaw, Megenger, Guraghe, and others. Of this the Oromos, Amharas, Tigres are the dominants respectively. The people of the region spoke different languages, example Afan Oromo, Amharic, Tigrigna and rarely the others.

Afan Oromo is the wider spoken language of the region followed by Amharic. The working language of the region is Afan Oromo. The sex composition of the region is almost balanced sex distribution, i. e is the males are a little bit abundant than females, i.e males **(14,680)** and females **(13,157).** Which means the sex ratio in the region is ***112: 100*** (Male to Female) (Halu Wereda Agricultural office, 2016).

3.1.3. Physical Characteristics

3.1.3.1. Topography

Halu Wereda is characterized by different land forms within high lands and low lands. Topography of the study area is characterized as flat, gentle slope, steep slope, very steep slope and hill. It is highly dominated by rugged topography that greatly affects the constructions of roads to connect the district with the neighboring.

The elevation of Halu Wereda ranges between1200ms to 1800ms above sea level. The district has different types of reliefs like mountain, valley, gorge, hills, knoll, plain, plateau, etc and water bodies, rivers like Baro, Ouka, Hoffa, Yatu, and Dimtu are also found in the study area *(*Halu Wereda Agricultural office, Water Office, 2016).

Table 3.1: Topography of the Study Area

No	**Topography**	**Area/ km ^{2}**	**% coverage**
1	Plain area/ gentle slope	7,624	28.67
2	Steep slope	12,750	47.99
3	Very seep	4,947	18.62
4	Others	1322.61	4.72
Total		**26,567.61**	**100**

Source: (Halu Wereda Agricultural office, 2018)

3.1.3.2. Soil Type

FAO, classified the soil of Ethiopia into 18 major soil groups based their characteristics. Of these the most important soil of the Zone, including the study area is Nito soil, which is essential for coffee plantation and cash crop production. Fluvi soils are also common in the lower courses of the river (FAO, 2010). The farmers practice traditional method of maintaining soil fertility like fallowing, crop rotation and, contour plowing, mulching, grass strip, residue management, minimum tillage (Halu Wereda Agricultural and Rural Development Office Report, 2016).

3.1.3.3. Climate

Due to the rugged topography the district experiences three agro-ecological zones, Woina Dega, Kolla and Bereha covering 15%, 68%, and 17% of the total area respectively. The distribution of the rainfall varies from season to season as other parts of the country. The study area gets rainfall almost throughout the year except for two to three months. Based on the meteorological data collected for 21 years' rainfall and temperature records from Ouka station, the mean annual rain fall of the Wereda for 22 years is about 1,669.18 mm, while the total annual rainfall of the study area ranges between 1236- 2200m.

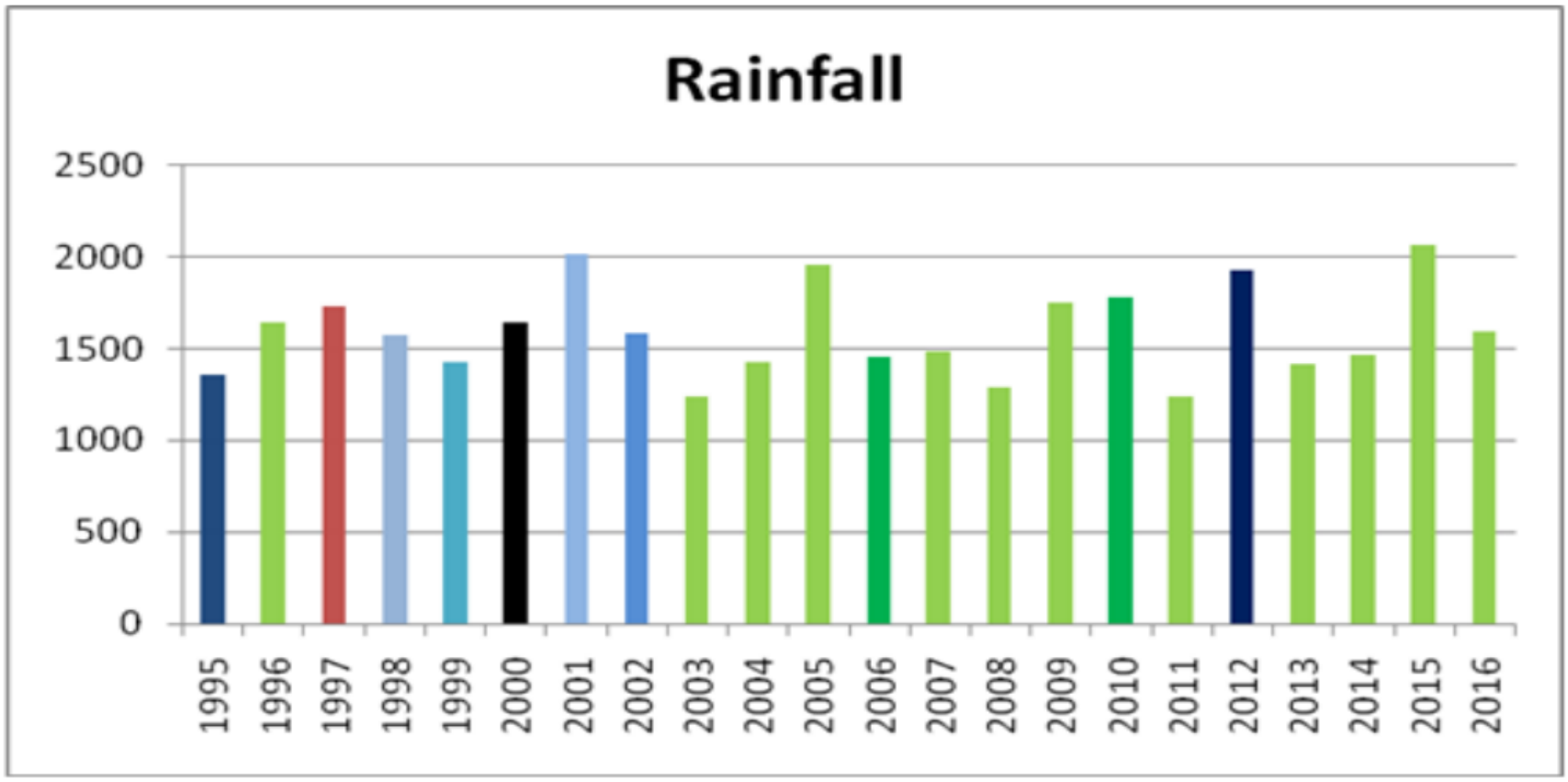

Figure 3.2: Total annual rain fall at Halu station (1995-2016)

(National Metrological Center, Mettu Branch, 2018)

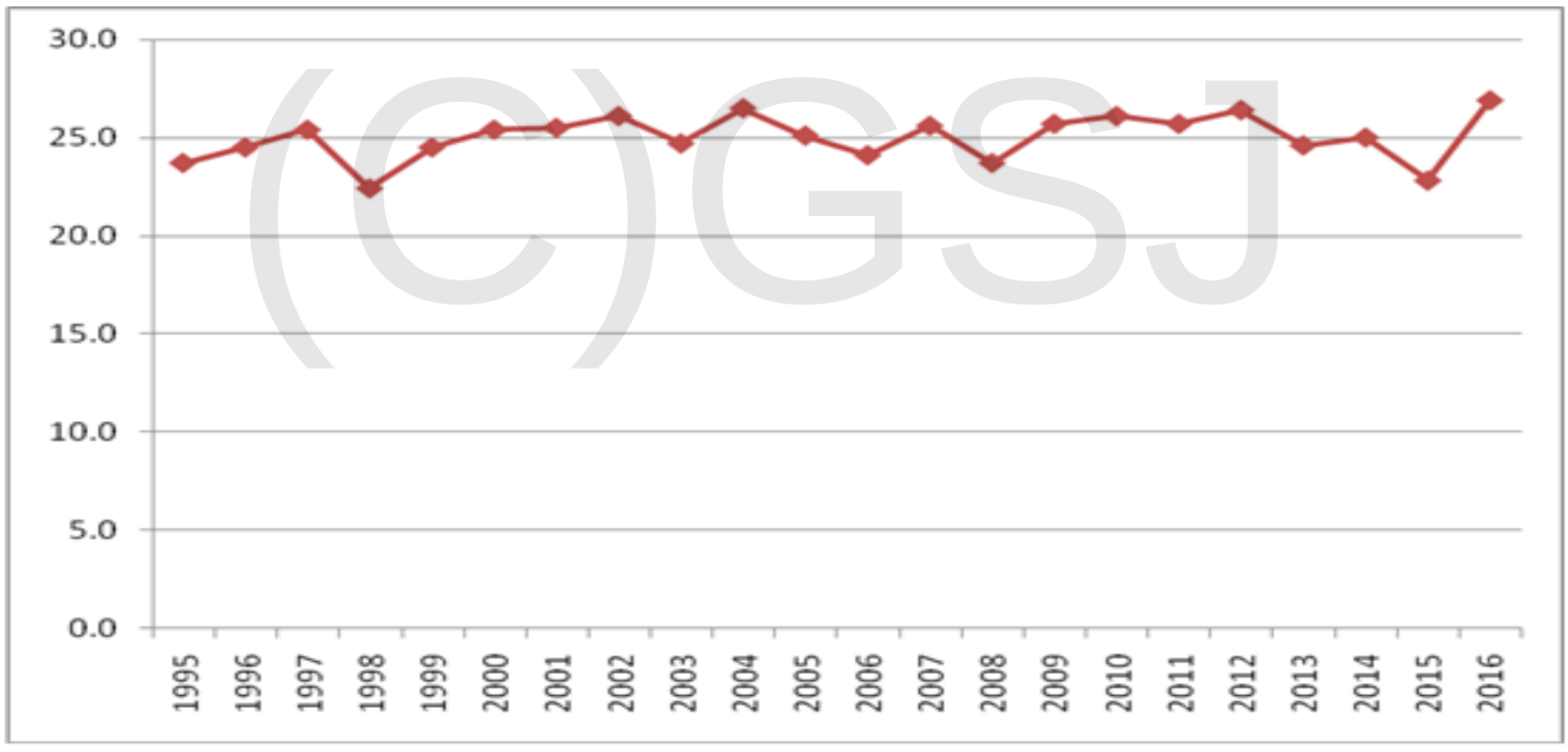

Figure 3.3: Mean annual temperature at Halu station (1995-2016)

(National Metrological Center, Mettu Branch, 2018)

3.1.3.4. Vegetation

The study area is known for it's a dense natural vegetation cover some 15 years ago, where remnant natural vegetation of a country is expected to be existed. But currently the area is under severe pressure of deforestation and land degradation, because of population increase and their encroachment in forestlands which are converted into farm lands especially in untouched low land areas of the Wereda.

This intensive destruction of natural vegetation had occurred during the last quarter decades according to Wereda agricultural office. Continuing increase in population pressure results not only due to natural increase in local population but also from the migration of adjacent lowland farmers. Such population increment declined the crop productivity at the lowland areas, which forced the continued expansion of cultivation in steep slopes, often involving the clearance of native upland vegetation. The loss of vegetation cover has caused increased soil erosion, biodiversity loss and ultimately reduced the water flows in streams and rivers.

Deliberate burning, clearing of forests for expansion of agricultural lands and fuel wood collection are some of the factors for the removal of natural vegetation in the study area. The remnants of some indigenous tree species and natural vegetation are found along the banks of river, streams and at the top of the hilly areas and in coffee plantation since it needs forest shadow. Eucalyptus is the dominant tree species widely planted in the middle altitude of the Wereda. Currently, most farmland and roadside areas are under Eucalyptus plantation. Farmers prefer to plant eucalyptus tree than other indigenous species due to its economic importance as a source of income from sale of wood as construction materials and fuel wood.

However, the Eucalyptus negatively affects the soil fertility and water potential of the Wereda, since natural vegetation is being an open access resource and it is exposed to misuse and over exploitation, upland soils have been subjected to misuse and unsustainable for farming practices that have resulted in land degradation. The uplands are being eroded and their nutrients depleted, resulting in soil instability and permanent damage. As the land resource base becomes less productive, food insecurity and competition for resource increases. Halu Wereda had good different types of forest coverage previously. But nowadays the available natural vegetation coverage is very small and only 25.9 % (6882) of the Wereda is covered by forests.

Table 3.2: Forest coverage from each kebeles of the Wereda

No	Name of kebeles in the Wereda	Forest coverage of the area in km^2	Percent
1	Halu	516	7.49
2	Leman	229	3.32
3	Gore Gidi	538	7.8
4	Kersa	377	5.47
5	Gemechisa	117	1.7
6	Hamuma	472	6.86
7	Sardo	310	4.5
8	Welkitessa	2500	36.32
9	Kidane Mihiret	146	2.1
11	Didibe	879	12.78
12	Enago	670	9.7
13	Ouka	118	1.7
Total Coverage		**6882**	**100**

(Source: Rural Land and Environmental protection Office of Halu Wereda, 2018)

3.1.3.5. Land Use

The total area of the Wereda is estimated to be 26,560.61 Km^2. This total land is classified to arable land, grazing land, forest land, settlement and others which are yet to be classified according to the data obtained from Wereda Agricultural Office, 2016.

Table 3.3 : Different land use type in the study area

No	Land Use Type	Area/ Km^2	% coverage
1	Arable land	15,563.725	58.6
2	Grazing land	1086.125	4.1
3	Forest land	6882	25.9
4	Bushes and shrubs	1012.25	3.8
5	Urban land settlement	336	1.3
6	Others	780	2.94
Total		**26,560.61**	**100**

Source: Halu Wereda, Agricultural Office 2018

3.1.3.6. Water Resources

The study area is mostly located at the highlands of the country and receives high rainfall during rainy season, which begin in late April, and ends in early November. Before some 20 years, the area was known in water resource potential, but currently water is becoming scarce. Due to land degradation caused by declining of watersheds, steep slope cultivation, deforestation for expansion of agriculture and plantation of Eucalyptus tree on

farm land and, along river and stream bank at the middle altitude area also causes water depletion.

During the dry season, some streams and wells are dry out or the volume of water reduces significantly due to clearance of vegetation cover at the upstream areas of the watershed. This indicates that surface runoff and soil erosion is increased and reducing the annual recharge of the ground water.

Table 3.4 Water resources of the Region

No	Types of water	Quantity(No)	Annual	Perennial
1	Rivers	10	10	-
2	Streams	20	9	11
3	Reservoirs	3	-	3
4	Deep well	2	2	-
5	Shallow well	22	22	-
Total		**57**	**43**	**14**

Source: Halu Wereda Water Resource Office, 2016

3.1.4. Socio-Economic Conditions

3.1.4.1. Population

According to the Weredas' Agricultural office annual report on the house hold socio economic profile of 2016, the total population of Halu Wereda is **27,837,** where (**14,680)** are males and **(13,157)** are females. Out of the total population **5,615** (20.17 %) are residing in urban areas, whereas **22,222** (79.83 %) are rural dwellers.

Table 3.5. Total population and Households of the Halu Wereda

No	Kebeles Name	Family Heads			Family Members			Total		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
1	Halu	286	84	370	869	926	1795	1155	1013	2168
2	Leman	450	65	515	694	1103	1797	1144	1168	2312
3	Gore Gidi	214	36	250	550	548	1098	764	584	1348
4	Kersa	271	58	329	806	983	1789	1085	1042	2127
5	Adere	475	140	615	848	1227	2075	1323	1365	2688
6	Hamuma	375	133	508	671	945	1616	1046	1056	2102
7	Sardo	312	88	400	840	667	1507	1152	754	1906
8	Welkitessa	133	12	145	332	304	636	465	516	981
9	Yembo	136	24	160	273	406	679	411	430	841
10	K/ Mihiret	350	85	435	1000	979	1979	1350	1064	2414
11	Didibe	314	64	378	964	763	1727	1278	827	2105
12	Enago	175	14	189	518	523	1041	693	537	1230
13	Ouka	331	153	484	2483	2648	5131	2814	2801	5615
Total		**3,822**	**956**	**4,778**	**10,848**	**12,022**	**22,870**	**14,680**	**13,157**	**27,837**

Source: (**Field Survey, 2018**)

3.1.4.2. Agriculture

Agriculture is also common in the area which focuses on the production of crops like maize, millet and other root crops like potatoes, cabbage, onion, etc. But the major cash crop of the area which shares the largest economic life of the people of the region is coffee. Almost 70% of the people of the region depend on the production of coffee as their livelihoods. Since most of the region is classified under highlands people practice mixed type of farming i.e. crop production and animal rearing/ husbandry/.

Potential arable land accounts for about 58.6 %, which is currently under annual crop cultivation. On the other hand, grazing land, and forest land constitute 4 % and 25.9 % respectively. The major crops produced dominantly in the study area are cereal crops such as, maize, sorghum, Millet and some amount of pulses and oil seeds. The production of these crops depends on rain fed agriculture on seasonal basis. Land clearing is commonly practiced from March to April which is the beginning of the raining season. The rain starts at the middle of March and ends in November.

3.1.4.3. Non- agricultural Activities

The people of the region also practices non- agricultural activities like shopping, hoteling, trading different goods in the markets and participate in other micro-economic activities. Secondary and tertiary economic activities are the recently introduced economic activities of the region since the urban center of the town called Uka is at its infancy stage in development.

However, due to rapid enter linkage of transport routes that joins most Kebeles, trade became common practice among the people of the region. The major trading commodity is coffee. There are also credit institution that serves the rural communities under the heads of Wereda Credit and saving institution. Rural people also started to use Bank by opening their own accounts for saving in addition to Ekub and Iddir. There are nine Peasant cooperatives which have a total of **512** members. Out of this 452 are males while the remaining 60 are females. But in a sampled Kebeles named: Halu, Kidan Mihiret, Yembo, Kersa, and Hamuma, there are five peasant cooperatives having **215** males and **32** female's members.

Table 3.6: Cooperative members of farmers in sampled Kebeles

No	Kebeles	Members of Farmers Cooperatives			
		Male	Female	Total	%
1	K/Mihiret	48	3	51	23.7
2	Yembo	36	4	40	18.6
3	Kersa	70	5	75	34.9
4	Hamuma	41	8	49	22.79
	Total	**195**	**20**	**215**	**100**

Source (Field Survey, 2018)

3.2. Research Designs

The researcher had used mixed research design which had incorporated both qualitative and quantitative research methods using sequential transformative design (using more of qualitative and less quantitative design). The main reason for using qualitative approaches was that it was framed using words/ theories to explain data's for open ended questions, interviews, Focus Group Discussion, observation, and data. While quantitative approaches allowed testing of theories, control for alternative explanation and builds protection against bias.

Therefore, a mix of quantitative and qualitative approaches was ideal because it had provided the quantifiable impacts as well as on explanation of the process and relationships that yield the expected out comes.

3.3. Data sources

The primary data were collected through distribution of both open ended and closed ended questionnaires and semi-structured interviews because the researcher has a list of issues and questions, in which the direction of questions were changed and asked additional questions. FGD were conducted with model farmers and kebele administrators. Interview was conducted with agricultural office experts and extension workers. Field observation was conducted to gather information about indigenous land management practices from farmers. It is also helpful to identify if there was communication gap between farmers and extension workers.

The researcher also had accessed secondary data from different published and unpublished sources such as books, journals, and research reports, magazines electronics media, official statics and reports.

3.4. Sampling Technique and Sample Size

The researcher purposively selected four Kebeles out of 13 kebeles because the indigenous land management practices were not similarly practiced by farmers of the Wereda. Since the practices are limited to a certain kebeles, the researcher selected purposively four kebeles (Kidane Mihiret, Yembo, Kersa and Hamuma), where indigenous land management practices are dominantly seen. Then using based on the work of *Kothari, 1990*, the researcher calculated the sample size, which was about **114**. Then codes were be given for each household of sample kebeles (1432) and respondents were selected using simple random sampling techniques / l*ottery method* / to take sample from the population of the representative samples. There are 13 kebeles in Halu Wereda, which had a total of **4,778** house hold heads, and with **1432** household heads of sampled kebeles. Therefore, a representative sample size with known confidence and risk levels was selected, based on the work of Kothari, 1990. Because using Kothari formula lowers the sample size which helps to save the researcher's time.

$$n = \frac{Z^2 pqN}{e^2(N-1) + Z^2 pq}$$

Where n = Sample size

Z= is vales of standard variant at 95 % confidence interval (Z= 1.96)

N = is the total number of House Holds (**1432**)

P = is proportion of sampled population (0.03)

e = 0.03 (since the estimate should be within 3% of the True vales)

q = 1- p

$$n = \frac{Z^2 pqN}{e^2(N-1) + Z^2 pq}$$

$$= \frac{(1.96)^2 \text{ x } 0.03(1-0.03) \text{ x } 1432}{(0.03)^2 \text{ x } (1432-1) + (1.96)^2 \text{ x } 0.03\ (1.0-0.03)}$$

$$= \frac{160.084}{1.39969056}$$

$$= \underline{\underline{114}}$$

Table: 3.7 Population size of Households and sample size of the randomly selected Kebeles

No	Kebeles	Total House Holds	Sample Size	Percentage
1	K/Mihiret	435	35	**31**
2	Yambo	160	13	**11**
3	Kersa	329	26	**23**
4	Hamuma	508	40	**35**
Total		**1432**	**114**	**100%**

Source: (Halu Wereda Agricultural Office and own computation, 2018)

So, based on the above researcher's computation, Kidane Mihiret 35 (31 %) house hold heads, Yambo 13 (11 %) house hold heads, Kersa, 26 (23 %) house hold heads and Hamuma 40 (35 %) house hold heads were randomly selected.

3.5. Methods of Data Collection

3.5.1. Questionnaire

Regarding the household survey, structured/questionnaires were used because respondents are free from biases of the researcher, answers are in respondents' own words, the flow of ideas is quick and from many people. In addition they were low cost in terms of money and time.

So both open and closed ended questions were designed to get information on the assessing role of traditional land management practices from respondents. Since farmers in the study area speak Afan Oromo, questionnaires were initially prepared in Afan Oromo for them and translated to English for analysis and interpretation. Closed ended questions enabled the respondents to select one option that meet their own views while, open-ended questions were designed to give alternatives to the respondents to express their feelings and perceptions concerning the problem under study.

3.5.2. Key informant interview

The purpose of interview was obtaining more information to strengthen the responses that were gained through questionnaires. Semi-structured interview were conducted due to its flexibility for researcher's to raise new question and ideas based on the response of the interviewee and the researcher might change the direction of questions. Again new ideas were raised and additional questions were asked in the study area. So interview was conducted with extension workers and agricultural Experts**.** To avoid language barriers the interview were conducted in Afan Oromo and finally translated into English for analyzing and interpretation.

Table 3.8: Sample of Agricultural Experts, Extension workers for interview

No	Kebeles	Agricultural Experts	Extension workers	Total
1	K/Mihiret		1	
2	Yambo		1	
3	Kersa		1	
4	Hamuma		1	
Total		**3**	**4**	**7**

3.5.3. Focus Group Discussion

For the focus group discussion (FGD), the researcher had selected a total of **25** participants from model farmers who are known to have better knowledge on the present and past environmental, social and economic status of the study area. The purpose of FGD was to get insights on and understand the determinant of land management practices in the study area. So the researcher had conducted four FGD in the study area which consisted of six up to seven members, having a total of **25** people. FGD composed of model farmers 25-65 years old both male and female were included and the time for discussion is one hour (**1:00 hr**.) for each groups.

Table 3.9 : Sample of (Model farmers & Kebeles administrators) FGD

Respondents	Names of kebeles				Total
	K/Mihiret	Yambo	Kersa	Hamuma	
Model farmers	5	6	5	5	21
Kebeles administrators	1	1	1	1	4
Total	**6**	**7**	**6**	**6**	**25**

3.5.4. Field observation

Structured observation, which is largely qualitative, had made as supportive or supplementary technique to collect data to fully understand the realities on the ground, particularly the nature of land degradation and land management practices. Therefore, the investigator has conducted observation in the study area by using standardized checklists to support the data that were collected by other methods.

3.6. Data Analysis

In analyzing the data obtained from primary and secondary sources, both qualitative and quantitative techniques were applied. The qualitative data were gathered through field observation, focus group discussion and interview were analyzed thematically and presented in the form of narration and used as supportive data to the main questionnaire.

Whereas, quantitative data that were generated from the questionnaire were tabulated and summarized by using percentage, frequencies and mean.

3.7. Ethical considerations

The researcher first asked permission from agricultural office Bureau to conduct study in the area before questionnaire distribution for respondents. To avoid any psychological harm, questions were framed in a manner that is not offensive and disturb their personality. They were assured that the information they had provided would be kept confidential. To ensure this, the researcher had removed information that requires identification of names of respondents. Furthermore, the first page of the questionnaire displayed an opening introductory letter that requested the respondents' cooperation to provide the required information for the study.

To conduct a valuable research and to create good relationship with the societies in the study area all action that was taken by the researcher considered the societies indigenous knowledge, cultural and social aspects, language and religions. The right dignity and worth of the people were the main thing that the researcher gave much emphasis.

While the distribution of questionnaires and conducting an interview the researcher had considered the age of respondent and voluntary and appropriate argument were made. If there were reluctant groups who didn't care for what the researcher was doing, while conducting the distribution of questionnaires, interview, FGD, responding, the researcher simply listened to their ideas, views whatever they were responded and had rejected the unnecessary responses after the data's were gathered.

CHAPTER FOUR

4. DATA PRESENTATION, ANALYSIS AND DISCUSSION

In this chapter the investigator attempted to interpret the data gathered from sample household heads, key informants and participants of focus group discussion by employing questionnaire, semi-structured interview and FGD guide respectively. Additionally some relevant data gathered through field observation were incorporated. Efforts were made to display the data by using tables, bar graphs and pie charts. Finally the author has tried to support the results with relevant local studies.

4.1. Socio Economic and Demographic Characteristics of Sample Respondents

Table 4.1. Demographic Characteristics of Sample Households

Characteristics	Description	Frequency	%
Age	16-25	10	8.8
	26-35	31	27.2
	36-45	18	15.8
	46-65	55	48.2
	Total	**114**	**100**
Sex	Male	90	78.9
	Female	24	21.1
	Total	**114**	**100**
Family size	1-3	13	11.4
	4-6	41	36.0
	7-9	44	38.6
	10-12	16	14.0
	Total	**114**	**100**
Marital Status	Single	8	7.0
	Married	102	89.5
	Divorced	4	3.5
	Total	**114**	**100**
Educational level of respondents	Cannot read and write	87	76.3
	Primary education (1-8)	21	18.4
	Secondary education (9-12)	6	5.3
	Total	**114**	**100**

Sources: Field Survey, 2018

As shown in the above Table 4.1 the proportion of sex structure 90 (78.9 %) of the household heads were male while the remaining 24 (21.1 %) were female. So the samples of females from the four sampled kebeles were 24 female. This indicates that the majority of the household heads were males. The majority of age groups of the sample households were between 46 and 65 years which account for 48.2 % followed by age group between

36 - 45 years which equates to 27.2 %. The remaining 15.8 %, 8.8 %, was accounted by 26-35 and 16-25 years groups respectively. Farmers with longer farming experiences are expected to be more knowledgeable and skillful in managing their land. This in turn enables them to use various strategies of management earlier than a farmer with short farming experience. The above analysis indicates that most respondents were experienced farmers. Therefore, the study area had relatively better potential of experienced farmers who could participate in indigenous land management practices.

Similar to the other rural regions of Ethiopia, the study area is characterized by large family size. Accordingly, about 38.6 % of respondents had a family size between 7- 9. Those respondents with family size between 4-6 accounts for 36 %, and 14 % had family size between 10 -12. While the remaining 11.1 % own between 1- 3. Having large family size could result in high age dependency ratio and also demands more land for agriculture so as to support themselves. Such circumstances in turn brought about land degradation as concluded by Shibiru, (2010).

Contrary to this, since land management practices are more of labor intensive, large family size with mature labor force has been found advantageous for proper implementation of indigenous land management as revealed by results of focus group discussion. Education is one of the basic human needs that all human beings deserve for the proper understanding of social, economic, political and natural environments in which an individual lives. In this study, with regard to the educational background of the respondents, as we can see from Table 4.1, about 76.3 % of the household heads are illiterate.

The researcher finds out that the lands owned by illiterate respondents were poorly managed than lands owned by literate farmers. Whereas 18.4 %, 5.3% of the respondents had 1-8 and 9-12 grades respectively. The above result tells us that the majority of the respondents had low level of educational qualification which could be a challenge for adoption of indigenous land management practices. So that, education has positive relationship with implementation of indigenous land management practices. The effect of farmers' educational attainment on practicing of structural conservation measures was significant. In fact, higher literacy level of farmers could have brought differences among farmers in practicing structural conservations on their land (Shibru, 2010).

The duration of time the land users have been living in the study area as it was summarized from FGD was as follows: Most of the participants said they have been

living in the study area between 25 and 40 years. The others were dwelling for the years between 41 and 65, and none of them were living in the study area for less than 20 years. Key informants disclosed that the longer the people live in an area, the more they can understand the physical and socio-cultural characteristics of the area. Furthermore, results of FGD and field observation portrayed that most of the people who lived longer duration in the study area have developed indigenous land management practices such as application of manure, grassed waterway, mulching, crop rotation, terracing and so on.

4.2. Ways of acquiring land, Landholding, factors affecting the practices of ILMP

One of the institutional factors that influence agricultural growth and rural transformation in a country is the property rights structure. The legal framework for rural land acquisition, transfer, redistribution, depriving of the holding right, administration and security in Ethiopia is provided by the 1995 Constitution and Proclamation No. 456/2005. Both the Constitution and the Proclamation promise that every citizen who wants to be engaged in agriculture for a living, whose age is 18 or greater, be given land free of cost. The subsequent regional proclamations, regulations, and directives are part of the legal framework that provides operational details. All the legal frameworks clearly state that the right to ownership of land is vested in the state and the public. Hence, it is impossible to sell or exchange land holding in Ethiopia. Peasant farmers, pastoralists, and semi-pastoralists who are engaged in agriculture or wish to engage in agriculture only have use rights. Finally, land administration is the responsibility of regional governments (Getnet and Mehrab, 2010).

Transfer of the land use right in the form of inheritance and donation is allowed only to the right holder's family members who are residing in the rural Kebele and are engaged in or wish to engage in agriculture. This means those who are residing in other rural Kebele, non rural residents, and those who do not want to engage in agriculture do not have the right to get rural land through donation or inheritance (Getnet and Mehrab , 2010).

On the other hand, others argue that private ownership of land can be considered as an incentive towards sustainable land management rather than a necessary condition, and hence it may or may not affect farmers' decision to invest on land management and their choice of land management practices (Woldeamlak, 2003).

Table 4.2 Respondents response on ways of acquiring land

Means of Acquiring Land	Frequency	Percent
Government policy of 1970's land distribution	14	12.3
Inheritance	55	48.2
Gift from parents/ relatives	33	28.9
Rent	12	10.5
Total	**114**	**100.0**

Sources: Field Survey, 2018

Regarding land ownership on table (4.2) most respondents 55 (42.8 %) reported that they had acquired their current land through inheritance. while 33 (28.9 %), 14 (12.3 %), 12 (10.5 %) acquired through gift from parents, government policy of 1970's land re-distribution and rent respectively. Participants of FGD said that their current lands were mostly acquired during government policy of 1970's, when Derg government redistributed using a slogan **"Land to Tiller" (Lafti Qote bulaaf, መሬት ለአራሹ").** Before Derg came to power most lands were under the controls of **"Abbaa Lafaa** (**ባለ ርስት**) and farmers were servants of them. But the Derg government had taken and re-distributed for farmers. FGD analysis indicated that inheritance of lands from parents or relatives resulted into land fragmentation because those who inherit the lands might be large in numbers. Most respondents acquire lands from their families/ relatives/ from generation to generation. Some others acquire the lands for short period of time/ years, i.e by rent, which may be for 1-5 years or above.

According to (CSA, 2005), land availability often influences farming practice, and affects the land degradation process. Most of the agricultural land in the study area has so far been subdivided into the smallest land holdings as it was come down from generation to generation in a form of inheritance and gifts, that are no longer economically viable for smallholders‟ subsistence. Farmers in the study area cannot expand land holdings because the frontier is limited.

It is argued that farmers' decisions to investment on land management activities as well as their choice and implementations of land management practices are affected by tenure security. Some argue that private ownership is vital, because it encourages farmers to invest on and opt for efficient and lasting land management practices (Belay, 2000).

Table 4.3 Respondents response on barriers to cultivate their land

Items	Frequency	Percent
It is sloppy	91	79.8
It give poor yield	102	89.5
Some are used for grazing	52	45.6

Sources: Field Survey, 2018

As shown on the above table (4.3) most respondents 102 (89.5 %) said that their land give poor yield. while 91 (79.8 %) of respondents said slope is the most barriers to cultivate their land, and 52 (45.6 %) said most of their land was used for grazing which affects them not cultivate their land respectively. People of the study area; plough their land continuously without any rest for long period of time which resulted in decline in soil fertility causing the land to give poor yield.

Studied also confirmed that steep slopes together with the farming practice that do not include conservation measures are the major causes for soil erosion in much of Ethiopia's highland areas. Population pressure and soil erosion in the areas are important causes for declining of arable lands. The productivity of arable lands in the highlands is decreasing due to the washing away of the fertile top soil by water erosion. The increasing population and pressure of over cultivation and over grazing accelerated soil erosion. Heavy tropical precipitation falling on areas of thin vegetation is causing a marked increase in soil erosion In addition to the fertile top soil; erosion washes seeds sown and applied fertilizers. Soil fertility is declining most rapidly and resulted in low crop yields and livestock numbers that led to reduced food security and increased poverty in the highlands of Southern Ethiopia. According to Pound and Ejigu Jonfa (2005), causes of soil fertility decline in the area are clearing of forests, removal of crop residues from the fields, land fragmentation, overgrazing, low fertilizer inputs, inadequate soil conservation, cropping of marginal lands, poor soil management, and increased pressure on land due to increased population and reduced in livestock number and therefore manure.

Fig. 4.1. ILMP on sloppy area where the land is infertile, field survey, 2018

Table 4.4 Farm distance from homestead

Items	Frequency	Percent
< 5 minutes' walk	10	8.8
6 to 10 minute	25	21.9
11 to 20 minutes' walk	42	36.8
21 to 40 minutes' walk	15	13.2
Over 40 minutes' walk	22	19.3
Total	**114**	**100.0**

Sources: (Field Survey, 2018)

As table 4.4 shows that the distance of most respondents from their home to cultivated land was 11 to 20 minutes' walk i.e. 42 (36.8%) , while 25 (21.9%) said that they walk between 6 to 10 minutes'. The remaining 22 (19.3 %), 15 (13.2%) and 10 (8.8%), were walk over 40 minutes, 21 to 40 minutes' walk, and less than 5 minutes' walk respectively. Distance from plot 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 land management practices. In this study, the researcher identified the distance of plots from home was assumed to have a negative relationship with the adoption of indigenous land management practices. Studies conducted in Ethiopia by Bekele and Holden (1998) in central highland and Wegayehu (2003) in the eastern highland noted a negative relationship between distance of a plot from dwelling and indigenous land management practices 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. Even if the respondents said that the distance of farm land affects them, but the researcher identified that most land of the respondents were closer to their home i.e not almost more than 40 minutes which had no as such impact on land management practices.

Table 4.5 Extent of respondents Land Holdings

Items	Frequency	Percent
More than enough	3	2.6
Just enough	33	28.9
Medium	61	53.5
Too small	17	14.9
Total	**114**	**100.0**

Sources: (Field Survey, 2018)

The above table 4.5 shown that 61 (53.5 %) said that their land holding extent was medium, while 33 (28.9 %), 17 (14.9 %) and 3 (2.6 %) of the remaining respondents said that just enough, too small, and more than enough respectively. From FGD with kebele administrator, most of them reported that the extent of land holding was good. They explained to researcher that the problem is the management practices rather than land holding size. They also explained that some farmers did not care about land management, while others strictly manage their lands.

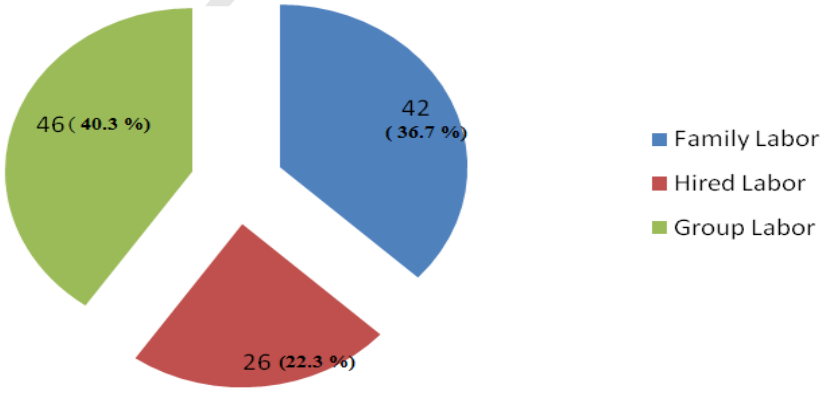

Fig. 4.2 Types of labor used:
Source: (Field Survey, 2018)

From Fig 4.1.2 the researcher conclude that most respondents 46 (40.3) respondents said family labor, 42 (36.7) said hired labor and 26 (22.3 %) said group labor. Based above figure most respondents practice family labor. Family labor is the type of labor in which people participate on their farm land with their family members, while hired labor **("Kontrat")** is labor in which people work on the land of others for limited period of

time i.e. for one or two years by paying them a certain money. From FGD and key interviews analysis, those respondents who participate on the land of others by "Kontrat'' did not care about land management practices because it is not his land. Lastly some others exercise group labor in which people work on land with collective neighboring (Debo).

Belay, 2000, argued that those farmers' decisions on land management activities as their choice and implementations of land management practices are affected by tenure security. Some argue that private ownership is vital, because it encourages farmers to invest on and opt for efficient and lasting land management practices. On the other hand, others argue that private ownership of land can be considered as an incentive towards sustainable land management rather than a necessary condition, and hence it may or may not affect farmers' decision to invest on land management and their choice of land management practices.

4.3. Factors affecting decision to use indigenous land management practices

Ethiopia is an agrarian country on which the economy mainly depends in rain fed agriculture. Agriculture provides 47% of the gross domestic product (GDP), 80% of the employment and 60% of the export commodity (World Bank 2011). Agriculture is mainly in the highlands and is predominantly based on mixed-crop-livestock farming (Haileslassie et al., 2005). The livelihood of the vast majority of the population depends directly or indirectly on this sector. Such dependence obviously leads to increased vulnerability of the economy to problems related to land degradation (Wegayehu, 2003). Most farmers are poor and operate at subsistence level, and investment for intensification of agriculture is not well developed in the country. This has created a vicious circle of low productivity. Land degradation reduces the production potential of the land and this, in return, makes it difficult for farmers to produce enough and invest in protecting the land. Although land provides a means of livelihood for the majority of the population, land resources are facing increasing degradation mainly due to erosion (FAO. 1986).

Generally, the Ethiopian agriculture is characterized by low productivity (Spielman *et al.*, 2011). Crop yields under farmer cultivation are over 50% less than those obtained under improved conditions (Belay and Abebaw 2004). The erosion hazard is aggravated by nutrient mining by crops, extended farming to sloping areas, shortened fallow system, and decreased vegetative cover, depletion of soil organic matter and mismanagement of crop lands. The general consensus is that the exhaustive nature of the farming system in

Ethiopia accompanied by environmental crisis (erosion, drought and deforestation) caused a sharp decline in soil fertility of arable lands throughout Ethiopia (Amsalu and de Graaff, 2006).

To mitigate land degradation problems in Ethiopia, the government has taken different soil and water conservation measures. Soil conservation in Ethiopia is therefore not only closely related to the improvement and conservation of ecological environment, but also to the sustainable development of its agricultural sector and its economy at large. Nevertheless, the rate of adoption of the interventions is considerably low. Space occupied by soil and water conservation (SWC) structures, impediment to traditional farming activity, water logging problems, weed and rodent problems and huge maintenance requirements are some of the reasons that cause farmers refrain from SWC works. In addition, top down approach in the extension activity, focusing mainly on structural soil and water conservation technologies, and land security issues contribute much to the failure of SWC works (Mitiku et al., 2006).

Table 4.6 Factors affecting respondent's decision to use land management practices

Items	Frequency	Percent
Sex	21	18.4
Age	43	37.7
Farm size	9	5.3
Family size	74	64.9
Education	17	14.9
Distance from farm plot	82	71.9
Extension services and training	38	33.3
Slope of the farm plot	97	85

Sources: Field Survey, 2018

On table 4.6 most respondents (71.9 %) said that the distance of farm land plays an important role in influencing farmers' decision to adopt land management practices, in cases a considerable amount of time can be lost in walking long distance. Households near to their farmstead spent more time and labor on their farms and use conservation strategies to increase the fertility of their land. Nevertheless, those who are far from their farmland are in less practice of land management practices due to time and cost of labor mobility. From this, one can conclude that the distance of farm plots from the homestead negatively affect farmers' decision to use of certain land management practices.

Table 4.6 shows that most respondents (85 %) reported that slope had impact on land management practices. Slope was one of the factors affecting soil conservation and land management practices. It implies that farmers are forced to invest conservation practices where their farm plots are located in higher slopes. This is due to expectation of more benefits from conservation and high rate of soil loss on steeper slope farm plots than others. This means that on sloppy plot the impact of soil erosion would be more visible to the farmers and this force them to construct appropriate measures and take remedial action. This suggests that conservation efforts should target areas where expected benefits are higher, like on the steeper slopes, in order to encourage use of conservation technologies (Asefa, 2009).

Slope as the farm attributes aggravates soil erosion and land degradation. It affects farmers' decision on adoption of land management practices as different landscapes need different land management practices. To this end, Wegayehu (2003) concluded that slope affects farmers' decision to adopt conservation structures. From this one can conclude that slope characteristics of households' farm plots have a significant influence on their decision to adopt and use land management practices. From the following contour map drawn from (Ethio GIS, 2007) findings by researcher, the slope of Halu Wereda is steeper/ sloppy/ and moderately steeper. So one can prove that the steepness of the slope affects the farmer's indigenous land management practices.

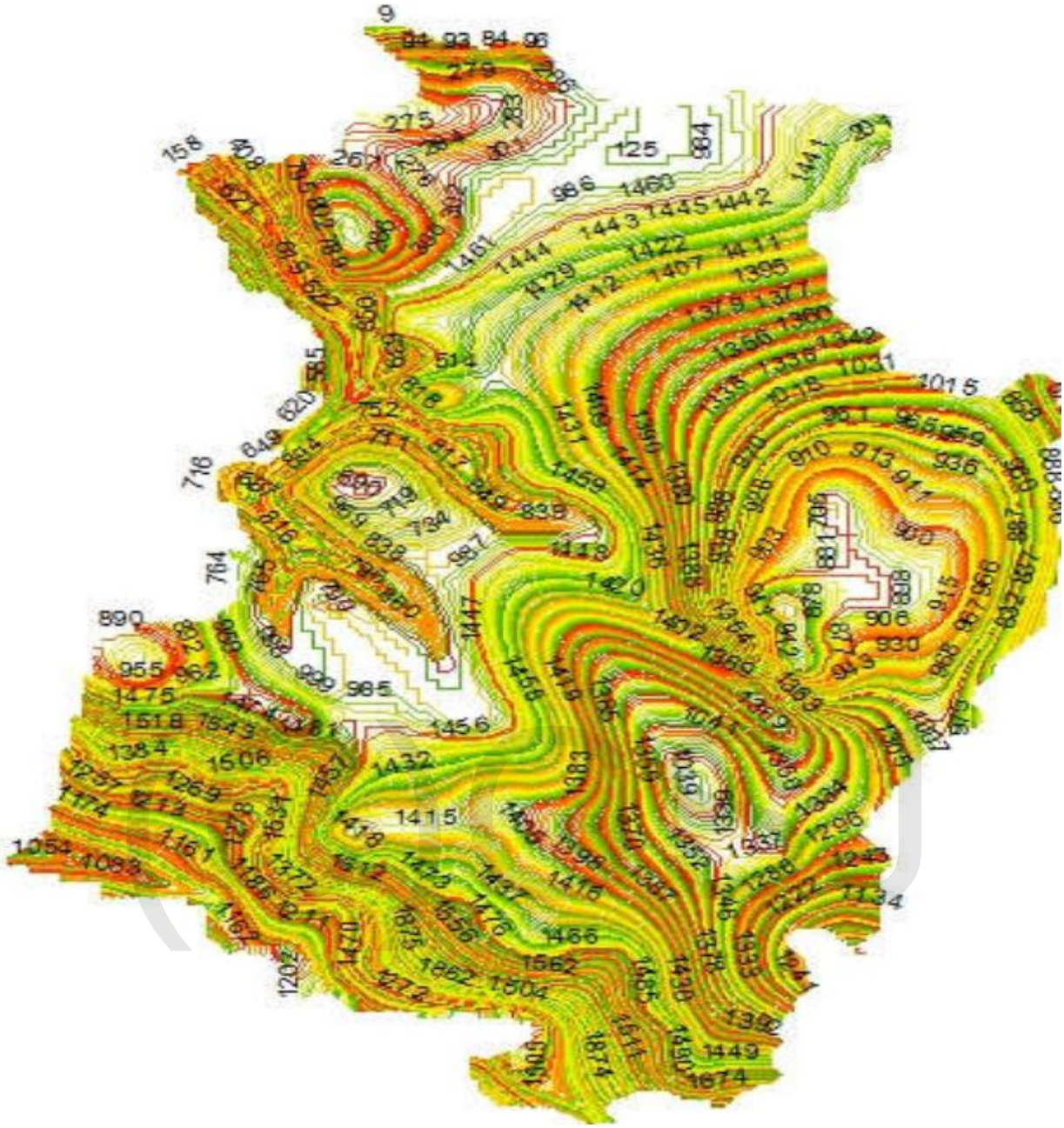

Fig. 4.3: The contours of Halu Wereda, Source: Ethio-GIS , 2007

Among 74 respondents (64.9 %) of them respondents reported that family size affects farmers' decision on adoption of land management practices. But from FGD the researcher analyzed large family size had no impact on land management practices; rather large family members manage their land than small family size. This support the conclusion made by Wegayehu (2006), practice of structural conservation is optimistically tied with higher labor forces. Households with larger number of economically active labor are supposed to be better in undertaking different land management practices, since they are less likely to have shortage of labor (Desta, 2012). Thus, household size influences the decision of farmers to undertake the conservation

measures given household labor is the whole supplier of the required labor for undertaking the farming and soil conservation operation. Large farm size has influences on the adoption of conservation strategies for management practices positively. Farmers with larger farm size are more likely to adopt better land management practices. This is because when farmers have large farm size, they can plan different management practices due to the large land holding size. Nevertheless, this is not consistent with 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.

Again 43 (37.7%) of respondents said age has impact on land management practices. From key informants interview the researcher faced two contradicting ideas. These were: Most interviewees said young age farmers were less experienced and they did not act as old age farmers who had an accumulation of knowledge for longer period of time. But few of interviewees from less experienced farmers said that old age farmers did not accept new technologies and they were rigid and did not associate with modern technologies and refuse or hate some government policies. Eg. Like Stone bunds, strip cropping, etc. which help them. The effect of age on the adoption of land management may be either positive or negative (Wegayehu, 2006). Old age often associated with long year of farming experience but older farmers usually have short planning horizon and they may be less interested on long term negative effects of resources depletion. In contrast, younger farmers with longer planning horizons are likely to invest more in conservation. More precisely, the younger the age of households the higher the number of conservation strategies for land management is practiced (Aklilu, 2006).

38 (33.3 %) of respondents said access to agricultural extension and training services and contact with DAs also affect farmers' decision on the adoption and use of land management practices. Access to extension and training services increase the attitudes and knowledge of households on the adoption decision and use of biological and physical land management practices. Farmers with access to extension services are expected to have better chance of adopting land management practices. This is consistent with initial assumptions and the findings of previous research which found participation in extension to contribute positively to farmers' behavior to build terraces (EEA/EEPRI, 2002).

Few respondents 17(14.9 %) said education affects farmers land management practices. This shows that educational status of households have significant positive influence on the adoption of different land management practices due to its impact in raising the level

of farmers' awareness and improving their planning horizon. As the educational status of households' increase, the ability to receive information and adopt on land management also increases. This result supports the finding of Paulos, (2004) that explained educated farmers tend to be better at recognizing the risks associated with land degradation and tend to spend more time and money on conservation structures for land management practices. This could lead to the conclusion that farmers with better educational status focus more on new land management practices than the indigenous ones.

Few of the respondents 21 (18.4 %) said sex affects them to use land management practices. Most of the land management practices require more labor force. Hence, male headed households are expected to have better undertake different land management practices, as better endowed with labor than women. Studies conducted by (Desta, 2012) confirmed that women are often faced with more labor constraints than male farmers. They need support from males near to them to construct conservation measures on their plot. They are also inhibited from making decisions about land management practices while their husbands are away. Some of respondents 9 (5.3 %) said farm size affects their land management practices. The researcher identified from FGD as farmers having large farm size manage poorly their land than farmers having small plot of land.

4.4. Indicators, Causes, Severity and Consequences of Crop land productivity Decline

The majority of the resource poor farmers are subsistence oriented, cultivating poor soils on sloping and marginal lands, which are highly susceptible to soil erosion, and other soil degrading forces. Since individuals' land use decision-making are patterned by the structure of the society that they create through their interaction over time and space, social scientists have suggested the collaborative actions are easier to understand in the context of the role of institutions. Institutions are the social rules, conventions and other elements of the structural framework of social interactions. This framework is taken for granted in much of the mainstream economics, and often pushed so much into the background that many of its central propositions are sometimes stated with an idea of institutional neutrality (Bardhan, 1989).

Soil erosion causes a considerable, in most cases an irreversible soil fertility and productivity loss. The effect of erosion on soil productivity is especially severe in the southern, southeast and southwestern highlands, where Nitiosols are the predominant soil types, and most of the soil fertility is concentrated in the topsoil. To control soil fertility decline, and to have sustainable agricultural development, soil erosion has to be arrested

or at least reduced to a tolerable level that is to a level below soil formation rate (Belay, 1992).

Hundreds of thousands of kilometers of structural types have been constructed over croplands in Ethiopia. However, reports indicate that these conservation structures have not been as successful as they could be, because the farmers were not enthusiastic enough in accepting and maintaining the technology (Wood, 1990). The failure of conservation programs partly emerge from the fact that planners and implementing agencies ignore or fail to consider socio-cultural factors as key determinants of the success or failure of conservation programs (Belay, 1992).

Table 4.7 Cause of Soil fertility decline

Items	Frequency	Percent
Soil erosion	73	64
Plowing along run off	65	57
Continuous plowing of the same plot of land	92	80.7
Over grazing	24	21

Sources: Field Survey, 2018

From the above table 4.7 one can conclude that most respondents 92(80.7%) said that continuous plowing of the same plot of land causes fertility decline. While 65 (57 %) of respondents said that plowing along runoff, 73 (64%) said soil erosion and the remaining 24 (21 %) of respondents said that over grazing causes soil fertility decline. 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 contents (Ministry of Agriculture, 2010). FGD and interviews analysis also indicated that the implementation of soil erosion control measures resulted from variation in the local relief including slope of the land, physical condition of the soil like drainage capacity, size of grazing land and so on. Field observation results were in harmony with that of FGD, and identified that check dams were built on the land with steep slopes where gullies were prevalent.

Table 4.8 Cause for yield decline

Items	Frequency	Percent
Absence of fallowing	57	50
Unreliable rainfall	29	25.4
High cost of chemical fertilizers	53	46.5
Erosion/runoff	89	78
Continuous cultivation of their land	101	88.6

Sources: Field Survey, 2018

The above table 4.8 indicates that most respondents 101 (88.6 %) said that continuous cultivation of their land cause yield decline. This clearly indicates that decline in land productivity negatively affects the livelihoods of farmers as their livelihood is dependent on crop production from their plot each year. The response of the households to the decline in land productivity and its causes is confirmed by studies by Yirga, (2007), who states that over the last decades, agricultural production and income growth in Ethiopia have lagged behind population growth. Concurrently, per capita food production, income and savings dropped. Cause for concern, in the highlands, soil, the basic natural resource on which the livelihoods of the majority of the population is based, has been steadily degraded. While 89 (78 %) of respondents said that erosion/runoff decrease their yield. Others said that high cost of chemical fertilizers 53 (46.5 %), and the remaining 29 (25.4 %), 57 (50 %) of farmers responded that unreliable rainfall, and absence of fallowing respectively.

4.5. Agricultural Land Productivity and Scarcity

Less than a quarter of the earth's land area has the potential to be agriculturally productive and almost all of it is already under cultivation. Although the remaining land is of marginal quality for agriculture, it is increasingly under pressure in many parts of the world. Moreover, human population is increasing at a shockingly high rate and the productive capacity of soil resources necessary to sustain that population is increasingly decreasing because of soil degradation (Gete, 2000).

Soil is the basic natural resource for sustenance of life on the planet. The use of this resource should not cause its degradation or destruction because the existence of humankind depends on the continued productivity of the soil, but the problem is that an over exploitation of resources without due attention to the management aspects. According to Hurni (1993), over 90% of all human food and livestock feed is produced

on land, on soils of varying quality and extent. Hence, our well-being is highly dependent on the potential of soils throughout the world and the way we manage them.

The laws of market demand and supply are simply applied to resource allocation without being fully conscious of the complexity of institutions on which contracts in actual markets crucially depend. Most studies on soil erosion analyze the impact of physical factors like topography, climate and soils, farming practices and population pressure on soil erosion. These analyses suggest interesting causal relationship that shed light on the impact of population pressure on resource degradation. When the population-land ratio increases, the processes of intensification takes place and threaten the sustainability and productivity of natural resources (Pender, 1998).

Table 4.9 Response on agricultural land productivity over time

Items	Frequency	Percent
No change	14	12.3
Decreasing over time	54	47.4
Increasing over time	39	34.2
I don't know	7	6.1
Total	**114**	**100.0**

Sources: Field Survey, 2018

Table 4.10 shows that most respondents i.e. 54 (47.4 %) said that their agricultural land productivity was decreased over time. As evidences indicate, remarkable changes have not been taken in terms of sustainable agricultural production and development. According to Teshome (2010) the performance of Ethiopian agriculture has been poor over the last three decades. One of the root causes of this problem is poor and unsustainable land management practices. the direct costs of loss of soil and essential nutrients due to unsustainable land management is estimated to be about three percent of agricultural GDP or $106 million and the loss of agricultural value between 2000-2010 could be $7 billion, even without taking into account of the indirect impacts of land degradation in Ethiopia.

While 39 (34.2%) of them reported that their agricultural land decreased over time and the remaining 14 (12.3%) and 7(6.1%) respondents said their agricultural land productivity did not shown change and they did not know, respectively.

Table 4.10 Reason for agricultural land scarcity

Items	Frequency	Percent
Population pressure	102	89.5
Land degradation	89	78
Expansion of forest	2	1.8
Land taken by government	5	4.4
Investment expansion	7	6.2

Sources: Field Survey, 2018

The respondents were asked what were reasons for agricultural land scarcity in their study area. Most of them 102 (89.5 %) and 89 (78 %) said population pressure and land degradation caused the scarcity of land in the study area respectively. The population pressure concept is a relative and a dynamic concept which is determined by taking into account endowment of natural resource, human capability, cropping system and production technologies in use and alternative employment/ income opportunities within and outside an area which are by themselves subjected to change.

In connection to this (Tesfaye, 2003) point out that as population growth increase fallowing and crop rotation as traditional soil fertility maintenance practice are substantially reduced or totally cease to exist. This would lead to soil mining and decline in per capita output unless significant investment is made in drainage terracing and most importantly in soil fertility management. The main causes of land degradation problems are very complex and attributed to both physical and socio- economic factors.

Many empirical studies have indicated that the main facts of land degradation such as deforestation, overgrazing, cultivation of marginal lands and soil fertility depletion can attribute to population pressure. Land degradation is an emergent issue in the study area and becoming one of the prime agricultural constraints in crop- livestock production. The area was previously known for its forest cover and agricultural potential. However, recently land degradation is increasing and cropland productivity is decreasing, due to deforestation, steep slope cultivation, over grazing and erosion. While 7(6.2) %, 5(4.4) %, and 2 (1.8 %), were reported investment expansion and taken by government and forest expansion respectively.

4.6. Roles of Indigenous land Management practices

A number of indigenous practices contribute to improved nutrient levels and physical soil properties that provide better aeration, infiltration, water holding capacity, and soil

moisture (Abeb, Sh, 2002) This in the long run contributes to improving soil ecological functions (productive, supportive, regulation and recreational). In spite of variation from farmer to farmer, different indigenous practices of land management contributes to different degree of accumulation of organic matter over time contributing to carbon sequestration and adaptation to climate change.

Crop residues are deliberately left by farmers on crop land to increase soil fertility and organic carbon. Farmers say the residue decompose as termites use and keeps the soil moist, protect soil from direct effect of sun light, flood and wind. The protection of soil by crop residue is wildly used in the area by different parts of the community (from rich to poor farmer). Crop residues from enset, root crops (potato, sweet potato) are often left by women on backyards while crop residue from cereals (maize, wheat, teff), pulses (haricot bean) and left over from cash crop are left deliberately for improving soil health on distant fields. Traditionally people do not allow livestock to graze on cropland after harvest, to avoid soil compaction and ensure crop residue incorporation in to the soil. Today, due to existing livestock pressure, land and forage scarcity; livestock are allowed to graze on cropland after harvest to feed on left over crop residue. This practice, however, reduce soil fertility by minimizing crop residue left to increase soil organic carbon.

Table 4.11 Techniques by which respondents participate on LMP

Items	Frequency	Percent
By incentives	31	27.2
Enforced by government	20	17.5
Self-motivation	63	55.3
Total	**114**	**100.0**

Sources: Field Survey, 2018

On table 4.9 most respondents (55.3) % said that they were participated on land management practices by their own motivation. While 31 (27.2) % and 20 (17.5%) of respondents said that they participate on ILMP by incentives and government enforcement respectively. FGD results indicate that there was time when government forces them to participate on land management practices.

On moderately sloping areas the farmers construct the soil bunds for erosion control. On steep eroded bare lands soil bunds and grass strip were the most used structures in study area. As it is stated by key informants during the interview session the grass strip and soil

bunds and cutting ditches were considered as effective in erosion control in steeply areas. In the study area 55.3 % of the respondents have constructed soil bunds, grass strip and ditches in the common eroded lands especially around the mountainous area, while 27.2% farmers were constructing bunds because of the cash they would earn from a safety net program.

Fig. 4.4. Participation in ILMP, field photograph, 2018

Table 4.12 The respondents response on roles of ILMP

Items	Frequency	Percent
Soil fertility and moisture improvement	94	82.5
Save soil from serious erosion	105	92
Avoid crops root exposure	51	44.7
Increase crop production and grass growth	90	78.9
Protect surface or underground water from danger	8	7
It is one of drought coping mechanisms	21	18.4

Sources: Field Survey, 2018

As table 4.12 shows that 105 (92 %) said that indigenous land management was important to save soil from serious erosion and 94 (82.5 %) of respondents said that indigenous land management was important to improve soil fertility and moisture. The next most respondents 90 (78.9 %) reported that ILMP increase crop production and grass growth. While 51 (44.7 %) said it is important for avoid crops root exposure. The remaining respondents 21 (18.4 %), and 8 (7%) said ILMP were important for drought coping mechanisms and protect surface or underground water from danger respectively.

Table 4. 13 Responses on ILMP which mostly increase their production

Items	Frequency	Percent
Terracing work	7	6.1
Contour plough	24	21.1
Grass strip	40	35.1
Manure application	21	18.4
Check dams	6	5.3
Grassed water ways	16	14.0
Total	**114**	**100.0**

Sources: Field Survey, 2018

On table 4.13 the majority of the respondents (35.1%) used grass strip to increase crop production than other ways of ILMP. Grass strips were planted across the boundary between strips of land with the same or different crops, and also along terracing lines. It has double advantage; soil conservation and animal feeding. Most efforts made by the farmers of the study area to control soil erosion was successful but it was not bring a long lasting solution. This is evidenced by wider impacts of land degradation. From FGD analysis participants said that the grass in the study area was taken by NGOs and government to other areas because it is unique grass to avoid soil loss and used for cattle feed.

From the total respondents 24 (21.1%) and 21 (18.4%) of the respondents were reported contour plough and manure application, respectively. Contour plough is cultivating against slope close to the contour instead of up and down the slope or round the field. When this is done, each furrow acts as a small dam, catching water as it runs down the hill and encouraging it to soak into the soil. This simple conservation measure may be enough by itself to prevent the runoff of water and erosion where slopes are gentle and the rainfall intensities are low. Such land management practices were also supported with semi-parallel drainage furrows depending on the slope and types of crops grown. For example Teff in the middle altitude is planted after the seed bed is smoothed and packed by animals, and higher run off rates are expected. In such cropland drainage furrows was constructed relatively at closer interval depending on the slope for controlling soil erosion in the study area which is in agreement with the finding of (Ministry of Agriculture, 2001) that reported, contour cultivation can be adjusted to standard ridge and furrow system to make it effective in controlling soil erosion and moisture conservation. While

the remaining 16 (14%), 7 (6.1%) and 6 (5.3%) of them said grassed water ways, terracing works and check dams respectively.

FGD results also confirm that most of the sample respondents know the importance of physical conservation strategies. However they do not use all of these conservation structures on their farmland. The reasons for this as indicated by participants were that some structures were source of rodents, some reduce plot size, and some requires high labor and cost. Therefore, in order to get essential insights in to farmers' decision on land management practices, looking at their perception on each practice to which they were employed was quite important. Hence, the investigator might infer that farmers' perception of land management practices had a direct and positive influence on farmers' decision and adoption of land management practices.

Fig. 4.5. Ccontour Plough, field photograph, 2018

Table 4.14 Effects of poor land management practices

Items	Frequency	Percent
Decline in production	107	93.9
Absence of fertile topsoil	94	82.5
Plants root exposure	45	39.5
Poor crop and grass growth	28	24.6

Sources: Field Survey, 2018

Table 4.14 above shown that most respondents 107 (93.9 %) said that poor land management resulted decline in production, 94 (82.5 %) reported that absence of fertile

topsoil was the major effects of poor land management practices. While 45 (39.5 %) and 28 (24.6 %) of respondents said that plants root exposure and poor crop and grass growth respectively.

Fig. 4.6. Un productive fallowed land, field photograph, 2018

Table 4.15 Respondents perception on degree of soil erosion

Items	Frequency	Percent
Severe	19	16.7
Moderate	68	59.6
Minor	15	13.2
No Soil Risk	12	10.5
Total	**114**	**100.0**

Sources: Field Survey, 2018

Most respondents 68 (59.6 %) from above table 4.15 shown that soil erosion was moderate in the study area. However 19 (16.7 %), 15(13.2%), and 12 (10.5 %) of respondents reported that the degree of soil erosion was severe, no soil risk and minor respectively. Soil erosion as a hazard to agricultural production and sustainable agriculture is the most important determinant of conservation measures. Theoretically, those farmers who perceive soil erosion as a problem having negative impacts on productivity and who expect positive returns from conservation are likely to decide in favor of adopting available conservation technologies (Gebremedhin and Swinton,

2003). On the other hand, when farmers do not acknowledge soil erosion as a problem, they will not expect benefits from controlling erosion and it is highly likely that they will decide against adopting any conservation technologies.

These variations in soil erosion forms are in line with what was reported by the NRCS (2006), namely that water erosion results in the formation of rills and gullies, stream-bank cutting at the site of removal, and down-slope deposition and sedimentation of downstream channels and water bodies, and also maintained that water erosion could occur as splash, sheet, channel (gully) and stream. Slope of a field affects the rate and amount of soil loss. This forces farmers to control or mitigate the impact of erosion on fields that are situated in steep slopes and hence slope influences the decision of farmers to undertake conservation measures (Habtamu, 2006).

Table 4.16 Common crops mostly you produce in the study area

Items	Frequency	Percent
Maize	88	77.2
Sorghum	107	93.9
Vegetables	32	28.1
Wheat	3	2.6
Cash Crops	67	58.8

Sources: Field Survey, 2018

As we can see from table 4.16 above, the major crops grown in the study area were Sorghum 44 (38.6 %), Maize 28 (24.6 %), cash crops 31 (27.2 %), Vegetables 10 (8.8 %) and wheat 1 (0.9 %) in the study area. Cereal crops such as maize, sorghum, barley and cash crops were cultivated at subsistence level, i.e., they are cultivated on smaller plots of land due to rugged topography.

Participants of focus group discussion forwarded that due to the existence of large coffee plants mixed with forests were a proud to the community of the study area. The production of fruits and vegetables tend to become low 8.8 % in the study area as shown in the above table. Key informants explained that even though the study area is endowed with perennial streams and rivers, low number of farmers cultivated garden vegetables and fruits through irrigation. The majority of land users depend on rain fed agriculture partly due to low experience regarding the significance of irrigation which could have supported the family life. From FGD and key interviews farmers reported that the production of oilseeds were at low levels. These crops demand tropical (kola) type of climate. According to the report of the study conducted by Belay, (2000) such practice

may ultimately lead to sever soil fertility depletion and productivity loss since very little nitrogen can be fixed in the absence of leguminous crops.

Fig. 4.7. Small irrigation in production of Vegetables

4.7. Adoption and Soil Conservation Practices

To overcome the problem of land degradation, the government has implemented soil conservation activities, such as construction of physical structures (terraces) to reduce overland flow thereby preventing removal of soil, soil fertility improvement practices (compost application), agro-forestry and reforestation of deforested hilly areas. These practices and the positive results yielded so far show how communities can reduce land degradation and improve their livelihoods and food security. Direct observation and interviews with farmers indicated that there were some initiatives, but there was still a long way to go.

Table 4.17 Extent of Indigenous land management practices used by Respondents

Practices	Very often	Often	Rarely	Never	Total
Mixed cropping	28	69	17	-	**114**
Organic manure	33	23	55	3	"
Terracing work	-	8	74	32	"
Crop rotation	-	26	51	37	"
Mulching	26	57	31	-	"
Tree planting	53	60	-	1	"
Contour plowing	32	57	25	-	"

Sources: Field Survey, 2018

Mixed Cropping: Mixed cropping is widely practiced in the study area. Most respondents (28 and 69) practice mixed cropping very often and often respectively. Mixed cropping in the area helped the potential to reduce erosion by having a crop on the land for a longer period of the year. Also, it served for them to cultivate different crops at one time on a single farm land. However, the crops in the area are widely similar growing seasons and thus the potential for this benefit is not as such. Nevertheless, the inclusion of leguminous plant may improve its nitrogen fixation process for cereal crops.

Application of manure: In the study area most respondents (55) respondents said that they never use organic manure, while 33 and 23 of them said they used organic manure very often and often respectively in order to improve the fertility of the soil. Manure Soil and Water Conservation Management by mixing of animal dung and urine, is the best form of organic fertilizer. Farmers used manure mainly near the homestead. Only 34 respondents said they did not use organic manure. During the focus group discussions with key informant and DAs (Development Agents at *kebele* level), farmers (especially, those who were poor) have increased the use of manure applied because of the high current price of inorganic fertilizers.

Fig. 4.8. Manure application, field photograph, 2018

Crop Rotation: Most respondents 51 were confirmed that they had rarely used crop rotation and 37 of them said they never used crop rotation**.** The above analysis was proved by Teklu and Gezahegn (2003), the major cereals, after legumes or oil crops are rotated mainly for soil fertility maintenance, weed and disease control. The use of crop rotation is another widespread phenomenon in the area where maize, ground nut and bean grown rotationally. Crop rotation is used by the farmers for different reasons, including soil fertility, thereby improved crop yield. The farmers of the area know that as of the scientific method improved soil fertility can be achieved by alternating high residue producing crops with the growing low residue producing crop.

Mulching: Most respondents (26 and 57) are using surface mulches often and very often) respectively on their fields, thus providing a protective cover at a time when crop cover is not present. The benefit of protective covering was widely appreciated, as was the improved infiltration rate afforded by the techniques and reduced evaporation rate. Further stated objective is the addition of nutrients to the soil through the decomposition of the organic matter. However, the density of mulch viewed in many fields was below the level required to be most effective as protective cover since the use of residence as animal food was witnessed in many households of the area.

Fig. 4.9. Mulching Photograph by researcher, field survey

Planting Trees: This type of conservation method is applied by 53 and 60 respondents used tree planting very often and often to reduce runoff and conserve the soil and water round the root of the plants. Indigenous and newly introduced trees and shrubs are planted on over used eroded lands to make the land fully productive again. In certain areas, common highly degraded lands are closed off to livestock to protect from grazing and planted with trees for regeneration.

Contour plowing: In the study area from the sample farmers, 57 and 37 respondents applied the structure often and very often in combination with cut off drain; it is carried out using the ox-drawn plough. It is a practice of tilling the land along the contours of the slope in order to reduce the runoff on a steep sloping land. It is used separately or in combination with their conservation structures such as plantation trees and cut- off drains. Hence, it is part of the normal farming activity; it needs no extra labor and time for construction (Desta, 2012).

Fig. 4.10. Contour plowing, field photograph

Table 4.18 Source of information for the above land management practices

Items	Frequency	Percent
Friends and relatives	39	34.2
Radio	13	11.4
Extension agent	27	23.7
Training	8	7.0
Self-experiences	27	23.7
Total	**114**	**100.0**

Sources: Field Survey, 2018

Regarding the sources of information on land management practices survey results (Table 4.18) shown that, 34.2 % of the respondents get information on land management practices from friends and relatives, 23.7 % of them get information from extension agent, while 23.7 % get from self-experiences and 11.4 %, 7 % get from Radio and Training. Access to information and media is an important variable that shape farmers decision on land management and degradation problems. Farmers who had access to media were more aware of land degradation problems than those who did not. Information provision through extension channels increased farmers' awareness on land degradation problems (Aklilu, 2006).

Access to extension services is assumed to improve farmers' attitude towards land management practices. This is because 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 (EEPRI, 2002). In the Ethiopian Highlands, agricultural extension has strongly promoted increased use of external inputs such as fertilizer and improved seed and has provided credit to obtain these inputs. Credit is provided in kind and must be repaid immediately after harvest; failure to pay often brings harsh punishment, including expropriation of oxen and other property and imprisonment (Aklilu and Alebachew, 2009).

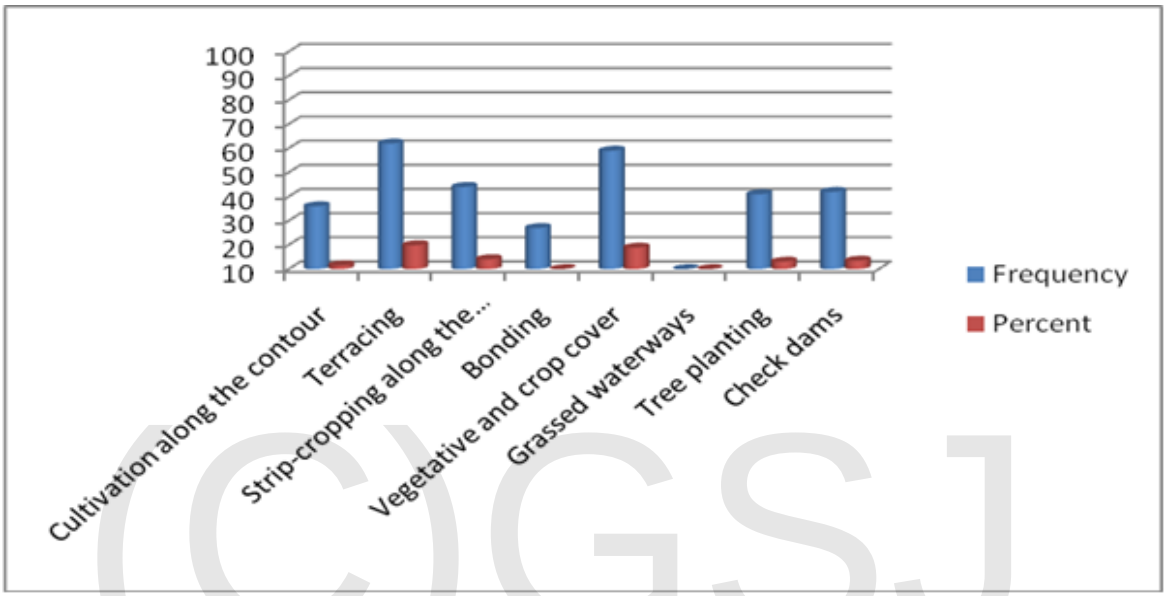

Fig.4.11 Local methods to prevent soil erosion and improve crop land productivity

Sources: Field Survey, 2018

As we can see the above figure, most farmers, 72.8 % practiced soil bunds and cut of drains, 67 % were applied cultivation along the contour, 63.2 % grassed water ways, (56.2%) used strip-cropping along the contour, 50 % practiced vegetative crop cover, (35 %) applied tree planting and lastly 7% and 6.1 % used terracing and check dams to improve soil fertility and soil loss in the study area.

Soil bund is one of the physical structures constructed by digging the soil deep in order to divert the runoff before reaching the farmland. It was constructed during dry season to avoid impediment to land preparation for main cropping season. This structure is a graded channel constructed mainly in moist areas to intercept and divert the surface runoff from higher slopes to protect downstream cultivated land or village (Fikru, 2009). On the contrary, cutoff drains in dry areas are used to divert runoff and additional water into cultivated fields to increase soil moisture. The farmer constructed

such structures to prevent loss of seeds, fertilizer and soil due to excessive run off coming from uplands and disposed excess water from the field. However, according to farmers' opinion, most of these structures are accelerating soil erosion through time.

Fig. 4.12 Field photograph, Soil bunds, 2018

4.8. Analysis of inferential statistics result

4.8.1. Pearson Correlation analysis

Correlation analysis studies the joint variation of two or more variables for determining the strength and direction of the relationship among the variables (Kothari 2004). Accordingly, in order to identify whether the dependent variable & independent variables have a joint variation. The study sought to establish the relationship between independent variables (Land holding size, family size and age of respondents) dependent variables (Yield /quintals). Pearson's product moment correlation coefficient was computed. Pearson correlation results range between 1 (perfectly linear positive correlation) to -1 (perfectly linear negative correlation). When the correlation value is zero, no relationship exists between the variables under study. For this study, the researcher used Marczyk, Dematteo, & Festinger (2005) interpretation guide to interpret the results by excluding zero.

Table 4.19 Correlation result on farmer's response on yields/ Quintals

Items	Pearson Correlation	Yield /quintals	Land Holding Size	Family Size	Age of Respondents
Yield/quintal	Pearson Correlation	1	.042*	-.116	-.137
	Sig. (2-tailed)		.460	.040	.016
	N	312	312	312	312
Land Holding Size	Pearson Correlation	.042*	1	.108*	-.116*
	Sig. (2-tailed)	.460		.058	.041
	N	312	312	312	312
Family size	Pearson Correlation	-.116	.108*	1	-.176
	Sig. (2-tailed)	.040	.058		.002
	N	312	312	312	312
Age of respondents	Pearson Correlation	-.137	-.116	-.176	1
	Sig. (2-tailed)	.016	.041	.002	
	N	312	312	312	312

*. Correlation is significant at 0.01 and 0.05 level (2-tailed).

The above table 4.19 SPSS analysis indicates that land holding size and family size and age of respondents has relationships with yield. So the correlation analysis between the above variables is significant at 0.05 and 0.01. The size of land mostly affects the yield on the above table because its beta coefficient is larger than for family size.

The inferential statistics using regression analysis was also applied to test the impact of and holding size and family size and age of respondents on yield. The regression analysis is a set statistical process for estimating the impact of one variable on the other variable. The most common form of regression analysis is linear regression, in which one finds the line that most closely fits the data according to specific mathematical criterion. So it is used for two conceptually distinct purposes.

Table 4.20 Regression Analysis result Coefficients [a,b]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Family size	.241	.056	.190	4.317	.000
Land holding size	.778	.045	.768	17.464	.000

a) Dependent Variable: Yield/quintals

b) Independent variable: Family size and Land holding size (controlling factor)

The above SPSS analysis indicates that land holding size and family size has an impact on farmers yield. So the linear regression analysis between the above variables is significant at 0.05 and 0.01. The size of land mostly affects the yield on the above table because its beta coefficient is larger than for family size.

Table 4.21 Farmers Perceptions regarding to ILMP

Items	Options	Frequency	Percent
There is public mass participation in indigenous land management practices with self-motivation	Agree	77	67.5
	Undecided	11	9.6
	Disagree	26	22.8
Eucalyptus tree planting is good way of soil fertility improvement	Agree	29	25.4
	Disagree	85	74.6
Growing more crops on small plot of land increase production	Agree	18	15.8
	Undecided	3	2.6
	Disagree	93	81.6
Land fragmentation affects my proper land management practices	Agree	38	33.3
	Disagree	76	66.7
Occurrence of frequent drought due to seasonal variation of rain fall reduce crop production	Agree	96	84.2
	Undecided	5	4.4
	Disagree	13	11.4
Our agro ecological Zone is better for cereal crop production	Agree	96	84.2
	Disagree	18	15.8
Government policies and extension services improved/ encouraged my indigenous land management practices	Agree	40	35.1
	Disagree	74	64.9
Using chemical fertilizer is better than organic manure application	Agree	33	28.9
	Undecided	15	13.2
	Disagree	66	57.9

Sources: Field Survey, 2018

Generally the attitude test result that farmers responded was analyzed in the above table 4.23, most respondent regarding public mass participation in indigenous land

management practices with motivation (67.5 %) agree, while the remaining disagrees and undecided. 74.6 % of respondents disagree Eucalyptus tree planting is good way of soil fertility improvement. While 25.4 % agree. 81.6 % disagree growing more crops on small plot of land increase production and 15.8 % of them agree. From FGD the researcher finds out that most farmers plant eucalyptus tree for commercial purpose that means they got more money in a short period of time by selling it for the purpose of construction. But it was dangerous to their soil fertility and attracts a large amount of water into their root.

Fig. 4.12 Eucalyptus tree planted by farmers field survey, 2018

Most respondents (66.7) % and (33.3%) of respondents disagree and agree that land fragmentation affects their proper land management practices respectively. 84.2 % of respondents agree that occurrence of frequent drought due to seasonal variation of rain fall reduce crop production and the left (11.4%) disagree. Most respondents (84.2 %) agree that their agro-ecological zone was better for cereal crop production. While 15.8% of the left respondents disagree. Most of respondents (35 %) reported that government policies and extension services improved/ encouraged their indigenous land management practices and 64.9 % disagreed. 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).

From FGD some of the participants said that the major weaknesses of government policies were top-down approach used or technological imposition, their less participatory nature or neglect of the land users, inadequacy to understand the local biophysical conditions, and above all disregard indigenous knowledge of the land user. They did not encourage land users to participate in project design, implementation, operation, maintenance and monitoring. Though participation is considered as essential to reach the target group and respond appropriately to their needs, the early approaches of land management failed to do so.

According to Hurni (1997), a multi-level stakeholder approach has been developed for finding feasible, acceptable, viable and ecologically sound solutions at local level. In the approach due emphasis is given to the use of appropriate technologies, i.e., technologies that are ecologically protective, socially acceptable, economically viable, economically productive, and reduce risk as well as better respond to the respective land use systems because any technology may not be applicable everywhere. He asserted such type of sustainable land management approach can promote participatory land management solutions. These solutions are again important in order to attain long lasting solutions for the problem in developing countries.

57.9 % of respondents said that organic manure is better than chemical fertilizer and 28.9 % agreed with the betterment of chemical fertilizer. Most of smallholder farmers stated that using manure was better than chemical fertilizer. The FGD analysis also implied that manure is easily absorbed in the soils and it sustains fertility and reduces the soil acidification. Farmers indicated that the use of manure encourages weed infestation in the farming gardens. They also indicated that fields where only fertilizer is applied are infertile than where manure was applied. With regards to application of inorganic fertilizers, farmers in the study areas faced a lot of problems. These are higher price of

fertilizer, shortage of rainfall and negative impact of fertilizer on the farm land are the major ones. Farmers use in organic fertilizers without studying the type of soil on their farm land.

4.9. Interview analysis of agricultural expert and extension workers

Interviews were conducted with 3 agricultural expert and 4 extension workers. They had reported that indigenous land management practices were largely practiced in the study area. But they were not equally practiced by all farmers due awareness variation and educational levels. Agricultural experts and extension workers gave trainings for farmers on land management practices and fertilizers application. The researchers asked the participants if they were forced farmers in land management practices, the interviewees said that it was based on their interest, but sometimes there were time when government forced them. Farmers of the study area practiced contour plough, grass strip, mulching, terracing, crop rotation, manure application. Agricultural experts explained that sometimes farmers hate to use introduced/modern land management practices.

CHAPTER FIVE

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary

The study focused on the role of Indigenous land management practices and its role on crop land productivity. Agricultural land productivity in the study area was hampered by many factors; among which soil fertility depletion is the major one, which is threatening the overall sustainability of agricultural productivity of the study area. As soil is the base of agriculture, the livelihood of the major parts of the population is depending on soil. For this soil loss people use different indigenous knowledge practices to reduce the crop land productivity decline.

The finding of the study revealed that indigenous biological and physical land management practices have a significant role in improving cropland productivity. It reduces soil erosion, increase soil moisture, increases plants growth.

In the study area people practices different indigenous management practices like grass strip, contour plowing, manure application, fallowing, terracing to improve their land productivity. Of which grass strip was commonly practiced and even taken by government to other areas.

There were also factors affecting their land management practices. Education influences farmers' decision to adopt conservation measures by enhancing farmers' perception and knowledge about land management practices. Both age and gender affects households' decision on the adoption of indigenous land management practices.

Slope characteristics of households also have a significant influence on their decision to adopt and use land management practices. It enables households to adopt different management practices that best suited to the slope characteristics of their farm plots. Farmers understand the effects of soil erosion on crop productivity. They attributed soil fertility levels and crop yield potential to slope position.

5.2. Conclusions

The findings of the study shows that 53.5 % said that their land holding extent was medium, and researcher concluded that most respondents 40.3 % respondents said they work on their land by family labor. About 71.9 % of respondents reported that the distance of farm land plays an important role in influencing farmers' decision to adopt land management practices, in cases a considerable amount of time can be lost in walking long distance. One can also conclude that most respondents (80.7%) said that continuous

plowing of the same plot of land causes fertility decline and other 57 % of respondents said that plowing along runoff, 64% said soil erosion causes soil fertility decline. Similarly most respondents (88.6 %) said that continuous cultivation of their land cause yield decline. shows that most respondents and 47.4 % of them said that their agricultural land productivity was decreased over time. The result of the study also shows that 89.5 % and 78 % of respondents said population pressure and land degradation caused the scarcity of land in the study area respectively. On other hand the study indicated that 92 % of respondents said that indigenous land management was important to save soil from serious erosion and while 82.5 % of respondents said that indigenous land management was important to improve soil fertility and moisture. Finally 59.6 % respondents reported that soil erosion was moderate in the study area.

5.3. Recommendations

Based on the above findings the following recommendations were forwarded.

- ⇨ Contour farming practices should be practiced for improving water use efficiency of the crop and controlling run off by farmers
- ⇨ The sequence of crop rotation should be kept, which is a base for the effectiveness of the other practices.
- ⇨ Due attention should be given to leave and incorporate crop residues in the soil, which maintain organic matter and increases water infiltration by reducing run off.
- ⇨ A set of indigenous biological and physical land management practices are effective in rain water management and soil conservation measures.
- ⇨ Development Agents must create mechanisms to increase the capacity for independent innovation within farming communities, while working with farmers to develop appropriate technologies to combat soil water conservation problems.
- ⇨ It is recommended that comprehensive studies to be undertaken focusing on diversity of the practices, its protection, transfer & integration of indigenous knowledge system in development.
- ⇨ Extension and training services on conservation strategies should get due attention by extension planners and DAs for effective land management and agricultural development of the country.
- ⇨ In general the researchers, extension agents, policy makers and farmers should interact to bridge the current knowledge gap and to develop multiple of technologies appropriate to farmers' situation.

Glossary Terms

Agro-ecology: Division of an area based on altitude, temp, vegetation, crop grown, soil type

Conservation: is essentially the preservation and protection of the environmental resources sustainably that has amenity value. Some scholars regard the maintenance of environmental quality much more a necessity than an amenity

Crop land: Land under cultivation for production of crops

Gully erosion: Water course that is formed as a result of severe erosion eg. It destroys houses, bridge, buildings, check dams etc.

Household: is a social unit living together to provide mutual care, including provision of food, shelter, clothing and health care as well as socialization

Indigenous knowledge: local knowledge, unique to a given culture or society.

Integrated SWC: is a process which promotes the coordinated development and management of water, land and related resources in order to maximize economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.

Land degradation: is reduction of resource potential resulting in temporary or permanent lowering of current or future productive capacity of land

Land management: the process of managing and development of land resources.

Land: sometimes referred to as dry land, is the solid surface of the Earth that is not permanently covered by water. The division between land and water is a fundamental concept by human. But earth is the totality of land and water bodies

Rill erosion: is form of erosion in which the running water forms a small channels and ditches

Sheet erosion: When water take the upper broken soil uniformly

Slope: is the degree of steepness of our land surface

Soil erosion: is the wearing a way of top fertile soil due to running water, winds, etc.

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APPENDICES

APPENDIX - I

ARBA MINCH UNIVERSTY SCHOOL OF POST GRADUATE STUDIES

COLLEGE OF SOCIAL SCIENCE AND HUMANITIES, DEPARTMENT OF GEOGRAPHY & ENVIRONMENTAL STUDIES

Questionnaire Prepared For Household Survey

Dear respondent:

I am a student at **ARBA MINCH UNIVERSITY**, School of Post Graduate Directorate Program, Geography and Environmental Studies Dep't and undertaken M.A Thesis research to fulfill the requirement of the Master of Arts in Geography and Environmental Studies. The main objectives of these questionnaires are to assess challenges indigenous land management practices in your locality, and also to forward possible solutions for the problems You are selected to participate in the study designed and kindly requested to share your opinion and experiences to collect information on the title "**Assessing the Role of indigenous land management practices to improve crop land productivity in case of Halu Wereda"**. Your genuine responses are invaluable for the effectiveness of this study. Be assured that your responses are treated confidentially and are only used for the research purpose. .

Yours' Sincerely

PART ONE – Background information of sample Households

1. Sex _____
2. Age _____
3. Marital status
   1. Single ☐ 3. Married ☐ 4. Divorced ☐ 4. Widowed ☐
4. Family size _____
5. What is the educational level of household head?
   1. Cannot read and write ☐ 3. Primary education(1-8) ☐
   2. Secondary education (9-12)☐ 4. Tertiary level (Diploma, Degree) ☐

Part- II: Land and Landholding and Farmers' Perception

6. How many hectares of land do you own? _____
7. How did you acquire your current land?
   1. 1970's land distribution 2. Inheritance 3. Gift from parents/ relatives 4. Rent
8. What are barriers to cultivate your land?
   1. It is sloppy ☐ 3. Some needs rest to regain its fertility ☐

2. It give poor yield ☐ 4. other_____

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

10. Compared to the land needs of your household now, how do you see your present land holdings?

1. More than enough ☐ 2. Just enough ☐ 3. Medium ☐ 4. Too small ☐

11. What type of labor is used on your farm?

1. Family labor ☐ 2. Hired labor ☐ 3. Group labor ☐ 4. Other specify __

12. Is the following factor affecting your decision to use land management practices.

N.B. Select "Yes" and "No" based on your perception.

Items	Alternatives	
	Yes	No
Sex		
Age		
Population		
Family Size		
Education		
Distance from plot		
Extension services and training		
Slope of the farm plot		
Topography or relief		

13. If the fertility of your land is declining, what could be the cause?_____

14. If the yield from your land is decreasing, what could be the reason behind? (More than one answer is allowed):

1. Absence of fallowing ☐ 2. High cost of chemical fertilizers ☐
3. Unreliable rainfall ☐ 4. Erosion/runoff ☐
5. Over cultivation ☐ 6. Other reason_____

15. How do you work on land management practices on your land

1. By incentives 2. Enforced by government 3. Self-motivation 4. Do not know

16. How do you see agricultural land over time?

1. No change ☐ 2. Becoming scarce ☐ 3. Increasing over time ☐
4. Do not know ☐

17. If the agricultural land is becoming scarce, what could be reason behind?

1. Population pressure ☐ 2. Land degradation ☐
3. Expansion of forest ☐ 4. Taken by government ☐
5. Taken by other organization ☐ 6. Other specify _____

Part-III: Roles of Indigenous land Management practices & Soil Erosion

18. What are the roles of indigenous land management practices on your land?

No.	Roles	Orders/ranks
1.	Soil fertility and moisture improvement	
2.	Save soil from serious erosion	
3.	Avoid crops root exposure	
4.	Increase crop and grass growth	
5.	Protect surface or underground water from danger	
6.	Others	

19. Which land management practices are importantly increase your crop production?__

1. Terracing work 2. Contour plough 3. Grass strip 4. Manure application

5. Check dams 6. Grassed water ways 7. Others _____

20. What are effects of poor land management practices

1. Decline in production 2.Absence of top fertile soil 3. Root exposure 4. Poor grass growth

21. How do you describe the degree of soil erosion in your farmland?

1. Severe ☐ 2. Moderate ☐ 3. Minor ☐ 4. No erosion risk ☐

22. Which type of crops you commonly grown on your land ?_____

Adoption and Soil Conservation Technologies

23. To what extent do you use the following indigenous/ introduced land management practices?

Practices	Very often	Often	Rarely	Never
Mixed cropping				
Organic manure				
Terracing work				
Crop rotation				
Mulching				
Tree planting				
Contour plowing				

24. What is your source of information for the above land management practices?

1. Friends and relatives ☐ 2. Radio ☐ 3. Extension agents ☐ 4. Television ☐

5. Trainings in SWC ☐ 6. If any (specify) _____

25. Are there any local methods used to prevent soil erosion?

1. Yes ☐ 2. No ☐

26. If yes, which of the following measures do you practice? (Multiple answer is possible)

1. Cultivation along the contour ☐
2. Terracing ☐
3. Strip-cropping along the contour ☐
4. Bonding ☐
5. Vegetative an crop cover ☐
6. Grassed waterways ☐
7. Tree planting ☐
8. Check dams ☐
9. Other

(specify)_____

27. How many Quintals of Maize and Millet did you get last year?_____

General questions regarding to ILMP

28. Read each of the following statements very carefully and decide whether you 'agree'; 'undecided' or 'disagree', put an (x) mark inside the appropriate box that indicates your opinion.

Items	Options	Frequency	Percent
There is public mass participation in indigenous land management practices with self-motivation	Agree		
	Undecided		
	Disagree		
Eucalyptus tree planting is good way of soil fertility improvement	Agree		
	Disagree		
Growing more crops on small plot of land increase production	Agree		
	Undecided		
	Disagree		
Land fragmentation affects my proper land management practices	Agree		
	Disagree		
Occurrence of frequent drought due to seasonal variation of rain fall reduce crop production	Agree		
	Undecided		
	Disagree		
Our agro ecological Zone is better for cereal crop production	Agree		
	Disagree		
Government policies and extension services improved/ encouraged my indigenous land management practices	Agree		
	Disagree		
Using chemical fertilizer is better than organic manure application	Agree		
	Undecided		
	Disagree		

Interview Guide Lines for Selected Model Farmers and Kebele Administrator

- Household conditions and assets ownership
- Agriculture/ constraints in crop production
- Local participation in resource management
- Awareness of land degradation
- Community participation in decision making.
- Indigenous knowledge

Interview Guide lines for Agricultural Expert and extension workers

- ✓ Status of Indigenous land Management practices
- ✓ Common indigenous land management practices
- ✓ ILMP used by farmers to improve Crop production
- ✓ Contribution of Indigenous land management practices

Observation Check List

No		Options	Mark (Tick)
1.	Topography of the Study area	1. Plain	
		2. Plateau	
		3. Sloppy	
		4. Largely steeper	
2.	Common indigenous land management Practices	1. Terracing	
		2. Grass strip	
		3. Mulching	
		4. Fallowing	
		5. Organic manure	
		6. Contour plowing	
		7. Crop rotation	
		8. Tree Planting	
3.	Water resources of the study area	1. Rivers	
		2. Lakes	
		3. Ponds	
		4. Reservoirs	
4.	Common crops produced	1. Maize	
		2. Sorghum, Millet, etc.	
5.	Climate Zones	1. Dega	
		2. Woina Dega	
		3. Kolla	
		4. Bereha	
6.	Socio- economic activities	1. Agriculture	
		2. Trade	
7.	Population (Ethnic Groups)	1. Oromos	
		2. Amharas	
		3. Tigres	
		4. Others minorities	

Questions for Focus Group Discussion

1. How long did you live in your current residence?
2. Explain the indigenous Land management practices and their roles that you are implementing.
3. Which indigenous land management practice you commonly use to improve your crop production
4. Have you ever got opportunity to participate in community discussions, trainings or forums regarding land management practices? Explain briefly.
5. Are there situations under which you have been forced to implement land management practices without any consultation? Explain in short.

YUUNIVERSITII ARBAA MINCITTI SAGANTAA DIGIRII LAMMAFFAA

KOOLLEJJII SAAYINSII HAWAASAA FI NAMUMMAA

DIPPAARTIMANTII JI'OOGIRAAFII FI QORANNOO NAANNOO

- **Bargaaffii, afgaaffii fi Daawwannaa Bakkee Qote bultoota, Geggeesitoota gandaa, expertii qonnaaf qophaa'an.**

Kabajamtoota deebii laattota qorannoo:

Ain barataa Yuuniversitii Arbaa Mincitti Sagantaa Digirii Lammaffaa gosa barnootaa Ji'oogiraafiin hordofaa turuun koo ni yaadatama. Dhuma irratti qorannoo mata duree **" Mala aadaa itti lafa kunuunsuun oomisha ittiin dabalan''** Aanaa Haluu keessatti Ganda ***Hamuma, Kersa, K/Mihiret fi Yamboo*** keessatti geggeessaa kanan jiru yommuun ta'u , qorannichis rakkoolee jiran qoratamee eega bira gahamee yaadni furmaataa ni kaa'ama. Kanaafuu hirmaannaan keessan galma gahiinsa qorannichaatiif bu'aa guddaa qaba. Deebiin isin kennitanis qorannoof qofa kan oolu ta'a.

Hirmaannaa keessaniif galatoomaa

1. Saala _____
2. Umurii _____
3. Haala gaa'ilaa_____
   1. Kan hin fuune 2. Kan fuudhe 3. Kan hiike 4. Kan irraa du'e/ duute
4. Baay'ina maatii _____
5. Sadarkaa baarnootaa
   1. Kan dubbsuu/ barreessuu hin dandeenye 2. Kutaa 1-8 kan barate
   2. Sadarkaa 2 ffaa 9-12 kan barate 4. Sadarkaa olaanaa (Diploma, Degree)
6. Lafa amma qabdu kana akkamitti argatte?
   1. Bara 1970 lafa qoodameen 3. Dhaaltummaa
   2. Kennaa maatii 4. Kiraa
7. Lafa kee akka hin qotneef wantootni si daangessan maal fa'i?
   1. Baay'ee dhundhulaadha 3. Gabbina isaa akka dabaluuf boqochuu qaba
   2. Bu'aa gadi aanaa waan kennuuf 4. Kan biroo_____
8. Fageenya mana keefii fi lafa qonnaa kee gidduu jiru hagamta'a?_____
9. Waa'ee lafa amma qabdu irratti maal jette?
   1. Hudaa ol gahaadha 2. Gahaadha 3. Giddu galeessa 4. Xiqqoodha
10. Lafa kee irratti hojii humnaa akkamii geggeessita

1. Gartuu maatiin 2. Kaffaltiin hojjechuu 3. Gartuu daboon

11. Lafa kee kunuunsuu keessatti kanneen armaan gadii keessaa kamtu dhiibbaa sirratti qaba?

Tartiiba kennaman	Filannoo	
	Yes	No
Saala		
Umrii		
Baay'ina maatii		
Barnoota		
Fageenya lafa qonnaa irraa		
Exteenshinii qonnaa fi leenjii		
Dhundhula lafa qonnaa isaa		
Haala teessuma lafa isaa		

12. Gabbinni biyyoo lafa keetii gadi bu'eera yoo ta'e maaliifi_____

13. Oomishni lafa keetii yoo gadi bu'e maaliif sitti fakkaata?

1. Lafa boqochiisuu dhiisuu 4. Gatiin xaa'oo ol ka'uu
2. Roobni waqtii eeguu dhiisuu 5. Dhiqama biyyoo
3. Humnaa ol irratti oomishuu 6. Kan biroo _____

14. Lafa kee kunuunsuu irratti akkamitti hojjetta?

1. Kaffaltiin 2. Dirqama mootummaan 3. Fedhii kootiin 4. Hin beeku

15. Haala qonnaa lafa kee irratti baroota dheeraaf akkamitti ilaalta?

1. Jijjiirrama hin qabu 2. Gadi bu'e 3. Ni dabale 4. Hin beeku

16. Lafti gadi bu'e yoo ta'e sababni isaa maali?

1. Baay'ina uummataa 3. Babal'ina bosonaa 4. Mootummaan fudhatame
2. Badiinsa lafaa 5. Dhaabbata birroon fudhatame 6. Kan biro_____

17. Faayidaan lafa sirnaan fayyadamuu maali sitti fakkaata?

No.	Faayidaa	Sadarkaan
1.	Gabbina biyyoo fi jiidhinsa fooyyessa	
2.	Dhiqama biyyoo hambisa	
3.	Hiddi biqilaa bakkee bahuu hambisa	

4.	Biqilaan biqilu guddisuu fi margi dabaluu	
5.	Bishaan lafa jalaa fi gubbaa eeguu	
6.	Kan biro	

18. Gosa lafa kunuunsuu keessaa isa kamtu oomisha kee sirriitti daabala?

1. Irkanii buusuu 2. Dalga qotuu 3. Daagaa hojjechuu 4. Kosii fayyadamuu
5.. Hidha fayyadamuu 6. Karaa bishaan yaa'u margaan haguuguu 7. Kan biroo

19. Dhiqama biyyoo naannoo keetii akkamitti ilaalta?

1. Ulfaataa 2. Giddu galeessa 3. Xiqqoodha 4. Rakkoon dhiqama biyyoo hin jiru

20. Gosa dhiqama biyyoo isa kamtu beekamaadha?

1. Dhiqama biyyoo ishee gubbaa 3. Dhiqama biyyoo isa ulfaataa
2. Dhiqama biyyoo giddu galeessaa 4. Hin beeku

21. Gosa midhaaan nyaataa kam oomishaa jirta?_____

22. Kunuunsa itti fayyadama lafaa armaan gadii isa kam fayyadamta?

Mala kunuunsaa	**Yeroo hunda**	**Darbee darbee**	**Haga muraasa**	**Gonkuma**
Oomisha wal makaa				
Dikee				
Kaabii kaabuu				
BiqilaaTartiibaan dhaabuu				
Margaan haguuguu				
Biqilaa dhaabuu				
Dalga qotuu				
Lafa boqochiisuu				

23. Kunuunsa lafaa irratti odeeffannoon ati argattu eessaa'i?

1. Hiriyaa fi fira 2. Raadiyoo 3. Haala Mijeessitoota 4.Television 5. Leenjii 6. Kan biroo

24. Dhiqama biyyoo hambisuuf malawwan aadaa naannoo kee ni jraa?

1. Eeyyee 2. Lakkii

25. Eeyyee yoo jette kanneen keessaa isaan kami?

1. Dalga qotuu 3. Sararaan facaasuu 5. Marga sarara bishaan yaa'urra dhaabuu
2. Kaabii kaabuu 4. Marga/ muka dhaabuu 6. Hidha fayyadamuu

26. Mishingaa fi Boqqoolloo waggaa darbe hagam argatte?_____

27. Gaaffii xiinxalaa kanneen armaan gaditti kenname ittin walii gala ykn walii hin galu jechuun deebisi.

28.

TL	Himoota	Waliin gala	Hin murteessine	Walii hin galu
1.	Hirmaannaan uummataa lafa kunuunsuu keessatti ofii isaan godhu jiraa?			
2.	Baargamoo dhaabuun mala gaarii itti biyyoo kunuunsaniidha			
3.	Biqilaa baay'ee lafa xiqqoo irra dhaabuun oomisha ni dabala			
4.	Qoqqoodamni lafaa lafa kunuunsuu koo irratti dhiibbaa qaba			
5.	Hongeen deddeebi'ee uumamu gadi bu'iinsa oomishaa fida			
6.	Agro ikoolojiin ani keessa jiru midhaan oomishuuf mijataa dha			
7.	Poolisiin mootummaa, fi ekisteenshiniin qonnaa haala itti fayyadama lafa kootii irratti na jajjabeesa			
8.	Xaa'oo nam-tolcheen kosii yookin dikee caalaa gaariidha.			

Qabxiilee Afgaaffiif qote bulaa fi bulchaa gandaaf qophaa'e

- ✓ Haala maatii fi qabeenya isanii
- ✓ Qonnaa fi wantoota gufuu qonnaa ta'an
- ✓ Mala aadaa qabeenya kunuunsuuf godhamu
- ✓ Galii fi baasii
- ✓ Hubannoo badiinsa lafa irratti qaqqabu
- ✓ Hirmaannaa hawaasaa murtoo kennuu keessatti qaban
- ✓ Danddeettii aadaa isaan qaban

Qabxiilee Afgaaffiif Expertii qonnaaf dhiyaatan

- ❖ Sadarkaa malawwan aadaa lafa itti kunuunsan irra jiru
- ❖ Malawwan aadaa beekamaa ta'an
- ❖ Mala qote bulaan oomisha dabaluuf itti fayyadamaa jiru
- ❖ Faayidaa malawwan aadaa qaban

Cheekliistii Daawwannaa Bakkee

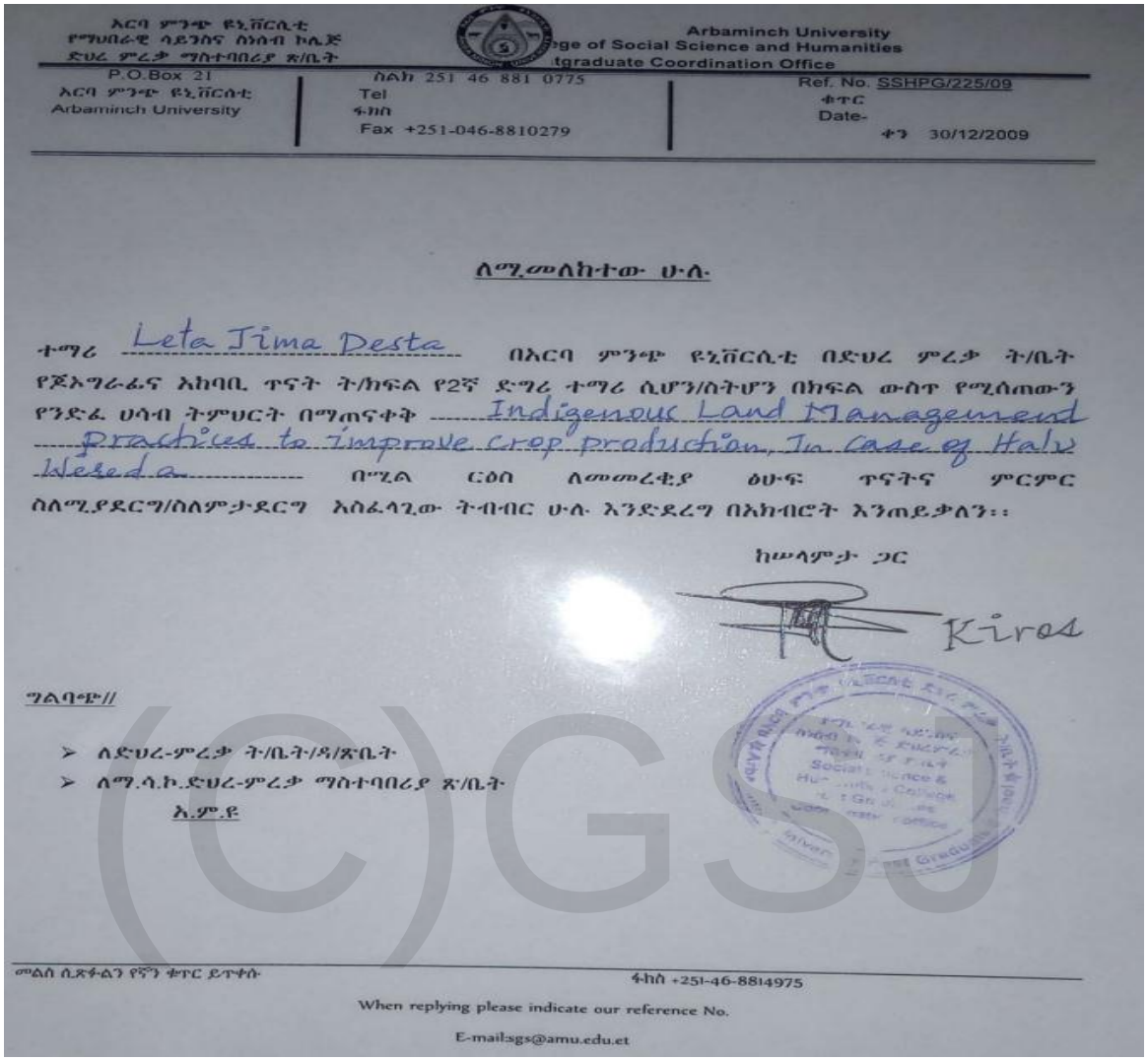
TL		Filannoo	Filadhu (✓)
1.	Haala Teessuma lafaa	1. lafa diriiraa	
		2. Pilaatoo	
		3. Lafa dhundhulaa	
		4. Baa'ee dhundhulaa	
2.	Mala aadaa itti lafa kunuunsan beekamoo ta'an	1. Kaabii kaabuu	
		2. Marga tartiibaan dhaabuu	
		3. Margaan haguuguu	
		4. lafa boqochiisuu	
		5. Kosii fayyadamuu	
		6. Dalga qotuu	
		7. Biqilaa Tartiibaan dhaabuu	
		8. Bosona dhaabuu	
3.	Qabeenya bishaanii naannoo sanaa	1. Laggeen	
		2. Haroowwan	
		3. Haroowwan goguu danda'an	
		4. Bishaan yeroo rakkoof kaa'an	
5.	Gosa midhaanii achitti oomishaman	1. Boqqoolloo	
		2. Mishingaa	
6.	Zoonii haala qilleensaa	1. Baddaa	
		2. Badda Daree	
		3. Gammoojjii	
		4. Gammoojjii ho'aa	
7.	Hawaas diinagdee naannichaa	1. Qonna	
		2. Daldala	
8.	Baa'ina uummataa sabaan	1. Oromoo	
		2. Amaaraa	
		3. Tigree	
		4. Kan biroo	

Maree Xiyyeeffannoo Addaa

1. Waggoota meeqaaf naannoo kana jiraatte
2. Malleen aadaa lafa itti kunuunsitu maal fa'i?
3. Kanneen keessaa yeroo hunda kan fayyadamtu isa kami?
4. Mare hawaasaa, fooramii Maree Paanaalii keessatti waa'ee kunuunsa lafaa ilaalchisee hirmaattee beektaa?
5. Yeroon ati dirqamaan lafa kunuunsuu irratti bobbaafamtee beektaa?

APPENDIX- II

Authorization letter from AMU



አርባ ምንጭ ዩኒቨርሲቲ
የማህበራዊ ሳይንስና ስነሰብ ኮሌጅ
ድህረ ምረቃ ማስተባበሪያ ጽ/ቤት

Arbaminch University
ge of Social Science and Humanities
tgraduate Coordination Office

P.O.Box 21
አርባ ምንጭ ዩኒቨርሲቲ
Arbaminch University

ስልክ 251 46 881 0775
Tel
ፋክስ
Fax +251-046-8810279

Ref. No. SSHPG/225/09
ቁጥር
Date-
ቀን 30/12/2009

ለሚመለከተው ሁሉ

ተማሪ Leta Jima Desta በአርባ ምንጭ ዩኒቨርሲቲ በድህረ ምረቃ ት/ቤት የጆኦግራፊና አከባቢ ጥናት ት/ክፍል የ2ኛ ድግሪ ተማሪ ሲሆን/ስትሆን በክፍል ውስጥ የሚሰጠውን የንድፈ ሀሳብ ትምህርት በማጠናቀቅ Indigenous Land Management Practices to Improve Crop production, In Case of Halu Wereda በሚል ርዕስ ለመመረቂያ ፅሁፍ ጥናትና ምርምር ስለሚያደርግ/ስለምታደርግ አስፈላጊው ትብብር ሁሉ እንድደረግ በአክብሮት እንጠይቃለን።

ከሠላምታ ጋር

Kiros

ግልባጭ//

- ለድህረ-ምረቃ ት/ቤት/ዳ/ጽቤት
- ለማ.ሳ.ኮ.ድህረ-ምረቃ ማስተባበሪያ ጽ/ቤት

አ.ም.ይ

መልስ ሲጽፉልን የኛን ቁጥር ይጥቀሱ

ፋክስ +251-46-8814975

When replying please indicate our reference No.

E-mail:sgs@amu.edu.et

The above figure was the letter that the researcher had taken a permission from Arba Minch University and Halu Wereda Agricultural office to conduct research on the because there was time when some government bodies did not want or fear to give data's or information. But holding this letter made the researcher confident because even if they were not interested to give, they were forced to help the researcher in providing the necessary information due to this legal letters. For respondents letter from Agricultural Office helped the researcher during questionnaires distribution and interview.