



**SALALE UNIVERSITY**

**SCHOOL OF GRADUATE STUDIES**

**ASSESSING CAUSES AND EFFECT OF LAND DEGRADATION ON  
CROP-LIVESTOCK FARMING AND ITS REMEDIATION PRACTICES:  
A CASE STUDY OF YAYA GULELE DISTRICT, NORTH SHEWA  
ZONE OF OROMIA, ETHIOPIA.**

**M.Sc. THESIS**

**June, 2024**

**FICHE, ETHIOPIA.**

**Assessing Cause and Effects of Land Degradation on Crop Livestock  
Farming and Its Remediation Practices in Yaya Gulele District, North  
Shewa Zone of Oromia, Ethiopia**

**A Thesis Submitted to the Department of Natural Resource Management,  
School of Graduate Studies**

**Salale University**

**In Partial Fulfillment of the Requirements for the Degree of Master of  
Integrated Watershed Management**

**Getu Regasa Hunde**

**June, 2024**

**Salale University Fiche, Ethiopia**

**SALALE UNIVERSITY**

**DEPARTMENT OF NATURAL RESOURCE MANAGEMENT**

I hereby certify that I have read and evaluated this thesis Assessing the cause and effects of land degradation on crop livestock farming and its remediation practices in Yaya Gulele, North Shewa Zone of Oromia, Ethiopia, prepared under my guidance by Getu Regasa. I recommend that it be submitted as fulfilling the thesis requirement.

<b>Major Advisor</b>	<b>Signature</b>	<b>Date</b>
Zewdie Kassa (PhD)	_____	_____

<b>Co-Advisor</b>	<b>Signature</b>	<b>Date</b>
Hana Tamrat (MSc)	_____	_____

As a member of the Board of Examiners of the Assessing Causes and Effects of Land Degradation on Crop Livestock Farming and its Remediation Practices of Land Degradation in Yaya Gulele, North Shewa Zone of Oromia, Ethiopia Thesis Open Defense Examination, I certify that I have read and evaluated the thesis prepared by Getu Regasa and examined the candidate. I recommend that the thesis be accepted as fulfilling the thesis requirements for the degree of Integrated Watershed Management.

<b>Chairperson</b>	<b>Signature</b>	<b>Date</b>
_____	_____	_____

<b>Internal Examiner</b>	<b>Signature</b>	<b>Date</b>
_____	_____	_____

<b>External Examiner</b>	<b>Signature</b>	<b>Date</b>
_____	_____	_____

Final approval and acceptance of the thesis are contingent upon the submission of its final copy to the Council of Graduate Studies (CGS) through the candidate’s department or school graduate committee (DGC or SGC).

## **DEDICATION**

First and foremost, I thank the Almighty God for granting me the patience and resilience to do my research. I would like to extend my appreciation and thanks to my lovely wife, Shaye Warku, and my mother, Atsedu Koricho, for their unconditional love, partnership, and unwavering support during my study period and thesis writing. My God, bless their abundance. Moreover, I would also like to extend my heartfelt gratitude to all my friends who were directly or indirectly involved in this research.

## **STATEMENT OF THE AUTHOR**

First of all, I declare that this thesis is the result of my genuine work and that I have duly acknowledged all sources of materials I referred to for writing it. I submit this thesis to Salale University in partial fulfillment of the requirements for the degree of Master of Science in Integrated Watershed Management. The thesis is deposited at the library of the university to be made available to borrowers for reference. I solemnly declare that I have not submitted this thesis to any other institution anywhere for the award of any academic degree, diploma, or certificate. Brief quotations from this thesis are allowed without requiring special permission, provided that an accurate acknowledgment of the source is made. Requests for permission for extended quotation from or reproduction of this document in whole or in part may be granted by the Head of the Department of Integrated Watershed Management or the Dean of the Postgraduate Program Directorate of the University when, in his or her decision, the proposed use of the material is for scholarly interest. In all other instances, however, the agreement must be obtained from the author.

**Name:** Getu Regasa

**Signature:** \_\_\_\_\_

**Place:** Salale University

**Department:** Integrated Watershed Management

**Date of submission:** \_\_\_\_\_

## **BIOGRAPHICAL SKETCH**

I was born on September 15th, 1994 G.C., in Buyama Ko'at Kebele, Yaya Gulale Woreda, North Shewa Zone, Oromia Regional State, to my mother, Atsedu Koricho, and my father, Regasa Hunde. I attended Kare Toke Primary School from 2001–2009 G.C., Fitch Secondary School from 2010–2011 G.C., and Kombolcha A.T.V.E.T. College from 2013–2015 G.C., graduating with a Diploma in Natural Resources Management. Later, I pursued my BSC Degree in Natural Resources Management at Wolega University, graduating on February 21, 2014 G.C. From 2016 to 2024 G.C., I served as an agricultural expert at the Yaya Gulele Woreda office, North Shewa Zone, Oromia Regional State.

## **ACKNOWLEDGEMENTS**

First and foremost, I would like to express my gratitude to Almighty God for giving me the strength and resilience during my studies to reach this stage. With this opportunity, I would like to extend my thanks to my major advisors, Dr. **Zewdie Kassa** and co-advisor, Mrs. **Hana Tamrat (M.Sc)**, for their unwavering support, professional guidance, and encouragement during the whole study period. I am fortunate to have them as my advisors for my master thesis. I would like to extend my heartfelt gratitude to all my friends for their moral and professional support, from data collection to thesis writing. I have great appreciation and thanks to all my department members, as well as Salale University's Integrated Watershed Management Head Department, for their continuous support and guidance throughout my study periods. Furthermore, I am thankful to my wife, Shaye Worku, who assisted me by facilitating material support during my study periods. I also have great respect and appreciation for all my data collectors for their significant support and cooperation in the accomplishment of this work.

# TABLE OF CONTENT

STATEMENT OF THE AUTHOR.....	iv
BIOGRAPHICAL SKETCH.....	v
LIST OF TABLES .....	ix
Lists of Figures.....	x
LIST OF ABBREVIATIONS .....	xii
ABSTRACT.....	xiii
1. INTRODUCTION.....	1
1.1. Background and Justification .....	1
1.2. Statement of the Problem .....	3
1.3. Objectives of the Study .....	5
1.3.1. General Objective.....	5
1.4. Research Questions .....	5
1.5. Scope and Limitation of the Study .....	5
2. LITERATURE REVIEW.....	6
2.1. Concept of land degradation.....	6
2.2. Land Degradation in the World.....	6
2.3. Land Degradation in Ethiopia .....	7
2.4. Causes of Land Degradation in Ethiopia.....	7
2.4.2. Indirect causes of land degradation .....	10
2.4.2.1. Population pressure .....	10
2.5. Effect of Land Degradation.....	11
2.5.1 Agricultural impacts of land degradation.....	11
2.5.2. Silting up of reservoirs .....	12
2.5.3. socio-economic impact of land degradation.....	12
2.5.4. Ecological impact of land degradation .....	13
2.6. Effect of land degradation on crop-livestock farming system.....	13
2.6. Remediation Practice of Land Degradation .....	13
3. RESEARCH METHODOLOGY .....	16
3.1. Description of Study Area.....	16
3.1.1. Topography .....	18
3.1.2. Climate .....	18
3.1.3. Vegetation .....	18

3.1.2. Farming system .....	18
3.2. Method of Data Collection .....	19
3.2.1. Sampling techniques and Sample size determination .....	19
3.2.2 Primary Data .....	20
3.2.3. Secondary Data .....	22
3.3. Data Analysis .....	22
4. RESULTS AND DISCUSSION .....	23
4.1. Socio-economic and demographic characteristics of the respondents .....	23
4.1.1 Marital Status, Family Size and Land Holding .....	24
4.2. Land degradation.....	25
4.3. Major Causes of Land Degradation.....	27
4.4. Effects of land degradation in the study area .....	31
4.4.1.Reduce Crop Production .....	31
4.4.2. Reduce Livestock Production.....	32
4.5. Major land degradation remediation practices .....	32
4.5.1. Traditional land remediation practices .....	32
4.5.2. Mechanisms of land remediation practice of soil fertility.....	34
4.6. Participation of the local community in the land degradation remediation efforts .....	35
4.7. The role of government in land remediation practices.....	36
4.7. Farmers receive agricultural extension services.....	37
5. CONCLUSION AND RECOMMENDATION .....	38
5.1. Conclusion.....	38
5.2. RECOMMENDATIONS .....	39
6. REFERENCE .....	40
7. APPENDIX .....	45

## LIST OF TABLES

<b>Table 1.</b> Components of Degradation, Types of Degradation, and Methods for remediation degraded Land.....	15
<b>Table 2.</b> Distribution of sample size in each selected kebeles.....	20
<b>Table 3.</b> Summary of Socio-economic Description of Respondents .....	23
<b>Table 4.</b> Marital Status, Family Size, Faram Land holding Size in hektar of the respondents.....	24
<b>Table 5.</b> Percentage distribution of respondents in land degradation issues .....	25
Table 6. Responses of the respondents on major indicators of land degradation in the study area .....	26
<b>Table 7.</b> Percentage distribution of respondent’s major cause of land degradation. ....	28
<b>Table 8.</b> Percentage distribution of respondents in level of land degradation .....	31

## LISTS OF FIGURES

<b>Figure 1.</b> Map of the study area.....	17
<b>Figure 2.</b> Cause of land degradation.....	27
<b>Figure 3.</b> Root Causes of the land degradation in the study area. ....	29
<b>Figure 4.</b> Effects of land degradation .....	32
<b>Figure 5.</b> Major land degradation remediation practices.....	34
<b>Figure 6.</b> Mechanisms of land degradation remediation practice of soil fertility.....	35
<b>Figure 7.</b> Land degradation remediation efforts by government. ....	36
<b>Figure 8.</b> Farmers get agricultural extension service.....	37

## **LIST OF FIGURES FOR APPENDIX**

Appendix 1:Deforestation in Lami .....	51
Appendix 2: Land degradation problems in Buyama ko'at kebelefield	52
Appendix 3: Cattle grazing on degraded land in Buyama ko'at kebele	53
Appendix 4: land degradation probems in Gobola katila	54
Appendix 5: Land degradation remediation activities by the local community in Gobola katila kebele.....	55

## **LIST OF ABBREVIATIONS**

FAO	Food Agricultural Organization
GDP	Growth Domestic Production
LULC	Land Use Land Coverage
SLM	Sustainable land management
SPSS	Statistical Package for Social Sciences
UNCCD	United Nation Convention Combat Desertification
UNESCO	United Nations Educational, Scientific and Cultural Organization
WMO	World Meteorological Organization
WFEDO	Woreda Finance and Economic Development Office.
WAO	Woreda Agriculture Office

## ABSTRACT

*Land degradation is a major environmental problem in Ethiopia, especially in areas like Oromia, where it has a negative impact on food security, rural poverty, and agricultural production. Although land degradation is a serious concern, little is known about the causes and effects of land degradation on crop and livestock farming and its remediation practices in particular regions like Yaya Gulale district. In order to close this knowledge gap, this study examines the primary causes, consequences, and local remediation strategies of land degradation in crop-livestock farming. The sample of 321 respondents was chosen using basic random sampling procedures..Focused group discussion and household surveys were employed to gather primary data. A one-way ANOVA and descriptive statistics were employed in the data analysis. The study's findings demonstrated that overgrazing, continuous cultivation, population development, and deforestation are the main factors contributing to land degradation, which in turn causes soil infertility, decreased output from cattle and agriculture, deforestation, loss of flora, and increased poverty. In addition, the effects of land degradation on agricultural yields lead to decreasing yields, food insecurity, lower livestock production, poverty, and difficulties with land preparation like shrinking farm sizes, famine, and drought.livestock are impacted by land degradation because it lowers the productivity of grazing areaswhich in turn lowers the amount of fodder available to animals. In general, this study has helped to clarify the potential cause ,effects and remediate of land degradation. Thus, the researchers suggested that appropriate land use policies, afforestation initiatives, public participation in forest conservation efforts, the adoption of sustainable land management practices, and soil conservation measures be put into practice.*

**Keywords:** - Causes, Crop-livestock, Effects, farming and Land Degradation,and Remediation

# 1. INTRODUCTION

## 1.1. Background and Justification

Globally, about 12 million hectares of dry land are degraded (Engel *et al.*, 2008). Similarly, land degradation is a crucial indicator of poverty levels in many developing nations, leading to reduced productivity, economic downturns, and social unrest (United Nations, 2019). Ethiopia is severely impacted by widespread soil erosion and land degradation, which have an effect on social, economic, and political facets of life. The problem is currently exacerbated by common activities, including deforestation, overgrazing, and house construction. The nation confronts significant challenges of land degradation arising from both natural and human factors (Megerssa and Bekere, 2019). It has been known that more than 85% of the Ethiopian economy is dependent on agricultural practices (Di Falco *et al.*, n.d.).

According to Million and Belay (2007), land degradation has a significant negative impact on economic production and is a major factor in food scarcity, poverty, and low agrarian output. The population's widespread poverty and an accelerating trend of degradation are to blame for the inflexibility of the devastating famines and consequent fatalities in 1972/73 and 1984/85 (Genene, 2006). Ethiopian land degradation is mostly caused by overgrazing, fallowing, deforestation, farming on steep slopes, and inadequate conservation measures. Population pressure is the fundamental cause of land deterioration (Lakew *et al.*, 2000). In response to substantial land degradation in the country, large-scale attempts to establish natural resource conservation programs have been underway since the recent past (Negasa, 2022).

The highlands of our nation are severely degrading as a result of multiple circumstances. Steep slope cultivation, deforestation, erosive rainfall patterns, inadequate fallowing, excessive grazing, population growth, political unrest, poor land administration, and extensive irrigated agricultural expansion without appropriate conservation measures are a few of these (Lakew *et al.*, 2000). This has a detrimental effect on animal and human health, agricultural productivity, and commercial ventures like ecotourism (UNCCD, 2004).

The World Bank estimates that land degradation affects at least 485 million Africans and costs the continent US\$9.3 billion a year (Ndiang'ui, 2007). Many agricultural and non-agricultural uses of soils, as well as inadequate land use planning and resource mismanagement by land users, particularly poorer farmers, are blamed for the majority of the negative effects on African lands (Sonneveld, 2002). Population growth, wars and conflicts that result in the growth of refugee settlements, poor soil management, deforestation, shifting cultivation, uncertainty about land tenure, and differences in the intrinsic qualities of fragile soils and climatic conditions in different agro-ecological zones are among the main causes of land degradation in Africa (Thiombiano and Tourino, 2007).

The primary cause of the land degradation issue in the study area is population pressure today. In order to remediate the degraded land, the government, agricultural office, local farmers, DAs, and a minimum of NGO involvement have undertaken a variety of cooperative activities in the study area since 2013 E.C. In the research area, land degradation is a serious socioeconomic issue that has led to decreased land productivity and production, a loss of natural vegetation, and poverty. These circumstances make the researcher want to investigate it further. Thus, the purpose of this study is to investigate land deterioration in the Yaya Gulale district by assessing the cause and effects of land degradation on crop livestock farming and its remediation practices.

In general, Yaya Gulale district is also affected by land degradation problems such as soil erosion, overgrazing, intensive agricultural crop production, and deforestation. The productivity of agriculture, livestock, human health, and economic ventures like ecotourism are all negatively impacted by deforestation and desertification (UNCCD, 2004). Comparably, to the best of the researcher's knowledge, Yaya Gulale district's declining soil productivity causes decreased farm income and food insecurity, especially for the rural poor, which either maintains or exacerbates poverty. Thus, the main objective of this study was to investigate Yaya Gulale district land degradation issues and remediation concerns, as well as to make potential recommendations that could ease those difficulties in the in the utilization of available land. So, this is the main issue that drives the researcher's evaluation of land degradation remediation and management strategies in the study region, as well as the development of some recommendations for scaling up the study's findings.

## 1.2. Statement of the Problem

Land degradation poses a significant global challenge, affecting ecosystems, livelihoods, and food security (Nations, 2021). Degradation of land quality and productivity is caused by a number of factors, including unsustainable agricultural practices, deforestation, urbanization, industrial activity, climate change, and natural disasters. The United Nations Convention to Combat Desertification (UNCCD) Global Land (Outlook, 2019) estimates that land degradation affects about 3.2 billion people globally. Population pressure, institutional and market failures, and poverty are frequently mentioned as root reasons (Kirui and Mirzabaev, 2014).

Furthermore, the degradation of land jeopardizes ecosystems, biodiversity, and water resources and exacerbates poverty and social disparities. It increases susceptibility to environmental hazards like desertification, soil erosion, and the loss of arable land (Nations, 2021). Without effective mitigation and adaptation strategies, land degradation presents formidable obstacles to achieving sustainable development goals and environmental preservation. Ethiopia, a Sub-Saharan African country, is severely affected by land degradation, accounting for 8% of the global total (Tesfaye, 2011). Despite its natural resource endowment, Ethiopia has long grappled with resource degradation, particularly affecting its agriculture-dependent population. The highlands, notably the Oromia region, suffer from soil erosion, nutrient depletion, gully formation, water scarcity, and reduced crop yields, rendering thousands of hectares unproductive (Negasa, 2022).

The North Shoa Zone faces various environmental challenges, including soil erosion, deforestation, unsustainable agricultural practices, and inadequate land management policies. Its hilly terrain makes it prone to soil erosion, exacerbated by heavy rainfall and improper land cultivation techniques (Nature and Causes of Land Degradation in the Oromiya Region, 2002) (Haregeweyn *et al.*, 2017). Widespread deforestation, driven by agricultural expansion and resource extraction, disrupts hydrological cycles and compromises local communities and ecosystems. In particular, Yaya Gulale, a district in the North Showa, confronts significant land degradation issues, adversely affecting the environment, livelihoods, and socio-economic development.

The issue is made worse by deforestation and agricultural expansion brought on by fast population growth and rural areas' reliance on crop cultivation and livestock production. Steep terrain, soil erosion, unpredictable rainfall, and the use of crop byproducts as animal feed all contribute to the problem of land degradation. When farmed land is not managed properly, it degrades severely over time, producing less and making it harder for farmers to support their family. Every year, this degradation sharply lowers living standards, with soil erosion appearing as a major effect (Dixon *et al.*, 2001). Similar problems with soil erosion, deforestation, and land degradation are prevalent in Ethiopia, which has led stakeholders to develop strategies.

The Ethiopian Ministry of Agriculture is leading initiatives, including community tree planting programs and agroforestry methods, that are essential in addressing these problems and strengthening the resilience of impacted farmers (Megersa and Bekere, 2019).

In order to prevent soil erosion and preserve soil nutrients, it is essential to maximize the quantity of vegetation cover. This also helps to minimize water runoff. Other recommended strategies to counteract soil degradation include terracing, land bunds, tree crops, perennial crops, intercropping, and reduced tillage techniques (Coxhead and Ygard, 2008; UNCCD, 2004). Indigenous wisdom and customs, especially those of the UNESCO-recognized Konso people, are essential to Ethiopia's attempts to save its soil (Yirdawa *et al.*, 2017). Even though earlier research has shown that Ethiopia has experienced significant land degradation, particularly in highland areas, the precise causes of this degradation have been corrected by land degradation remediation practices (Schmidt & Tadesse, 2017).

Yaya Gulele, the North Shoa Zone, and restoration methods in certain areas remain unclear. By investigating these components in Yaya Gulale district and making recommendations to relevant parties, this study aims to narrow this gap. It was necessary to assess the cause and effects of land degradation on crop livestock farming and its remediation practices. Though little is known about the origin of land degradation, studies on crop and livestock farming in the study region have been done. The study's focus was on the causes and effects of land degradation on crop and livestock farming in Yaya Gulala district in order to close this gap. In order to fill these knowledge gaps regarding the causes of soil degradation and their effects on crop livestock farming in the Yaya Gulale district, this study was conducted.

### **1.3. Objectives of the Study**

#### **1.3.1. General Objective**

The general objective of this study was to assess the causes and effects of land degradation on crop livestock farming and its remediation practices in Yaya Gulele district.

#### **1.3.2. Specific objectives**

- To assess cause of land degradation.
- To evaluate effect of land degradation on crop-livestock farming. .
- To examine land degradation remediation practices.

### **1.4. Research Questions**

- What are the causes of land degradation in the study area?
- What are the effects of land degradation on crop-livestock farming in the study area?
- What are the land degradation remediation practices in the study area?

### **1.5. Scope and Limitation of the Study**

A study conducted in Yaya Gulale district, North Shewa zone, focused on assessing the causes and effects of land degradation on crop and livestock farming, as well as remediation practices specific to the area. This research aims to provide valuable insights for farmers and decision-makers, offering mechanisms to enhance degraded land. However, the study was confined to Yaya Gulale district, with surveys conducted across three kebeles: Gobola katila, Buyama ko'at, and Lemi. This limitation was due to logistical challenges such as transportation constraints, security issues, and financial constraints during data collection. The findings of this study hold significance for governmental organizations and policymakers, offering essential information on land degradation remediation practices for rural communities and supporting environmental protection efforts in the district. Furthermore, the results shed light on the indirect benefits of these practices and their outcomes for the Yaya Gulale district agricultural office, serving as a foundational resource for policy and strategy development. Additionally, researchers and academics can utilize these findings as a valuable reference for future research endeavors and educational purposes.

## **2. LITERATURE REVIEW**

### **2.1. Concept of land degradation**

Land degradation arises from intricate interactions among physical, chemical, natural, socio-economic, and political factors at local, national, or global levels (Blaikie & Brookfield, 2015). In Ethiopia, it adversely impacts the economy and agricultural productivity by diminishing land fertility. This issue is escalating globally, with over 20% of cultivated areas, 30% of forests, and 10% of grasslands undergoing degradation (Nations, 2021). Each year, millions of hectares of land face degradation across various climates, affecting an estimated 2.6 billion people in over 100 countries and encompassing 33% of the Earth's land surface (Change, 2022). Despite its global scale, land degradation is subject to dynamic equilibrium influenced by human activities (Ghebru, 2010).

### **2.2. Land Degradation in the World**

Land degradation is a global environmental challenge with far-reaching consequences for ecosystems, economies, and livelihoods. Land, a vital non-renewable resource, undergoes degradation due to natural, anthropogenic, and climatic factors (Council *et al.*, 1991). As the primary source of human well-being and livelihood, land provides food, shelter, and various ecosystem services (Ahmed, 2010). Its degradation poses a severe environmental challenge, garnering significant attention in global discourse throughout the 20th century and continuing into the 21st century due to its adverse impact on terrain, income, and food security (Mahata and Sharma, 2022).

Land degradation is a global environmental challenge with far-reaching consequences for ecosystems, economies, and livelihoods. Land, a vital non-renewable resource, undergoes degradation due to natural, anthropogenic, and climatic factors (Council *et al.*, 1991). As the primary source of human well-being and livelihood, land provides food, shelter, and various ecosystem services (Ahmed, 2010). Its degradation poses a severe environmental challenge, garnering significant attention in global discourse throughout the 20th century and continuing into the 21st century due to its adverse impact on terrain, income, and food security (Mahata and Sharma, 2022).

According to the UNCCD, over 250 million people are directly affected by land degradation, while over one billion individuals across more than one hundred countries are at risk. The UNDP's Office to Combat Desertification and Drought (UNSO) highlights the vulnerability of

arid regions, encompassing 54 million km<sup>2</sup> globally. The majority of these drylands are situated in Asia (34.4%) and Africa (24.1%), followed by America (24%), Australia (15%), and Europe (2.5%). In Australia, over 68% of the land is estimated to degrade, while land degradation processes affect approximately 46% of land in Africa, impacting about 485 million people. Additionally, vulnerability extends to about 25% of land in Asian countries. In the 1990s, UNEP estimated that about 33% of the global land faced vulnerability to land degradation (Mahata and Sharma, 2022).

### **2.3. Land Degradation in Ethiopia**

Land degradation in Ethiopia is a significant environmental and socio-economic challenge, exacerbated by factors such as deforestation, soil erosion, overgrazing, and unsustainable agricultural practices. This degradation threatens the food security, water resources, biodiversity, and livelihoods of millions of people in the country (Nkonya *et al.*, 2015). One prominent cause of land degradation in Ethiopia is deforestation, driven by agricultural expansion, fuelwood consumption, and infrastructure development. Soil erosion, particularly in the highlands, is another critical issue, leading to the loss of fertile topsoil and reduced agricultural productivity. Overgrazing by livestock exacerbates soil erosion and degradation in many regions.

Efforts to combat land degradation have intensified since the 1970s. Ethiopia has undertaken numerous initiatives, including soil conservation practices, reforestation programs, and sustainable land management strategies, with the goal of restoring degraded lands, enhancing soil fertility, and bolstering ecosystem resilience (Bewket, 2003) (Temesgen and Abraham, 2014).

### **2.4. Causes of Land Degradation in Ethiopia**

Land degradation in Ethiopia is a complex issue with multifaceted causes. Several factors contribute to the degradation of land in Ethiopia, including both natural and anthropogenic influences (Nkonya *et al.*, 2015).

**Deforestation and Overgrazing:** Deforestation for agricultural expansion, fuelwood collection, and construction materials, coupled with overgrazing by livestock, leads to soil erosion and loss of vegetation cover, exacerbating land degradation (Nkonya *et al.*, 2015).

**Soil Erosion:** Ethiopia's rugged topography, combined with unsustainable land use practices such as improper tillage methods and a lack of soil conservation measures, accelerates soil erosion rates, reducing soil fertility and productivity (Nations, 2019).

**Population Pressure:** Rapid population growth in Ethiopia results in increased demand for land for agriculture, settlements, and infrastructure development, leading to land fragmentation, soil degradation, and loss of biodiversity (Kidanu *et al.*, 2019).

**Climate Change:** Climate variability and extreme weather events, such as prolonged droughts and erratic rainfall patterns, exacerbate land degradation by intensifying soil erosion, reducing agricultural productivity, and triggering desertification processes (Nyssen *et al.*, 2019).

**Land Use Conversion:** The conversion of natural habitats, such as forests and grasslands, into agricultural lands, urban areas, and industrial zones without adequate land-use planning and sustainable management practices accelerates land degradation processes (Gebrehiwot *et al.*, 2016).

**Poor Land Management Practices:** Inadequate land management practices, including improper crop rotation, monoculture farming, and the use of chemical fertilizers and pesticides, degrade soil quality, decrease biodiversity, and compromise ecosystem resilience (Nyssen *et al.*, 2019).

#### **2.4.1. Direct causes of land degradation**

Land degradation in Ethiopia can be attributed to various direct causes, including agricultural expansion, deforestation, and overgrazing. Several factors contribute to these direct causes, including population pressure, poverty, limited access to agricultural inputs and credit due to high costs, low profitability of agricultural practices and conservation methods, risks encountered by farmers, fragmented land ownership, insecure land tenure, short-term farming perspectives, and insufficient information on alternative technologies. Human intervention is the primary driver of direct land degradation, leading to the depletion and loss of natural resources (Mesene, 2017).

##### **2.4.4.1. Deforestation**

Deforestation, the clearing or removal of trees from wooded areas for various purposes, notably commercial, remains a significant issue in the 21st century, contributing to widespread

land degradation. Tree cutting has been a common practice for centuries, with historical records indicating its impacts on regions suffering from land degradation. The scale and extent of deforestation have varied across continents and countries throughout prehistoric and historic times. Man-made causes, often stemming from population growth, drive deforestation, leading to severe soil erosion and subsequent land degradation (Abebaw, 2019).

In the early twentieth century, Ethiopia boasted approximately 40–35% forest coverage, but by the early 1950s, it had dropped to 16% and moved down from 3%. Deforestation, present since the twentieth century, has surged alarmingly, with estimates indicating a loss of 15,000–20,000 hectares annually (Nellemann *et al.*, 2014). However, since 2000, some scholars point to a positive trend, citing a 9% increase in forest cover (0.3% of the total country area) attributed to sustainable land management practices. The drivers of land cover change in Ethiopia are multifaceted and site-specific, encompassing factors such as agricultural expansion, grazing, firewood collection, and poverty, all of which contribute to forest degradation (Mengist and Asfaw, 2023).

#### **2.4.4. 2. Agricultural expansion**

Agricultural expansion in Ethiopia has been identified as one of the direct causes of land degradation, leading to various forms of environmental harm such as deforestation, soil erosion, and loss of biodiversity (Fantaw *et al.*, 2019). Agricultural land expansion at the expense of other lands increases pressure on agricultural land, reducing productivity due to resource exploitation, unsustainable cultivation, and soil fertility decline. High population pressure has led to the conversion of grazing or bush lands to cultivated lands (Abate and Lemenih, 2014).

#### **2.4.4. 3. Overgrazing**

Overgrazing in Ethiopia occurs when livestock consume vegetation faster than it can naturally regenerate, resulting in environmental degradation and desertification across the nation. Contributing to this issue are factors such as rapid population growth, the expansion of agricultural land, and limited alternative livelihood options for rural communities (Tadesse *et al.*, 2016).

As noted by Legesse (2008), overgrazing arises when livestock density exceeds sustainable levels, leading to vegetation degradation, soil compaction, and erosion. Additionally, the

unchecked consumption of trees and shrubs exacerbates overgrazing, directly contributing to deforestation, flooding, and soil erosion.

#### **2.4.2. Indirect causes of land degradation**

Population growth, land scarcity, insecure land tenure, poverty, and economic pressures are indirect drivers of land degradation. Population growth has long been recognized as a major factor in environmental deterioration. This growth amplifies land demand, worsening challenges such as insecure land tenure and poverty (Hester & Harrison, 2012). As populations expand, farmers often turn to marginal lands for cultivation. Without comprehensive efforts to integrate development initiatives in family planning, environmental rehabilitation, and agriculture, supported by enabling policies, the trajectory of population growth poses significant challenges to both ecological sustainability and the economic viability of current agricultural practices (Mesene *et al.*, 2017).

##### **2.4.2.1. Population pressure**

Population growth often triggers land degradation, sparking debates on the correlation between population size, growth rate, and agricultural development, especially in intensively farmed areas. As populations swell, the demand for land for agriculture, housing, and other activities escalates, often leading to mismanagement and degradation. The world's population is increasing alarmingly, exacerbating issues like land redistribution, which, in recent years, has fragmented plots, reduced crop yields, and heightened insecurity. In Ethiopia, rapid population growth has fueled deforestation, severe soil erosion, and alarming environmental degradation. Overpopulation's negative impacts include accelerated erosion, overexploitation of land resources, and heightened demand for agricultural land, resulting in deforestation and its adverse effects on land quality (Abebaw, 2019).

##### **2.4.2.2. Improper land management**

An ecologically balanced ecosystem maintains dynamic equilibrium, primarily comprising forest land, grassland, and wetland, critical for land protection, biodiversity, and hydrological and geochemical cycles. However, inappropriate land use changes can disrupt their natural ecological functions, resulting in decreased land productivity and biodiversity loss. One immediate consequence of improper land management is a scarcity of fuelwood and construction materials for rural communities, compelling farmers to travel long distances for collection or resort to burning crop residues and organic manure for cooking and heating. This

depletion of organic matter in cultivated soils significantly impacts cropland fertility and productivity (Alemu, 2015).

## **2.5. Effect of Land Degradation**

Land degradation in Ethiopia has multifaceted effects on the environment, economy, and society. This includes loss of soil fertility, reduced agricultural productivity, desertification, deforestation, and biodiversity loss. These effects exacerbate poverty, food insecurity, and environmental vulnerability, particularly in rural areas where agriculture is the primary livelihood source (Tadesse *et al.*, 2009).

### **2.5.1 Agricultural impacts of land degradation**

#### **2.5.1.1 Soil erosion effects**

Soil erosion, driven by processes like wind and water flow, involves the removal of soil and rock from the Earth's surface through various physical, chemical, and biological mechanisms, including weathering. Its widespread occurrence has adversely impacted natural and human-managed ecosystems, including agriculture and forests, making it a significant global environmental concern linked to land degradation. Its effects are far-reaching, and its damage is long-lasting. While soil erosion has been a historical occurrence, its severity has escalated due to the expanding human population and their activities encroaching into natural ecosystems, leading to reduced land productivity, diminished biodiversity, and ultimately threatening ecosystem stability (Abebaw, 2019).

**On-site effects:-** The breakdown of aggregates and the removal of smaller particles or entire layers of soil organic matter can weaken the structure and even change the texture. Textural changes can in turn affect the water-holding capacity of the soil, making it more susceptible to extreme conditions such as drought (Abiye, 2019).

**Off-site effects:** Soil erosion, a significant contributor to land degradation, has off-site effects. These effects include the movement of sediment in water bodies, the loss of fertile soil, and environmental damage (Hudson, 2015). It impacts ecosystems beyond its immediate location, influencing water quality, biodiversity, and agricultural productivity (Montgomery, 2007).

**Loss of nutrients:** Soil erosion can lead to the loss of essential nutrients from the soil, which contributes significantly to land degradation. When soil erodes, it not only loses its top layer but also the organic matter and nutrients that are crucial for plant growth and soil fertility.

Nutrient loss occurs primarily through the displacement of soil particles during erosion as well as through runoff carrying away dissolved nutrients (Montgomery, 2007).

#### **2.5.1.2. Reduction of Crop Yield**

Husbandry is greatly impacted by land degradation, and one of the main effects is lower crop productivity. Diminished output of crops Crop yields decline when land declines because the soil's quality and productivity are reduced. The physical, chemical, and natural deterioration of soil quality is known as soil degradation. The factors that may contribute to this include depletion of organic matter, deterioration of soil fertility and structure, rusting, unfavorable variations in salinity, acidity, or alkalinity, and the presence of harmful substances, adulterants, or excessive floods (Thampatti, 2022).

Land deterioration is a process in which a variety of mortal-convinced processes acting upon the land affect the value of the biophysical soil, also known as the biochemical soil. Any alteration or disturbance to the land that is thought to be harmful or unwanted is considered it.

#### **2.5.2. Silting up of reservoirs**

Agricultural impacts of land degradation, including soil erosion leading to reservoir silting, are profound. Soil erosion occurs when the protective vegetative cover is removed, exposing the soil to erosion by wind and water. This process not only reduces soil fertility but also leads to sedimentation in water bodies such as reservoirs. As a result, the capacity for water storage diminishes, affecting irrigation systems, hydroelectric power generation, and water supply for agriculture and domestic use (UNEP, 2015).

#### **2.5.3. socio-economic impact of land degradation**

Land degradation affects socio-economic systems in various ways. Firstly, it reduces agricultural productivity, leading to food insecurity and loss of livelihoods for farmers and rural communities. This can exacerbate poverty and increase dependency on external aid. Secondly, land degradation decreases the ecosystem services provided by healthy soils, such as water purification, carbon sequestration, and biodiversity conservation, which are vital for human well-being and economic activities. Thirdly, it can exacerbate social conflicts over dwindling resources, such as water and arable land, leading to displacement and migration (UNCCD, 2019).

#### **2.5.4. Ecological impact of land degradation**

Land degradation has profound ecological impacts, disrupting ecosystems and biodiversity. Land degradation leads to the loss of soil fertility, vegetation cover, and habitat destruction, causing significant ecological repercussions. Soil erosion, desertification, deforestation, and pollution degrade ecosystems, resulting in decreased biodiversity, disrupted nutrient cycles, and altered hydrological patterns (Conacher, 2013). This can lead to habitat loss for plants and animals, increased vulnerability to invasive species, and reduced resilience to climate change. Ultimately, land degradation threatens the stability and functioning of ecosystems, compromising their ability to provide vital services such as carbon sequestration, water purification, and pollination (UNEP, 2018).

#### **2.6. Effect of land degradation on crop-livestock farming system**

Land degradation poses significant challenges to crop-livestock farming systems worldwide, impacting agricultural productivity, environmental sustainability, and rural livelihoods. **Decreased Productivity:** Land degradation, including soil erosion, nutrient depletion, and desertification, reduces the productivity of arable land and pastures, resulting in decreased crop yields and forage availability for livestock (Steinfeld et al., 2006).

#### **2.6. Remediation Practice of Land Degradation**

Remediation practices for land degradation involve restoring degraded land to a functional and productive state. Remediation practices for land degradation encompass a range of techniques aimed at restoring soil health, vegetation cover, and ecosystem functions (Wong, 2018). Common approaches include reforestation, afforestation, agroforestry, soil conservation measures (such as terracing and contour plowing), re-vegetation with native species, and soil amendment with organic matter or minerals to improve fertility and structure. Additionally, sustainable land management practices, such as conservation agriculture and integrated watershed management, can help prevent further degradation and promote ecosystem resilience (UNCCD, 2019).

Various studies have highlighted soil erosion, deforestation, and land degradation as prevalent and significant issues in Ethiopia. In response, numerous strategies have been devised by different stakeholders to promote afforestation and conservation practices on both farm and community lands. For instance, the Ethiopian Ministry of Agriculture has actively pursued

community tree planting programs and agroforestry initiatives (Meybeck, 2021). These efforts are regarded as crucial solutions to mitigate the impact of land degradation on farmers. Drawing from existing literature, this study examines the efficacy of tools utilized to combat land degradation in Ethiopia, as discussed in the findings of (Megerssa and Bekere, 2019).

Maximizing vegetation cover is essential for mitigating land degradation as it helps retain soil nutrients and slows down water flow over the soil. Additionally, implementing techniques such as terracing, land bunds, tree crops, vegetation strips, perennial crops, and intercropping, while minimizing tillage practices, is preferred to reduce soil erosion and degradation (Coxhead and Ygard, 2008). According to (UNCCD, 2004), utilizing forest and tree cover can effectively combat land degradation and desertification by mitigating water and wind erosion and sustaining soil nutrient cycling. Developing forest ecosystems and adopting agroforestry practices can also contribute to poverty reduction and enhance resilience among rural farmers affected by land degradation.

In Ethiopia, indigenous knowledge and practices play a significant role in combating land degradation, particularly in soil conservation efforts. The Konso people, recognized by UNESCO for their traditional soil conservation practices, employ techniques such as terracing, contour ploughing, crop rotation, field boundaries, and mixed cropping to mitigate land degradation (Yirdawa *et al.*, 2017, as cited in Megeerssa and Bekere, 2019).

Effective control and potential reversal of land degradation hinge on judicious land use, comprehensive consideration of all land functions, and prioritization of long-term benefits over short-term gains observed that the success of remediation degraded landscapes depends on weighing the costs against the anticipated value of output or environmental benefits. Historically, Ethiopia's efforts to combat land degradation have predominantly centered on implementing physical conservation structure. Additionally, found that farmers in Dera woreda, Ethiopia, heavily rely on such physical soil conservation structures (Abebaw, 2019).

**Table 1.** Components of Degradation, Types of Degradation, and Methods for remediation degraded Land

<b>Component</b>	<b>Degradation</b>	<b>Improvement</b>
Physical soil management	Crusting	Implement soil conservation barriers
	Compaction	Apply terracing techniques
	Sealing	Re-vegetate denuded land
	Water erosion	Protect trees
	Wind erosion	Decompose soil pans
	De-vegetation	Introduce cover crops and windbreaks
	Over-tillage	Promote soil deposition and refine tillage methods
Soil water management	Impeded tillage	Manage irrigation efficiently
	Water logging	Harvest rainwater and improve field drainage
	Reducing infiltration	Establish drainage systems in waterlogged areas
	Nutrient depletion	Utilize filter strips and manage soil nutrients
	Reduced water holding Capacity	Implement soil amendments like compost and lime
Soil biology management	Over-application of agri-chemicals	Control agri-chemical usage and mitigate industrial contamination
	Industrial contamination	Introduce beneficial biotic organisms
	Introduction of biotic organisms	Foster nitrogen-fixing microorganisms

Vegetation management	Decline in vegetative cover	Combat species decline with increased vegetation
	Decline in species compaction	cover and enhanced species diversity
	Decline in availability of valued species	Improve species composition and ensure availability of valued species

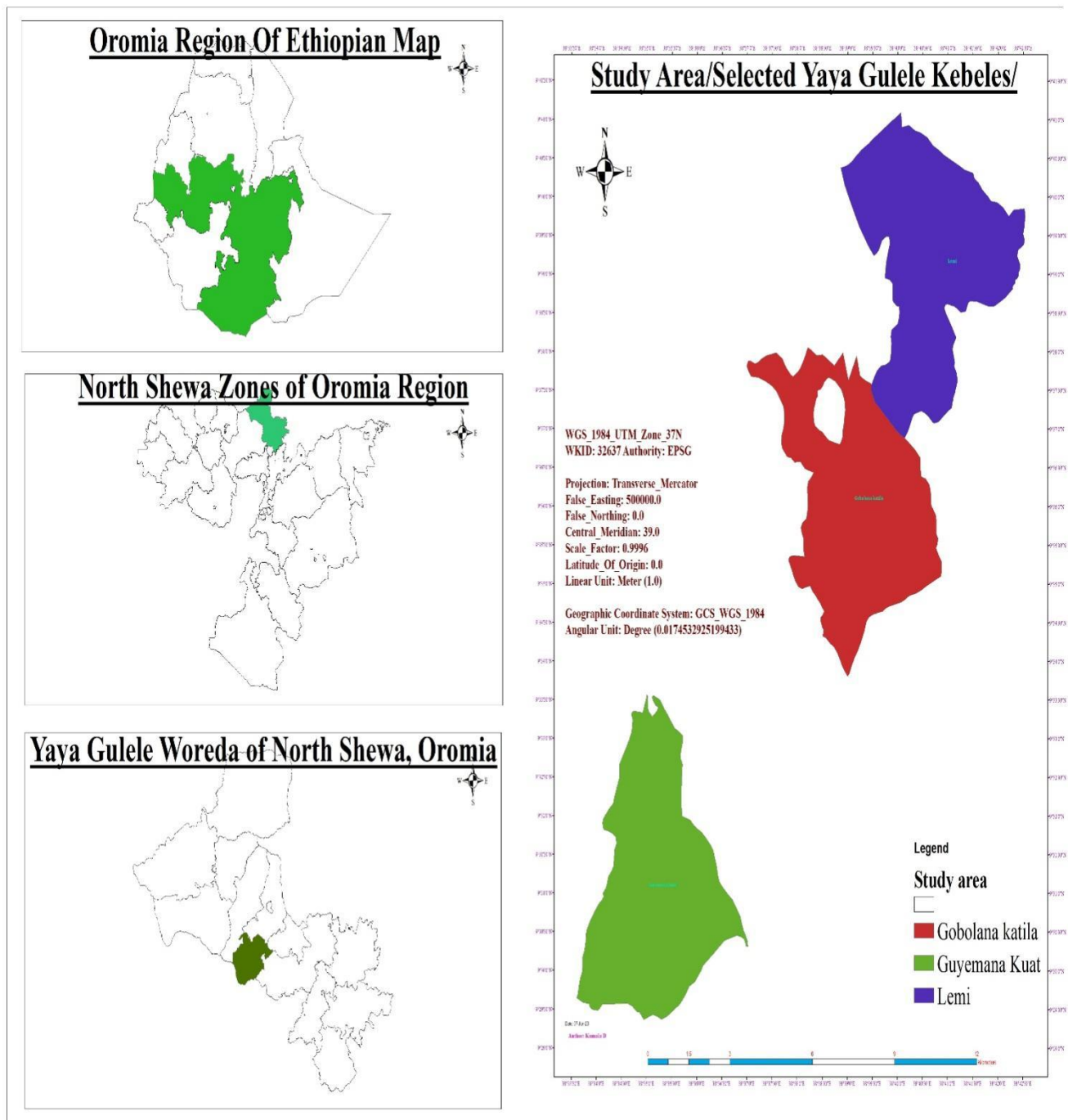
---

Source: (Abebew, 2019)

### **3. RESEARCH METHODOLOGY**

#### **3.1. Description of Study Area**

The study was conducted in Yaya Gulale district. Yaya Gulale district is one of the sixteen woreda of North Shewa Zone, Oromiya National Regional State. The district lies along the the way Addis Ababa to Debre Markos, northern part of Ethiopia at a distance of 114 km from Addis Ababa. The district shares border with Girar Jarso district in the north, Adea Berga in the south, Degam on the east and the Debre Libanos and Wucale district on the west. The total area of the woreda is about 33,645.55 ha. The altitude of the district ranges from 1500-2850 meters above sea level. Yaya Gulale district which is located between latitudes 9°37'19"N and Longitudes 38°38'50"E (Yaya Gulale Agricultural office report, 2023). According to 2023 CSA, population number of the Yaya Gulale district 80,135 (Male 40,786& Female 39,349) with an average family size of 5.



**Figure 1.** Map of the study area

**Source:** ARC GIS, 2023

### **3.1.1. Topography**

The study district's geography is made up of gorges, sloppy to steep sloppy, and mountains. According to basic data from the Yaya Gulale District Agricultural Office (2023), over 56% of the land surface is plain, and roughly 11% is regarded as sloppy. The remaining 33% is categorized as hill gorges and mountains. The shoa plateaus make up the majority of the Yaya Gulale district. The district's terrain is separated into three main agro-ecologies: the middle-highlands (bada dare), which make up 41.17 percent, the kolla (gamoji), which makes up 31.78%, and the highlands (bada), which make up 27.5%.

### **3.1.2. Climate**

One of the physical environment's key determinants of human life, soil type, flora, and wildlife, as well as settlement patterns, is the climate. The National Metrology Agency (2023) reports that the average yearly temperature is between 12 and 25 degrees Celsius, and the average yearly precipitation is between 800 and 1200 millimeters, with an average of 900 millimeters.

### **3.1.3. Vegetation**

The lowlands of the district are covered in sporadic patches of bushes and shrubs, making up a thin vegetative cover. Homesteads are dotted with eucalyptus trees, while remnants of native trees, including churches, water features, and farmland, while remnants of indigenous trees, such as *laaftoo* (*Acacia Abyssinia*), *Bakkaniisa* (*Croton macrostachyus*), *Waddessa* (*Cordia africana*), *Harbu* (*Ficus sarforuk*), *birbirsa* (*Podocarpus*), *Ejersa* (*Juniper prosera*), *Nechbeharzaf* (*Eucalyptus globulus*), and *keybeharzaf* (*Eucalyptus camaldulensis*) (Yaya Gulale district finance and development economy office, 2023). The remaining tree species show how human activity has changed the dynamics of land use, with grasslands and forests being overgrazed and eventually turned into farms. However, there are still areas of shared grazing ground where farmers let their livestock graze close to their houses.

### **3.1.2. Farming system**

#### **3.1.2.1. Crops practiced**

The district economy is based primarily on agriculture, with over 90% of the inhabitants earning a living from raising cattle and crops. Ten percent of the remaining people work in small trade and other jobs. For rural people, livestock production is especially important

because it provides both food and cash. The majority of the animals in the district are cattle (Yaya Gulale District Agricultural Office (2023)).

### 3.2. Method of Data Collection

#### 3.2.1. Sampling techniques and Sample size determination

Both primary and secondary data sources were used in this investigation. Key informant interviews (KIIs), field observations, focus groups (FGDs), and household surveys were the main techniques used to obtain data. Secondary data were gathered from a number of literature sources, including books, journals, and reports, as well as from the district Agricultural Office and Kebele administration offices. In order to conduct a more thorough literature review, pertinent websites were also visited. The study district and Kebeles (the smallest administrative units) were chosen using both basic random selection and selective sampling procedures. Yaya Gulale district was purposefully chosen from 16 districts in North Showa, Oromia regional state, based on a number of criteria, such as the degree of land degradation, the absence of prior research studies in this specific district, and the area's convenience as it is closest to my place of employment and requires the least amount of money. Three kebeles (Gobola Katila, Lami, and Buyama Ko'at) out of the 17 in the Yaya Gulale district were chosen due to their agro-ecology, low vegetation covering, and degree of land degradation. These elements could affect land degradation in different ways. From these three kebeles, a sample of homes was then chosen by a simple random sampling technique. Using Yamane's (1967) formula, the sample size of households for each of the three kebeles was determine.

$$n = \frac{N}{1+N(e)^2} \text{-----(eq.1)}$$

Where; n is the sample size,

N is the population size (2250), e is margin of error 0.05 (5%) level of precision at 95% significance.

Purposive sampling techniques were used to select the study woreda and kebeles. Out of a total household population of 2250 across three kebeles, the sample size of households was calculated as follows:

$$n = \frac{2250}{1+2250(0.05)^2} = 321$$

**Table 2.** Distribution of sample size in each selected kebeles.

Kebeles	Total household of kebele	Household sample size
Lami	850	121
Gobola katila	820	117
Buyama ko'at	580	83
Total	2250	321

### **3.2.2 Primary Data**

#### **3.2.2.1. Household interview**

A home survey was used to collect data via a questionnaire regarding the respondents' demographics and land degradation. The household survey involved a sample of households using semi-structured questionnaires. A thorough and painstakingly designed structured questionnaire was developed in English and translated into Afaan Oromo to enable the gathering of extensive data concerning the objectives of the study. Three kebeles were randomly chosen for a house sample, and the questionnaire is pre-tested among them to find out about any participant concerns, ambiguities, or misconceptions.

#### **3.2.2.2. Key informant interviews**

The purpose of the key informant interview was to gather information from stakeholders involved in the research region's assessing the cause and effects of land degradation on crop livestock farming and its remediation practices. Fifteen (15) respondents were selected from three kebeles (each with four key informants) and three district's, which are groups of people who are highly knowledgeable about the cause and effects of land degradation on crop livestock farming and solutions for land degradation in the research region. These individuals include development agents, kebele administrators, and experts in agriculture offices. Open-ended questions were used in the interview to elicit information about the causes, effects, and solutions for land degradation . In order to analyze the causes of land degradation, its effects

on the crop-livestock agricultural system, and the remediation measures employed to address it in the research area, purposeful key informant interviews were carried out with relevant stakeholders. Three kebeles, each with four key informants, and three districts were used to select fifteen (15) people who possessed in-depth knowledge of the causes, consequences, and solutions for land degradation in the research area. These people included development agents, kebele administrators, and agriculture office experts. In order to gather information regarding the cause and effects of land degradation on crop livestock farming and remedies, open-ended interview questions were employed.

#### **3.2.2.3. Questionnaires (survey)**

Simple and contingent item questions, as well as closed and open-ended (mixed) questionnaires, were used to collect data for a descriptive survey. In order to collect sufficient and correct data, the researcher planned to use questionnaires. 45 surveys were given in all, and 321 respondents filled them out. Since the majority of family farmers spoke Afan Oromo, the questions were translated from English to that language.

#### **3.2.2.4. Focus group discussion**

Using a purposive random sampling technique, three individuals from each of the two villages participated in focus groups. There were three kebeles in all. Nine focus group discussions (FGDs) took place in the study area. Nine FGDs, or three groups per kebele, with six to eight participants per, are thus produced. to avoid any possible societal repercussions from restricting men's and women's ability to communicate freely. In her role as moderator, the researcher gave the participants guidance by introducing conversation points. A series of open-ended questions was developed for the discussions in order to gain a deeper understanding of the problems and its implications. The primary focus of these inquiries was on the causes, consequences, and remediation strategies of land degradation in crop and livestock farming.

#### **3.2.2.5. Field observation**

Field observation was used to gather additional information and counter-check information provided by household respondents. In addition, it was used to evaluate cause and effects of land degradation on crop livestock farming and its remediation practices. Furthermore, direct field observations were made to evaluate cause and effects of land degradation on crop livestock farming open and close-ended questions to ask information relating general problem

relate this title Moreover, the camera is used to capture some events and structures of interest to this study.

### **3.2.3. Secondary Data**

Secondary data are those that have previously been gathered and examined by another party. Scientific books, journal articles, published reports, and various government documents are among the secondary sources of information used in this study. Other trustworthy websites, reports from the agriculture and rural development office, the central statistics agency (CSA), and documents reviewed at various levels of government organizations were also consulted.

### **3.3. Data Analysis**

Data from household surveys was analyzed using quantitative techniques with the Statistical Package for Social Scientists (SPSS) software. Descriptive statistics such as percentages, One-way ANOVA, or analysis of variance and frequency distributions were used to analyze the quantitative data. Some basic descriptive statistics included: (bar char, pie chart, and means) were used to explain the Socio-economic and demographic characteristics, major cause of land degradation, effect of land degradation and and remediation practices.

Qualitative data from key informant interviews, focus group discussions, personal field observations, and secondary sources was analyzed through Information from key informant interviews with woreda agriculture and natural resource office workers and focus group discussions with various individuals such as elderly people, teachers, DAs, religious leaders, kebele administrators, and women's association leaders was organized primarily in the form of verbal/narrative information. During field observations, any tendencies towards misinformation or exaggeration about the challenges of land degradation and management were addressed through triangulation of information and careful interpretation of data.

## 4. RESULTS AND DISCUSSION

### 4.1. Socio-economic and demographic characteristics of the respondents

The study result Table 3, showed that the majority of farmers were male (61.4%) and the remaining female (38.6%) respondents replied that there was a land degradation problem on their farmland. In terms of annual income, approximately 34.9% of households earned between 15,001 and 25,000 ETB annually, with only 5.6% earning below 5000 ETB. Education-wise, 37.7% had primary, secondary, or tertiary education levels, while 62.3% couldn't read or write. Household live stock size ranged mainly between 4-6 (42.2%) and 7-10 (41.7%). Occupation-wise, the majority (83.2%) were farmers, followed by civil servants (3.7%) and business owners (13.1%).

**Table 3.**Summary of Socio-economic Description of Respondents

Variables	Categories	Frequency	Percent (%)
Sex	Male	197	61.4
	Female	124	38.6
Age	18-25	24	7.5
	26-35	73	22.7
	36-45	107	33.3
	46-55	78	24.3
	>55	39	12.1
Annual income	less than 5,000	18	5.6
	5,000-15,000	90	28.0
	15,001-25,000	112	34.9
	Above 25, 000	101	31.5
	Total	321	100.0
Cattle size	1-3	45	14.0
	4-6	136	42.4
	7-10	134	41.7
	>10	6	1.9
Education Level	Can't read and write	200	62.3
	Primary	88	27.4
	Secondary	26	8.1
	Tertiary	7	2.2
	Total	321	100
Occupation of household head	Farmers	267	83.2
	Civil servant	12	3.7

Business	42	13.1
Total	321	100

#### 4.1.1 Marital Status, Family Size and Land Holding

The majority of the respondents the respondents (56%), whereas the remaining 14.3%, 14.6%, and 14.3% were divorced, single, or widowed, respectively (Table 4). The family size of 62.6% of respondents ranges from 1-4, while that of more than 8 respondents is 2.2%. Accordingly, households with farm land holding size were 229 (71.3%), while 22 (6.9%) had a land holding size less than 0.5 ha, respectively.

**Table 4.** Marital Status, Family Size, Faram Land holding Size in hektar of the respondents.

Variables	Categories	Frequency	Percent (%)
Marital status	Married	180	56.1
	Single	47	14.6
	Divorced	46	14.3
	Widow	46	14.3
	Total	321	100.0
Family size	1-4	201	62.6
	5-8	113	35.2
	>8	7	2.2
	Total	321	100.0
Faram Land holding size in hectare	< 0.5	22	6.9
	0.5-2.5ha	229	71.3
	2.6-3.5	50	15.6

#### 4.2. Land degradation

The study result Table 5, showed that the majority of household responses (89.7%) indicated that soil erosion is the main problem on their farmland, and the remaining (10.3%) respondents replied that there was no soil erosion problem in their study area, which can be a negative constraint for crop production, animal production, and human life as a whole. From the respondent's confirmation, 22.4%, 43%, and 34.6% were relatively proportional responses for the types of erosion like rill erosion, sheet erosion, and gullies on the farm, respectively. On the other hand, 95.6% of the respondents perceived that in the summer season the rate of land degradation was very high, and the remaining 4.4% of respondents replied that there was low land degradation in the spring season. According to the survey, most of the farmers confirmed that the land degradation occurred more during the summer season because of the high degree of soil erosion during this season, the lack of conservation measures, and the high intensity of the rainfall. Interestingly, in the study area, the major forms of land degradation were soil erosion by water.

**Table 5.** Percentage distribution of respondents in land degradation issues

Variables	Categories	Frequency	Percent (%)
Household Response to soil erosion on your farm land	Yes	288	89.7
	No	33	10.3
	Total	321	100.0
Soil erosion degree of the problem seen on your farm	Low erosion	72	22.4
	Medium erosion	138	43.0
	High erosion	111	34.6
	Total	321	100.0
Respondents view in which season degradation is more severe	Spring	14	4.4
	Summer	307	95.6

A similar finding was reported by (Shanko, 2023) who conducted on Land Degradation Causes, Consequences and Sustainability of the Restoration Efforts in Hadiya Zone, Southern Ethiopia.

According to Table 6, the major indicators of land degradation are decreasing soil fertility (38.9%), while 10.3% indicate low unemployment and outmigration rates as indicators of land degradation. Overall, the survey highlights decreasing soil fertility as the primary indicator of land degradation in the study area, leading to reduced agricultural productivity.

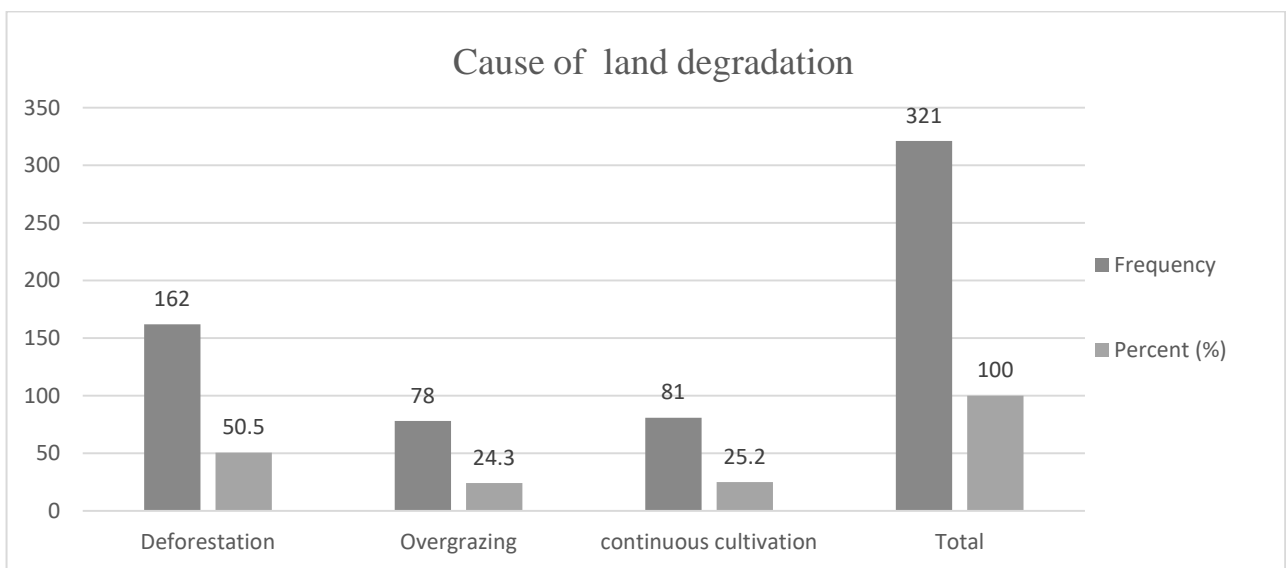
Table 6. Responses of the respondents on major indicators of land degradation in the study area

Variables	Categories	Frequency	Percent (%)
Respondents view major indicators of land degradation in your locality	Climate is become harsh	114	35.5
	Decreasing soil fertility	125	38.9
	Unemployment and out-migration	33	10.3
	Drought	49	15.3
	Total	321	100

Similarly, this result is in agreement with the previous study by (Temesgen *et al.*, 2014) in Dera district, Ethiopia, which exemplified the increased land degradation, which is mainly caused by the growing population of the area. Additionally, the study by (Fistum *et al.*, 1999) illustrated that there are multiple interacting forces that have caused and are causing land degradation in Ethiopia.

### 4.3. Major Causes of Land Degradation

In the research area, deforestation was cited by almost 50.5% of respondents as the primary cause of land degradation, while overgrazing and continuous cropping were cited by 25.2% and 24.3% of household heads, respectively (Figure 2). The main causes of deforestation are increased agricultural productivity, the need for fuelwood and charcoal, and population pressure from longer home construction.



**Figure 2.**Cause of land degradation.

This finding is in agreement with (TSaguye's, 2017) analysis of farmers's perceptions of the impact of land degradation hazards on agricultural land productivity in Jeldu district in West Shewa Zone.

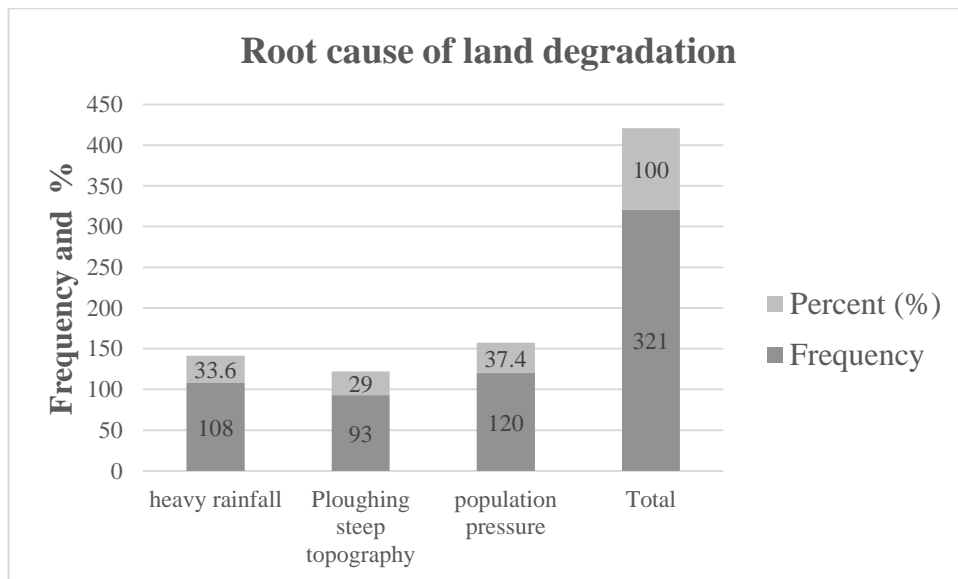
According to Table 7, the primary source of land degradation, as reported by Buyama Ko'at, Gobola Katila, and Lami Kebeles, was believed to be deforestation; their respective percentages were 61.4%, 47%, and 46.3%. Buyama Ko'at stands out as having the highest rate of deforestation due to widespread charcoal burning, inadequate agricultural services, poverty, agricultural growth, and tree cutting for construction. Overgrazing is the reason for 30.6% of land degradation in Lami Kebele, according to household respondents. This can be explained by the fact that because of the area's irrigation potential, farmers turned grazing land into agricultural use. This resulted in a shortage of grazing areas and increased overgrazing, both of which aggravated soil degradation. For example, Gobola Katila kebele had a higher percentage of continuous cultivation (29.9%) than the other kebeles due to the fact that fallowing practices were less common and farmers there were less knowledgeable about fallowing techniques. For instance, Gobola Katila had a higher rate of continuous cropping (29.9%) than the other kebeles, which was related to farmers' lack of knowledge about fallowing practices.

**Table 7.** Percentage distribution of respondent's major cause of land degradation.

No	Name of kebele	Variables	Categories	Frequency	Percent (%)
1	Gobola katila	Cause of land degradation	Deforestation	55	47
			Overgrazing	27	23.1
			Continuos cultivation	35	29.9
			Total	117	100
2	Lami	Cause of land degradation	Deforestation	56	46.3
			Overgrazing	37	30.6
			Continuos Cultivation	28	23.1
			Total	121	100
3	Buyama ko'at	Cause of land degradation	Deforestation	51	61.4
			Overgrazing	14	16.9
			Continuos Cultivation	18	21.7
			Total	83	100

These results are in line with the research on deforestation in Ethiopia's drylands conducted by (Dereje *et al.* ,2018).

Land degradation in the research area is mostly caused by population pressure, according to about 37.4% of respondents (Figure 3). Furthermore, heavy rainfall and ploughing steep topography were mentioned as contributory factors by 33.6% and 29% of household heads, respectively. The respondents highlighted the persistent population growth as a major obstacle that has resulted in few land resources and worsened rural population growth, which has increased the demand on available land. Smaller farms, lower yield per person, and an increase in landlessness are signs of this pressure and are direct sources of degradation as well as unsustainable land management techniques. According to reports, land degradation is caused by a growing population, which in turn encourages activities like grazing, deforestation for agriculture, fuelwood extraction, fodder gathering, charcoal manufacture, and housing development.



Source filed survey (2024)

**Figure 3.** Root Causes of the land degradation in the study area.

This result is in agreement with the findings of (Belet, 2020), who studied land degradation problems and management challenges in Abichu Gnea woreda, North Shoa Zone.

In the study area, Table 8 shows the different degrees of level of land degradation in three kebeles within the research area. With a degradation rate of 63.9%, Buyama ko'at kebele is the most degraded, followed by Gobola katila kebele (43.6%) and Lami kebele (28.1%). This indicates markedly increased deterioration in Buyama ko'at, which can be attributable to factors such as high deforestation rates, the area occupied by sandy soils ,and highly susceptible to erosion, decreased vegetation cover, decreased revenue for the local community, and increased agricultural activity. The statistical significance level of the observed land degradation frequencies within each kebele is indicated by the significance values (Buyama ko'at 0.00, Gobola katila 0.06, and Lami 0.05). A **significant difference at p-value (p < 0.05)** suggests a statistically meaningful relationship between the kebele and land degradation

No	Name of kebele	Variables	Categories	Frequency	Percent (%)	Sig.
1	Gobola katila	Level of land	High	51	43.6	

levels, emphasizing the need to tailor interventions and policies to the specific needs and conditions of each area

		degradation		Medium	43	36.8	0.06
				Low	23	19.7	
2	Lami	Level of land degradation	High	35	28.9	.005	
			Medium	66	54.5		
			Low	20	16.5		
3	Buyama ko'at	Level of land degradation	High	53	63.9	.000	
			Medium	29	34.9		
			Low	1	1.2		

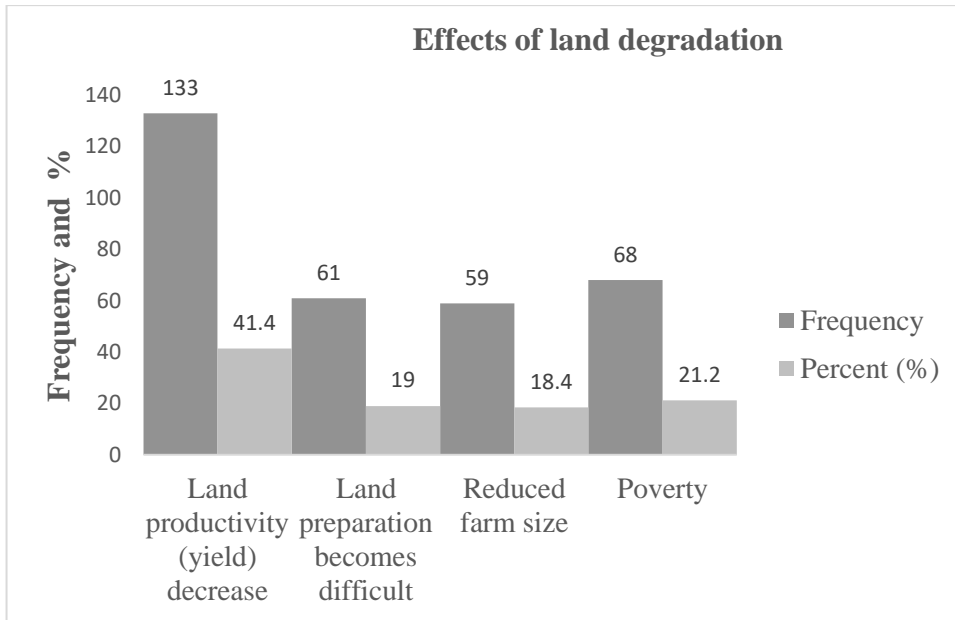
**Table 8.** Percentage distribution of respondents in level of land degradation

This finding is consistent with the study conducted by (Saguye, 2017) Analysis of farmer's perception on the impact of land degradation hazard on agricultural land productivity in Jeldu district in West Shewa Zone, Oromia, Ethiopia.

#### **4.4. Effects of land degradation in the study area**

##### **4.4.1.Reduce Crop Production**

In response to the land degradation in their community, indicated 41.4% of participants reported a decline in agricultural productivity (Figure 4). Additionally, poverty, difficulty land preparation, and reduce farm size were 21.2%, 19%, and 18.4% of respondents as results of land degradation, respectively. Key informant responses and focus group discussions (FGDs) indicate that decreased crop productivity is one way that land degradation shows up, impacting the amount and quality of harvests from agricultural areas. Numerous causes contribute to this drop, such as unfavorable weather patterns like reduced soil fertility, smaller farms, droughts, floods, and extremely high or low temperatures. In addition, over time, poor agricultural methods, nutrient deficits, insect and disease infestations, degraded soil, and poverty make matters worse.



**Figure 4.** Effects of land degradation

This finding is consistent with the finding (Abebaw, 2019) Review on impacts of land degradation on agricultural production in Ethiopia.

#### **4.4.2. Reduce Livestock Production**

According to the focus group discussion (FGD), key informants, and observation, land degradation in the study area can have a negative impact on their availability and quality, which can lead to a large reduction in livestock production. degraded soils may experience nutrient depletion, vegetation loss, and soil erosion, all of which reduce the amount of productivity available to grazing animals. Because of this, animals might not have as much access to nutrient-rich fodder, which would result in slower growth rates, less milk produced, and generally worse health. degradation of the soil can lower soil fertility and the productivity of grazing areas, which can ultimately effect animal output.

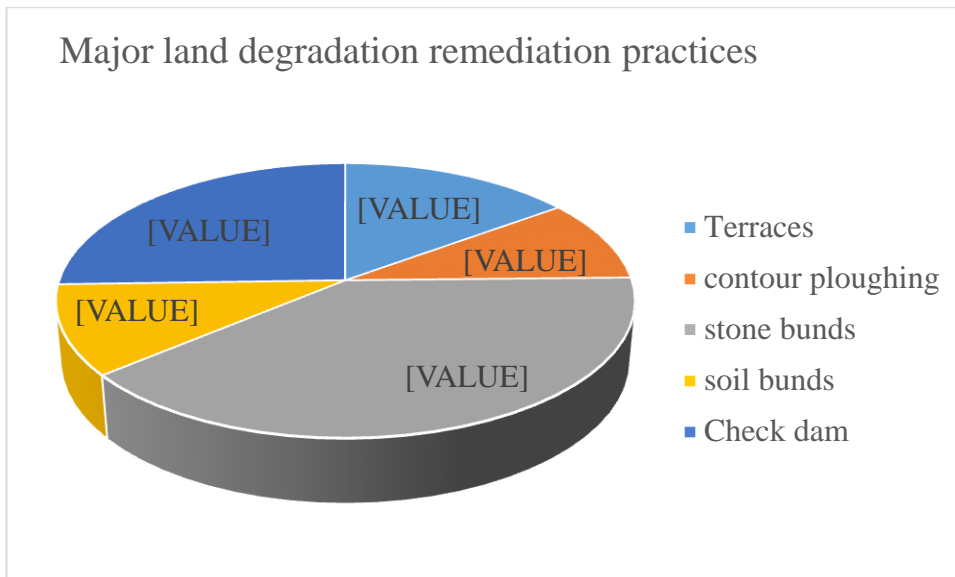
#### **4.5. Major land degradation remediation practices**

##### **4.5.1. Traditional land remediation practices**

In study area, several land degradation remediation practices are being implemented to address the challenges posed by soil erosion, nutrient depletion, and loss of arable land. These

practices include: Soil and Water Conservation: Terracing, bunding, contour plowing, and check dams are commonly used techniques to control soil erosion and retain water on agricultural land.

Figure 5 illustrates the occurrence of erosion control methods among households with stone bunds being the most commonly used (39.3%), followed by check dams (25.5%), terraces (15%), soil bunds (10.6%), and contour plowing (9.7%). This widespread adoption signifies farmers' proactive approach to combat erosion. The ranking of these practices by adoption can be attributed to several factors: effectiveness: Stone bunds are often perceived as highly effective in controlling soil erosion and retaining water on agricultural land, especially in areas with steep slopes and intense rainfall. Farmers have accessibility of materials such as stones or rocks, and community participation construction often involves communal labor, fostering a sense of community ownership and promoting widespread adoption among farmers.

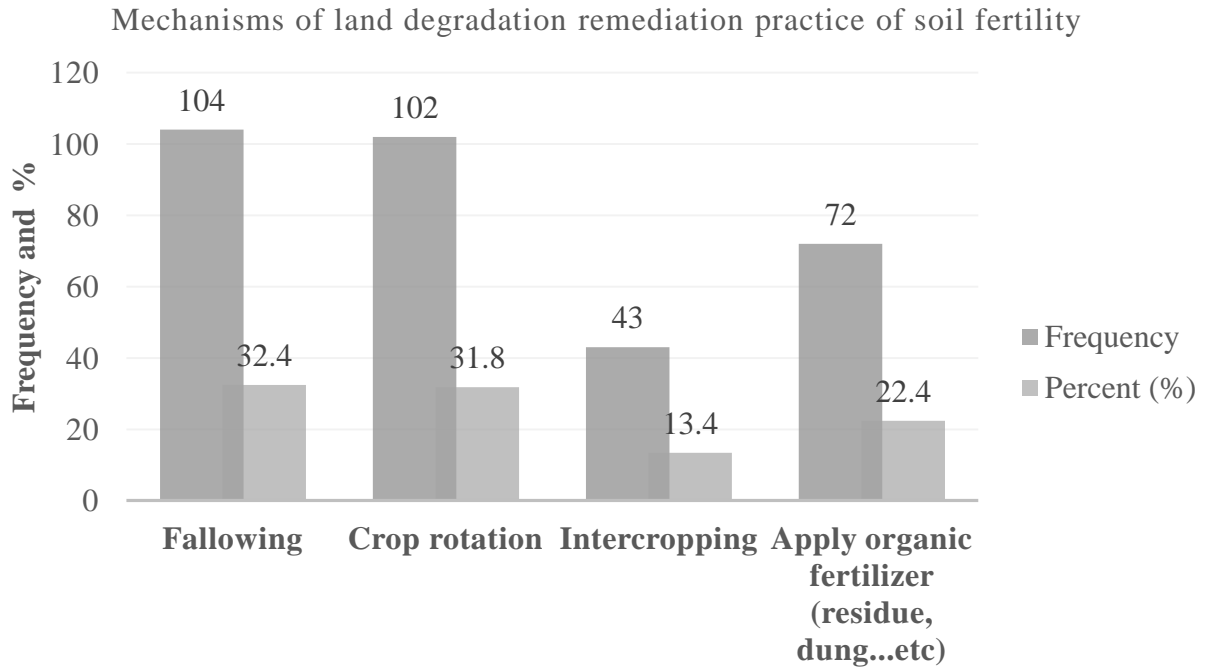


**Figure 5.** Major land degradation remediation practices

The result of the current finding agrees with Negasa (2022) finding who reported the successful soil conservation methods in Ethiopia and Lemma *et al.*(2016) who assessed the factors influencing the choice of soil and water conservation measures in Adami Tullu district.

#### **4.5.2. Mechanisms of land remediation practice of soil fertility**

In the study area, diverse mechanisms are employed for land remediation practices aimed at improving soil fertility. As indicated in Figure 6, the majority of respondents (32.4%) prioritize soil fertility, with fallowing identified as a key practice for land degradation remediation. Additionally, 31.8%, 22.4%, and 13.4% highlight crop rotation, organic fertilizers (such as residue and dung), and intercropping, respectively, as essential practices in their localities. During focus group discussions (FGD), participants stressed the importance of community and government intervention in implementing remediation measures. While individual farmers engage in various remediation activities to enhance yields and preserve the environment, collective action is considered necessary for effective land management. Without concerted efforts from all landholders, sustainable land management and protection from degradation remain elusive.



**Figure 6.** Mechanisms of land degradation remediation practice of soil fertility

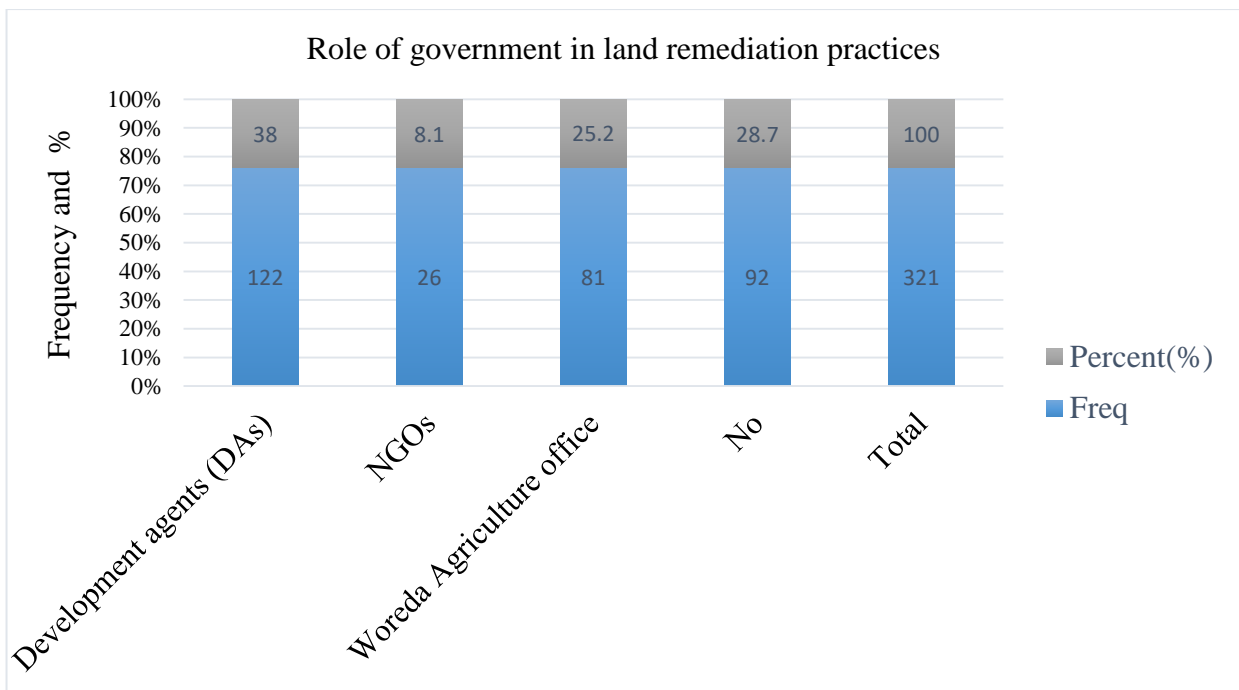
This finding is in agreement with the study of (Aleminew and Alemayehu, 2020) on soil fertility depletion and its management options under crop production perspectives in Ethiopia, as well as with (Tadesse *et al.*, 2019) study on farmers practice and potential of composting in Ethiopia. Environmental Systems Research.

#### **4.6. Participation of the local community in the land degradation remediation efforts**

In the study area, the involvement of local communities in land degradation remediation efforts is vital for their success and sustainability. These communities often directly affected by land degradation possess valuable traditional knowledge and practices essential for effective remediation. Their participation can take many different forms, such as actively building and maintaining structures like check dams, terraces, stone bunds, and contour trenches, as well as putting soil and water conservation methods into practice.

#### 4.7. The role of government in land remediation practices

As indicated in Figure 7, 38% of HHs realized that DAs support them in their land remediation practices, and 25.2% of HHs replied that they are supported by the district agricultural office. The remaining few HHs respondents (8.1% and 28.7%) answered that they are supported by NGOs and no support, respectively. Development agents, appointed by the government, work directly with farmers to implement sustainable land remediation practices, such as terracing, afforestation, and soil conservation. district agricultural offices oversee agricultural activities at the local level and coordinate efforts to combat land degradation through extension services and technical assistance.

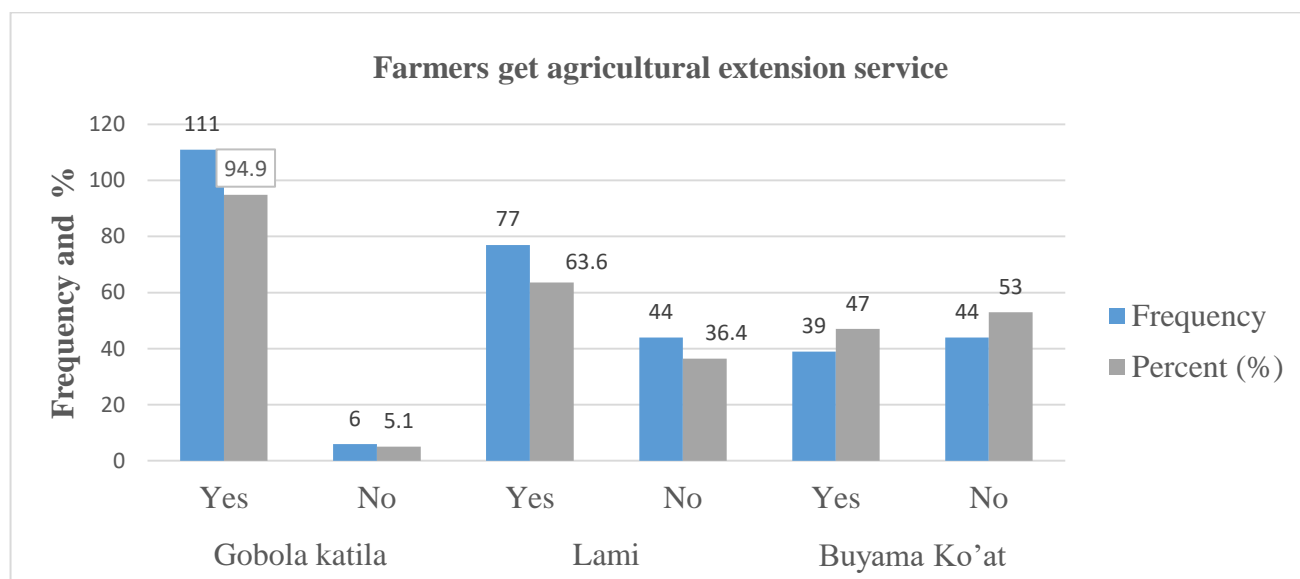


**Figure 7.** Land degradation remediation efforts by government.

These findings are consistent with (Mengistu and Assefa, 2020) towards sustaining watershed management practices in Ethiopia: A synthesis of local perception, community participation, adoption and livelihoods

#### 4.7. Farmers receive agricultural extension services

The majority (94.9%) of respondents in Gobola katila kebele receive agricultural extension services, 63.6% in Lami kebele, while only 53% of farmers in Buyama ko'at kebele have access to these services (Figure 8). Gobola Katila Kebele stands out for its high rate of agricultural extension service provision, as it is closer to urban centers and has better infrastructure and transportation networks, facilitating easier access for extension agents to reach farmers and deliver services. Conversely, in Buyama ko'at kebele, farmers face challenges in accessing agricultural extension services due to its distance from the district administration, security issues, and lack of accessibility such as infrastructure and transportation. This lack of services exacerbates land degradation problems in the area. Additionally, 47% of farmers receiving agricultural extension services benefit from various forums at the woreda level and during the purchase of agricultural inputs. Consequently, this leads to increased land degradation due to limited knowledge, inadequate crop management, technology gaps, and a lack of environmental conservation awareness.



**Figure 8.** Farmers get agricultural extension service.

This funding is similar to (FAO, 2019). Agricultural extension and advisory services: key policy and institutional issues. Food and agriculture organization of the United Nations.

## **5. CONCLUSION AND RECOMMENDATION**

### **5.1. Conclusion**

This study seeks to assess cause and effects of land degradation on crop livestock farming and its remediation practices in Yaya Gulale woreda, as well as the existing remediation practices. Researchers have identified key causes of land degradation by assessing their impact on livelihoods. Major contributors to land degradation include deforestation, overgrazing, over-cultivation, rapid population growth, and cultivation on steep, marginal lands. Additionally, the report suggests ways to counteract degradation and enhance land use regulations in the area. One such strategy is Sustainable Land Management (SLM): Adopt strategies that minimize adverse effects on the environment while maintaining or increasing land productivity. Crop rotation, agroforestry, and soil conservation methods are a few examples. We can protect food security, biodiversity, and ecosystem services for present and future generations by tackling land degradation.

The consequences of land degradation encompass declining yields, food insecurity, reduced livestock production, poverty, and challenges in land preparation such as decreased farm sizes, drought, and famine. To address this issue, collaborative efforts between rural communities, government agencies, and non-governmental organizations are underway in the study area. Remediation strategies include biological soil and water conservation methods, agroforestry, and agronomic practices. Structural conservation measures like stone bunds, check dams, terraces, and soil bunds are commonly used alongside biological measures such as tree planting, forest management, and area closure.

Agronomic practices such as contour cultivation, organic fertilizer application, fallowing, intercropping, and crop rotation are widely adopted. In the study area, physical soil and water conservation measures are regarded as the most effective approach due to the community's awareness of their significance. The government's Community-Based Participatory Watershed Development Program has fostered broad participation from men, women, and youth in addressing land degradation. Remediation initiatives in Yaya Gulale district primarily target areas with severe land degradation, focusing on zones where resource availability struggles to meet escalating demands from population growth. Key objectives include enhancing agricultural production and productivity, ensuring food security, reducing poverty, and transforming stony land into fertile or vegetated areas.

## 5.2. RECOMMENDATIONS

The study's findings lead to practical suggestions aimed at enhancing remediation efforts for degraded land in the study area.

- ✓ Enhance community engagement and capacity through targeted training, acknowledging land as a critical natural asset essential for Ethiopia's agricultural economy, thus engagement the remediation process.
- ✓ Establish and execute a participatory approach to cultivate stakeholder ownership, a vital element in attaining remediation objectives.
- ✓ Illustrate the program's benefits for rural communities to incentivize participation and integrate watershed management, prioritizing both conservation and development.
- ✓ Ensure the district agricultural office's pivotal role in achieving and maintaining program sustainability, a critical aspect of the remediation process.
- ✓ Involve the head of the agricultural office, development agents, and administration at the kebele level in selecting surveyor farmers to measure degraded land and allocate areas for rehabilitation.

Enhance household members' education levels to facilitate informed decisions regarding livelihoods, encompassing access to new technologies, adoption of novel crop varieties, and family planning.

- ✓ Foster community participation in the conservation and management of barren land to mitigate soil erosion effectively.
- ✓ Promote anti-free grazing practices and improved animal feeding methods to mitigate land degradation resulting from overgrazing.
- ✓ Enforce laws at the kebele level to safeguard restored land and penalize offenders, fostering responsible resource utilization.

Prioritize capacity building at the district level to address skill gaps in soil and water conservation engineering works, ensuring the effective implementation of remediation efforts.

## 6. REFERENCE

- Abate, S. (2019). Deforestation and Land Degradation in Ethiopia: A Review. *International Journal of Research in Environmental Science (IJRES)*, 5(1), 7-15.
- Abebaw, W.A. (2019). Review on impacts of land degradation on agricultural production in Ethiopia. *J. Resour. Dev. Manag*, 57.
- Adimassu, Z., Langan, S., Johnston, R., & Mekuria, W. (2017). Socioeconomic factors influencing farmers' adoption of land management practices in the North-Western Ethiopian Highlands. *Environmental Management*, 60(5), 868-880.
- Ahmed, M. T. (2010). E Ahmed, M. T. (2010). Ecosystems and Human Well-being. UNEP/Earthprint.
- Aleminew, A & Alemayehu, M. (2020). Soil fertility depletion and its management options under crop production perspectives in Ethiopia: A review. *Agricultural Reviews*, 41(2), pp.91-105.
- Alemu, B. (2015). The effect of land use land cover change on land degradation in the highlands of Ethiopia. *Journal of Environment and Earth Science*, 5(1), pp.1-13.
- Alemu, D., Stage, J., & Mugeru, A. (2020). Agriculture Productivity Growth in Ethiopia: The Role of Agricultural Research and Extension. *Agribusiness*, 36(4), 621-643.
- Anteneh, B. (2010). *Cattle Milk and Meat Production and Marketing Systems and Opportunities for Market-orientation in Fogera Woreda, Amhara Region, Ethiopia*.
- Bahta, Y. T., Teshome, D. A., & Gebru, A. A. (2019). Impacts of irrigation development on pastoralist land use and land cover changes in the lower Awash valley, Ethiopia.
- Bewket, W. (2003). Towards Integrated Watershed Management in Highland Ethiopia.
- Change, I. P. O. C. (2022). *The Ocean and Cryosphere in a Changing Climate*. Cambridge
- Conacher, A. (2013). *Land Degradation*. Springer Science & Business Media. University Press.
- Dereje, T., Teshome, S., & Demel, T. (2018). Drivers and consequences of deforestation in the drylands of Ethiopia: A review. *Journal of Arid Environments*, 153, 1-9.
- Desta, L.(2000). Land degradation and strategies for sustainable development in the Ethiopian highlands: Amhara Region (Vol. 32). ILRI (aka ILCA and ILRAD).

- Di Falco, S., Veronesi, M., & Yesuf, M. (n.d.). Does Adaptation to Climate Change Provide Food Security? A Micro-Perspective from Ethiopia. *American Journal of Agricultural Economics*, 93(3), 829–846.
- Dixon, J. A., Gibbon, D. P., Gulliver, A., & Nations, F. a. a. O. O. T. U. (2001). *Farming Systems and Poverty*. Food & Agriculture Org.
- Engel, S., Pagiola, S., & Wunder, S. (2008). Designing payments for environmental services in theory and practice: An overview of the issues. *Ecological Economics*, 65(4), 663–674. <https://doi.org/10.1016/j.ecolecon.2008.03.011>
- Fantaw, Y., et al. (2019). "Land Degradation in Ethiopia: Causes, Impacts and Rehabilitation Techniques." In: Egbenda Bilame, K. (Ed.), *Soil Erosion Issues in Agriculture* (pp. 97-119). IntechOpen.
- FAO. (2019). *Agricultural Extension and Advisory Services: Key Policy and Institutional Issues*. Food and Agriculture Organization of the United Nations.
- Food and Agriculture Organization of the United Nations (2019). Trees, forests and land use in drylands: the first global assessment: full report. Rome: Food and Agriculture organization of the United Nations.*
- Gebrehiwot, S. G., Bewket, W., & Teketay, D. (2016). Land use and land cover change in the Bale Mountain Eco-Region of Ethiopia during 1985-2015. *Environmental Systems Research*, 5(1), 4.
- Genene, Ts. (2006). *Farmer's Perception of Land Degradation and Determinants of Household Food Security Status at Middle Catchments of Bilate Water shade*. A Thesis submitted to College of Agriculture, Department of Agricultural Economics.
- Haregeweyn, et al. (2017). "Resilience of traditional farming systems in southwestern Ethiopia in the face of socio-economic and climate-induced stresses." *Environmental Management*, 59(5), 738-756. Doi: 10.1007/s00267-017-0804-2
- Hester, R. E., & Hester, R. E., & Harrison, R. M. (2012b). *Soils and Food Security*. Royal Society of Chemistry.
- Holden & Shiferaw, 2004) Holden, S., & Shiferaw, B. (2004). Land degradation, drought and food security in a less-favoured area in the Ethiopian highlands: a bio-economic model with market imperfections.

- Hudson, N.W. (2015). *Soil conservation*. Scientific Publishers.
- Kidanu, S., Nyssen, J., Govaerts, B., & Fikreyesus, S. (2019). Land Degradation Indicators for Assessing Land Use/Land Cover Changes in the Modjo watershed, Ethiopia. *Land*, 8(3), 44.
- Lal, R. (2015). Restoring soil quality to mitigate soil degradation. *Sustainability*, 7(5), pp.5875-5895.
- Lemma, B., Kassa, H., & Girma, A. (2016). Factors influencing the choice of soil and water conservation measures: The case of small-scale farmers in Adami Tulu District, Ethiopia. *Ecological Processes*, 5(1), 10.
- Mahata, S. and Sharma, V.N. (2022) . The global problem of land degradation: A review. *National Geographical Journal of India*, 67(2), pp.216-231.
- Megerssa, G.R. and Bekere, Y.B. (2019). Causes, consequences and coping strategies of land degradation: Evidence from Ethiopia. *Journal of Degraded and Mining Lands Management*, 7(1), p.1953.
- Mengist, W. and Asfaw, A. (2023) . Forest Policy of Ethiopia from 1990 to 2020: An Assessment of Contemporary Forest Management Approach and Its Impact on Local Livelihood. Green and Low-Carbon Economy).
- Mengistu, F. and Assefa, E., 2020. Towards sustaining watershed management practices in Ethiopia: A synthesis of local perception, community participation, adoption and livelihoods. *Environmental Science & Policy*, 112, pp.414-430.
- Mesene, M. (2017) . Extent and impact of land degradation and rehabilitation strategies: Ethiopian Highlands. *Journal of Environment and Earth Science*, 7(11), pp.22-32.
- Meshesha, D. T., Tsunekawa, A., Tsubo, M., & Ali, S. H. (2013). Land-use/cover dynamics and their effects on land degradation in the central highlands of Ethiopia. *Environmental Management*, 52(4), 1093-1107.
- Meybeck, A. G. V. W. J. W. T. (2021). *Addressing forestry and agroforestry in National Adaptation Plans*. Food & Agriculture Org.
- Meybeck, A. G. V. W. J. W. T. (2021). *Addressing forestry and agroforestry in National Adaptation Plans*. Food & Agriculture Org.
- Montgomery, D.R. (2007) . Soil erosion and agricultural sustainability. Proceedings of the National Academy of Sciences, 104(33), pp.13268-13272.

- Nations, F. a. a. O. O. T. U. (2021). *The impact of disasters and crises on agriculture and food security: 2021*. Food & Agriculture Org.
- Ndiang'ui, N. (2007). *Climate and Land Degradation*. Springer Science & Business Media.
- Negasa, K.A. (2022) . Assesment of the effect of land degradation in Dale Wabara District, Kelem Wollega Zone, Oromia Regional State, Ethiopia.
- Nellemann, C., Henriksen, R., Raxter, P., Ash, N., & Mrema, E. (2014). *The Environmental Crime Crisis*.
- Nkonya, E., Mirzabaev, A., & Von Braun, J. (2015c). *Economics of Land Degradation and Improvement – A Global Assessment for Sustainable Development*. Springer.
- Nyssen, J., Poesen, J., Moeyersons, J., Deckers, J., Mitiku Haile, Billi, P., & Frankl, A. (2019). Human impact on the environment in the Ethiopian and Eritrean highlands – A state of the art. *Earth-Science Reviews*, 193, 1-27.
- Saguye, T.S. (2017) . Analysis of farmer’s perception on the impact of land degradation hazard on agricultural land productivity in Jeldu district in West Shewa Zone, Oromia, Ethiopia. *Journal of Agricultural Extension and Rural Development*, 9(6), pp.111-123.
- Scherr, S.andYadav, S. (1996). Impacts of Land Redistribution on Land Management and Productivity in the Ethiopian Highlands.” *Land Degradation and Development*, Vol. 12, pp. 555-568.
- Sonneveld, B.G.J.S. (2002) . Land under pressure: the impact of water erosion on food production in Ethiopia.
- Steinfeld, H., Gerber, P., Wassenaar, T. D., Nations, F. a. a. O. O. T. U., Castel, V., & De Haan, C. (2006). *Livestock’s Long Shadow*.
- Tadesse, G., Gebru, G., & Mesfin, G. (2016). Overgrazing and land degradation: Socio-economic impact and policy implications in Ethiopia. *International Journal of Environmental Protection and Policy*, 4(4), 107-114.
- Tadesse, G., Ketema, M., & Hurni, H. (2009). Impacts of land use/land cover changes on land degradation dynamics: a case study in the Beressa watershed, highlands of Ethiopia. *Mountain Research and Development*, 29(3), 204-212).
- Tadesse, G., Yirga, C., Yohannes, D., & Tadesse, T. (2019). Farmers’ practice and potential of composting in Ethiopia. *Environmental Systems Research*, 8(1), 1-9.

- Temesgen, G., Amare, B. and Abraham, M. (2014). Farming households' knowledge and perception on soil degradation in Dera Woreda. Ethiopia. *Agricultural Science, Engineering and Technology Research*, 2(3), pp.1-10.
- Tesfa, A. and Mekuriaw, S., 2014. The effect of land degradation on farm size dynamics and crop-livestock farming system in Ethiopia: a review. *Open Journal of Soil Science*, 2014.
- Thampatti, K. C. M. (2022). Problem Soils. CRC Press.
- Thiombiano, L. and Tourino-Soto, I. (2007). Status and trends in land degradation in Africa. In *Climate and land degradation* (pp. 39-53). Berlin, Heidelberg: Springer Berlin Heidelberg
- United Kirui, O., & Mirzabaev, A. (2014). Economics of land degradation in Eastern Africa: An analysis of the costs and benefits of land management options. *Land Degradation & Development*, 25(6), 589-604. Nations Convention to Combat Desertification (UNCCD) Global Land Outlook 2019.
- United Nations Convention to Combat Desertification (UNCCD). (2019) . the Global Land Outlook. Bonn, Germany: UNCCD.
- United Nations Environment Programme (UNEP). (2015). Land degradation and climate change: Impacts and adaptation strategies. Retrieved from <https://www.unep.org/resources/report/land-degradation-and-climate-change-impacts-and-adaptation-strategies>.
- United Nations Environment Programme (UNEP). (2018). *Frontiers 2018/19: Emerging Issues of Environmental Concern*. Nairobi, Kenya: UNEP.
- Wassie, S.B., 2020. Natural resource degradation tendencies in Ethiopia: a review. *Environmental systems research*, 9(1), pp.1-29.
- Wong, M. (2018c). *Remediation and Management of Degraded Lands*. Routledge.

## **7. APPENDIX**

### **Appendix I: Household Survey Questionnaire**

#### **School of Postgraduate Studies**

**Department:** Natural Resource Management.

**Program:** **integrated watershed management** (Postgraduate Studies)

My name is Getu Regasa. I am an MSc candidate student and am undertaking a study to assess the cause and effects of land degradation on crop livestock farming and its remediation practices: The Case of Yaya Gulale woreda, North Shewa Zone, Oromia, Ethiopia.

#### **Dear Respondents**

The main purpose of these interview questionnaires is to acquire information relevant for research entitled Assessing the cause and effects of land degradation on crop livestock farming and its remediation practices. Therefore, your genuine answer to the interview questionnaire is a necessary condition for the reliability of this research output. The information is meant only for academic purposes. The responses you give will not have a negative impact on anyone. I can honestly assure you that your personal information will be kept confidential. Hence, just feel free to provide the correct answer. I am very grateful for the favorable contribution of your time and energy to the success of this study.

**N.B:** For some tabular questions, please put tick mark where needed and encircle for others parts.

Code of respondent \_\_\_\_\_ Kebele \_\_\_\_\_ Date: \_\_\_\_\_

**Part I One: Socio-economic and demographic characteristics of households**

- 1) Sex of household head a) Male  b) Female
- 2) Age of household head a) Below 25  b) 25-35  c) 36-45  d) 46-55 e) above 55
- 4) Marital status a) Married  b) Single  c) Divorced  d) Widow
- 3) Educational Status of household head a) Can't read and write  b) Primary   
c) Secondary  d) Tertiary (Certificate, Diploma, and Degree)
- 5) Size of household a) 1-4  b) 5-8  c) Above 8
- 6) Occupation of household head  
a) Farmer  b) Civil servant  c) Business  d) Other-specify.....
- 7) Average annual income in birr (Ksh)  
a) Less than 5,000  b) 5,000-15,000  c) 15,001-25,000  d) Above 25, 00
- 8) Land size in hectare a) 0.5-2.5hek  b) 2.6-3.5hek  c) Above 3.5hek
9. How many hectares of grassland do you own? Less than 0.25hek  b) 0.26-0.5hek   
 c) 0.51-0.75hek  d) Above 0.75hek
10. Cattle size a) 1-3  b) 4-6  c) 7-10  d) Above 11
11. Farmers annual income in birr (Ksh)from livestock in average a) Less than 6,000  b) 6,000-15,000  c) 15,001-30,000  d) Above 30, 000

**Part II. Question relates to Cause and effect of land degradation on crop-livestock farming system**

**Choose the best answer and encircle number of your answer among the following questions.**

1. Have you faced soil erosion problem in your farm? (1) Yes \_\_\_\_ (2) No \_\_\_\_.
2. If yes, what type is it? (1) Low erosion \_\_\_\_ (2) Medium erosion \_\_\_\_  
(3) High erosion \_\_\_\_ (4) others (specify)
3. What do you think the causes of soil erosion mainly? (1) Deforestation \_\_\_\_ (2) Overgrazing \_\_\_\_ (3) continuous cultivation \_\_\_\_ (4) others (specify) \_\_\_\_
4. In which season erosion is severe in your farm land? (1) Summer \_\_\_\_ (2) autumn \_\_\_\_  
(3) Winter \_\_\_\_ (4) spring \_\_\_\_

5. What are the immediate root causes of land degradation?  
 (1) Overstocking\_\_\_ (2) cutting trees for fuel and construction\_\_ (3) ploughing steep slopes\_\_\_ (4) limited use of conservation structures\_\_\_ (5) continued cultivation/no fallowing\_\_\_ (6) others (specify) \_\_\_\_\_
6. What is/are the underlying root causes for land degradation in your area? (Multiple Answers are possible) (1) heavy rainfall\_\_\_ (2) steep topography\_\_\_ (3) population pressure\_\_\_ (4) others (Specify)\_\_\_\_\_
7. Is it possible to halt/minimize land degradation problem?  
 (1) Yes \_\_\_ (2) no \_\_\_ (3). I don't know\_\_\_\_\_
8. If your answer is „yes“, how? \_\_\_\_\_
9. If your answer is „no“, why? \_\_\_\_\_
10. What seems to be the major consequence of land degradation mostly in your locality?  
 (1) Climate is become harsh \_\_\_ (2) decreasing soil fertility \_\_\_  
 (3) Unemployment and out-migration\_\_\_\_\_ (4) drought \_\_\_\_\_
11. What consequences do you observe after impacts of land degradation in your locality?  
 (1) Land productivity (yield) decrease \_\_\_ (2) Land preparation becomes difficult\_\_\_  
 (3) Reduced farm size\_\_\_ (4) Poverty \_\_\_ (5) others (specify) \_\_\_\_\_
12. Have you ever noticed the decline of soil fertility in your farmland? (1) Yes \_ (2) No\_\_\_
13. If yes, what indicators did you observe? (1) Stunted growth of crops \_\_\_ (2) Color Change on leaves \_\_\_ (3) Yield decline \_\_\_ (4) Others (Specify) \_\_\_
14. Is there forest currently in your locality? (1) Yes \_\_\_\_\_ (2) No\_\_\_\_\_
15. If yes, what type? (1) Natural (2) plantation.
16. Do you observe problem of deforestation in your area? (1) Yes \_\_\_\_\_ (2) No\_\_\_\_\_
17. If yes, what kinds of deforestation for what purpose? (1) Conversion of forest to Farmland \_\_\_ (2) Fuel wood and charcoal production \_\_\_ (3) Construction of house \_\_\_ (4) Conversion of forest to grazing land \_\_\_\_\_
18. How does deforestation affect you and the community as a whole? In order to impact?  
 (1). Causes land degradation \_\_\_ (2) loss of habitat \_\_\_ (3) gullies and rills created \_\_\_  
 (4) Others (Specify) \_\_\_\_\_
19. If deforestation is a problem in your village, is there community participation to solve the Problem? (1) Yes \_\_\_\_\_ (2) No\_\_\_\_\_

20. If yes, how do communities in the village contribute to the protection of forest? (1) Participate in afforestation and reforestation programs \_\_\_\_ (2) Reduce pressure on forest by Planting multipurpose trees \_\_\_\_ (3) participate in forest development program \_\_\_\_ (4) Respect rules by laws and regulation of local governments and the Community \_\_\_\_ (5) Others (specify) \_\_\_\_

**Part III. Question relates to Remediation practices of land degradation.**

1. Did you take any measure to protect erosion? (1) Yes \_\_\_\_ (2) No \_\_\_\_
2. If yes, which measures did you take mostly? (1) Terraces, \_\_\_\_ (2) contour ploughing \_\_\_\_ (3) stone bunds \_\_\_\_ (4) soil bunds \_\_\_\_ (5) Check dam \_\_\_\_ (6) others (specify) \_\_\_\_.
3. What will happen to your farm if you do not take protection measures? (1) Loose of Farmland fertility \_\_\_\_ (2) Crop yields will be reduced \_\_\_\_ (3) others specify \_\_\_\_
4. Does community play role in the management of land resources? (1) Yes \_\_\_\_ (2) No \_\_\_\_
5. If yes, what roles do they play? (1) Organizes communal labor for the management Activities \_\_\_\_ (2) Manages and controls the uses of resources \_\_\_\_ (3) Regulates the use and Management of land resources at local level \_\_\_\_ (4) others (specify) \_\_\_\_
6. How do you manage the soil fertility? (1) Fallowing \_\_\_\_ (2) Crop rotation \_\_\_\_ (3) Intercropping \_\_\_\_ (4) Apply organic fertilizer (residue, dung...etc)
7. Do you use organic fertilizer to maintain soil fertility and organic matter in your farm? (1) Yes \_\_\_\_ (2) No \_\_\_\_
8. If no, what is/are the reason/s for not using organic fertilizer? (1) Shortage of composting materials \_\_\_\_ (2) Preference to artificial fertilizer \_\_\_\_ (3) Lack of knowledge and skill of compost making \_\_\_\_ (5) others (specify) \_\_\_\_
9. Is there any kinds of constraints in the process of your land management practice? (1) Yes \_\_\_\_ (2) No \_\_\_\_
10. If yes, what are the constraints to crop production in your area? (Multiple answers are Possible) (1) Erratic rainfall \_\_\_\_ (2) drought \_\_\_\_ (3) Pest and disease \_\_\_\_ (4) Others (Specify) \_\_\_\_
11. Did you get agricultural extension service? (1) Yes \_\_\_\_ (2) No \_\_\_\_
12. If yes, who provides the extension service? (1) Development agents (DAs) \_\_\_\_ (2) NGOs \_\_\_\_ (3) woreda agriculture office \_\_\_\_ (4) others (specify) \_\_\_\_
13. What the Development agents (DAs) taught or training in your locality? (1) Input supply

And use \_\_\_\_ (2) Soil and water conservation \_\_\_\_ (3) Land management practice \_\_\_\_ (4) rain water harvest \_\_\_\_ (5) Animal husbandry \_\_\_\_ (6) Agro forestry \_\_\_\_ (7) Any other, please specify \_\_\_\_

**Part IV. Check list for the focus group discussion (FGD) about Cause, effect of land degradation on crop-livestock farming system and land degradation remediation practices.**

1. What are the major causes of land degradation in your locality?

---

---

2. If there is a problem of land degradation, what are the indicators? \_\_\_\_\_

---

3. What are the contributing factors for land degradation? \_\_\_\_\_

---

4. What is the trend of productivity of land through time? \_\_\_\_\_

5. What are the major effect of land degradation in your locality? \_\_\_\_\_

---

6. How did you see **remediation** of land management practice carried out in your area in the past?

---

7. What Indigenous practices are undertaken mostly in your area?

---

8. What interventions are there by government and NGOs in the area with regard to land?

**Part V: Questionnaire for key informant interview about effect of land degradation on crop-livestock farming system, and remediation practice of land degradation and land Remediation practices.**

1. What are the major effect of land degradation on crop-livestock farming system in your woreda?

2. How do you describe the status of land degradation in study area?

3. If there are problems of land degradation, what are the indicators for the problems?

4. What are the major causes for land degradation?

5. What factors are aggravating the problem of land degradation?
6. How farmers participating in sustainable land management practices?
7. When and how you are playing the role to create awareness about sustainable land Management among the farmers.

Appendix II:

Checklist for Observation

**1. Cause of land degradation in the study area?**

---

---

---

Indicators/Consequence of land degradation?

---

---

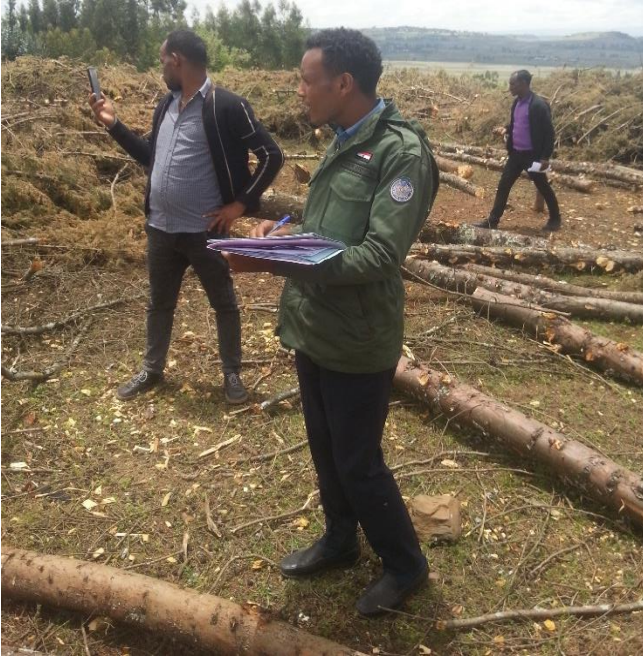
Watershed activity of land degradation?

---

---

Government and NGO activity on land degradation?

---



**LIST OF FIGURE FOR APPENDIX**

**Appendix 1:Deforestation in Lami kebele Photo taken during field survey.**



Appendix 2: Land degradation problems in Buyama ko'at kebele, Source: Photo taken during field survey.



Appendix 3: Cattle grazing on degraded land in Buyama ko'at kebele, Source: Photo taken during field survey.





Appendix 4: land degradation problems in Gobola katila kebele Source: Photo taken during field survey.



Appendix 5: Land degradation remediation activities by the local community in Gobola katila kebele. Source: Photograph taken during field survey.