IMPACT OF DEFORESTATION ON RURAL LIVELIHOOD IN SHEKILA AND QALLO KEBELES OF DEWA-CHEFA DISTRICT, OROMIA ZONE, AMHARA REGIONAL STATE, ETHIOPIA

MSc THESIS

MENGISTU BIRHANU TASISA

AUGUST 2017

HARAMAYA UNIVERSITY, HARAMAYA

Impact of deforestation on rural livelihood in Shekila and Qallo Kebeles of Dewa-Chefa District, Oromia Zone, Amhara Regional State, Ethiopia

A Thesis Submitted to the School of Natural Resources Management and Environmental Sciences, Postgraduate Program Directorate

HARAMAYA UNIVERSITY

In Partial Fulfillment of the Requirements for the Degree of

MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCE AND MANAGEMENT

MENGISTU BIRHANU

August 2017

Haramaya University, Haramaya

HARAMAYA UNIVERSITY

DIRECTORATE FOR POSTGRADUATE PROGRAM

As thesis research advisor, I hereby certify that I have read and evaluated this thesis prepared under my guidance by **Mengistu Birhanu** entitled *"***Impact of Deforestation on Rural Livelihood in Shekila and Qallo kebeles of Dewa-Chefa District, Oromia Zone, and Amhara Regional State, Ethiopia".** I recommend that it be submitted as fulfilling the thesis requirement

Muluken Gezahegn (PhD)	_____	_____
Major Advisor	Signature	Date
Lisanework Nigatu (PhD)	_____	_____
Co-Advisor	Signature	Date

As members of the Board of Examiners of the M.Sc.Thesis open defense examination, I certify that I have read and evaluated the thesis prepared by **Mengistu Birhanu** and examined the candidate. We recommended that the thesis can be accepted as fulfilling the thesis requirement for the degree of Master of Science in Environmental Sciences Management.

Chairperson	Signature	Date
_____	_____	_____
Internal Examiner	Signature	Date
_____	_____	_____
External Examiner	Signature	Date
_____	_____	_____

The final approval and acceptance of the thesis is contingent up on the submission of the final copy of the thesis to the Council of Graduate Studies (CGS) through the Departmental Graduate Committee (DGC) of the candidate's major department.

DEDICATION

This thesis work is dedicated to my wife **Alemnesh *Taye*, and my son Hawi Mengistu and Sinbone Mengistu who have been** consistently rendering me encouragement and help during the study period, and for their love, prayers they made towards my success.

STATEMENT OF THE AUTHOR

I declare that this thesis is my work and that all sources of materials used for this thesis have been duly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for a M.Sc. degree at the Haramaya University and deposited at the University Library to be made available to borrowers under rules of the Library. I declare that this thesis is not submitted to any other institution anywhere for the award of any academic degree, diploma or certificate.

Brief quotation from this thesis is allowable without special permission provided that accurate acknowledgement of sources is made. Requests for permission for extended quotations from or reproduction of this manuscript in whole or in part may be granted by the head of the major department or the Dean of the School of Graduate Studies when in his or her judgment the proposed use of the material is in the interests of scholarship. In all other instances, however, permission must be obtained from the author.

Name: Mengistu Birhanu

Signature: _____

Place: Haramaya University, Haramaya

Date of Submission: _____

BIOGRAPHICAL SKETCH

The author was born on September 12, 1984 from his father Birhanu Tasisa and his mother Mulu Garie at Bushane Alalitu Kebele Administration, Nedjo District, West Wollega Zone, Oromiya Regional State, Ethiopia. He attended his primary education in Dongoro Buna Primary School (from grade 1-6) and his junior Secondary education (from grade 7-8) in Lalisa Aleltu and Secondary School Education (from grade 9-12) in Nedjo Senior high School. After he had completed his secondary education, he joined Mersa ATVET College in 2003 and graduated with a Diploma in Natural Resource Management in 2005.

Soon after graduation he was employed in Artuma Fursi District of Agricultural Office, Oromia Special Zone where he served as a Natural Resource Management expert since he joined Bahir Dar University in 2008 and graduated with a B.Sc. Degree in Natural Resource Management in 2012. After graduation he was employed by the Natural Resource Management (NRM) expert in Artuma Fursi District Agricultural Office Since 2013 June 12/6/2013. After 13/6/2013 He served as a Natural Resource Management expert in Oromia Special Zone Agricultural Office, Amhara Regional State since he joined the School of Graduate Studies of Haramaya University in October 2016 to pursue his MSc. Studies majoring in the field of Environmental Sciences and Management.

ACKNOWLEDGEMENTS

First and for most, I would like to thank my God for his overall gifts and help in passing me through the complicated situations I faced for pursing my study (from starting to end) and for his help and encourage during my whole life time.

Next, I would like to express my heartfelt thanks to my major advisor Dr. Muluken Gezahegn for his invaluable comment, close supervision and encouragement all along from research proposal formulation to its successful execution.

I am also grateful to my co- advisor Dr. Lisanework Nigatu for his encouragements, critical comments and suggestions during the write up of this thesis. I would like to thank the Amhara regional state of Agricultural bureau for letting me join post graduate studies at Haramaya University and for funding my M.Sc. study and research work. I would like also to express my sincere appreciation to Oromia Administrative Zone of Agriculture office for giving me a chance to pursue my post graduate study. Moreover, I am highly indebted to Shekila and Qallo kebeles development agents for assisting me in the field work and their encouragement.

Last but not least, I would like to express my deepest thanks and appreciation to my wife Alemnesh Taye for her encouragement, love, and patience to challenges faced during my absence from home. She deserves much credit for my accomplishment. My love also goes to my sons, Hawi Mengistu and Sinbone Mengistu.

LIST OF ABBREVIATIONS AND ACRONYMS

BoARD	Bureau of Agriculture and Rural Development
DA	Development Agent
DCDADO	Dewa-Chefa District Agricultural Development Office
ETB	Ethiopian Birr
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
GDP	Growth Development Program
ITCZ	Inter Tropical Convergence Zone
NGO	Non-Governmental Organization
NTFPs	None Timber Forest Products
PFM	Participatory Forest Management
PSNP	Productive Safety Net Programme
SLMP	Sustainable Land Management Program
UNRISD	United Nations Research Institute for Social Development
WB	World Bank

TABLE CONTENTS

LIST OF TABLES

Table **Page**

LIST OF FIGURES

LIST OF TABLES IN THE APPENDIX

Appendix Table **Page**

Impact of Deforestation on Rural Livelihood in Shekila and Qallo Kebeles of Dewa -Chefa District, Oromia Zone, Amhara Regional State, Ethiopia

ABSTRACT

Deforestation has significant negative impacts on the livelihood of the local community. The rate and extent of deforestation is much higher today than in the past. However, the impact of deforestation on community livelihood is not documented. Therefore, this study was aimed to address and fill the existing theoretical and practical research gap. That means by providing the necessary information about the impact of deforestation on rural livelihood. This research was carried out with the intention of investigating impacts of deforestation on rural livelihood in selected Kebeles of Dewa -Chefa District, Oromia Zone, Amhara Regional State, Ethiopia. The study used a cross sectional data consist of survey method, which was supplemented by qualitative research to enrich quantitative data. Two kebeles were purposively selected based on their severity of deforestation impact on livelihood, exploitation of the forest resources for different purposes. Ninety seven sample household heads were selected using simple random sampling technique. In addition, key informants and people as FGD were selected by purposely sampling technique .SPSS software (version 20) were used to analysis the data. The study findings indicated that the major factors contributing to the rapid deforestation of the natural forest were attributed to farm land expansion, the rising demand for tree products for fire wood, expanding population pressures, poverty /lack of income/ and construction materials ,demand for grazing land. The results of the study also included that the major environmental consequences of deforestation included the decline of soil fertility, increase in temperature, and decline in amount of rain fall. Furthermore, the study showed that the socioeconomic impacts of deforestation on livelihood of rural households in the study area was identified by factors like decline in forest products, decreased in household income, decline in agricultural yield, decreased in livestock population and livestock products, increase in desolation of people and decrease in social consistency. The study also showed that forest resource degradation had resulted in biodiversity loss in the study area. The efforts in forest resources conservation by rural households in the study area were not adequate to mitigate the problem of local forest degradation and deforestation despite the fact that there were some efforts on part of governmental and nongovernmental organizations in mobilizing the rural community towards forest conservation. By considering the above facts, then it's recommended that the natural forest of the study area could be developed. Through- provision of environmental education, afforestation, providing alternative form of fuel (energy), strengthening PFM and strong law enforcement on part of the government. On those who illegally and indiscriminately eliminate the forests help solve the impacts deforestation on the environment and socio-economic of livelihoods of rural household of study area.

Keywords: Deforestation, Forest degradation, Dewa Chefa district, household, rural livelihood.

1. INTRODUCTION

1.1. Background of the Study

Forests are one of the most important natural resources with diverse economic, socio-cultural and ecological uses. The livelihoods of hundreds of millions of people worldwide have been engaged on forest products either directly or indirectly. Forests have a vital safety net role in time of needs (Anonymous, 2008).

In addition to contributing to the overall macroeconomic growth of nations, it also uses the people those depend on these resources for their basic livelihood needs. This is especially true for the poor and rural populations. So the forest functions depend on the daily needs of livelihood of people living close to it. For instance, rural populations depend most fundamentally on forests in terms of subsistence, health, income and culture (Adebisi, 2008).

Forests provide a wide varieties of ecological, economic and social services, including the conservation of biological diversity, carbon storage, soil and water conservation, provision of employment and enhanced livelihood, enhancement of agricultural productivity and improvement of urban and per urban living conditions. That means forest is an intricate system made up of plants and trees that protect biodiversity, providing home to terrestrial biodiversity and improving the quality of life forms on earth (Popoola, 2014). While some services are immediately visible, other is a long term nature and takes their full sense only in the perspective of intergenerational equity. These services are at risk where they are most needed, especially in fragile ecosystem which characterized many poor countries and areas in the developing countries.

The livelihoods of over two hundred million forest dwellers and poor settlers depend directly on food, fiber, fodder, fuel and other resources taken from the forest or produced on recently cleared forest resources. Also, according to Nzeh and Eboh (2007) poor people have thus been able to exploit the forest for food, fuel and other marketable products which create both income and employment for the rural dwellers.

However, these forest functions and services are being continuously affected by deforestation and land degradation. Deforestation is one of the major environmental issues not only in directly

affected countries and locations, but also from global perspective, the degree of international attention to deforestation is appropriate with the role of forests in the global, national and local ecosystems.

There is increasing societal concern about the impact of deforestation especially in this 21st century because of the mixed effects; socio-economic benefits and negative effects that it produces. On the positive side, the loss of the world's forest resources has contributed to the fulfillment of households' livelihoods and provided other socio-economic, cultural and spiritual benefits. It's identified about 500 million to 1.6 billion people live in and around forests benefitting partly from the forests for their livelihoods (TEEB, 2010).

The causes of continuous forest loss are multidimensional and they include both internal and external factors. The internal factors include: unsustainable agriculture, conversion to agriculture, wildfires, fire wood collection and charcoal production, mining, population pressure, poorly defined land and resource tenure. On the other hand, the external factors include: market failures, international trade, and the imposition of economic programs such as the structural adjustment program (Appiah *et al*., 2009).

Different studies indicate that the fertile topsoil is lost at a rate of about one billion cubic meters per year, resulting in massive environmental degradation and a serious threat to sustainable agriculture and rural livelihoods (Haileslassie *et al.*, 2005). Altitude and topographic location have favored Ethiopia to have varying agro climatic zones. This has given rise to the presence of a botanical treasure house containing over 6000 different flowering plants in Ethiopia; out of these flowering plants, 12% are probably endemic (FAO, 2007). Measuring the total rate of habitat conservation for the 1990-2005 intervals, Ethiopia lost 3.6 percent of its forest and woodland habitat due to firewood collection, conservation to farm land, overgrazing and use of forest for building materials (FAO, 2005). Population increase have resulted in extensive forest clearing for agriculture, overgrazing by domestic animals, utilization for fuel wood, fodder and construction materials (Sands, 2006).

These factors undermine agricultural productivity and aggravate economic development efforts, especially in developing countries where there is heavy land dependence (Shiferaw and Holden, 2000) in low external-input farming systems as the case being experienced in the Ethiopian

highlands. Incomes from forest sources play an important role in rural livelihoods in developing countries. In particular, products from forest sources contribute significantly to rural households' economic wellbeing (Getachew *et al*., 2007).

1.2. Statement of the Problem

Alarming population growth has attributed to increasing demand for forest products and impacted forest based livelihoods of the local communities adversely. It also confirmed that deteriorating livelihoods of the local communities at household level were impacts of a growing population and increasing demands for forest products and other natural resources (Zelalem, 2008). According to Bedru (2007) forest products have a significant role in rural livelihoods since they are sources of food, medicine, fuel, lumber, paper and habitats for a variety of life forms. In addition to this, they help to protect soil erosion, regulate climate change and are places of grazing for livestock during the dry season. African countries the spate of deforestation has increased over the past four decades, with significant effects on rainfall, temperature, water resources, wildfire frequency, agriculture and livelihoods (Amisah *et al*., 2009).It is generally accepted that consumption of forests has multifaceted benefits for rural livelihood in Ethiopia. Increase use of fuel wood and charcoal leads to deforestation and forest degradation, soil erosion, loss of biodiversity and other environmental problems such as negative environmental, economic and health impacts (Cooke, 2008).

Pressure on arable land is growing, forcing people to convert more marginal lands to arable land and this leads to further deforestation and land degradation. On the other hand, former areas used as grazing land are converted to arable lands. Because forest resources are very few and further decreasing, people are forced to use animal dung as a fuel wood substitute organic matter is thus not brought back to the soil, but used for other purpose (Ludi, 2002). This fundamental condition, lead the investigator to propose the research programmes to take the issue seriously.

Loss of forest resources, therefore, make rural people poorer due to loss of direct access to forest resources, disappearance of arable land due to soil erosion, loss of animal and plant species of medicinal value, poor environmental quality and loss of water bodies. Therefore, the study focuses on the impact of deforestation on rural livelihood and to understand rural community

perception towards major causes of deforestation with the current high deforestation rates, which reduces the yield and the food insecurity problem of the country.

However, local communities are clearing the forests deliberately and/or unknowingly for various purposes. Similarly, from the investigator's observation, the existing forest in the study area is being highly destroyed due to exert excessive pressure on forest reserves as their livelihoods predicated on the availability, access and utilization of forest products (Appiah, 2009). Additionally, forest degradation risks the quality of life in rural communities and beyond, militates against the stability of climate and local weather; threaten the existence of other species. Ultimately, these effects affect the livelihoods in such rural communities in most.

Therefore, forest degradation has significant impact on the livelihood of the local community and environment of the study area. Cognizant of the above mentioned issues one can infer that increasing demand of wood for fuel and construction purpose, the shortage of farm land, scarcity of forest product coupled with poverty and rapid population growth in the study area would lead to clearance of vegetation cover. Therefore, this research work was conducted to fill the existing theoretical and practical research findings gap by providing the necessary information about the impact of deforestation on rural livelihood of households in the Dewa Chefa district.

1.3. Research Questions

In relation to the cause's extent, the study tries to answer the following research questions.

- What is the impact of deforestation on rural livelihood in the Shekila and Qallo *Kebeles* of Dewa-Chefa district?
- What is the contribution of forest resource to rural livelihood in the Shekila and Qallo *Kebeles* of Dewa-Chefa District
- What the efforts by local community on forest resource in the Shekila and Qallo *Kebeles* of Dewa-Chefa District?

1.4. Objectives of the Study

General Objective: -

The study focused on investigating the impact of deforestation on the rural livelihood in the Shekila and Qallo *Kebeles* of Dewa-Chefa district

The specific objectives were:-

- To assess the impact of deforestation on the rural livelihood in the Shekila and Qallo *Kebeles* of Dewa-Chefa District
- To assess the contribution of forest to rural livelihood in the Shekila and Qallo *Kebeles* of Dewa-Chefa District
- To investigate the efforts by local community on forest resource in the Shekila and Qallo *Kebeles* of Dewa-Chefa District

1.5. Significance of the Study

Livelihoods of rural households are adversely affected by impacts of deforestation and land degradation since them directly or indirectly depend on forest resources. The study is useful to assess the impact of deforestation on the rural livelihood of the farming households. Furthermore, the findings of this study important in providing valuable information to policy makers, development planners, NGOs, and government institutions working in the locality; for the purpose of successful food security programme enhancement practices. Deforestation, besides altering the natural environment, affects the access of households to wood for fuel and construction. Rural households rely mainly on the forest products for energy. Therefore, understanding of the impact of deforestation on the rural livelihood of farmers would enable policy makers and development partners of the government to plan and implement programmes and projects to alleviate the problems there by improving livelihood of the community.

This research is designed to understand the level of knowledge of the community about deforestation and the associated negative impacts on their rural livelihood which is essential in the development and implementation of natural resource management programmes. The declining fertility of the soil leading to demand for chemical fertilizers to compensate for the loss of organic matter and essential nutrients through deforestation has been a pressing issue among

rural communities. This study helping know the extent to which the rural livelihoods of the study area are affected by deforestation and land degradation. Therefore, the information can be useful to understand, the impact of deforestation on the rural livelihood of farmers, what are the major determinants for households to impacts environmental and socioeconomic on the study area.

1.6. Scope of the Study

The geographical size of the study area and the scope of the problem should be delimited to restricted selected Kebeles. Accordingly, the focus of this study was to assess the impacts of deforestation on the rural livelihood. The survey activity was conducted in two representative *Kebele* administrations of Shekila and Qallo in Dewa-Chefa District, Oromia Zone, Amhara Regional State. These findings from the study may possibly assist policy makers in developing pertinent policies to protect the forests in study area and also, provide better alternatives for the people take advantage of the forest for their own development.

2. LITERATURE REVIEW

2.1. Definition of Forests

A basic definition of a forest is that, it is an ecosystem or assemblage of ecosystems dominated by trees and other woody vegetation. The Food and Agriculture Organization (FAO) however, provides a more comprehensive definition of the term. According to FAO (2010), a forest is a land spanning more than 0.5 hectares with trees higher than 5meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds situated naturally and uninterrupted.

2.2. The Concept of Deforestation

Deforestation defined broadly can include not only conversion to non-forest, but also degradation that reduces forest quality, density and structure of the trees, the ecological services supplied, the biomass of plants and animals, the species diversity and the genetic diversity (FAO, 2005). Angelsen and Balcher (2005), report that the disappearance of natural forests in developing countries is a major problem because it negatively affects the livelihoods of people dependent on forest products and services.

Historically forests have been any important for the people of Ethiopia for their livelihood even more than now. People used trees to cook their food, to build their traditional homes. They also made traditional medicines from trees and other forests plants. Ethiopia reported in FAO (2010) puts Ethiopia among countries of the world with forest cover of 10–30 %. According to this report Ethiopia's forest cover (FAO definition) is 12.2 million ha (11 %). It further indicated that the forest cover shows a decline from 15.11 million ha in 1990 to 12.2 million ha in 2010, during which 2.65 % of the forest cover was deforested.

Bishaw (2003) indicates that forests and the benefits they provide in the form of wood, food, income and watershed protection against land degradation have an important and critical role to play in enabling people to secure a stable adequate food supply. Claus (2006), deforestation impacts economic activity and threatens the livelihood and cultural integrity of forest-dependent people at local level. Deforestation reduces the supply of forest products and leads to siltation,

flooding and soil degradation. Yasuoka and Levins (2007) are of the opinion that clearing forests and the subsequent agricultural development has a detrimental effect on every element of local ecosystems such as microclimate, soil and aquatic conditions, and most significantly, the ecology of local plants and animals including human disease factors.

Ethiopian farmers and a significant number of urban dwellers depend solely on biomass energy for cooking and in some cases even for lighting. Wood is therefore vital sources of domestic energy besides the need for construction and production of farm implements and household furniture. Bekele (2001) maintains that the energy sector remains heavily dependent on wood for fuel. Wood provides 78% of the energy required, while dung and crop residues provide 16 %. Additionally, Asfaw (2003) reports that a marked feature of Ethiopia's energy sector is the high proportion about 93% of biomass energy relative to modern forms of energy consumption. However, deforestation and land degradation are rapidly becoming the most serious problems in rural Ethiopia where the majority of the population live and depend on the forest products for energy.

Tumbe *et al.* (2005) and Schereckenberga *et al.* (2007) state that forests fulfill central role in rural livelihoods, providing a wide range of products and services for subsistence use, cash income and safety nets in times of need. In particular, rural households depend on forest and wood land resources to meet their energy needs, to provide construction and roofing materials, and to provide fodder for livestock. In addition wild fruits ensure healthy diet as well as a supply of medicinal plants.

Consumption of wood for fuel occurs not only in rural areas, but also in urban areas. Area attributed to deforestation stands at 150, 000 to 200,000 hectares per year, Bishaw (2001), Haile *et al.* (2006) and Berhe (2004). Generally deforestation occurs when people clear forest for their personal need such as, for fuel, hunting, when they need the land to grow and harvest crops, for building houses, and at times because of religion beliefs (Sucoff, 2003).

2.3. The Causes of Deforestation

The causative factors of deforestation have their roots in different sectors (Mahapatra and Kant, 2003) and as a result, the effects produced are also varied across the global, national and local

boundaries. These factors may be categorized broadly into anthropogenic and natural. In most cases the anthropogenic causes are often easily identifiable probably because of the increasingly recognition of human footprints on the earth's system (McCarthy, 2009). It is important to note the human drivers of environmental change (deforestation) vary in nature and scope but can be broadly grouped together as economic, conflict and governance, demographic, social and science and technology (UNEP, 2006).

There are several reasons for the depletion of forest resources in Ethiopia. However, the major causes include: increases in population and consequent increases in the demand for agricultural land, fuel wood as well as construction and industrial use; settlements around forest areas and forest fires; the expansion of large commercial farms in forest areas; the absence of a forest protection and conservation policy; the absence of a strong forest administration system capable of arresting the rapidly increasing rate of deforestation as well as controlling and preventing the disruption of the various eco-systems; lack of effort to ensure the participation of communities in forest protection and conservation and the sharing of benefits; failure to clearly demarcate and enforce the boundaries of natural forest reserves (EPA, 2003, MELCA Mahiber, 2008). Ethiopia, forest degradation is closely linked to the ongoing population growth. As commonly known more people lead to an increasing demand on land for living and for agricultural production. This is can be done at the expanse of forest lands.

2.3.1. Fuel wood and charcoal making

People who are living in developing countries depend largely on fuel wood as major energy for cooking and heating. The collection and burning of fuel wood create environmental problems including soil erosion, loss of watershed areas, and emission of particulate and other pollutants (De Souza et *al.,* 2003). Firewood gathering and charcoal making have significantly contributed to land degradation and forest destruction.

In most developing countries, more than 80% of wood extracted are being used for fuel (Myanmar, 2000). Fuel wood consumption is one of the main causes of deforestation and excessive cutting trees for firewood before they are fully grown, leads to the loss of potential growth of the forest stands in these countries.

In Ethiopia, 85% of domestic energy consumption is derived from forest products and this clearing land without selection to expand agricultural lands is the main cause of loss of biodiversity (Girma. *et al.,* 2002).As population increases household energy consumption also increases. Large population of the country depends on fuel wood and charcoal. For the poor in rural areas, it is not only a source of energy but a means of income generation too.

Charcoal making and selling is a major non-farm employment along main roads of the country (Mulat *et al*., 2004). Scarcity of fire wood has become acute in many parts of the country causing a continuous rise in prices, and thus increasing the economic burden on house hold budget. Animal dung and crop residues are increasingly being used for household fuel rather than being added to the soil to improve soil fertility, thus further exacerbating the problems of environmental degradation and deforestation. This indicates that the situation with energy use is one of the most critical land degradation issues in Ethiopia.

2.3.2. High population growth

Rapid population growth affects the quality of the environment and living standard of the people and the reverse is true. Population growth means an increasing number of people with no proportionally growing alternative sources of livelihood. This unbalanced growth of population and alternative resources may lead to environmental deterioration such as deforestation, overgrazing, soil erosion, water pollution and others (Woldeamlak, 2002).

According to the United Nation's Framework Convention on Climate Change (UNFCCC, 2010), the overwhelming direct cause of deforestation is agriculture; with subsistence farming responsible for 32%, logging 14% and fire wood removal make up 5%. Nigeria has the worst deforestation rate in the world, which can be attributed to increase in population with high poverty level bulk of the population depend on forests for their energy needs (IITA, 2011).

In most parts of Ethiopia, rural households are depending on subsistence agriculture; use forest products as fuel, fodder, and building materials. In poor rural comminutes the continued need for family labor supports high fertility and rapid population growth that places additional pressure on natural vegetation (De Souza *et al.,* 2003). Similarly, Medhin (2002), in his report titled with sustainable development in Ethiopia, " described that unchecked population growth, coupled

with overgrazing, has brought about the encroachments of the marginal areas as steep slopes and ecologically precious lands to meet the need for wood, fuel and grazing. The subsequent removals of natural vegetation and improper land use practices have resulted in the degradation of the land and eventually conversion into wastelands.

2.3.3. Agricultural land expansion

The rapid population growth coupled with accelerated deforestation and land degradation has led to an increasing demand for agricultural land. The rapid degradation and depletion of the forest resources base is already finding its expression in the different sectors of the economy such as agriculture, water resources, energy and biodiversity (Hosonuma *et al*., 2012).

The expansion of agricultural land by clearing forests is the major cause of deforestation in Ethiopia (Verchot, 2014) The greatest threats to the remaining natural forests of Ethiopia are man-made clearing for farm land expansion at present level, the clearing of forests by investors for coffee and tea plantations, and indicated that uncontrolled exploitation of the timber and fuel wood in the remaining woody vegetation. Yet, depending on the orientation between land-converting activities and forest resource extraction, effort allocation by households might increase deforestation, increase forest degradation, or enhance both (Delacote and Angelsen, 2015).

2.3.4. Overgrazing

In the highlands, the expansion of grazing land beyond the land's carrying capacity occurs at the expense of the remaining natural vegetation and further land degradation. The scarcity of grazing land and livestock feed causes the wide spread use of natural vegetation particularly forests to feed livestock (MoARD, 2007).

Livestock pressure and stock management (mainly based on free grazing system) are major sources of deforestation and land degradation. Only 25% of Ethiopia's high livestock population grazes in the rangelands, where as 75% graze in the highlands (EPA, 2010). Overgrazing destroys the most palatable and useful species in the plant mixture and reduces the density of the plant cover, thereby increasing the erosion hazard and reducing the nutritive value and the carrying capacity of the land.

In Ethiopia, overgrazing is mainly due to keeping large number of cattle in forest and wood lands. The consequences of overgrazing have been land degradation, soil erosion, soil compaction as well as reduced species diversity and density of the vegetation (Chamshama and Nduwayezu, 2002). Heavily grazed plots result in poor quality of physical and even chemical properties of soils. High soil compaction is clearly observed in heavily grazed plots than less grazed plots (Girma et. *al.,* 2002).

2.4. Effects of Deforestation

Deforestation is a contributor to global warming and is often cited as one of the major causes of the enhanced greenhouse effect. Tropical deforestation is responsible for approximately 20% of world greenhouse gas emissions (Williams, 2006). Removal of forest cover leads to a loss of animal habitat, loss of biodiversity, shortage fuel wood, agricultural land soil erosion and drought (Mulligan, 2004).

2.4.1. Climate change

Deforestation, particularly tropical deforestation, can change the global change of energy by increasing the concentration of carbon dioxide in the atmosphere (Lawton *et al*., 2001). Tropical deforestation has regional effects on the ecological environment of adjacent mountains. Deforestation disrupts normal weather patterns creating hotter and drier weather thus clearly increasing drought and desertification, crop failures and displacement of vegetation regimes. In dry forest areas, land degradation and deforestation has become, an increasing serious problem resulting extreme cases in desertification (Hays, 2008).

Climate is the interaction of all of the components of the earth's system and it includes the solar and infrared radiations and sensible and latent heat fluxes are all impacted by changes in the earth's surface. The significant role of the land within the climate system should not be surprising. Apart from their role as reservoirs, sinks, and sources of carbon, forests provide numerous additional ecosystem services. Many of these ecosystem services directly or indirectly influence climate. The climate-related ecosystem services that forests provide include the maintenance of elevated soil moisture and surface air humidity, reduced sunlight penetration, weaker near-surface winds and the inhibition of anaerobic soil conditions (Pielke, 2002).

It is frequently stressed that the changes of vegetation type can modify the characteristics of the regional atmospheric circulation and the large-scale external moisture fluxes. So that Changes in surface energy budgets resulting from land surface change can have a profound influence on the Earth's climate (WMO, 2005). On the other hand, the transported transformation of substances in the environment, through living organisms, the atmosphere, oceans, land, and ice are known collectively as biogeochemical cycles. The Earth system is composed of a number of biogeochemical cycles, all powered by the sun's energy. These global cycles include the circulation of certain elements, or nutrients, upon which life and the earth's climate depend. Then, through these cycles, all components of the environment are interrelated and greatly affect each other.

2.4.2. Water and soil resource loss and flooding

In rural Ethiopia, food security is affected by a combination of socio-economic factors and increasing fragility of local ecosystems (erosion and deforestation in particular), together with increasing population pressure which has seriously affected agriculture productivity in many areas. Bruijnzeel (2004) in his study of hydrological function of forests, described deforestation disrupts the global water cycle. With the removal of forest, the area cannot hold as much water creating drier climate. Thus, deforestation seriously affects water resources including drinking water, streams and dams affected by siltation, and damage to crops and irrigation system from erosion. In line with above ideas, Van NordWijk (2006) indicated deforestation results in to watersheds that are no longer able to sustain and water flows from rivers and streams which leads to flooding and soil erosion. The formation of sheet, rill and/or gully erosion are common in areas where ground cover is insufficient.

In Ethiopia, soil erosion is the most ecological process which degraded the precious soil resources which is basis of agricultural productivity and food for the people (Hurni, 1993). Loss of fertile soil reduced production and the per capita income, which further impoverished the resources poor-subsistence farmers (Mekuria, 2005). The massive removal of forests cover is a driving force behind land degradation in Ethiopia. The removal of vegetation cover for the use as fodder, and fuel leads to an increasing surface runoff and, to high soil erosion. In addition this will lead to loss of soil nutrient and a reduction in water holding capacity (Teketay, 2001).

2.4.3. Decreased biodiversity and habitat loss

Forest ecosystems play several roles at worldwide as well as local levels as contributor of environmental services to nature in general, humans in particular, and as source of economically valued products (UNEP, 2005). Forests especially natural forests are used for various ecological and economic purposes.

Myers and Mittermier (2002) stated that forests especially those in tropics serve as store house of biodiversity and consequently deforestation, fragmentation and degradation destroys the biodiversity as a whole and habitats for migratory species including the endangered species. They also argue that tropical forests support about two-thirds of all species and contain 65% of the world's 10,000 endangered species. Moreover, the biodiversity loss and associated large changes in the forest cover trigger abrupt, irreversible harmful regional, climatic changes which could shift rainforests to savannas and deserts (FAO, 2010).

In support of this, MoARD (2007) described Ethiopia's forests has been currently depleted by conversion of forest areas to agricultural lands, by a high demand for timber and fuel wood. In Ethiopia, a leading cause of degradation of marginal forested is caused poor farmers and landless people who clear trees to grow crops and the abject of rural population poverty. People damage environment and accelerate environmental degradation, there by adding to rural poverty and misery.

Moreover, CBD (2009) reported that forest and generally biomass degradation, as well as consequent land degradation leads to the destruction and erosion of biodiversity of both plants and animals. In the past, the focus of biodiversity conservation in Ethiopia was only in crop genetic resources. Thus, animal diversity was completely neglected, while plant diversity was only of interest as far as it related to crop genetic resource diversity. More specifically, the destruction of habitats; the introduction of a narrow spectrum of crop varieties; recurring droughts, as well as wars and conflicts could be mentioned as the most common causes for the destruction of biodiversity in Ethiopia. In view of the presently growing conflicts between biodiversity conservation and agricultural needs, there is a potential danger that conservation of biodiversity may lose.

The loss of plant biodiversity may lead to the decline of ecosystem integrity and loss of plant genetic resources, which in turn result in hindrance of scientific progress in agriculture and pharmaceutics. According to WHO (1999), 80 percent of the world population depends on herbal medicine for primary health care needs. The main source of these traditional medicines is the forest ecosystem. Therefore, loss of plant biodiversity would have great influence on the health of the poor who are financially constrained and will not be able to buy modern medicine. According Tadesse (2003), deforestation resulting in loss of biodiversity is among the most acute environmental problems in the country. The use of herbal medicine in the country therefore may not have a sustainable future.

2.4.4. Social consequences

According to Schmink and Wood (1992), the most immediate social impact of deforestation occurs at local level with change or loss of ecological service provided by forests. Forests afford humans valuable service such as erosion prevention, flood control, water treatment functions that are particularly important in the world's poorest people who relying on natural resources for their own every day survival. They also argue that by destroying the forests peoples risk own quality of life, gamble with the stability of climate and local weather, and threaten the existence of other species.

Cultural factors such as attitudes and perceptions as unconcern for forests due to low morale and frontier mentalities, lack of steward ship values, and disregard for "nature", profit-orientation of actors, traditional or inherited modes of cultivation or land-exploitation, and a commonly expressed sentiment that it is necessary to clear the land to establish an exclusive claim (Alex, 2002).

As to Wageyehu (2003), the destruction of tree stocks would cause changes the ecology of rural areas, mainly carrying capacity of the soil loses of top soil, reduced erosion soil moisture content and greeter flooding adversely changes water tables, reduction in the recycling of soil nutrients are observed in many parts of Ethiopia.

2.5. Definition of Livelihood

Carney (1998) defines a livelihood as "the capabilities, assets (including both material and social resources) and activities required for a means of living". The assets are defined as capitals (natural, human, financial, physical and social) and more than just being simply the means to make a living with, they also give value to people's life. This definition incorporates attributes such as: getting the basic requirement of living (food, shelter, clothing, money); capabilities or capacities, which are based on equity of resources and participatory decision making (Hiremath and Raju, 2004).

Ellis (2000) also defines livelihood as the activities, the assets and the access that jointly determine the living gained by the individual or household. What is common to the three views is the ability of people to undertake activities and own assets to guarantee them decent living conditions. Aduse-Pokuet *al*. (2003) posits that livelihood is much more than a job. It covers the wide and diverse range of things people do, comprising the capabilities, assets and activities required for a means of living. In most situations resources found within one's immediate vicinity will provide a livelihood or the means of making a living, which is true of most rural dwellers in Ethiopia.

2.6. Concept of Sustainable Rural Livelihoods

The concept of 'Sustainable Rural Livelihoods' relates to a wide set of issues and is increasingly central to the debate about rural development, poverty reduction and environmental management (Scoones, 1998).Thus, the idea of sustainable livelihoods emerged as an approach to maintaining or enhancing resource productivity, securing ownership of and access to assets, resources and income-earning activities, as well as ensuring adequate stocks and flows of food and cash to meet basic needs. Clearly, impact of deforestation on rural livelihood is an important component of this framework (Tropenbos International, 2005).

A livelihood is sustainable when it can cope with and recover from stress and shocks maintain or enhances its capabilities and assets, and provide sustainable livelihood opportunities for the next generation, and which contribute net benefit to other livelihood at the local or global levels and in the short and long term (Solesbury, 2003) .Rainfall remains a constraint outside the influence of households, and its affects the productive practices. The importance of rainfall for agriculture,

especially small holder agriculture, cannot be over emphasized as its variability and scarcity affects sharply the yields and livelihood of farmers. It is factor within the control of small holders, and depends on the use of sustainable management practice. Rain fed agriculture and animal husbandry are the principal economic activities in the study area. These factors lead to deforestation and land degradation, which reduces the bio- productivity of the soil and land. Deforestation mostly affects rural households who are forced to depend on natural resources for their livelihoods. More so, deforestation and land degradation lead to the migration of people to urban or other areas to engage in economic activities such as farming, grazing and fishing. Other impacts of deforestation are that it could lead to economic and social strife. Food security remains a top priority for most rural people, including the urban poor that constitute the majority of farmers in the study area. Contending with low rainfall, depleting soil fertility, and high temperature, farmers adopt various methods to ensure adequate harvests.

2.7. Livelihood in Forest Surround Rural Communities in Ethiopia

Most forest fringe communities are rural in nature and that, the rural economy is primarily agricultural although some trading, small-scale production and food processing, collection and processing of non-timber forest products (NTFPs) and services take place in the community (Abane, 2009). Some of the dominant livelihood activities include farming (crop production and animal rearing.), gathering, hunting, trading and craft making. Among these livelihood activities, crop production and animal rearing are the most common source of livelihoods for most rural dwellers.

Gathering is a seasonal livelihood activity since most of the items collected do not appear throughout the year. These products are usually gathered in the forest and are called non timber forest products (NTFPs). Examples include snails, mushrooms, canes and leafy vegetables. They are particularly important among the rural poor who have access to few resources beyond the forest. Hunting is another form of livelihood, mainly practiced by males. Small wild animals are hunted during the day and bigger animals hunted during the night. Women are normally not involved (Aduse-Poku *et al.*, 2003). This livelihood depends on the continued existence of suitable wildlife habitats. With the introduction of commercialization, trading has become very popular in most rural economies. Items traded in include food, crops, local and imported

products. Women and the youth used to do most of the selling; however the trend is now changing since more men are getting involved. In some villages and towns cottage industries such as pottery, woodcarving, soap making, basket weaving, cloth making, wood industry, palm oil extraction and food processing e.g. corn or rice mill are found. Some rural dwellers that have some form of formal training are employed in the public services such as teaching, nursing, or in providing services to the public. These people may be few due to lower levels of education in the rural areas (Aduse-Poku *et al*., 2003).

2.8. Impact of Deforestation on Rural livelihood

From the reviewed literature, deforestation is a known development challenge. It is proposed that people have an understanding of forest types and that deforestation influence the local perception of the rate and extent of deforestation and its causes (Adams, 2009).

The livelihood of rural people is directly linked to the utilization of forest resources for food production, energy sources and shelter. Mismanagement of these resources reduces the livelihoods of those who are dependent on these resources. The majority of the Ethiopian population (85%) relies on land resources including forest resources for their livelihood, mainly through land cultivation (Bekele, 2001). The traditional system of land cultivation has led to the removal of the productive top-soil hence a decline in land productivity, which has negative economic and environmental implications. The demand for wood both to build houses and for fuel contributes to the depletion of the resources. This imbalance between the natural regeneration and removal of the resources exacerbates land degradation there by placing a strain on the livelihoods of households. Therefore, further exploration of the causes of deforestation and soil erosion and linking this impact to rural livelihoods of the farming communities of Ethiopia can make a vital contribution to local knowledge and community development planning.

Deforestation, partly resulting from unsustainable agricultural practices and fuel wood exploitation are exacerbating problems of environmental degradation especially desertification and soil erosion and loss of biodiversity in the more arid and semi-arid regions. These environmental problems may ultimately result in soil impoverishment or outright loss of the productive topsoil with an attendant decline in vegetation cover of the areas. This was

consequently cause forest ecosystems to change in various ways, such as in animal and plant species distribution, changes in tree physiology and stability. This was manifested itself in stand-level effects, as well as in major disruptions or disasters caused by more dramatic weather events.

3. MATERIALS AND METHODS

3.1. Description of the Study Area

3.1.1. Location of the study area

Geographically, Dewa-Chefa district is located in Amhara National Regional State, Oromia special administrative Zone. Dewa-Chefa district was found 325 km North-East of Addis Ababa. In terms of relative location, Dewa-Chefa district is bordered on the North by Kalu district, on the South by the Artuma fursi district, on the East by Dawe Harewa district and on the West by Antsokya district. The geographical location of Dewa-Chefa district is in North-Eastern part of Ethiopia between 10°32'–10°58'N latitudes and 39°46'–39°56'E longitudes with an altitudinal range between 1,400 to 2,500 meters above sea level (masl). The Dewa-Chefa district covers an area of 1,156.36 square kilometer (115,636 ha) (DCDADO, 2015).

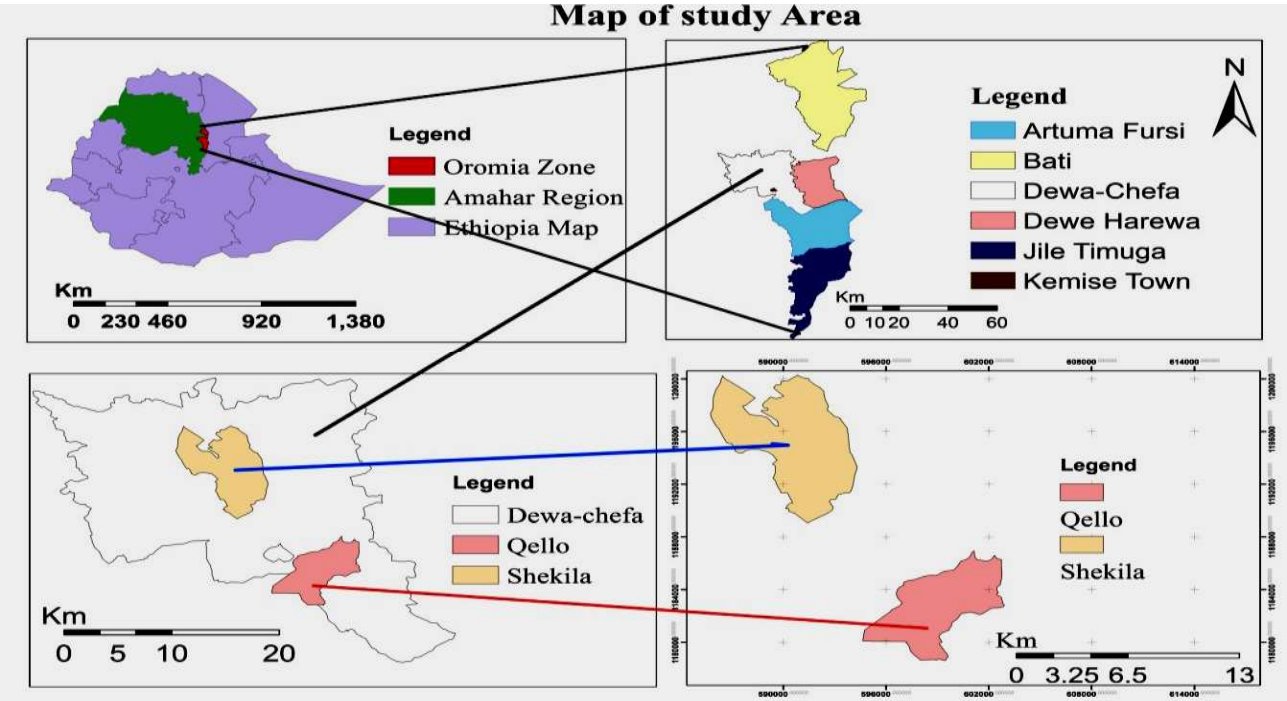

Figure 1: Location map of the study area

Source: Ethio-Arc GIS, 2014

3.1.2. Soils of the study area

According to FAO (1984), the soils of Wollo area have been developed almost exclusively on trap series volcanoes. The soil on the land forms, which include wide parallel valleys, side slopes and volcanic plateau, are generally stony phase eutric and dystric Vertisols or vertic Cambisols. In the intensively cultivated, even on minimum slopes, these highly erodible soils can become quite shallow. On the steeper land forms, eutric Cambisols predominate, with lithic phases and Leptosols occurring on the steepest slopes. The soil for the study area includes predominantly Chromic Cambisols, Eutric Cambisols and Chromic Vertisols where the Chromic Cambisols dominates the eastern part of the study area and the Chromic Vertisols occupies the southern, south western and north western area of the study area. Vertisols is generally fertile soil, with good moisture holding capacity, but with water logging problems in those areas where the land slope is below 8% (IPMS, 2004). They are hard and crack during dry season and sticky when it is wet in the rainy season (summer).

3.1.3. Physiographic feature of the study area

Dewa-Chefa district is composed of various altitudinal categories of highlands that rising from 1400m to 2500 masl (meters above sea level) in the extreme West (Terefe kebele) to the extreme East (Reke Glana and Gula kebele) of the study area.According to DCDARDO (2015), the topography of Dewa-Chefa district is grouped in to three; namely, mountain, rugged topography, and flat land. Generally, rugged topography is the dominant land form of the survey area. It is obvious that the present day land configuration of the district is the result of past tectonic activities in the area. The study area is largely exposed to these negative impacts of deforestation and forest resources degradation.

3.1.4. Vegetation of the study area

The Dewa Chefa district administration vegetation cover is categorized as vegetation of arid and semi-arid lands (highly variable, including cactus scrub, thorn scrub and many woody and sparse grasses formations). The vegetation in the Administration is not found in contiguous form covering large area; rather it is seen as fragmented patches of bush land, shrub land and trees in agricultural sites and hillsides. The natural forest has been cleared to satisfy the demands of the ever increasing population such as construction material, fuel wood, fodder and agricultural

expansion. The remaining high forests cover less than 7% while the majority of the landmass is covered with shrub lands. According to the Dewa Chefa district Agricultural Development Office 2015 report about 7.8 percent of the total land area of the district is covered by vegetation; 16% open shrub and lantana camara land, Whereas, the vast area of the district 8.7%, is bare land, sand or rock with scrubs and grasses. On large hills of the area, the vegetation is extremely threatened because of intense grazing and fuel wood extraction.

However, recently, substantial environmental regeneration campaign practices have been underway in some parts of the district where enclosing an area from livestock and human interventions being taken as a one of strategies in the restoration of the degraded forest lands. In addition to this the planting of different young trees is enabling the degraded hills in restorations and conservations of vegetation in the district where. Reke forests can be taken as a good example.

3.1.5. Climate of the study area

The agro-climate of the study area is sub-divided in to two zones; that is, Woyina Dega and Kola zones. Therefore, the agro-climate of the study area is dominantly characterized by Tropical (Kola) type of climate. The highest temperature is observed during the spring season (May to June), while the lowest temperature is during the months of October, November and December. Temperature and rainfall are considered to be the two most important factors in the agriculture of the highland regions of Amhara, and Ethiopia at large. The maximum and minimum annual average temperatures are 35 $^{0}_{C}$ and 25 $^{0}_{C}$ (DCDADO, 2015).

There are two rainy seasons in the highland regions of Ethiopia namely the short rainy season (*Belg*), occurs between February and April and "Kiremt" and which show the big rains. Summer (*Kiremt)* rains which accounts for about 74% of the annual precipitation are the most economically important rains for crop production (Kahsay, 2004).The rainfall of the study area is similar to other parts of the lowland regions. The rainfall pattern of the study area is bi-modal and the main rainy season (summer) extends from June to September when the ITCZ is to the North of the equator. The small wet season is usually occurs during the first two months of spring (March to April). The annual total rainfall of the study area is not more than 900 mm. on an average DCDADO (2015).

3.1.6. Livelihood

The major source of livelihood of the population in the study area is mixed farming (i.e. crop and livestock). The primary economic activities are crop and livestock production. In addition to these activities, the people engage in petty trading, construction, and daily labor. Crop production plays a great role in income generation in the district. Cereals and pulses are the main crops grown. Farming land has expanded towards steeper slopes and this has accelerated soil erosion and vegetation degradation in Dewa Chefa district. The farmers are also rear animals like cattle, sheep, goats, and donkeys. Hillside areas are used as a communal grazing land. There is high animal feed shortage throughout the year, especially during the dry season. The major crops grown in the area include teff, sorghum, and maize. The major growing season is the Meher, the most productive (dominant) season in the study area. Having only one productive agricultural season is one of the reasons, coupled with severe deforestation and land degradation, that the population of the area is often faced with food shortages (Dewa- Chefa district ADO, 2015).

Agriculture activities are rain-fed, and planned around the Kiremt season which lasts from June to mid-September. An erratic belg short rainy season occurs from February to April. The cultivation of staple sorghum, maize, and teff is complemented by an assortment of cash crops that include *masho* (mung bean), tobacco, fruits and vegetables. Oxen are used to provide draught power for land preparation.

Ploughing requires the heaviest labour and is done by men. Women do most of the weeding, and support men during harvesting. Migrant laborers from the Wollo and Shoa highlands come into the zone in search of harvesting labor opportunities. The main livestock reared are cattle and goats. Goats are the commonly sold and slaughtered livestock. Goat sales and slaughter increase during the religious festivals in April (*Easter*), September (*New Year*) and January (*Christmas*). Income from the sale of goats is important for covering regular household expenses throughout the year. Cattle are high-value assets owned only by the middle and better-off households. Though they are sparingly sold, they provide most of livestock income. Livestock sales in normal years are moderated by the interest in modest herd growth in order to accumulate a stock of animals that can be sold in bad years. For this reason, mature female animals are particularly esteemed. They are usually replaced from within the herd. Increased availability of mature

female animals on the market is a strong indicator of severe household distress. Lactating cows provide additional income from the sale of butter. Oxen are also important for providing traction power. Seasonal oxen sales occur during the land preparation period, and provide an opportunity to replace ageing oxen from the market. Children are mainly responsible for watching over all livestock. Black leg and anthrax are the main hazards to livestock production. Treatment and vaccination for these diseases is available from the BoARD free of charge or from the market. The poor earn additional income from firewood sales and wage labor opportunities. Firewood is collected from state protected areas, and labor is available in urban areas or in the fields of the better off households.

The productive safety net programme (PSNP) was initiated in 2005 and is designed to protect the assets of chronically food insecure households through the provision of food and cash entitlements. Household with able-bodied members get access to their entitlements through public works activities, and households without labor receive direct support i.e. without participating in public works. PSNP distributes cash to the very poor from January to June. Participants are paid 25 Ethiopian Birr (ETB) per day for a 5-day working week for one person (Dewa- Chefa district ADO, 2015).

Since agro-climatic zone of the district is conducive for crop production, various types of crops such as sorghum, teff, maize, mung beans, etc. are the major crops grown in the district. Furthermore, cattle breading is very common in the area. In addition, forest exploitation and sale of forest resources is also one of the major household income sources of the forest surrounding community and the poorest households. Forest products such as constructional materials, fuel wood and charcoal are supplied to Kemise, Komobolcha and Dessie town and even to the city of Addis Ababa from the existing forest resources in the district.

3.1.7. Population of the study area

Dewa-Chefa district has the total population of 141,529. Out of this 70,115 are females the remaining 71,414 are males. From the total Population (urban and rural) about 98 percent are Muslims; the remaining (2 percent) are Orthodox, Protestant and other religious groups. About 97.8 percent (137, 283) live in rural areas and out of these 99 % are Muslims (DCDADO, 20015).

3.2. Research Design

The study was designed to investigate the impact of deforestation on rural livelihood in selected kebeles of Dewa-Chefa district, Oromia Zone; Amhara Regional State. A cross sectional data was employed to collect data because this method is suitable for describing the existing situation, narrating facts and investigating phenomena. Cross sectional data involves data collection from sample of population at one specific time as opposed to longitudinal method which gathers data on a factor over time. Its advantage is that it is an efficient way to identify possible group differences because one can study them at one point in time. Here, it was used to describe, the causes and impacts of deforestation on rural livelihood in the study area. In order to address the stated objectives both quantitative and qualitative approaches were used.

The cross sectional data used to describe and explain the current situation of forest degradation in the study area. It was also chosen because it would be helpful in obtaining pertinent and precise information on impact of deforestation on rural livelihood by concerned stakeholders and to draw valid conclusions about the events of the sample population.

3.2.1. Sample size and sampling techniques

There are 21 administrative *kebeles* in Dewa-Chefa district. Out of them two *kebeles* were selected purposively based on severity of deforestation and forest degradation. Moreover, these two *kebeles* were selected, because of the researcher's own experience about the area, which was important to know and prioritize the serious problems in the study area. Their inhabitants live in close proximity to the main road and forest product selling site than the remaining ones. Therefore, the information obtained through in depth discussions made with Dewa-Chefa district Agricultural Development Office (DCDADO) and Dewa-Chefa district Agricultural experts(DCDAE) gave priority to them to be selected. The purposively selected kebeles were Shekila and Qallo. Shekila *kebele* has the total population of 7,068 and total household size of 1414 and Qallo *kebele* has the total population of 7,041 and total household size of 1408. The total numbers of households of these *kebeles* are 2,822. The sample households for Shekila and Qallo *kebele* administrations were 97respondents.

Selection of data collection techniques depended on the type of information needed, and also the types of the respondents. While designing of the techniques, attention was given to answer the research questions and to attain the objectives. The following are key techniques which applied to collect the required data from the subject matter of the study in the selected area. The sample household heads were selected from each kebele using Simple random sampling techniques. Out of 2,822 totals households (HHs), 97 sample households plus 8 key informants and 16 focus group discussions were purposively selected.

The sample size was determined by using formula to determine sample size. Once the total sample household size is determined, the sample household's size from each kebele was determined proportionally. Finally, the sample households were chosen from each Kebele using Simple random sampling technique as follows:

$$n = \frac{N}{1 + N(e)^2}$$

Where:

n= Sample size of household

N= total number of housing units (excluding institutions)

e= is the precision level with 95% of confidence level i.e. 0.1

Table 1: Provides some registered household figures for the two Kebeles in study area

No	Kebele	Total population	Total household	Sample size	Percent (%)
1	Qallo	7068	1408	48	49.5
2	Shekila	7066	1414	49	50.5
	Total	14134	2822	97	100

Hence,

Using the mathematical determination with the total household of the two (2) selected Kebeles = 2822.

$$n = \frac{N}{1 + N(e)^2}$$

$$n=\frac{2,822}{1+2822(0.1)^2}$$

$$n=\frac{2,822}{1+2,822\ (\ 0.01)}$$

$$n=\frac{2,822}{1+28.22}$$

$$n = \frac{2,822}{29.22}$$

$$n=97$$

Therefore**,** 97 respondents were selected by using simple random sampling and purposely sampling techniques. Generally, the sample size of the researcher was 97 including those selected as key informants and FGD.

3.2.2. Method of data collection and instrument

Both primary and secondary data sources were used in this study in order to achieve the objectives of the study. The primary data sources were the purposively selected *Kebeles*, which in turn the sources of sample individual household head's (HHHs). In this respect, questionnaires, interviews, and focus group discussion (FGD) were used to gather the original data. Additionally, based on the nature of data required, field observation was conducted by the researcher. The necessary data related to the socioeconomic and physiographic factors that could affect the rural livelihoods were examined. Relevant secondary data were obtained from published and unpublished office documents, governmental and nongovernmental organizations,

articles, journals, internet sources, research reports and books were employed for acquiring the necessary information.

3.2.3.1. Questionnaires

Questionnaire is the most appropriate tool to obtain reliable information. It is also better for the household respondents in that minimizing the difficulties of ambiguity and reduces effect of biased conclusion and interpretation happened in the other methods. The questionnaires were used to collect the data from the sample household heads (HHHs) in the form of open-ended and close-ended questions. Open-ended question enable respondents to freely express their options and view without prejudices, and hence obtain adequate information in relation to the objectives set for this study. However, the close-ended questions, apart from reducing time consumption, made it easier for data analysis and processing of factual information.

The items of the close-ended questions were choice type. The questionnaires covered the wide range of socio-demographic variable as well as variable related to the assessment impact of deforestation and land degradation on rural livelihoods. Before distributing the actual questionnaire, it was pre-tested on selected farmers of non-sample household respondents. The enumerators were recruited and trained for four hours. The trained enumerators under close supervision of the researcher administered the questionnaires. It was again used for the training and discussion with the enumerators at the beginning of the survey period to familiarize and make any necessary modification. One day was spent on training the enumerators. Ten enumerators were hired to execute the survey. The target person to be interviewed was the household head or an influential person in each household.

3.2.3.2. Key informant interview

The semi-structured interview schedules were prepared. The interviews were conducted by the researcher targeting the key informants such as elderly persons, kebele officials, youngsters, women, development agents (DAs), and experts at the districts office of agriculture and rural development. The key informants were selected and interviewed purposively. Due to time and financial constraints, eight key informants were interviewed for this study from the kebeles including the district agricultural office experts. Based on their experience and indigenous knowledge on forests on the study area, one local elder from each kebele were purposively

selected for the interviews and the interviews were also done with one youngster and one woman from the two kebeles was purposively selected for the interviews. The interviews were also done with two district experts in environmental protection and Agricultural Office in natural resource management department of Dewa-Chefa district and two kebele experts working on natural resource management and agronomy field. The interview was conducted with a focus on the present status of forests, the change in forests of the study area, the response taken by concerned bodies, and the level of community and stakeholders participation in the management of forests. Key information gathered from informant interviews was used as a means of triangulation with the data from the questionnaire result.

3.2.3.3. Focus group discussion

The focus group discussion was made to collect the qualitative information from the selected two kebele administrations. The individual participants of the focus group discussion was purposively selected based on the information obtained from the DAs working in the sites, their interest of participation in group discussion and their knowledge backgrounds about the severity impact of deforestation and land degradation on rural livelihoods in the study area. The discussion was structured so that participants were asked a predetermined set of questions, using the same wording and order of questions.

Thus it was helpful that to substantiate the information that was obtained through interviews of the key informants. Therefore, sixteen target individuals were selected from the two kebele administrations and the total numbers of selected household heads' discussion were accordingly, different open- ended questions were prepared and presented to the selected individual to express their responses regarding the current research question under investigation. This condition in turn, enabled the researcher to confirm and justify the results of the questionnaires that distributed to the household heads' (HHHs).

3.2.3.4. Field observation

Field observation was begun while writing the proposal and continued on to the whole process of data collection to make sure the validity of acquired information. It was aimed on an understanding the local condition of local community in terms of their culture, farm practices and traditional way of resources utilization and application of conservation measures, etc. During

the study, the researcher took notes on the impact of deforestation on rural livelihood of the community, existing physical and biological soil conservation measures, livelihoods of the community, yield conditions, livestock condition ,forest resources, topography and land use. It was also necessarily used to gather primary information with regard to the current conditions of cultivated lands, the observable management practices and the surrounding environmental conditions relating to the conservation practices through transect walking across the environment and forest lands of the study area with the aid of visual photographs so as to realize the actual existing realities that will be raised in the questionnaires. While the investigator was conducted frequent field observation by using the check lists on to assess the impact of deforestation and forest degradation on rural livelihood and the types of livelihood.

3.3. Methods of Data Analysis

Both qualitative and quantitative data which were collected from primary and secondary sources were analyzed by using different methods of data analysis. The qualitative data were analyzed through narration, summarization, and discussion. Whereas, the quantitative data were analyzed using simple descriptive statistics such as frequency, percentages, mean, graphs and cross tabulations were used in analyzing the data. The basic data analysis tools which were used for this were Statistical Package for Social Science (SPSS) software version20 and Excel.

4. RESULTS AND DISCUSSION

This chapter deals with the result of survey data that was conducted using different instruments of gathering information from a sample of 97 households. The results extracted from the sample respondents through questionnaire, interviews, focus group discussions and observation are presented as follows.

4.1. Descriptive Statistics on Socio Demographic Characteristics

This section looked at the demographic characteristics of the respondents interviewed during the field survey for the study. Though this section does not necessarily address the core objectives of the study, it provides useful information that might complement the findings for policy decisions to be made on the affected population.

Table 2: Descriptive statistics on socio demographic characteristics

Variables	Frequency	Percent
Sex		
Male	66	68.0
Female	31	32.0
Total	97	100
Age Group (years)		
16-25	3	3.1
26-35	15	15.5
36-45	35	36.1
46-55	33	34.0
56-65	9	9.3
≥66	2	2.1
Total	97	100.0
Educational qualification		
Illiterate	65	67.0
Grade 1-4	25	25.8
Grade 5-8	6	6.2
≥12	1	1.0
Total	97	100.0

Table 2 shows the descriptive statistics on socio demographic characteristics of the respondents. The results indicate that about 68.0% of the respondents were males and the female respondents account for only 32.0%. Though literature has identified many causes of deforestation which include mining, logging, and bushfires among other factors, this did not show much significance in the study communities in relation to agricultural production (food and cash crop farming) as being the major activities undertaken by men with women and children playing supporting roles.

People in different age groups have different perception due to forest resources conservation practices. Accordingly, the relatively respondent age group (36-45 years) respondents, 36.1 percent responded to the impacts of deforestation on rural livelihood. The proportion is 34.0 for the impacts deforestation on livelihood community .Hence, the response is less among the relatively old age group and younger age groups (66 years and above and 16-25 years) respondents to the impacts of deforestation on rural livelihood (2.1and 3.1percent) respectively. The age range of the respondents was so divers that there has been good information gathered in relation with the impact of deforestation on rural livelihoods. The interview conducted with some of the youth during the survey also indicated that the youth in the communities did not find much prospects in the forest and its resources. Farming has also been left basically in the hands of the elderly households who depended on hire labor with their little earnings instead of the youth being encouraged to take over farming activities that would increase productivity. The situation has led to subsistence and peasant farming which has exacerbated poverty in the study area. It provides the data on the ages of respondents. According to Table 2, educational backgrounds of the sampled households of the study area were 67% (Illiterate), 25.8 %(1-4 grade) and 6.2% (5-8 grade) respectively. The percentage of respondents above 12grades is 1%.

Education would have a great influence to use and manage forest resources. Mainly, the educational background of a respondent was used as indicators of the level of awareness of the respondents on the forest resources uses and abuses and the impacts of deforestation on the rural livelihoods of the communities. The literacy status of farmers is useful to know their perception about the current situation of impacts of deforestation on rural livelihoods. Educational level of farmers has a great impact on the general awareness on the adverse effects of environmental degradation due to deforestation (Shibiru, 2003).

Level of education is one of the demographic features of households which have crucial role to increase information about environmental problems in general and causes and consequences of deforestation and land degradation. Practically the education performance of farmers who attended primary education (1-8) was better than that of farmers who did not attend formal education. Similarly farmers who attended high school (10-12) were found to be superior in terms of understand the impact of deforestation on rural livelihood when we compared to those who had primary education in general.

Therefore, literacy has fundamental impacts on the environment in general and deforestation and land degradation management in particular and practices to be implemented. The finding was consistent with initial assumption and it was also similar to findings by Habtamu (2006) who identified educational status of farmers to have positive influence on their decision to retain introduced natural resource conservation practices. That means either biological or physical conservation mechanism since adequate education enhances farmers' level of forests and its conservation practices. It was therefore, expected that the farmers would be inclined to sustainable forest resources management.

Table 3: Family size of respondents

Family size	**Frequency**	**Percent (%)**
1	3	3.1
2	7	7.2
3	17	17.5
4	15	15.5
5	21	21.6
6	10	10.3
7	6	6.2
8	6	6.2
9	4	4.1
10	2	2.1
11	2	2.1
12	1	1.0
13	2	2.1
14	1	1.0
Total	97	100

According to the above Table the size of the household is an important demographic variable affecting the perception of deforestation and land degradation. It should be noted that as the household size increases, there will be more chances to implement negative changes on forest resources due to food insecurity to generated income. The data presented in Table 3 lists the number of family members per household interviewed, -and then the member ranged from 1 to 14. The percentage of households with family members of 5 was 21.6%; the percentage of households with a total family size of 7 was 17.5% and 15.5% of households had a total family size of 6.

In principle, despite the differences in socio-economic status and other related factors, households having large family size need large area of cultivated land. When the comparison of the family size is seen among the individual age groups, the maximum family size is common by those whose frequency ranges between 5-7 family size in these kebeles and their respective sub kebeles. The size of family members can be seen from different angles; in the first place, if the household size is larger with many mouths to eat rather than to work, will have negative effect on practices of forest resources conservation measures in general. In relation to this, the study conducted by Drake (2003) indicated that in the large families with greater number of mouth to feed, immediate food need is given priority and labor is diverted to deforestation activities that generate livelihood items. In the field observation it was observed that gender of the farming household; literacy status, household size, and even experience of the household in deforestation were other major causes of economic losses from deforestation in Dewa Chefa district.

4.2. Livelihood Strategies

4.2.1. Sources of livelihood in the study area

Based on the findings, the major livelihood activities can be categorized broadly into agricultural production; and other forms of livelihoods. Farming activities, including crop production and animal husbandry, are the major economic activities as well as main sources of household income in the Dewa Chefa district. Hence the dominant livelihood of the area is derived from mixed farming (85.6%). crop production and animal husbandry dominate because livestock are the assets that a rural household needs to possess for security in overcoming food shortages in times of crop failure. Additionally, land cultivation is undertaken using oxen and a human labor,

unless it is very poor, a households needs to have at least two oxen for tilling the land it is owns.8.2% of households interviewed indicated that earning livelihood included small trading in addition to farming and animal husbandry and 6.2% of households participated on farm and off farm activities fields. Farming activities are usually seasonal and rain fed, however they are by far the biggest income generators for the local people. In fact, the Ethiopian economy is heavily dependent on agriculture/farming, which provides employment for about 85% of the population and accounts for 45% of the GDP (FDRE, 2013).

Table 4: Major livelihoods of the respondents

S/No	Major livelihoods	Frequency	Percent (%)
1	Mixed farming	83	85.6
2	Farming and Trading	8	8.2
3	On farm and off farm activities	6	6.2
	Total	97	100.0

4.2.2. Total annual income of the sample households

It's difficult to establish precise information regarding household income because the respondents could hardly tell sincerely their household earnings. However, effort had been made to know their income by asking the amount of money they earned from all livelihood activities such as selling of grain, livestock and livestock products, vegetables, charcoal , fire wood , local trades product and other non-farm activities. Accordingly, as indicated in the Table 4, below, the monthly income distribution of the respondents ranges from≤6,000 to≥ 9,000 Ethiopian birr with an average income.

According to the expert from Dewa-Chefa District Agricultural Development Office, the forest resource at district area is an important constituent of the natural capital available to the local people. Forest productivities and forest income are important components of household's livelihood strategies. Forest income plays a role in alleviating poverty, filling seasonal income gaps and coping with income crisis, particularly in the poorer households who were more dependent on forest income than better off households.

This finding concurs with a finding by Yemiru *et al*. (2010) who used a sustainable livelihood perspective in Southern Ethiopia in which forest provides 24% of household incomes for high

income groups and 52% for low income groups. In both groups, forest products generate both subsistence and cash incomes which let rural people tackle poverty or have income in crisis times. Rural households (poor and non-poor) commonly seek forest resources for support when they have to face emergency situation such as crop failures and shortage of rainfalls.

Meanwhile, the investigator observed that some households sell forest products from the local forest as additional source of livelihood to generate supplementary income, particularly in the rainy period/before harvest. In addition, those who did not have land or hold small land sizes gradually became involved in clearing the forest land into crop and /or grazing areas as a coping mechanism to resolve their seasonal income insecurity.

One of the key informants from kebele development agents working on natural resource management in district described that "forest resources are highly exploited due to the high demand for farming land expansion, for firewood consumption and for fire wood and charcoal sale in the nearby markets. This is mainly because the district was very close to Kemise, the capital town of the Oromia special Zone. In the Dewa Chefa district, the main way through which the community generated income from forests was through selling firewood, charcoal and timber products." The rural households were also inquired how often they sell forest products like firewood and other forest products to the market in order to get money for their household as well as whether their household income was disturbed if they stopped selling these forest products.

Table 5: Total annual income of the respondents

S/No	Yearly income of respondent	Frequency	Percent (%)
1	≤6000	27	27.8
2	6001-7000	26	26.8
3	7001-8000	24	24.7
4	≥9000	20	20.6

4.2.3. Major source of cash income in study area

As indicated in Table 5, off-farm employment opportunities in Dewa Chefa district as a whole and in particular are available but not considerably much. Thus, the single most important source

of cash for the households was the sale of agricultural products such as grain, livestock and livestock products, and in very few places vegetables, fruits and khat. In fact, extremely poor peasants and some female- headed households secure subsistence cash from firewood and charcoal sales, and petty trades.

As presented in Table 5, the most significant source of cash income from the grain sale was accounted for 30.9%.That means it was found out to be the most important source of the respondents' subsistence in the study area. Cash income from livestock and livestock products sale accounts for 27.8% while income from other non-timber forest products and off- farm activities constitutes 17.5% of the total cash earned by the respondents in 2016. The remaining minor sources such as transfer or gift, firewood and charcoal sales, poultry and bee production, petty trades and local crafts work are responsible for only 23.7.% of the total financial income for the sample households.

Table 6: Summary of households major sources of cash income

S/No	Source of cash income	Frequency	Percent
1	Livestock's and livestock products sale	27	27.8
2	Grain sale	30	30.9
5	Fire wood Sale	20	20.7
6	Transfer (PSNP)	3	3.1
7	Other off farm activities and NTFP	17	17.5
	Total	97	100.0

4.3. Land Holding Size of Respondents in Hectares

Farmland holding size of households which ranges from ≤0.5 hectares to ≥ 1.51 hectares is presented in Table 6. When compared to the average land holding size of 2 hectares at national level, only 7.21% of the interviewed households owned land near to the national average of 2 hectares. Owning land by the households enables generation of information in relation with the impact of deforestation and land degradation. This is because households can clearly see what deforestation causes on their farm plots and the associated problem in affecting land productivity and impacting the livelihoods of the rural community.

Again the survey results showed that most of the respondents were engaged in crop production for subsistence and commercial purposes only while some of them undertake it for both purposes. The motive for farming usually influence the size of land on which one undertakes his or her activities. From the survey result it was realized that the farmers undertake their farming productivities both for home consumption and for sale. This clearly indicates that crop production is the main source of livelihood for the respondents. Therefore, from the discussions, farmers expand food and cash crop production on forest land by deforesting forest resources, but must be encouraged to integrate tree crops in the farm land to regain the loss vegetation that nourishes the land for increase productivity.

Table 7: Farmland holding size of the respondents' in hectare

S/No	Farm land Size	Frequency	Percent (%)
1	≤0.5	45	46.4
2	0.51-1.00	37	38.14
3	1.01-1.50	8	8.25
4	≥1.51	7	7.21
	Total	97	100.0

Land is one of the most important natural resources to a community or rural household. People use land for many different purposes, like agriculture. This variable is a basic asset for majority of the rural livelihoods. As it has been shown in the Table 6, the average farm size is aggregated to 1 hectare per household and it's difference to the national average of land size two hectare . This means that there is an acute shortage of land in study area, which inhibits the farmer's ability to produce an adequate amount of crops to nourish the fast-growing population. In Ethiopia, the ratio of people per hectare of land under cultivation is less than one hectare; this means a family with seven members has only a hectare of land (Sisay, 2003, CSA**,** 2007). Hence, pressure on land at the household level has been increased as long as the population size was increased. Generally, as discussed above in detail farmlands in the study area were small and fragmented. This has contributed to massive expansion of agricultural land at the expense of vegetation area.

4.4. Livelihood Contribution of Forest

Forest resources contribute directly to the livelihood of 90% of the 1.2 billion people in the developing world that live in extreme poverty (Culas, 2006). Poverty and dependency on forests as a livelihood are also a serious threat to forests and other natural resources. They have been causing destruction of forests and environmental degradation. This point is further elaborated that many people in our country are dependent on forest and forest products. They cut and sale firewood and charcoal or use forest products for cooking and construction. As a result such integrated effect contributes for the destruction of forest resources. Such challenge is facilitated by the weaker enforcement mechanism, lack of alternative energy sources especially in country sides. Observation on sufficient benefit obtained from forest resources as a result of deforestation was one of the points used to collect information from the sampled households. Figure 6 summarizes the response from sampled households; due to forest resources degradation the respondents' responded with 61.9% of them indicating that there was no sufficient benefit obtained from forest resources at this time due to decline of vegetation cover. 38.1% households were agreed that have sufficient benefit obtained from forest resources of study area.

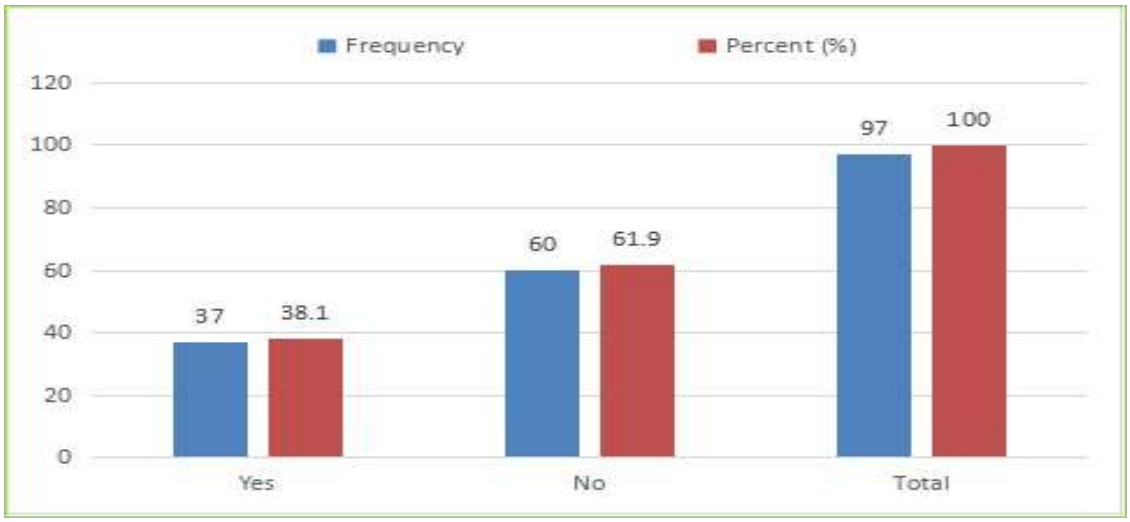

Figure 2: Do you benefit obtained from forest resources sufficiently

4.4.1. Households extraction of forest products

As it can be shown on, Table 7: the respondents extract forest products or supply them to support the household consumption and income. In view of that, considerably large proportion (94.8%)

of the sample households replied that they had produce forest products to supplement their family income with other activities. Local people in the study area utilize forests for different purposes. Forests are exploited to gather natural resources, including timber for construction and furniture making, for sale, for firewood, and for the production of charcoal. Only 5% of the sample households responded that they were not clears the vegetation for making household products either for market or consumption.

The households were also they produce forest products like fire wood ,charcoal, timbers, pole, construction woods and other forest products either for market or for household consumption in order to get money for their household as well as whether their household income was disturbed if they stopped selling these forest products. This is illustrated in the Table 7 below.

Table 8: Percentage distribution of households by forest product exploitation

Do you use forest products	Frequency	Percent%
Yes	92	94.8
No	5	5.2
Total	97	100.0

4.4.2. Utilization of forest products for sale and consumption

As shown in Table 8, the majority of households in the study area use forest products mainly for household consumption 74.2%, while only 20.6% of households use them for the local market sale and 5.2 % no used forest products. It is estimated that about 45% of the wood consumed in the world is used for home heating and cooking. Being one of the poorest countries in the world, Ethiopia's experience is not an exception, where 96 percent of the population is dependent on biomass energy sources for cooking and other energy demands (Mekonnen, 2012). Moreover, 99.9 percent of the total rural population uses energy that is derived from biomass fuels (Gebreegziabher, 2007).

Forest products generate both subsistence and cash incomes which let rural people tackle poverty or have income in crisis times. Rural households (poor and non-poor) commonly seek forest resources for support when they have to face an emergency situation such as crop failures and shortage of rainfalls. Meanwhile, the researcher observed that some households sell forest

products from the local forest as additional source of livelihood to generate supplementary income, particularly in the rainy period/before harvest. In addition, those who did not have land or hold small land size gradually became involved in clearing the forest land into crop/or grazing areas as a coping mechanism to resolve their seasonal income insecurity.

Table 9: Utilization of forest products for sale and consumption

Item	Frequency	Percent (%)
For market	20	20.6
For consumption	72	74.2
None	5	5.2
Total	97	100.0

4.4.3. Forest resources role for rural livelihood and major causes of deforestation in study area

Forests resources are valued from a variety of perspectives and for a variety of purposes. Table 9 shows impact of the deforestation on rural livelihood of the study area. As the result indicates, 73.2% of farmers' responded that the main cause of deforestation was energy supply to the households. This may be attributed to the fact that farmers use trees for home fuel wood energy consumption. However, from interviewed farmers 13.4% of them were aware of most of the causes of deforestation such as using wood product materials for shelter, local crafts materials (7.2%) and food supply (6.2%). Whatever it is, from the above result, it is convincing to say that the majority of farmers' perceived energy supply from fuel wood; using wood products for house construction materials; local crafts materials, and food supply as the main contribution of deforestation on rural livelihoods, while the least contribution to deforestation of rural livelihoods identified by farmers were local crafts materials and food supply practices.

Table 10: Dominant forest resources contribution for rural livelihood and major livelihood activities causing deforestation of the study area

Item	Frequency.	Percentage (%)
Energy supply	71	73.2
Food supply	6	6.2
Materials for shelter	13	13.4
Local crafts materials	7	7.2
Total	97	100.0

4.4.4. Dominant tree species use for the domestic consumption

The inhabitants of the study area also make use of the surrounding vegetation for different purposes such as social, cultural, and environmental values. The local population obtained almost all of their house hold utensil and construction material from forest product. The survey conducted in the area also showed that the great majority of the households' utensil and furniture were derived from the forest resources.

As information obtained from the sampled households indicates, forest is everything so as far as house construction, fences and furniture are concerned in the area. The construction of any kind of houses demands forest at least to obtain doors, windows and the like, although the major tree species that respondents used for the production of energy sources were ***Eucalyptus camaldulensis***, ***Cordia africana, Calpurnia aurea, Acacia decurrens, Dodonea viscosa*** etc, shrubs and bushes were obtained from own forest resources. These forests products for energy source purposes were obtained through collection of wood from forests depending on the accessibility. These caused over exploitation of the forest ecosystem for local energy sources purpose; it had induced substantial pressure on the forest resource of the study area.

Table 11: Dominant tree species use for the domestic consumption of the respondents

Tree species	Frequency	Percent (%)
Cordia africana	2	2.1
Calpurnia aurea	3	3.1
Acacia decurrens	21	21.6
Eucalyptus camaldulensis	25	25.8
Dodonea viscosa	12	12.4
Shrubs and Bush	34	35.1
Total	97	100.0

It was observed that 35.1% of the respondent farmers were used for the production of energy sources are shrubs and bush, 25.8% of the respondents indicating that making fuel wood is Eucalyptus camaldulensis, the third major species that respondents were used for the production of energy sources indicated by 21.6% of the respondents were Acacia Decurrens, Dodonea Viscosa species for energy source with 12.4% , Calpurnia Aurea species 3.1% ,and Cordia Africana 2.1% of the respondents indicated that the search for energy sources respectively. This is illustrated in the table 10 above.

4.4.5. Sources of energy for domestic consumption

Forest resources are the base for social and economic development in Ethiopia. This development of a society finds expressions in its increasing capacity to meet certain need. Satisfying most of these needs would require the consumption of energy, albeit in varying degree. The development and the use of energy are thus vital to economic and social development and contribute to the improvement of living conditions. The global energy demand was growing and is expected to continue growing with the projected growth of the population and with the expansion of energy-dissipative economic activities.

Fuel wood production was the cause of deforestation in the Dewa-Chefa District, because, wood is required for fuel in rural areas. The excessive cutting of trees for firewood before they are fully grown leads to the loss of growth potential of the forest stands. As indicated in Table 9, (21.6%)

of the respondents confirmed that fuel wood production was a major cause of deforestation next to agricultural land expansion in the study area.

In most developing countries, more than 80% of wood extracted from forests is being used for fuel (Myanmar, 2000). In relation to this, most of the key informants noted that they were collecting a lot of firewood to prepare food and heat their houses as there were few or no sources of alternative energy in their locality. According to the respondents, in the study area fuel wood consumption was the common and major household energy source for home based activities (food cooking, water heating, etc). Because of the lack of modern electric energy supply, the majority of the households are depends on fuel wood. This indicates that much of the rural livelihoods do not have access to alternative energy sources like biogas, solar energy and electric energy. In connection with this, the respondents were also inquired to describe the source of energy for household use (cooking and heating) as revealed in Table 12 below.

Table 12: The dominant source of energy for domestic consumption of respondents

Source of energy	Frequency	Percent (%)
Fuel wood	31	32.0
Charcoal	6	6.2
Cow dung	24	24.7
kerosene	4	4.1
Crop residues	32	33.0
Total	97	100.0

The respondents agreed that the major source of energy for household consumption was crop residues, fuel wood and cow dung. In this regard, 33.0%, 32.0% and 24.7% of the respondents indicated that the source of energy was crop residues, fuel wood and cow dung respectively, the other energy sources were from, Kerosene and Charcoal were 10.3%. The local leader and focus groups and Development Agents support the above statement in that firewood consumption was one factor for forest's depletion in their area. It was obvious that land and forests were some of the resources used as major means of livelihoods of the local community. However, there was a scarcity of these resources; as a result, the resources were under serious degradation particularly forest lands (Abaynesh *et al*, 2015).

Wood provides 78%, with dung and crop residues supplying 16 % of the energy required. Additionally, many studies (Dawit, 2010) revealed that, next to agricultural land expansion, the most leading factors for high deforestation is using firewood as a source of energy in Ethiopia and it has been suggested that the key issue in the energy sector is improving the supply of household energy and reducing the heavy reliance of the household sector on biomass source of energy to abate the ever increasing deforestation in the country. Other researchers support the findings of this study that deforestation and land degradation are the most serious problems in rural Ethiopia, where the majority of the population is dependent on the forest products as a source of energy.

4.5: Vegetation Cover Change in the Study Area

The increasing population of Ethiopia has resulted in excessive forest clearing for agricultural purpose, overgrazing and exploitation of the existing forests for fuel, fodder and construction purposes because, livelihood of rural people is directly linked to the utilization of forest resources for food production, energy sources and shelter. Understanding the changes in environmental conditions stems mainly from knowledge of land insight into the changes related to the availability of natural resources, particularly soil, forest and water. With declining forest cover, environmental and economic costs increase each year therefore the next generation will face severe challenges unless the current generation implements strategies to reverse deforestation, through planting tree seedlings and managing the existing vegetation significantly.

Table 13: Observation of decline in vegetation coverage's

Observation of vegetation cover change	Frequency	Percent (%)
Yes	91	93.8
No	6	6.2
Total	97	100

Observation of vegetation cover change and deforestation were similar since deforestation has led to a decline in vegetation cover over the past 10 years. Households were also asked whether or not they had observed deforestation in their area. As in Table18 above; 93.8% of the respondents indicated that they have observed deforestation in their areas. 6.2% of respondents

no changes in forest cover to recognize the existence of deforestation within their areas regardless of age. Therefore, it was clear from the responses of the households sampled that deforestation is clearly understood by the community in the study area.

4.5.1. Observation of forest resource degradation in study area

Environmental services of forest (conservation of soil, water, biological diversity; micro and macro climatic effects; nutrient cycling) and socio-cultural services other than those provided by the production of wood and non-wood products (e.g. recreation and tourism, protection of cultural, aesthetic and scientific values) provided by forests. Forest degradation impoverishment of standing woody material mainly caused by human activities such as over-grazing, over-exploitation (for firewood in particular), repeated fires, or due to attacks by insects, diseases, plant parasites or other natural causes such as cyclones. Deforestation had caused and continued to cause environmental degradation, land degradation, water resources degradation and loss of biodiversity. Deforestation and forest degradation therefore are undoubtedly part of the largest environmental problems facing the world today. The study which supported this investigate, 16 million square kilometers of forest that once covered the earth's surface; only 6.2 million remain up to date, 2.3 million have been destroyed between 2000 and 2012 (Goldstein,2016).

In the study area; forest resources were extremely cleared. Other bush and shrubs types of vegetation are found. In many part of the study area, forest resources were found along river valleys, gorges and on other in accessible areas which is not suitable for agricultural purposes. According to experienced farmers in the villages their local area was covered by forest some two decade ago. During that time forests of the area were an important habitat for a great diversity of wild life. However, deforestation has led the biodiversity at great risk. A number of wild animals were found in forest such as elephant, lion, monkey, etc. which have disappeared now from the area. Tree species such as *Cordia africana (wanza), Acacia nilotica, Olea Africana, Faidheribia albadia, Croton macrostchys (bissana), Podocarpus fulcatus (zigba),), Maesea lanceolata (kelewa)* and other variety tree species were highly distributed in the district. However, these tree species were highly affected and destructed by deforestation and forest degradation at the present time. Large areas of land which were once covered by forest have changed into other land use and only small areas were covered by bush and shrubs. While as indicated in Figure5 below observing the impact of forest resources degradation on the environment, the majority (86.6%) of

the respondents observed that deforestation have impacted on environment while 13.4% had not observed the impact of deforestation on environment. In the study area some tree species were still found around Reke terrain as a result the environment of the area was good.

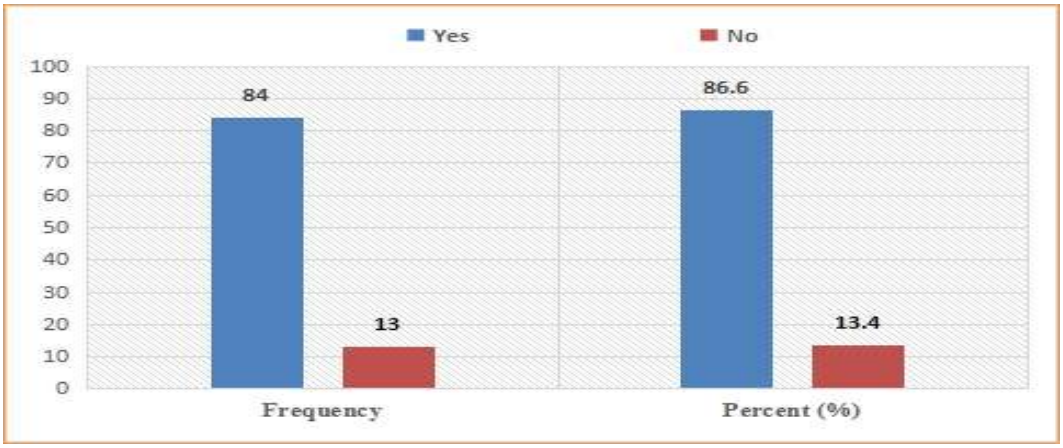

Figure 3: Observation of forest resource degradation in study area

4.6. The Main Cause of Forest Degradation in Study Area

The cause of forest destruction in the study area was complex and many in numbers. Many human and natural factors are responsible for the gradual destruction of the vegetation cover of the land masses of the study area. Data obtained from districts agricultural and rural development offices reveals that, rising demand for tree products, conversion of forest land to agricultural land, poverty and expanding population pressures are the major factors. The population also often lacks the finance necessary for investments to maintain the quality of soil or increase yields on the existing cleared land (Purnamasari, 2010). Deforestation is affected mainly by the uneven distribution of wealth. Shifting cultivators at the forest frontier are among the poorest and most marginalized sections of the population. They usually own no land and have little capital. Consequently they have no option but to clear the virgin forest.

Table 14: The factors and cause of deforestation in study area

Forest degradation factors	Frequency	Percentage (%)
Natural factors	18	18.6
Human activities	79	81.4
Total	97	100.0
Human cause of deforestation		
Search for fuel wood	27	27.8
Charcoal production	22	22.7
Illegal logging for sale and consumption	9	9.3
Farm land expansions	29	29.9
Population pressure	6	6.2
Over grazing	4	4.1

The majority of household respondents, (81.4%) indicated that the process of deforestation in the municipality is solely driven by anthropogenic factors, while less than 2% is solely influenced by natural factors. The remaining 18.6% argued that the process of deforestation is caused by a combination of both anthropogenic and natural factors. It is also identified that, the broad sources of anthropogenic deforestation in the communities include economic, demographic, conflict and governance, and social factors and that these are similar to the factors highlighted by the UNEP (2006).These human impacts was Farm land expansions was 29.9% .However, as the land degrades people are forced to migrate, exploring new forest frontiers increasing deforestation (Amor, 2008; and Pfaff, 2008). Deforestation is proxied by the expansion of agricultural land. This is because agricultural land expansion is generally viewed as the main source of deforestation. Shifting agriculture also called slash and burn agriculture is the clearing of forested land for raising or growing the crops until the soil is exhausted of nutrients and/or the site is overtaken by weeds and then moving on to clear more forest. It is been often reported as the main agent of deforestation. It appears that the proportion of direct conversion of forest to agriculture is increasing and the proportion of shifting agriculture is decreasing with time.

Search for wood fuel 27.8%, for search of charcoal 22.7%, 9.3% for illegal logging for sale and consumption. Logging and fuel wood production is more intensive and can be quite destructive.

However, logging provides access roads to follow-on settlers and log scales can help finance the cost of clearing remaining trees and preparing land for planting of crops or pasture. Logging thus catalyzes deforestation (Chomitz *et al*., 2007).

10.3% was for overgrazing and other purpose of human house hold consumption and for market sale. Overgrazing is more common in drier areas of the tropics where pastures degraded by overgrazing are subject to soil erosion. Stripping trees to provide fodder for grazing animals can also be a problem in some dry areas of the tropics but is probably not a major cause of deforestation. Clear cutting and overgrazing have turned large areas of the study area. Overgrazing is causing large areas of grasslands province to turn into a desert. But now the grass is disappearing and the sand is coming." Huge flocks of sheep and goats strip the land of vegetation. Animals remove the vegetation and winds finished the job by blowing away the top soil, transforming grasslands into desert. "The lands are too infertile to grow crops—herding is the only way for us to survive (Hays, 2008).

Deforestation and forest degradation over the past 30 years had been the continuation of a process with a long history. The historic loss of forests was closely related to demographic expansion and the conversion of forest land to other uses. Major direct causes of forest degradation brought on by humans include over harvesting of industrial wood, fuel wood and other forest products, and overgrazing. Generally deforestation occurs when people clear forest for their personal need such as, for fuel, hunting, when they need the land to grow and harvest crops, for building houses, and at times because of religion beliefs (Sucoff, 2003).

4.7. Mechanisms of Obtaining Farmland the Respondents

In 2011 about 713,770 hectare of land was burnt and out of this 76, 629 hectare was forest land (EMA, 2012) Agricultural land expansion was the major cause of deforestation in the study area. The rapid population growth, coupled with a high demand for food, has added to further destruction. As mentioned in Table 9, the largest proportion (38.14%) of the respondents stated that the conversion of forest land into farmland was the major cause of deforestation in their local area. As it was learned from the field observation, most of the rural households did not have adequate cultivated land to produce an adequate amount of food for their households.

Similarly, participants of FGD described that the people in the study area were highly dependent on agriculture as their main means of livelihood, in spite of its low productivity. They added that the uncontrolled increase in population led to the clearing of forests cover to produce crops. This clearly provides support for the conclusion of Netsanet (2007) in her study of land use and land cover change. In the Reke (Riqee) forest and the surrounding areas there was constant decrease of high forest due to its conversion into agricultural land, logging, and khat production activities. A further study by Alemtsehay (2010) showed that farmers were cutting down trees to expand agricultural lands in order to produce various types of crops.

4.7.1. Agricultural land size and forest area of the respondents

In Ethiopia, agriculture forms the back bone of the country's economy. According to Table 6, the land holding of farmers in the study area varied from less than or equal to 0.5 hectare to more than 1.51 hectares with an average holding of 1.00 hectare per household. The farmers in the study area are extending the farm lands to the fragile forest ecosystem in an attempt to meet the increasing demand for food and forest products'. The uncontrolled population growth and subsequent increase in demand for livelihood to support the surplus population could contribute to further deforestation. During field survey, many inhabitants reported that they do not have enough agricultural land to produce enough food for their family. According to Table 6 more than 85% of the total sampled house hold in the village owned farm land less or equals to one hectare. Under current production technology, as justified by different researchers, this holding size is too small to produce adequate grain for a household in the country as a whole. Provided that the present rapid population growth continues unabated, the scarcity of farmlands will be more severe in the future and the corresponding grain production per household will undoubtedly be affected. In fact most inhabitants obtain additional agricultural land in the form of crop sharing and contract.

One can infer from Table11; that about 30.9 % of respondents obtains farm land through clearing vegetation area and change it into agricultural land. The vegetation area of the study area started to change into agricultural land since farm land expansion started. This is because of decline of soil fertility, population growth and food insecurity. They also respond that the low productivity of traditional method of farming demanded extensive lands. In addition to that, the amount of

land required to feed the growing population is steadily increasing. With agricultural productivity lagging far behind population growth rates the gap between the availability and the demand for agricultural land continues to grow from year to year. This led to severe land use conflicts among crop farming animal grazing and forestry. Under such condition clearance of the existing forest resource and soil degradation is inevitable. The following table shows the land previously under forest and ready to use for farming purpose.

Table 15: Do you have sufficient agricultural land? And mechanism of obtaining farmland of respondents

Do you have sufficient agricultural land	Frequency	Percent (%)
Yes	45	46.4
No	52	53.6
Total	97	100.0
Mechanisms of obtaining agricultural land		
By clearing vegetation	30	30.9
By inheritance	1	1.0
Contract	13	13.4
Crop sharing	36	37.1
Selling forest products	17	17.5
Total	97	100.0

Figure 4. The dense vegetation in the Reke heap of the study

Figure 5. Farmland expansion by clearing trees in study area

4.7.2. The impact of deforestation on agricultural production

Deforestation has socioeconomic impacts on livelihood of rural households .Some of the socio-economic changes in Dewa Chefa District local government that was directly linked to deforestation include the loss of vegetation cover making the soil bare and prone to erosion. As a consequence the soil losses its fertility and there was poor crop yield. Also, it leads to accelerated erosion in the study area. Most of the respondents were believed that deforestation had reduced crop yield, this was due to the fact that the level of crop production keeps dropping in recent years due to the problem of erosion, the loss of plants that has medicinal potential and animal species that have migrated to other areas because of loss of habitat all contribute negatively to the socio-economic development in the study area.

Most of the forested lands in study area were located in the rural areas and in these areas where the level of environmental awareness was very low compared to the highly enlightened populace in the city centers. Therefore, the physical effects of deforestation which was mostly environmental were not foreseen by the rural dwellers. However the economic effects of deforestation which affects their substance directly cannot be over emphasized. It was thus very common to observe the high cost of forage crops and other forest products as deforestation results in their scarcity in communities and settlements where they used to would be cheap and available; this was in agreement with (Oguntala, 2000).

Table 16: Impact of deforestation on agricultural production

Impact of deforestation on Agricultural Production	Frequency	Percent (%)
Decrease in production per hectare(Kg)	11	11.3
Decrease in livestock production	11	11.3
Both in crop production and livestock	69	71.1
Decrease in cash income from forests	6	6.2
Total	97	100.0

As it was shown in Table 20, the respondents were asked their understanding of the impact of land-use change on agricultural production the study area. Accordingly, the respondents were also asked to tell the reason behind a decrease in land productivity over time. Accordingly, as described in Table 20, the main reason for the decrease in production per hectare (Kg) of their farmland was rain fluctuation due to the results of deforestation brings climate change of the study area (11.3%), followed by decrease in livestock production (11.3%) due to lack of sufficient grazing land , both decrease in production per hectare (Kg) and decrease in livestock numbers and products loss (71.1%), and a combination of other factors, like the equivalent in cash per year of the livelihoods (6.2%).

4.8. The Livestock's as a Source of Income and the Grazing Land of Respondents

There are different levels in numbers of livestock owned by farmers in the study area. The major categories of livestock include cattle, small ruminants such as goats and sheep. Furthermore, 37.1% of the respondents were engaged in other alternative livelihood activities such as rearing of livestock, bee-keeping to help supplement their major livelihood venture (farming) which has seen some decline over the years. The district in general is known for crop production predominantly and less attention is given for rearing animal. This is related to the scarcity of grazing land. However, the cattle population is large enough to affect the communal grazing area of the forest. Some farmers with relatively large cattle population from different corners of the district drive their cattle's in group to unsettled and forested area especially around Chefa valley.

These farmers have the habit of communally grazing on this area without restriction which is called “Urane or Godansa”. Hence, people with large population commonly spent more than six months of dry season on this communally grazing land. They return with their cattle around July when there is communal other grazing land shift to other place.

Table 17: Livestock’s as a source of income for respondents

Use cattle as a source of income	Frequency	Percent (%)
Yes	27	27.8
No	70	72.2
Total	97	100.0
Methods of obtain grazing land for cattle		
Separated grazing land	29	29.9
Forest area	48	49.5
Privately owned	25	25.8
Commonly owned	52	53.6
No answer	20	20.6
Total	97	100.0

4.9. Major Impacts of Deforestation on Environment

Forests contain numerous species of flora and fauna. Forests protect the soil from heavy rainfall and control erosion. However, deforestation reduces the biological diversity and increases soil erosion and flooding. The removal or the destruction of significant areas of the forest cover has resulted in degraded environment, adverse impacts on socio-economic condition of the people aspects and biodiversity.

As it is portrayed in Table 14, the respondents have been requested to state the major impacts of deforestation on the environment of the rural households. Accordingly, out of the total respondents, 63.9% replied that there were high impact on rainfall patterns, followed by 35% medium impact in rainfall patterns, and the rest 1% said no impact in rainfall patterns in the study area. The forest resource prioritizes to improve of water resources is concerned, highly

49.5% of the respondents described that and moderately it had improved of water resource 50.5%. Due to forest degradation and only 7.9% of the respondents replied that the temperature has increased in a lesser amount in their area. Similarly, the respondents were asked the reducing temperature change of climate in respect of forest resource some of the respondents, 58.8% highly perceived that the benefit obtained from forest due to reduced environmental temperature and 39% respondents were medium prioritized the benefit obtained from forest resources. Very insignificant proportion (2.1%) replied that the impact due to forest degradation in their area was very low. Meanwhile, the sample respondents were also requested the status of air quality where by considerably large proportion (50.5%) confirmed that its impact was medium and 47.4% highly. Only 2.1% of them argued that the impact on air quality was low. As to biodiversity loss, the majority (54.6%) of the respondents responded that it was impacted medium. 42.3% said the loss of biodiversity was impacted strongly, whereas only 3.1% described its loss was low. Furthermore, the sample households were inquired about the increment in the occurrence of flood in the area as result of deforestation. Consequently, the majority (71%) replied that the erosion control was extremely increased, 24.7% said that it was medium and 3.1% of them indicated that the forest resource benefited in erosion control was in insignificant amount and 1% of the respondents agreed that forest resource loss is no impact on soil erosion control. The most environmental impacts of deforestation are briefly described in the following sections.

Table 18: Prioritize the environmental impacts of deforestation as perceived by respondents

No	Item	High		Medium		Low		No		Total	
		Fre.	(%)	Fre.	(%)	Fre.	%)	Fre.	%	Fre.	%.
1	Rainfall patterns	62	63.9	34	35	-	-	1	1	97	100
2	Improvement of water resources	48	49.5	49	50.5	-	-	-	-	97	100
3	Reducing temperature	57	58.8	38	39	2	2.1	-	-	97	100
4	Air Quality	46	47.4	49	50.5	2	2.1	-	-	97	100
5	Erosion control	69	71	24	24.7	3	3.1	1	1	97	100
6	Promotion of biodiversity	41	42.3	53	54.6	3	3.1	-	-	97	100

4.9.1: The impact of deforestation on the environment interims of (Climate change, loss of biodiversity, decline of soil fertility and increase of temperature).

In addition to climate change, deforestation is the key environmental challenge for the country. Forest degradation leads to CO2 emissions and is primarily caused by fuel wood consumption and logging in excess of the natural yield of the forests, with the major driver being population growth. This demand for fuel contributes to an imbalance between the natural regeneration and removal of the forest resources. One of the major dominantly uses traditional fuel like fuel wood and charcoal stent is the clearing of forest for fuel and crop production.

In the study area, where the population grows repeatedly, forests were being cleared at an alarming rate to make way for agricultural crops, and to meet the demand for fuel wood, construction wood, etc. The respondents highlighted impact of deforestation on the environment interims of Climate change, loss of biodiversity, decline of soil fertility and increase of temperature. These experiences are built on their understanding of the local climate and which in turn were related with a respondent's age, livelihood and probably length of stay in the community. The perceived manifestations of environmental climate change as identified by household respondents were summarized in Table 20. It was identified that, though different viewpoints were suggested, a higher proportion of the household respondents (65.9%), indicated that the impact deforestation on environment due to rain fall variability were highly declined. 29.9% of respondents were agreed on medium level of deforestation impact on environmental change due to rain fall variability with regard to 4.1% impact of deforestation on rain fall variability in low level impact.

The impact of deforestation on the environment interims of biodiversity loss (49.5%) of the respondents were highly reported, (50.5%), respondents moderately agreed the impact of deforestation on biodiversity loss. The impact of deforestation on the environment due to soil fertility loss 63.9% of the respondents realized high. The remaining 35.1% and 1% of the respondents replied moderately, and low respectively. Due to the impact of deforestation the environmental temperature increased 67% of respondents were highly agreed, with 31.9% regarded too moderately and 1% of the respondents were agreed at low level impact the

environmental temperature. Deforestation affects wind flows, water vapor flows and absorption of solar energy thus clearly influencing local and global climate (Chomitz *et al.,* 2007).

Table 19: Impact of deforestation on the environment interims

Item	High		Medium		Low		Total	
	Fre.	%	Fre.	%	Fre.	%	Fre.	%
Rainfall variability	64	65.9	29	29.9	4	4.1	97	100
Loss of domestic animals and plants (i.e., fauna and flora	48	49.5	49	50.5	-	-	97	100
Decline of soil fertility	62	63.9	34	35.1	1	1	97	100
Warmer temperatures	65	67.0	31	31.9	1	1	97	100

4.10. Impact of Deforestation on Socio-Economic of the Respondents

Land degradation, as a result of deforestation, reduces the goods and services that the community had negatively affected the standard of living. However, deforestation obstructed people from receiving such benefits. Forest degradation affects and drags livelihood downward resulting in reduced access to sufficient forest products, lower yields, increase misery of people (workloads) and decease in social cohesion. This was presented in Table17 below and discussed widely in the following parts.

Table 20.Impact of deforestation on livelihood of the respondents

Item	high		medium		Low		Total	
	Fre.	%	Fre.	%	Fre.	%	Fre.	%
Decline of forest product (quality and quantity)	77	79.4	20	20.6	-	-	97	100
Agricultural production reduce	69	71.1	27	27.8	1	1.0	97	100
Long distance to be traveled to collect fuel wood	64	65.98	31	31.96	2	2.1	97	100

Deforestation and land degradation had impacted the socioeconomic livelihood of rural households as shown in Table17. As result of deforestation; both timber and non-timber forest products were no longer easily available in the study area. This had the greatest impact on rural communities' socio economic as perceived, which depend primarily on forest resources for fuel wood, construction materials, farm implements, energy, medicinal use, forest food and fodder needs.

As it was depicted in the above Table, the majority (79.4%), of the respondents indicated that the forest products were highly declined and the socio economic of the rural community was impacted in study area due to the shocking rate of deforestation. Information obtained from FGDs showed that the people had been continuously clearing forests for fire wood, timber, and construction materials and to expand crop and grazing areas. This resulted in declining of the forest resources in such a way that the people were even unable to produce non-timber forest products such as honey production, traditional medicine and others as there was no forest in the nearby surroundings.

About 20.6% of the respondents indicated that the income of their households was moderately declined due to deforestation as it indicated in Table17. In connection with this, field observation of the researcher indicated that there were many people who were involved in the exploitation of forest resources as an extra source of livelihood through gathering and selling of forest products from the forest to make additional income, particularly in periods before harvesting crops. Similarly, people those who hold small land sizes and did not have land at all steadily become involved in clearance of the forests land into crop and grazing land as a coping method to solve their recurring income uncertainty in the study area. Likewise, most of the key informants showed that selling of timber and non-timber products was the main source of income during existence of high forest coverage in the study area. They further said that as there were less or not enough forest products to be sold in the study area, there were also loss forest products and forest related income. This in turn has negatively affected the livelihood of the rural households who was depended on the selling of forest products and services. On the contrary to the above findings, Karke (2004) concluded that deforestation did not reduce income of local community. It can be understood from this that the thinning forest products from the wild has brought the

reduction of income of forest dependent rural livelihood and thereby their living condition has been threatened.

Agricultural yield decline was also considered to be the second highly socioeconomic effects of deforestation in the study area as described by 71.1% of the respondents (Table17). This was supplemented with FGDs which showed that the decline in the amount of rainfall, its irregularity and scarcity of farm land brought about by the population pressure were attributed to the declining of the productivity of farm lands overtime. In line with this, the study of Legesse (2008) indicated that conversion of forests into farmlands, indiscriminate cutting of trees for fire wood and charcoal making, and inappropriate agricultural practices were the main causes for the declining productivity of the land. (Table17), also illustrates that moderately (27.8%) of the respondents reported and 1.0% at low level that deforestation had significantly increased their misery since they were dependent on forest products due to reduced availability of forest product. Focus Group Discussions revealed that the availability of fuel wood, timber, wood for construction and furniture making were highly diminished so that they feared that could lose such products in the near future. People had to go long distance in search of the above mentioned forest products which took much of the time otherwise they would pass in other productive economic activities- this aggravates the economic problems of the households.

In support of the above results, Kassu (2011) in his study of „ deforestation and rural livelihoods in Central Rift Valley of Ethiopia‟ indicated that the time spent on collection of wood for households was significant in terms of economic interpretation because if this time had been used for other household activities, more income could have been generated for their households. He also added that the problem of deforestation imposes an additional burden on women who frequently collect fuel wood for the household. Therefore, from this it can be interpreted that deforestation has led to increased misery of the local people who are directly dependent on forest exploitation as the result of shortage of the forest resources in their vicinity. Moreover, the households‟ response, as illustrated in (Table17)., showed that about 65.98% of respondents affirmed that deforestation has strongly decreased their social cohesion (relation), 31.96% moderately and 2.1% shows at low level it was impacted the socio economic of the livelihood.

In support of this, Acheampong and Marfo (2011) indicated that forests loss not only reduces the contribution of forest communities to national economic growth, but also more critically threatens the livelihood and traditions of rural and forest dwelling people across the country. Meanwhile, based an interview made with key informants, the lives of local people were generally tied up with natural forest availability not only as a means of livelihood but also in its socio-cultural value. But, due to forest resource degradation, nowadays, the local people lost the socio-cultural value they used to get from the forest. According to these informants, the deterioration of forest resources affected the indirect use components of socio-cultural value of the natural forest to local community. The local people were unable to celebrate cultural festivals and perform different ritual ceremonies under respected trees. The local people believed that this culture had contributed to conservation of natural forest during the past periods. Moreover, the culture of people prohibits them from cutting tree near rivers and swamps. However, the local people had removed trees indiscriminately whether they had socio-cultural value or not. This in turn reduced the traditional lifestyle and broke down their social cohesions which were used to generate from the forests. Failures to protect and manage forests by local community led to decrease tree abundances, decreased the number of wild animals and decreased social cohesion (Karke, 2004). Therefore, it can be interpreted from the above views that due to shortage of forest in the vicinity, the social relation among rural household is worsened.

4.11. Awareness Crate of Training on Impact of Deforestation on Rural Livelihood of Community

This awareness training is expected in order to conserve and manage the forest resources and other natural resources from destruction. Accordingly, the sample households were asked whether they had been given training on forest conservation and management by experts from the District forestry department and non-governmental organizations (NGO) working on natural resource management particularly on the forest resources.

As indicated in Table19, about 47.4% of the respondent received training on forest conservation and management by district forestry expert and NGO working on forest and/or natural resource management, climate change issues and livelihood diversification, whereas 52.6% of the respondents did not get any training on issues under consideration. As it was already stated in

literature review, Dewa-Chefa District natural resource management (GOV), and Sustainable Land Management Program (SLMP) (NGO) were the two organizations that work on Participatory Forest Management (PFM) and livelihood diversifications in Dewa Chefa District.

Experts from above organizations, as key informants, described that the society was sensitized and mobilized through different panel discussions, workshops, training and establishing community committees. The training given to the community also includes conservation, protection, development and utilization of forest resources. Information on how to develop conservation plan, livelihood sources and resource assessment were also taught to the community. However, some of key informants and participants FGD argued that the training and/or education given to create awareness were not enough and on a regular basis to change the community's attitude and perception on forest resource degradation. This would have future implication for those actors to provide the training appropriately, so that the establishment process ends up with success.

4.11.1. The responsibility of rural communities in forest resource management

The respondents were asked whether they put it in to practice the training rendered to them by conserving and planting trees. The role of local communities is not only preventing deforestation and forest degradation, but encouraging forest regeneration. Also they have responsibility in implementing adaptation and mitigation actions in the study area. The following Table showed the extent to which the rural households put in to practice the training given to them and whether they plant trees or not.

Table 21.Respondents responses on training of forest conservation and management

Did you get training on forest conservation?	Frequency	Percent (%)
Yes	75	77.3
No	22	22.7
Total	97	100.0
Have you implemented the training		
Yes	71	73.2
No	26	26.8
Total	97	100.0

4.12. The Level of Deforestation Impact in the study area

According to the key informant interviews, both the livestock population and grazing land have highly decreased in the past couple of decades and all respondents also believe the same. This is due to population increment and expansion of farmland among others. Grazing lands are converted to cropland as there is always the need to expand farm plots among land scarce farmers who are out weighting with increase in population.

A shortage of feed is associated with deforestation and land degradation and expansion of agricultural land which had encroached much of the grazing areas (serious land use change). In the area, there was no enough grazing land for livestock, as observed by the researcher during field observation, and this is a serious problem associated with deforestation. The role of deforestation and land degradation in affecting crop and livestock production was also reported by other researchers. For instance, land degradation as a result of deforestation, low productivity, poverty, and declining human welfare as the dominant problems encountered in crop livestock production systems prevalent in most parts of the tropical highlands of the world (Okuma *et al.,* 1995).

Table 22.The level of deforestation impact on rural livelihood

Level of deforestation impact	Frequency	Percent
Low level	3	3.1
Medium level	28	28.9
High level	66	68.0
Total	97	100.0

Deforestation has socioeconomic impacts on livelihoods of rural households as shown in Table21: as result of deforestation, various forest products (both timber and non-timber forest products) are no longer easily available in the study area. As it is depicted in the above Table, the majority 68.0% of the respondents were highly impacted deforestation the rural livelihood. About 28.9 of the respondents indicated that the income of their households was medium

declined due to deforestation as it indicated in Table20. Only 3.1% of the respondents were found to be low level impact livelihood.

4.13: The Strategies to Overcome the Impact of Deforestation on Livelihood

Forests contain numerous species of flora and fauna. Forests protect the soil from heavy rainfall and control erosion. However, deforestation reduces the biological diversity and increases soil erosion and flooding. The removal or the destruction of significant areas of the forest cover had resulted in degraded environment, adverse impacts on socio-economic condition of the people aspects and biodiversity. As it has already been mentioned, the objectives of this research were to assess the impacts of deforestation on rural livelihoods or socioeconomic condition of the rural households. The tropical forests destroyed each year amounts to a loss in forest capital valued at US $ 45 billion (Hansen, 1997). By destroying the forests, all potential future revenues and future employment that could be derived from their sustainable management for timber and non-timber products disappear.

Table 23.Coping Strategies to overcome the impact deforestation on livelihood

Strategies	Frequency	Percent (%)
Reduced number of food per day	15	15.5
Reduced quantity of food per day	59	60.8
Sale of forest products such as fire wood and charcoal	7	7.2
wage earned from labor	2	2.1
Expansion of farm land cultivation	1	1.0
All	13	13.4
Total	97	100.0

Deforestation has negative impact on livelihood as shown in Table22 above. Means of overcoming impacts of deforestation on rural livelihood 60.8% of the respondents include reducing the quantity of food per day, with 15.5% reported they were forced to reduce the number of food taken per day, and 13.4% of the respondents were impacted in all factors showed in Table 22, only 7.2% of the respondents forced to sale of forest products such as fire wood and charcoal since they cannot provide them with food and the others. 2.1% and 1.0% of the

respondents were agreed to wage earned from labor and also expansion of farm land cultivation measures respectively.

The negative impact of deforestation on livelihood of rural households was also reported elsewhere, Sunderline *et al.* (2005) maintain that the dwindling natural forests in developing countries was a critical problem, since this negatively affects the livelihood of people dependent on forest products and services. Table22, above supports the facts reflected the Strategies to overcome the impact deforestation on livelihood of households in the study area. The majority of the respondents indicated that the reduction in income had resulted in adopting strategies such as reducing the quantity of food taken per meal, reducing the number of meals taken per day, withdrawal of children from school, poor health and marginal land cultivation all above mentioned was the main effects of deforestation on rural livelihoods of the study area.

4.14. Focus Group Discussions, Key Informant Interviews and Field Observation

During group discussion and Key informant interviews the selected respondents explained how local communities use the forest resources, the types of indigenous knowledge for forest conservation practices, how the individual or the communities are actively responding to these forest loss and land degradation problems, the possible causes of deforestation and impact of deforestation on the rural livelihood of the study area. During a series of group discussions with the individual participants, planting trees was not generally a prioritized activity among the local community of the study area. Before the beginning of the soil conservation and afforestation program, farmers only planted a few eucalyptus trees and other tree species as a rule; they raised a few trees around their homestead. The majority of the respondents perceived that they had no tradition of planting trees away from the homestead of the study area. Some of the participants said that planting of trees had benefits not only for attaining environmental sustainability but also for construction of houses and even for income generating mechanism as selling of woods and other forest products which was being used as livelihood for the communities.

From this, it was possible to say that, planting of trees were played important role which creating environmental, social, and economic sustainability. The participants also said that the farmers in the study area have no a tradition of planting trees rather than expanding of their agriculture, as a

result loss of the benefits being obtained from the forests, only a few benefit was gained. Expansions of agriculture, wood collection, charcoal production and urbanization were the main factors for increased deforestation rates of the study area. By these factors were decreasing yields due to impoverished soils, land degradation due to forest lost and increasing workload due to the time spent for firewood collection were then identified by farmers as the main adverse impacts of deforestation on rural livelihood . By large, the totality of available evident physical measures and farmers' perceptions indicates a troubling forest resources degradation route in the study area. However, the capability of local people to adapt their livelihoods in order to control, or even avoid, deforestation activities indeed, as the interviews also suggest, farmers are well aware of the potentially losing impacts of deforestation on their livelihood and their knowledge of the factors and processes involved was very detailed.

Deforestation has been considered as the most important causes of land degradation and affected rural livelihood by all the respondents. Deforestation and Land degradation leads to loss of agricultural production, increase the requirement of fertilizers and difficulty of farming have been observed (MoARD, 2007).The group discussion concluded to solve the problems of forest resources degradation, to sustain forest resources and to solve rural livelihood problems in the District, all local communities stand together without discriminating by age and sex without waiting local administrations concern.

Key informant interviews with the individual participants (a team with eight members from both genders who are as elderly persons, kebele officials, youngsters, women, development agents (DAs), and experts at the districts office of agriculture development), indicated that deforestation were major causes of forest destruction and land degradation in study area. In relation to impact of rural livelihood and change in environmental conditions, they confirmed that they had observed changes such as a decrease in vegetation cover, with a decline in soil fertility as a result of soil erosion and then declined of community livelihood due to livestock production and farm productivities decreased. According to the key informants, deforestation also results in loss of wild life, by seriously reducing biodiversity.

Formerly, household used to have adequate numbers of livestock as there was good grazing. Currently some own no livestock or very small when compared with the previous years. In

general, the situation they find themselves in now, when compared to the time when most of them were young, has deteriorated. Now it is very difficult to make a living because there are a whole range of new problems due to high deforestation rate serious reduction in soil fertility and frequent crop failure as well as livelihood declined. Collecting water for drinking presents a further challenge and they are forced to travel long distances to get wood for fuel. The major reasons for forest resources lost in the study area according to these informants were expansion of agricultural land, population pressure, fuel wood collection, and the other activities. There is no wood for fuel, no water to drink and less wood for construction, forcing them to use Geomemberen plastic and buying construction materials from other place by expensive price to construct their house. The general perception of the individuals' participant was that deforestation affected the livelihoods of farmers significantly. These views and knowledge are in line with what has been discussed by the household members who were interviewed.

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary

Based on the major findings of the study, the following summary has been made. Forest resources play a vital role in income generation and household food security in Ethiopia, with forest products providing sustenance and revenue for million people in the country.

The study results showed that there was a significant deforestation process in the study area. This was the fact that, most of the dwellers in the study area depend on agriculture activities, especially crop cultivation and rearing livestock, which required the clearing and converting of vast forest areas into farmlands and grazing lands. From interviews with some of the farmers, it was pointed out that, the principal way they expand their farm sizes were by clearing additional virgin lands, which are usually forest areas.

From the questioners, interviews, discussion, field observation and consultation with the experts it was found that deforestation as a form of land degradation were widespread phenomena in the study area that negatively impacted the rural livelihood of the community members. Deforestation is another major socio economic problem of the community of the study area. The community members were forced to travel long distances to collect wood for fuel and much of their time had taken up collecting wood and to buy construction materials to build their houses. Farmers also spent much of their money to purchase the farming tools for farming activities. Environmental degradation as a result of deforestation and land degradation had reduced the goods and services that the community had access thereby negatively affecting their standard of living. As a result of the deforestation of forests and degradation of land, the community in the study area had been to increase farming expenses. Responses from the respondents indicate that the cost of improved seed variety was rising. From the general trends in crop production, livestock rearing, and food security situation, there is a clear indication that the community members are facing critical problems. Their livelihoods are dependent on adequate and reliable rain, which at present is not the case as a result of sustained drought. In general, the overall results from both interviews with the sampled households and discussions with key informants reinforced the fact that the livelihoods of the community were being threatened by land degradation, the driver of which was deforestation of forest resources.

5.2. Conclusion and Recommendation

Forest play essential role in the preservation of an environment that facilitates sustainable development. Forests, apart from their short to long-term positive effects on weather and climatic conditions, are instrumental in controlling soil erosion, land degradation and desertification, problems that appear to have reached their best moment in Ethiopia.

Deforestation is serious problems that negatively impact rural livelihood of farmers in Ethiopia. Deforestation is a contributor to global climate change, and is often mentioned as one of the major causes of the enhanced greenhouse effect. In addition, shrinking forest cover lessens the landscape's capacity to intercept, retain and transpire precipitation. Instead of trapping precipitation, which then percolates to groundwater systems, deforested areas become sources of surface water runoff, which moves much faster than subsurface flows and then eroding the productive part of the soil.

Members of households, selected through simple random sampling were interviewed. A diverse sample ranging in age from 21 to 66 years was identified. Perceptions of the impacted of deforestation were identical, regardless of the age groups of the participants. Land holding size of the respondents ranged from less than 0.25 to 2.25 hectare and the number of members per family ranged from 1 to 14. Both gender groups were included in the sample, with 31.96% being women and 68.04% being men The major livelihood earners according to household members are farming and livestock rearing, with a very few respondents indicating that they are also engaged in small trading. When asked about observation of change in land productivity, the majority of the respondents indicated that they had observed changes (decline) in Decrease in livestock and crop production (71.1%) and a significant reduction in production over time.

Among the causes, fuel energy consumption took the highest contribution for the depletions of forests resource in the study area. The local community in the study area had no options for energy source; the only was forests wood and continued use of forests for local community who were highly aggravated the lands resources to be eroded and degraded. Livelihood of the local community in the study area is mainly depended on agricultural activities. They generate income from it for sustaining their life, to precede such activities the forest area was changed for expanding agricultural land. Agricultural land expansion is major drivers of deforestation and

land degradation and possesses key problems to livelihoods of the community members in the study area. Deterioration of soil fertility as a result of severe deforestation is a critical deterrent to crop production and a lack of fodder has been a major factor in the decline in livestock production. As wood was the major source of energy for cooking in the study area, deforestation had seriously depleted forest resources. This has compelled community members to travel long distances and spending significant amount of time for collection of fuel wood.

As alternative sources of energy, the community members burn cow dung and crop residues due to forest resources degradation. So, this leading to degrading soils as the application of compost and nutrient recycling has been adversely affected exacerbating the problem of crop failure and dwindling land productivity. The negative impacts of deforestation on the livelihoods of farmers are well understood by the households. The existing attempts implemented to combat the problems of deforestation have helped when a comparison is made between a situation as it was and the results achieved so far.

Therefore, the aim of this research has been achieved as it has been shown that deforestation negatively impacted rural livelihoods of the study area. Though it is tempting to generalize the results of this study from a Dewa-Chefa to the overall conditions of Ethiopia, the fact that the work was conducted in a very small area, is a limiting aspect of this study. This study has also not addressed the negative impacts of forest degradation on livelihood in pastoral areas as the livelihoods in such areas are quite different from livelihoods of agriculturalists. This study did not estimate the economic costs of deforestation as this was not the point of departure. Carrying out similar assessments in all the agro-ecological zones of the country will supplement the results of this study.

The result of investigation revealed that the forest in the study area was progressively being depleted. While the majority of the communities, entirely depended for their daily livelihood on the local environmental resources. Thus, conservation and sustainable utilization of these resources are crucial. Therefore, in order to alleviate the challenges, it may better to take the conservation measures.

To overcome these problems, efforts have been made to launch afforestation/reforestation and conservation programs; however, success to date has been limited by the government and non-

government organizations. Social and economic issues, such as participation of the local people in natural resource management and the existence of clear land and tree tenure policies are critical for the long-term sustainability and expansion of conservation practices.

The present study recommends in under adaptation measures and strategies.

- Training of the development agents and land user association officials is essential to build the local understanding, management capabilities and community responsiveness the natural resources; especially on biological conservation activities.
- The environmentalists and experts around the study area require a special attention to harmonize the negative and positive impacts of fire treatment on forest resources in the forest and give attention for farmers' local knowledge;
- Improve extension capacity especially with respect to sustainable forest resources use;
- Institutional variables like extension agents need to be given due to attention to rural livelihoods in side of farmers and intimately work relationships among farmers and give emphasize to impact regarding forest resources users;
- The farmers' attitude should be changed with regard to the importance of conserving and developing natural resources, and the planning and management of agricultural activities.

6. REFERENCES

Abane, H. 2009. Livelihoods in a forest community in Southern Ghana: Intervening policies and community resistance, Department of Sociology and Anthropology, University of Cape Coast, Ghana (2009). Livelihoods in a forest community in Southern Ghana: Intervening policies and community resistance. Journal of African Studies and Development 1(2): 028-035.

Abaynesh Ketema, A. Chimdi, S.N. Akhila. 2015. Effect of Firewood Energy Consumption of Households on Status of Soil Fertility in Debis Watershed Ambo District, Oromia Regional State, Ethiopia. Sci. Technol. and Arts Res. J., 4(1): 154-159.

Acheampong, E., E.Marfo. 2011. "The impact of tree tenure and access on chainsaw milling in Ghana." Ghana Journal of Forestry, Vol. 27: 68-86.

Adams, W. M. 2009. Green Development: *Environment and Sustainability in the Third World*, 3rd Edition, Rout ledge, London and New York

Adebisi, L.A. 2008. Nature's Pharmacy in Man's Immediate Environment: Implications for Primary Health Care Delivery. 2007/2008, Faculty Lecture. Faculty of Agriculture and Forestry, University of Ibadan, 59pp

Aduse-Poku, K., Nyinaku, F., Yao, A. V., Awuah, R., Owusu, M. E.; Dwobeng, N. H., Owusu, K.; and Agyenim-Boateng .2003.Improving Rural Livelihoods within the Context of Sustainable Development Case Study of Goaso Forest District.Tropenbos International, Wageningen, and the Netherlands.

Alemtsehay Jima. 2010. Determining Factors for a Successful Establishment of Participatory Forest Management: Acomparative Study of Goba and Dello Districts, Ethiopia.M.Sc.thesis. The University of Agder, Norway.pp 10-12.

Alex, D. S.2002. Land-Use and Land-Cover Change, A CIESIN Thematic Guide, Center for International Earth Science Information Network (CIESIN) of Columbia University, Palisades, NY, USA.

Amisah, S., Gyampoh, A. B., Sarfo-Mensah, P.; and Quagrainie, K. K. 2009. "Livelihood trends in Response to Climate Change in Forest Fringe Communities of the off in Basin in Ghana." Applied Science and Environmental Management, Vol. 13: 5-15.

Angelsen, A., Balcher, B. 2005. Livelihoods, forests, and conservation in developing countries: an overview. Journal of world development, 33(9):1384-1402 [Online]. Available from: www.elsevier.com/locate. [Accessed: 18/09/2010].

Anonymous .2008. Sustainable Forest Management Practices in Ethiopia

Appiah, M.; Blay, D.; Damnyag, L.; Dwomoh, F.K.; Pappinen, A.; and Luukkanen, O. 2009.Dependence on Forest Resources and Tropical Deforestation in Ghana. Environ. Dev. Sustain., 11: 471-487

Asfaw, Damtewu.T. 2003. Policies for Sustainable Land Management in the East African High lands.An Assessment of Restoration of Biodiversity in Degraded High Mountain Grazing Lands in North Ethiopia. Land Degradation and Development.

Bedru Babalo. 2007. Economic Valuation and Management of common-pool Resources: The Case of enclosures in the Highlands of Tigray, Northern Ethiopia, PhD Dissertation. Leuven.

Bishaw and Abdu Abdulkadir. 2003. Agro-forestry and Community Forestry for Rehabilitation of Degraded Watersheds in the Ethiopian Highlands.The Second EA International Symposium on Contemporary Issues in Ethiopia: Addis Ababa, Ethiopia (July11-13, 2003).

Bishaw Badege. 2001. Deforestation and Land Degradation in Ethiopian Highlands. A strategy for physical recovery. North East African Studies 8(1) 17-25.

Bruijnzeel, L.A. 2004. Hydrological Functions of Tropical Forests: Not seeing the Soils for the Trees? Agricultural Ecosystem Environment 104:185-228.

Carney.1998. Implementing the Sustainable Rural Livelihoods Approach. Sustainable Rural Livelihoods: What contribution can we make? D. Carney. London, DFID**:** 3-23.

CBD. 2009. Convention on Biological Diversity (CBD).Ethiopia's 4th Country Report. Institute of Biodiversity Conservation. Addis Ababa, Ethiopia.

Chambers, R., and Conway, G. 1992. Sustainable Rural Livelihoods: Practical concepts for the 21st century. IDS Discussion Paper 296, IDS, Brighton, UK.

Chemshama, S.A., and J.B. Nduwayezu. 2002. Rehabilitation of Degraded sub-humid lands in sub-Saharan Africa a Synthesis. Sokoine University of Agriculture, Morogoro, Tanzania.

Chomitz, K. M., Buys, P., Luca, G. D., Thomas, T. S., and Wertz-Kanounnikoff, S. 2007.At loggerheads?Agricultural expansion, poverty reduction and environment in the tropical forests.World Bank Policy Research Report.World Bank, Washington DC.

Cooke, P. 2008. Fuel wood, forests and community management - Evidence from household studies. Environment and Development Economics, February 2008, Vol 13(1), pp 103-135 13(1): 103-135.

CSA.2007. Population and Housing Census of Ethiopia: Results for Oromia Region, Vol. 1, Addis Abeba.

Dawit Haile.2010. Ethiopian energy systems: Potentials, Opportunities and Sustainable Utilization MSc. Thesis. Uppsala University, Sweden.

De Souza, M., S. Williams and A.B., Myerson. 2003. Critical Links: Population, Health, and the Environment. Washington, D.C Population. 58(32):3-16.

DeJong, T. U. 2012. Property Rights and Artisanal Diamond Development (PRADD) Environmental Rehabilitation and Artisanal Diamond Mining: A Case Study of Land and Livelihoods in the Central African Republic. Prepared for the United States Agency for International Development, USAID.

Delacote, P., Angelsen, A. 2015. Reducing deforestation and forest degradation: Leakage or synergy? Land Economics 91 (3), 501–515.

Dewa-Chefa District, Agricultural Development Office (DCDAO).2015. Annual Report, Kemise.

Drake, L. 2003. Adoption of Soil and Water Conservation Measures by Subsistence Farmers in the Eastern Ethiopia: Presented at the 17th World Congress of Soil Science, Bangkok, Thailand.

Ellis, F. 2000. Rural Livelihoods and Diversity in Developing Countries. Oxford: Oxford University Press.

EMA (Environmental Management Agency).2012.-www.chronicles.co.zw/index.phh?option Sunday 26 August 2012.

EPA (Environmental Protection Authority) .2010.State of environment report of Ethiopia. The Federal Democratic Republic of Ethiopia. Addis Ababa, Ethiopia.166pp.

EPA (Environmental Protection Authority).2003.State of environment report of Ethiopia.The Federal Democratic Republic of Ethiopia. Addis Ababa, Ethiopia.166pp.

FAO (Food and Agricultural Organization).2007.State of the World's Forests.Food and Agriculture Organization of the United Nations, Rome.

FAO (Food and Agricultural Organization).2005a.State of the World's Forests.Food and Agriculture Organization of the United Nations, Rome.

FAO (Food and Agricultural Organization).2005b.Global Forest Resources Assessment. 2005. FAO Forestry Paper 147, Rome.

FAO. 2010. Global Forest Resource Assessment. 2010. Main Report FA Forestry Paper. Food and Agricultural Organization United Nations, Rome.

FAO/UNDP (Food and Agriculture Organization of the United Nation/ United Nations Development Program).1984. Ethiopian geomorphology and soils (1:1,000,000 scales).Assistance to land use planning. Addis Ababa.

FDRE.2013."Economy.”Retrieved04.03, 2013,from http://www.ethiopia.gov.et/English/Information/ Pages/Economy.aspx.

Gebreegziabher, Zenebe. 2007. Household fuel consumption and resource use in rural-urban Ethiopia. Wageningen Universities (Wageningen University).

Getachew Mamo, Sjaastad. E., Vedeld, P. 2007. Economic dependence on forest resources: a case from Dendi district, Ethiopia. For. Policy Ecol. 9 (8), 916–927.

Girma Tadesse, Saleem, M. A., Abyie, and A., Wagnew. 2002. Impact of Grazing on Plant Species Richness, Plant Biomass, Plant Attribute and Soil Physical and Hydrological Properties of Vertisols in East African a Highlands. Environmental management.

Goldstein, D. 2016. Eliminating deforestation and forest degradation in order to prevent species from extinction, especially with regard to areas in Asia, Africa and South America. Environmental Committee, Research Report: Deforestation Reports/RR ECI Deforestation.pdf on 3rd, march, 2017

Habtamu, Ertiro. 2006.Adoption of Physical Soil and Water Conservation Structures in Anna Watershed, Hadiya Zone, Ethiopia.(Unpublished Master’s Thesis Addis Ababa University, 2006).

Haile, Mitiku, Herweg, K., and Stillhardt, B. 2006.Sustainable land management.A new approach to soil and water conservation in Ethiopia. University of Bern, Switzerland.

Haileslassie, Amare, Priess, J., Veldkamp, E., Demel Teketay, Lensschen, J.P.2005. Assessment of Soil Nutrient Depletion and its Spatial Variability on Smallholders‟ Mixed Farming Systems in Ethiopia Using Partial versus Full Nutrient Balances. Agriculture, Ecosystems & Environment 108 (1), 1–16.

Hansen, C. P. 1997. Making available information on the conservation and utilization of forest genetic resources. The FAO Worldwide Information System on Forest genetic resources.

Hays, J. 2008.Deforestation and Desertification in China.Hong Kong.

Hiremath, B.N., and Raju, K.V.2004. Livelihood Security: A Prerequisite for Sustainable Natural Resource Management ON Srivastava (ed.) Management of Natural Resources for Sustainable Livelihoods and Poverty Alleviation, Volume I 1 Hyderabad: National Institute of Rural Development, pp 95-111.

Hosonuma,N., Herold, M., De Sy, V., De Fries, R. S., Brockhaus, M., Verchot, L., Angelsen, A., Romijn, E. 2012.An assessment of deforestation and forest degradation drivers in developing countries. Environmental Research Letters 7 (4), 044009.

Hurni, H. 1993. Land Degradation, Famine and Land Resource Scenarios in Ethiopia. In World Soil Erosion and Conservation, (Ed: Pimentel), Cambridge University press.

IITA.2011. Deforestation: Nigeria ranked worst in the World. A publication of International Institute of Tropical Agriculture.

Improving Productivity and Market Success (IPMS). 2004. Adea-Liben Woreda Pilot Learning Site Diagnosis and Program Design. ILRI, (unpublished) Addis Ababa, Ethiopia.

Kahsay Berhe. 2004. Land Use and Land Cover Changes in the Central highlands of Ethiopia. The Case of Yerer Mountain and its Surroundings, [M.Sc. unpublished Thesis], Addis Ababa University, Addis Ababa, Ethiopia.

Karke, K. 2004. Effects of Deforestation on Tree Diversity and Livelihoods of Local Community: A Case Study from Nepal. Lund, Sweden, Lund University.

Kassu Kebede. 2011. Soil Erosion, Deforestation and Rural Livelihoods in The central Rift Valley Area of Ethiopia: A Case Study in the Denku Micro watershed, Oromia Region. University of South Africa.MSc. Dissertation.

Krantz, L. 2001. The Sustainable Livelihood Approach to Poverty Reduction: An Introduction. Division for Policy and Socio-Economic Analysis, Swedish International Development Cooperation Agency.

Lawton, R. O., Nair, U. S., Pielke Sr., R. A. and Welch, R. M. 2001. Climatic impact of tropical lowland deforestation on nearby Montane Cloud Forests. Science294: 584-587.

Legesse G/Meskel. 2008. The impact of community based land resource management on agriculture and rural livelihood. The case of Dhabe Dongore: Eastern Shoa Zone.

Ludi, E. 2002. Economic Analysis of Soil and Water Conservation: case studies for the highlands of Amhara Region, Ethiopian African Studies series A18. University of Berne, Switzerland.

Mahapatra, K., and Kant, S. 2003. Tropical Deforestation: A Multinomial Logistic Model and some Country-specific Policy Prescriptions, *Journal of Forest Policy and Economics 7 (2005),* pp.1 8

McCarthy, J. 2009. Reflections On: Our Planet and Its Life, Origins, and Futures, Science, available at: http://www.sciencemag.org/content/326/5960/1646.short

Medhin Zewdu. 2002. Sustainable Development in Ethiopia: Report of assessment of activities and issues relevant to the review process of the earth. IBCR,.A.A, Ethiopia.

Mekonnen, Alemu. 2012.Coping with Fuel wood Scarcity: Household Responses in Rural Ethiopia.Resources for the Future.

Mekuria Argaw. 2005. Forest Conservation-Soil Degradation-Farmers Perception Nexus: Implications of Sustainable Land use in the Southwest of Ethiopia. Ecology and Development Series. No 26, Cuviller Verlag Gottngen.

MELCA Mahiber .2008. Communal Forest Ownership: An Option to Address the Underlying Causes of Deforestation and Forest Degradation in Ethiopia? Proceeding of a workshop held at Chilimo Forest and Ghion Hotel November 25-27/2008. 43pp.

MoARD. 2007. Woody Biomass Inventory Strategic Planning Project. A National Strategic Plan for the Biomass Energy Sector.

Mulat Demeke, Fantu Guta, and Tadele Ferede. 2004. Agricultural Development in Ethiopia: Are there alternatives to food aid? Addis Abeba, Ethiopia, pp.12-62.

Mulligan,M. 2004.Environmental Modeling Finding Simplicity in Complexity, Johan W. Sons, England.

Mulugeta Lemenih. 2004. Effects of Land use Changes on Soil quality and Native Flora Degradation and Restoration in the Highlands. Doctoral Dissertation of forest Soils, SLU.Acta Universitatis Agriculturae suecie, silvesteria vol. 306, pp 99.3-1.

Myres, N., and R. A.,Mittermair.20002. BiodiversityHotspots for Conservation Priorities.Nature 403-835-884.

Netsanet Deneke. 2007. Land Use and Land Cover Changes in Harenna Forest and Surrounding Area, Bale Mountains National Park, Oromia National Regional State, Ethiopia.M.Sc Thesis, and AAU.

Nzeh, C. E. P., and Eboh, E.C. 2007. Analysis of income effects of forest products activities among rural households in Enugu state Nigeria, Journal of Agriculture and Social Research(JASR),Vol.7,No.1,2007,ISSN1595-7470.Pages23-33. www.ajol.info/journals/jasr.

Oguntala, I. A. 2000. Oyo state in Nigeria: a people united, a future assured: Survey of states vol. 2. Reference

Pielke, R. A. 2002. The Influence of Land-Use Change and Landscape Dynamics on the Climate System: Relevance to Climate-Change Policy beyond the Radioactive Effect of Greenhouse Gas.

Popoola, L. 2014. Imagine a Planet without Forest. An inaugural lecture delivered at the University of Ibadan on Thursday, 24 July, 2014. Ibadan University Press, Nigeria. ISBN: 978- 978-8456-56-8.

Sands, R. 2006.Forestry in a Global Context.CABI Publishing Agency.

Schmink, M., and C.Wood. 1992. Contested Foresters in Amazonia. Columbia University Press, Newyork.

Schreckenberg, K., Luttrell, C., Zorlu, P. 2007. A way out of poverty: A review of participatory Forest Managemen, Kenya.

Scoones, I. 1998. 'Sustainable Rural Livelihoods: A Framework for Analysis.' *IDS Working Paper* 72, Brighton: IDS, pp. 3-22.

Sherman, K. 1993. The Environmental Data Book.The World Bank. Washington. D.C.

Shibru Tedla. 2003. Ethiopians Environmental Condition: Today and Twenty five Years from Now" In Economics focus. Bulletin of Ethiopian Economics Association.Vol-5, No.5.

Shiferaw Bekele, Stein, T., Holden. 2000. Policy instruments for sustainable land management: the case of highland smallholders in Ethiopia. Agricultural Economics 22, 217–232.

Sisay Asefa. 2003. " The Ethiopian Population in the 1990s and Beyond" In Population and Development. Vol.4 No.4 Addis Ababa: National Office of Population.

Solesbury, W. 2003. Sustainable Livelihoods: A case study of the Evolution of DFID policy. Working paper 217. London: Overseas Development Institute.

Sucoff, E. 2003.Deforestation.In Environmental Encyclopedia. (P.g.358-359). Detroit: Gale.

Sunderlin. W., Angelsen, A., Balcher, B., Burgers, P., Nasi, R., Santoso, L., and Wunder, S. 2005. Livelihoods, forests and conservation in developing countries: An overview. Journal of World Development, 33(9): 1384-1402.

Tadesse, K. 2003. Environmental and Habitat Management.The case of Ethiopia and Ghana. Environmental management31 (3): 313-32.

TEEB. 2010. The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature: A synthesis of the approach, conclusions and recommendations of TEEB, availableat:http://www.teebweb.org/LinkClick.aspx?fileticket=bYhDohL_TuM%3d&tabid=1278&mid=2357

Teketay Demel. 2001. Deforestation; Wood and Famine, and Environmental Degradation in Ethiopia‟s Highlands Ecosystem; Urgent Need for Action. North East African Studies.

Tropenbos International. 2005. Alternative Livelihoods and Sustainable Resource Management Wageningen, the Netherlands.

Tumbe, C., Mulenga, S., and Hasselman, M. 2005.Contribution of dry forests to rural livelihoods and the national economy of Zambia, Zambia.

UNEP. 2005. Forest Loses and Gains, Where do we stand? United Nations Environmental Program. Rome, Italy.

UNEP. 2006. Global Environmental Outlooks Past, Present and Future Perspective. United Nations Environmental Program. Italy, Rome.

UNFCCC.2010. Glossary of climate change acronyms. United Nation's Framework Convention on Climate Change.*WRM's bulletin Nº 161*, December 2010.

Union of Myanmar Website. 2000. United Nations Convention to Combat Desertification (UNCCD). National Report on the UNCCD implements, pp, 6-25.

Van NordWijk. 2006. Managing Watershed Services in Eco-agriculture Landscapes In: the State of the area of Eco-agriculture, eds. Island Press, Washington, D.C.

Verchot, L. V. 2014. Challenges and opportunities for mitigation in the agricultural sector. Center for International Forestry Research.

Wegeyehu Bekele. 2003. Economic of Soil and Water Conservation. Theory and Empirical Application to Subsistence Farming in the Eastern Ethiopian Highlands.Doctoral Thesis, Swedish University of Agricultural Sciences. Uppsala, Sweden.

WHO. 1999. FAO production year book 1999:53.

Willams, M. 2006. Deforesting the Earth: from prehistory to Global crisis: An Abridgment. Chichgo.The University of Chicago Press.

Woldeamlak, B. 2002. Land cover dynamic since the 1950s in Chemoga watershed, Blue Nile basin, Mountain Research and Development22 (3):263-269.

World Meteorological Organization. 2005. Climate and Land Degradation. Soil conservation Land Management- Flood forecasting- Food Security. WMO- No 989.

Yasuoka, J., and Levins, R. 2007. Impact of deforestation and agricultural development on Anopheline ecology and Malaria Epidemiology. Journal of American Society of Tropical Medicine and Hygiene, 76(3): 450-460.

Yemiru Tesfaye, A., Roos, B.M., Campbell and F.Bohlin. 2010. Forest Incomes and Poverty Alleviation under Participatory Forest Management in the Bale Highlands, Southern Ethiopia". International Forestry Review 12(1):66-77.

Zelalem Temesgen .2008. Resettlement and Its Impact on Vegetation A Case of Angar Gutin, Unpublished Thesis, Addis Ababa University

Zerihun Woldu, Meseresha Fetene and Asferachew Abate. 1999. Vegetation Under different Species in Acacia Woodland in the Rift Valley of Ethiopia. SINET: Ethiopia, J. Sci. 22:235-252, Faculty of Science Addis Ababa, Ethiopia.

7. APPENDICES

Haramaya University

Post Graduate Program Directorate

College of Agriculture and Environmental Sciences

School of Natural resource and Management and Environmental Science Management

Program: Environmental Science Management

Questionnaires Prepared for Household Heads (HHHs)

Appendix - A

Questionnaire to be filled by farmers of Shekila and Qallo kebeles

Dear Respondents,

This questionnaire is meant to gather information for a study on farmers' knowledge and practices towards impact of deforestation on rural livelihoods in selected rural kebeles of Dewa Chefa district, Oromo zone administration, Amhara Regional State, Ethiopia.

The purpose of this study is to generate the necessary information for the assessment of impact of deforestation on rural livelihoods in the study area. It is out puts will be used by decision makers, planners, researchers, government institutions and sectors at different levels those who are concerned with the assessment the impact of deforestation on rural livelihoods in the study area. Therefore, your honest and genuine co-operation in responding and filling the questionnaire is highly essential.

Thank you! in advance for your time and patience in completing this questionnaires fill the blank spaces.

N.B. 1. The response you give will not have any negative impact on you.

2. No need of writing your name on the questionnaire.

3. Please respond for in feeling free warty on think is correct.

A. Socio-economic background of the respondent

1. Household head Male ☐ Female ☐ , Kebele _____

2. Age _____

3. Family size_____ Female _____ Male_____

4. Level of Education (house hold heads) _____

5. Educational and marital status of other family members

Grade	Sex and age			
	Male	Age	Female	Age
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
12^{+}				

6. Occupation _____

7. Monthly Income _____

8. Source of Income _____

9. How much money did the household earn from the following sources during 2016 crop-year? (Estimate)

Sources Estimate Income in Birr	**Sources Estimate Income in Birr**
1. Livestock and livestock products Sale	
2. Grain sale	
3. Firewood and Charcoal sale	
4. Credit:	

i. rural credit	
ii. individual credit	
5. Transfer	
6. Others (specify)	

10. Land holding size _____

B. General Forestry related Questions

1. Do you produce forest products? Yes ☐ No ☐

2. If your answer for question number (1) is yes, could you list them in order of quantity of product you produce

Rank	Forest product
1	
2	
3	

3. For what purpose you produce those forest products?

A. For market ☐ B. For Household consumption ☐

C. If other specify _____

4. Which type of forest product you supply for markets please list them in terms of quantity of these products per month?

Rank	Type of forest product	Quantity
1		
2		
3		

5. Do you use forest product as one of the sources of income? How much income you generate from these forest product? Please list them in order of priority.

Rank	Types of forest product	Income per month (Birr)

6. Which one is greater in number in your area?

A. Seller of forest product ☐

B. Those do not sale ☐

7. Which tree species you use for the production of energy sources you mostly sell? _ _____

8. Do you use this forest product for household consumption?

A. Yes ☐ B. No ☐

9. Which type of forest product you use for household consumption? Please list them in terms of priority.

Rank	Types of forest product
1	
2	
3	

10. What types of energy you use for domestic consumption?

A. Charcoal ☐ B. Crop residue ☐ E. Kerosene ☐

C. Fuel wood ☐ D. Dry dung ☐

11. Which of the above do you use for cooking _____

12. Do you think the agricultural land size you owned is sufficient for the production food for your family?

A. Yes ☐ B. No ☐

13. If your answer for question number 12 is no, by what means you increase food production for your family?

A. By increasing agricultural land ☐

B. By selling forest product ☐

14. If your answer for question number 13 is A; how do you obtain additional agricultural land?

A. By inheritance ☐ D. Contract ☐

B. By clearing forest ☐ E. Crop sharing ☐

C. From government ☐ F. Please, if other specify _____

15. If your answer for question number 13 is yes, why do sell forest product? _____

16. Have you use cattle as a source of income?

A. Yes ☐ B. No ☐

17. If your answer for question number 16 is yes, how do you obtain grazing land for cattle?

A. Separated grazing land

B. Forest area

18. What type of grazing land you use for cattle?

A. Privately owned ☐

B. Commonly owned ☐

C. Forest resources degradation and its impact on the environment related questions

19. Do you know the role of forest resources towards environmental protection? E.g. Soil conservation, climate adaptation, rainfall, etc

A. Yes ☐ B. No ☐

20. If your answer for question number 19 is yes, how do you prioritize the benefit obtained from forest? For each Option please ticks the box that you feel most fits your views?

Issues	High	Medium	Low	Don't know
Rainfall patterns				
2. Improvement of water resources				
3.Reducing temperature				
4. Air Quality				
5. Erosion control				
6. Promotion of biodiversity				

21. Are there other benefits missing from question 20?

A. Yes ☐ B. No ☐

22. If your answer for question number 21 is yes, could you list them?

No	**Benefits of forest reason**
1	
2	
3	

23. In your local area, do you get that benefit from forest resources sufficiently?

A. Yes ☐ B. No ☐ C. Specify if others _____

24. If your answer for question no 23 is no, what do you think its reason?

25. When you compose the areal coverage of forest in your local area before 10 years and at the present time, did you observe its change?

A. Yes ☐ B. No ☐

26. If there is change, what is this change?

27. With forest change, what do you observe its impact on the environment interims of?

	High	Medium	Low	N
A) Climate change (i.e., rainfall variability	☐	☐	☐	☐
B) Loss of biodiversity (i.e., fauna and flora	☐	☐	☐	☐
C) Decline of soil fertility	☐	☐	☐	☐
D) Increase of temperature	☐	☐	☐	☐

28. Are there other environment impacts missing from question 27?

A. Yes ☐ B. No ☐

29. If your answer for question number 21 is yes, could you list them?

_____

30. What did you observe the impact of forest reduction on the socio-economic of the people in terms of?

	High	Medium	Low	N
A) Decline of forest product (quality and quantity)	☐	☐	☐	☐
B) Agricultural production	☐	☐	☐	☐
C) Distance to be traveled to collect forest product	☐	☐	☐	☐

31. Are there other socio-economic impacts of forest reduction on the society surrounding? If these, please list them.

_____

32. What do you think the reasons for forest degradation in your locality?

A. Natural ☐ B. Human impact ☐

33. If your answer for question number 32 is b, could you list the means by which human have impact on forest degradation in your area?

_____

34. Do you participate in community based forest management in your local area?

A. Yes ☐ B. No ☐ C. Specify if others _____

35. Did you get training (education) about forest resource management by district Agricultural experts or other NGO's?

A. Yes ☐ B. No ☐

36. Who control (owned) forest resources in your area?

A. Government ☐ B. Community ☐

37. What is your attitude/opinion/ towards forest resource conservation?

38. What do you suggest to minimize forest resource degradation in your local area? For example what should be the following bodies do?

Government_____
NGOs_____
_____
Rural Societies _____

Changes in income as a result of deforestation

1. As a result of deforestation impact, has your income decreased? Yes ☐ No ☐

2. How do you quantify the decrease in your income? a. decrease in production per hectare KG☐
b. decrease in livestock production ☐ c. both ☐ d. Equivalent in cash per year ☐

3. As a result of this impact, what is the level of the problem you have encountered in relation with your livelihoods? a. low ☐ b. medium ☐ c. high ☐ d. no change ☐

4. What is the consequence of the reduction in your income? Mark all that apply. a. reduced no of meal ☐ b. reduced quantity per meal ☐ c. withdrawal of children from school ☐
d. poor health ☐ e. marginal land cultivation ☐ f. all ☐

Appendix - B

Haramaya University

Post Graduate Program Directorate

College of Agriculture and Environmental Sciences

School of Natural resource and Management and Environmental Science Management

Program: Environmental Science Management

Questions for Interviews

This interview guide is prepared to direct the interviews to be conducted with employee (environmental experts) of District Agricultural Office or any equivalent offices in the selected District. The purpose of this guide is to secure additional data that may not be clearly secured the questionnaires to be filled by respondents. It is also designed in such a way that it helps the interviews and the interviewees focus the discussion on issues related to the research questions. Thus, this interview is meant to secure only relevant data that could not be obtained through other means of data collecting tools.

1. What is considered as a major problem leading to forest destruction and degradation in Dewa-Chefa District?
2. Do you have any policy statement regarding environmental education? If yes, what does it say? Does it specify any specific areas of training?
3. Do you believe that there are suitable and enough forest resources management plan? If Yes, what are these guidelines?
4. Do you believe that environmental policy and forest resources management plan incorporate the rural livelihoods? if so, to what extent?
5. Do you involve the rural poor (forest dependent) is the designing and development of forest resources management plan?
6. What are the government improvement of forest resource degradation and destruction to manage up with the environmental impacts (soil erosion, climate change, loss of biodiversity?)

7. What recent actions have been taken to reduce forest resource degradation?

8. What actions do you think need to be taken to reduce the risk of forest resource degradation and to minimize its environmental impact?

9. If you have any opinion about forest degradation and the loss of biodiversity, decline of soil fertility, climate change issues which is not mentioned, I would appreciate if you could mention it.

Appendix - C

Haramaya University

Post Graduate Program Directorate

College of Agriculture and Environmental Sciences

School of Natural resource and Management and Environmental Science Management

Program: Environmental Science Management

Questions for Focus Group Discussions

1. How do the local communities use the forest resources? Discuss!
2. What are the types of indigenous knowledge for forest conservation practices that the local community participates?
3. Do you think that the individual or the communities are actively responding to these forest degradation impacts?
4. What do you think are the possible causes of deforestation in your area? Discuss!
5. What do you think are the major consequence of deforestation and land degradation in your area?
6. What is the implication of human activity and land resource interaction in the District?
7. To solve the impacts of deforestation on rural livelihoods, what do you think to be done?
8. How do the local administrations concern the customarily forest land management?
9. What is the trend of total production per unit area from year to year? Discuss!
10. What attempts have been made to sustain forest resources and to solve forest degradation impacts on rural livelihoods in the District?

THANK YOU FOR YOUR ASSISTANCE AND YOUR VALUABLE TIME!

Appendix Table 1.Forest area of Ethiopia (1990-2015)

Country	Land area(1000ha)	Forest Area (1000 ha)				
		1990	2000	2005	2010	2015
Ethiopia	109, 631	15, 114	13, 705	13, 000	12, 296	12, 499

Source FRA 2015

Appendix Table 2.Deforestation estimates in Ethiopia by forest type (in hectare) 1994-2003 E.C

Type	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
High forest	270, 897	118, 355	99,601	73, 025	57, 182	48, 235	66, 036	76, 412	73 ,875	76, 723
Wood land	83, 720	77, 929	75, 460	79, 195	83, 379	85, 365	86, 611	91, 038	95, 633	96, 323
Shrub land	44, 678	51, 432	56, 752	59, 377	77, 242	70, 164	68, 051	65, 548	61, 854	58, 685
Total	39,9295	247,716	231, 813	211, 597	217,803	203,764	220,698	232,998	231,362	231, 731

Source: Ministry of Agriculture and Rural Development (2004)

Appendix Table 3.Projected population of the study area (1984-2015)

Years	Projected total population of Dewa Chefa District
1980	73,940
1984	80,443
1987	86,054
1990	92,057
1994	100,152
1996	105,347
2000	114,611
2005	126,810
2007	133,388
2010	142,692
2013	152,646
1015	160,564

(Source CSA, 1984)

Appendix Table4. Land under cultivation and major crops cultivated in the Dewa Chefa District

Crop	Area Cropped (Ha)			Average Yield (Mt/ha)			Area Cropped (Ha)			Average Yield Mt/ha)		
	2007	2009	% Change	2007	2009	% Change	2010	2014	% Change	2010	2014	% Change
Maize	2165	3380	56.12	112424	86573	29.86	3243	1716	47.1	65370	14873	77.23
Teff	3460	3188	7.86	58606	42026	28.3	3400	3923	15.5	44200	50220	13.62
Sorghum	8860	7539	14.9	404178	163963	59.4	7847	8688	10.7	239969	115879	51.7
Mung bean	80	1	9.75	1184	10	99.2	1	1124	100	1	10116	100
Barley	590	204	65.4	8260	3027	63.35	94	328	248.9	1410	4920	248.9

Source DCDAO (2015)

Appendix Table 5.The type and number of Livestock in Dewa Chefa District Figures (2007- 2015)

No	Types of livestock's	Number of livestock's in the study area (2007-2015)				
		2007	2009	2010	2014	2015
1	Cattle	348,283	123,189	128,260	149,068	173,224
2	Goats and Sheep	230,070	44,551	47,699	36,638	42,715

Source DCDAO (2015)