WOLLEGA UNIVERSITY

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DEPARTMENT OF ENVIRONMENTAL SCIENCE

MSC THESIS PROPOSAL:

EVALUATION OF SOIL FERTILITY STATUS IN DIFFERENT LAND USE SYSTEMS IN EJERE DISTRICT, CENTRAL HIGHLAND OF ETHIOPIA.

BY

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APPROVAL SHEET FOR SUBMITTING RESEARCH PROPOSAL

Evaluation of Soil Fertility Status in Different Land Use Systems in Ejere District, Central Highland of Ethiopia.

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Table of content

Contents **Page**

ABBREVIATIONS AND ACRONYMS

AAS …………………………………… Atomic Absorption Spectrophotometry

FAO ………….. ……………………….Food and Agricultural Organization

FES ……………………………………..flame emission spectrophotometry

GSP ……………………………………..Global Soil Partnership

GDP …………………………………….Gross Domestic Product

LULCC ………………………………….Land Use and Land Cover Change

SCRP ………………………………….. .Soil Conservation Research Program

SOM ………………………………….. .Soil Organic Matter

BD ……………………………………….Bulk Density

CEC ……………………………………..Cat ion Exchange Capacity

LIST OF TABLE

LIST OF FIGURE

CHAPTER ONE

1. INTRODUCTION

1.1 Background

The word soil has various meanings in its substance meaning, soil is the natural resource body for the growth of plants. Soil has also been defined as a natural body consisting of layers that are composed of weathered mineral materials, organic material, air and water. Soil is the end product of the combined influence of climate, topography, organisms on parent materials over time. As a result, soil differs from its parent material in texture, structure, consistency, color, chemical, biological and physical characteristics (Flores-Magdaleno et al., 2011).

Soil can be defined as the organic and inorganic materials on the surface of the earth that supply the nutrients for plant growth. Soil develops slowly over time and is composed of many different materials. Inorganic materials, or those materials that are not living, include weathered rocks and minerals. Weathering is the mechanical or chemical process by which rocks are broken down into smaller pieces. As rocks are broken down, they mix with organic materials, which are those materials that originate from living organisms. For example, plants and animals die and decompose, releasing nutrients back into the soil. Generally, the basic types of soil are, sand, silt and clay (Rebecca Gillaspy, 2021).

Land degradation is defined as a negative trend in land condition, caused by direct or indirect human-impact processes including anthropogenic climate change, expressed as long-term reduction or loss of at least one of the following: biological productivity, ecological integrity, or value to humans. Deforestation is the conversion of forest to non-forest land and can result in land degradation. Soil degradation is one of the most dangerous global environmental problems of this generation. Even though degradation status is different from place to place, it is touching every corner of the world (Ouyang.W, et al., 2018).

This worldwide depletion of soil resources continues to be a serious hazard, particularly, in the least developing countries, where agriculture is the main pillar of their economy. It is threatening their survival on this planet as well as national prosperity (Antonio.S, 2016).

Degradation is broadly natural and anthropogenic. In general, land degradation is defined as a negative trend in land condition, caused by direct or indirect human-induced processes including anthropogenic climate change, expressed as long-term in appropriate agriculture practices, uncontrolled grazing and overgrazing, encroachment and unplanned settlements, and so forth are the common problem (Montanarella.L,et al., 2018).

Chemical soil degradation processes include relatively simple changes, like nutrient depletion resulting from the imbalance of nutrient extraction on harvested products and fertilization, and more complex ones, such as acidification and increasing metal toxicity. Acidification in croplands is increasingly driven by excessive nitrogen fertilization and, to a lower extent, by the depletion of cation like calcium, potassium or magnesium through exports in harvested biomass (Guoet.J.H, al., 2010).

One of the most relevant chemical degradation processes of soils in the context of climate change is the depletion of its organic matter team. Reduced in agricultural soils through the increase of respiration rates by tillage and the decline of below-ground plant biomass inputs, SOM pools have been diminished also by the direct effects of warming, not only in cultivated land, but also under natural vegetation (Bond-Lambertyet al., 2018).

Natural resource degradation and land degradation in particular has negative impact on the economy of developing countries including Ethiopia. The major causes of land degradation in Ethiopia as rapid population increase, severe soil loss, deforestation, low vegetative cover and unbalanced cropping and livestock production. This is because; the country heavily depends on their natural resource for food self-sufficient, food security and economic development. Soil erosion and nutrient depletion are the most important forms of land degradation in Ethiopia. Besides the human induced causes, factors such as land topography, ecology, rainfall, land cover and soil types counted as being as proximate and underlying causes of land degradation in Ethiopia (Deresa.F and Legesse.T, 2015).

Soil erosion is a complex dynamic process involving detachment and travel rapidly the particles or aggregate topsoil by the physical forces of wind, water, and gravity (mass movement) and immediate sediment deposition in downstream areas. Soil erosion has been registered as one of the greatest global problems that result in serious threats to natural resources, agriculture, and the environment. Erosion displaces soil organic carbon and the most important nutrients, and consequently affects vegetation growth, biodiversity, and overall sustainability of ecosystem services and functions. Soil erosion can also cause severe environmental problems, including soil and water degradation, a decrease in land productivity, and eutrophication and sedimentation of water (Sujatha, E.R, Sridhar.V, 2018).

Resources degradation and environmental deterioration in Ethiopia are: cultivation on steepen soil with inadequate management in soil conservation or vegetation cover, erratic and torrential rainfall patterns, deforestation and overgrazing. In addition, the topography of the land settling has also a great impact on the soil quality and soil depth due to the interaction impact of cultivation practices and slope (Aytenew and Kibret, 2016).

In Ethiopia, the rapidly increasing population has led to a declining availability of cultivable land and a very high rate of soil erosion. In general term, the historical land use and land cover change in Ethiopia had induced great impact on biodiversity, water resources, forest and local livelihoods of the country. Due to deforestation and contours removal of other vegetation in Ethiopian central areas examined showed significant signs of accelerated soil erosion (Deresa F, Legesse T, 2015).

Soil fertility is an energizing natural property which can change under the influence of natural and human induced factors. In agriculture, depletion can be due to excessively intense cultivation and inadequate soil management. Topsoil depletion occurs when the nutrient-rich organic topsoil, which takes hundreds to thousands of years to build up under natural conditions, is eroded or depleted of its organic material. As human population continues to increase, human disturbance on the Soil fertility to produce food and will place greater demand on soils to provide essential nutrients. Continuous cropping for enhanced yield removes substantial amounts of nutrients from soil. Imbalanced and inadequate use of chemical fertilizers, improper irrigation and various cultural practices also deplete the soil quality rapidly (Medhe.SR *et al.*, 2012).

Soil fertility, requires the sustainable use of soil resource, because soil can easily lose its quality and quantity within a short period of time for different reasons such as intensive cultivation, leaching and soil erosion (Kiflu.A and Beyene.S, 2013).
However, the basis of this sustainable agricultural development is good quality of the soil, since maintenance of soil quality is an integral part of sustainable agriculture and the convenient witness to enhance the crop productivities (Liu et.F.C, al., 2010).

Currently, the land degradationand erosion and conservation of land, was drastically observed in the Ejere district West shewa of Ethiopia. Because of expansion of cultivated and grazing lands, which may result in the decline of soil fertility and limit crop productivity, which in turns affect the livelihood of local communities.

Therefore, the objective of this study will be to evaluate oil fertility status, that effects of land use types on selected soil physical and chemical properties in Ejere district, West shewa, Ethiopia.

1.2 Statement of the Problem

Despite the fact that the country's government effort in massive and vast participation in prevention of soil erosion through implementation of different soil conservation works, still the average soil loss rate of the country is about 18 ton/ha/year and nearly 1 billion tons of fertile soil originating from human-activities soil erosion still reach the rivers every year. a serious problem soil erosion is shows in west shew in Ejere district, because of Continuous cultivation with little protection measures exacerbated the level of soil erosion, and hence land productivity had declined significantly and farmers were cultivating the land without giving more attention to soil maintenance in the area. This caused the loss of soil fertility, same essentials nutrients and reduced productivity capacity of the land and socioeconomic of the area. There are no more evidences which is done on the status of soil fertility to reduces the land degradation and soil erosion around Ejere district. Thus, this research will be focus on the evaluation of status of soil fertility of cultivated, forest and grass land to the area and to see the loss of nutrient from cultivated land every year with relate to forest and grass land.

1.3 Research Hypothesis

The study will be able to answer the following research hypothesis: -

i There is significant difference in soil properties among the different land use systems?

ii Soil fertility status would not be affected by change in land use system of the study areas?

1.4 OBJECTIVE OF STUDY

1.4.1 General Objective of study

The overall aim of the study is, to evaluate soil fertility status in different land use systems in Ejere district, central highland of Ethiopia.

1.4.2 The specific Objective will be:

1 To evaluate some selected soil physicochemical properties under different land use systems in the study area.

2 To compare soil fertility among cultivated lands, Forest and grass land systems in the study area.

1.5 Significance of the study

To combat the problem of the land degradation, due to continuous cultivation, inappropriate use of fertilize and overgrazing with little protection measures, government and non-government organizations have taken considerable measures in the area. The soil system remains the major determinant of crop yields when compared with plant genetic potential and weather because of the environment it provides for root growth. Thus, increasing and sustaining agricultural production should aim not only at sustaining higher level of biological productivity but also at ensuring that the system is stable enough to maintain soil quality. The key soil characteristics that affect agricultural yield sustainability are nutrient content, water holding capacity, organic matter content, soil reaction, topsoil depth, salinity and soil biomass.

The purpose of this study is to investigate the effect of soil conservation measures on some soil quality attributes so as to draw conclusion that contribute in the future improvement of soil conservation measures implementation in improving soil for a better land productivity, erosion control and sustainable use of resources available in the study area. Therefore, these finding will benefit consumers, all society, government farmers in the study area and further community, environments and future researchers.

CHAPTER TWO

2. LITERATURE REVIEW

2.1 land uses

Global land use and soil management play a central role in determining our food, material and energy supply because land is a finite resource. The effects of land use on the environment ranges from minor land cover changes and soil modification to severe desertification, deforestation, erosion, and river encroachment problems. Therefore, there is increasing concern about the land use land cover changes and its negative impacts on soil quality and the environment in many parts of the world due to the current global population growth and economic development. In order to have sustainable land use systems, land use development must not be only economically sustainable but also socially acceptable and environmentally sound. Therefore, strategies to improve agricultural productivity have to seek a sustainable solution that better addresses soil fertility management. Soil physical and chemical properties play a central role in transport and reaction of water, solutes and gases in soils, their knowledge is very important in understanding soil behavior to applied stresses, transport phenomena in soils, hence for soil conservation and planning of appropriate agricultural practices. The anthropogenic changes in land use have altered the characteristics of the Earth's surface, leading to changes in soil physicochemical properties such as soil fertility, soil erosion sensitivity and content of soil moisture. according to the definition of (Abad, J.R.S, et al., 2014).

The broad concept of land management practices refers to activities on the ground that uses appropriate technologies for the improvement or maintenance of productive capacity of the land. This includes activities such as soil and water conservation, soil fertility management and controlled-grazing. These changes may be caused by soil compaction that reduces soil volume and consequently lowers soil productivity and environmental quality. as definition of (Abad, J.R.S, et al., 2014).

The research done in Southwestern Nigeria indicated that, Soil physical and chemical properties have been proposed as suitable indicators for assessing the effect of land-use changes and management. This approach has been used extensively by several authors to monitor land-cover and land-use change patterns (Yao, M.K, et al., 2010).

Land-use changes and unsustainable land management are direct human causes of land degradation, with agriculture being a dominant sector driving degradation.

Soil loss from conventionally - land exceeds the rate of soil formation orders of magnitude. Land degradation affects humans in multiple ways, interacting with social, political, cultural and economic aspects, including markets, technology, inequality and demographic change (very high confidence). Land degradation impacts extend beyond the land surface itself, affecting marine and freshwater systems, as well as people and ecosystems far away from the local sites of degradation (Adugna. A, Abegaz .A, 2015).

Land degradation is a complex phenomenon often affected by multiple factors such as climatic (rainfall, temperature, and wind), abiotic ecological factors (e.g., soil characteristics and topography), type of land use (e.g., farming of various kinds, forestry, or protected area), and land management practices (e.g., tilling, crop rotation, and logging/thinning). Therefore, attribution of land degradation to climate change is extremely challenging. Because land degradation is highly dependent on land management, it is even possible that climate impacts would trigger land management changes reducing or reversing land degradation, sometimes called transformation adaptation (Kates.R.W, et al., 2012).

There is not much research on attributing land degradation explicitly to climate change, but there is more on climate change as a threat multiplier for land degradation. However, in some cases, it is possible to infer climate change impacts on land degradation, both theoretically and empirically. Direct linkages with climate change the most important direct impacts of climate change on land degradation are the results of increasing temperatures, changing rainfall patterns, and intensification of rainfall. These changes will, in various combinations, cause changes in erosion rates and the processes driving both increases and decreases of soil erosion. The climate-change-related drivers of land degradation are gradual changes of temperature, precipitation and wind, as well as changes of the distribution and intensity of extreme events. (Liu.K.C, et al., (2017).

2.1 Soil Erosion

Soil degradation in the Eastern African highlands is manifested mainly in the form of soil erosion gully formation, soil fertility loss, with a consequence of reductions in crop yield. (Gashaw.T, et al, (2014), Numerous studies have reported that the magnitude of soil erosion rates has been accelerating worldwide due to land use and land cover change (LULCC) and inappropriate land use and management practices resulting in widespread land degradation process.The global annual average potential soil loss due to water-caused erosion was estimated at, LULCCs have been accounted for an overall increase of 2.5% in the global average soil erosion. (Uddin, K. Abdul Matin, M. 2018).

According to the study by the Global Soil Partnership (GSP), around 75 billion tons of topsoil is lost annually due to erosion from the arable land worldwide that is equivalent to about $400 billion losses in agricultural production (GSP,2018).In addition of this, the Food and Agriculture Organization (FAO) of the United Nations and Intergovernmental Technical Panel on Soils, stated that “if action is not taken to reduce erosion, total crop yield losses projected by the year 2050 would be equivalent to removing 1.5 million km2 of land from crop production– or roughly all the arable land in India”. In the developing countries where the overall economy and the livelihood of a majority of the population depend on the productivity of their land, the displacement of the most productive topsoil layer by erosion and a poor conservation practice have resulted in the reductions in agricultural production and land productivity potential and contributing to food insecurity. With a population of about 107.53 million (estimated as of December, 2018).

Growing at an annual rate of 2.46%, Ethiopia is the most populous landlocked country in the continent of Africa, and the second-most populous nation in Africa. Agriculture sector, which accounts for about 50% of the Gross Domestic Product (GDP), 85% of the total export revenue, and over 80% of the total employment, is the main source of the country’s economy. The great majority of the population is dependent on subsistence agriculture that is an overwhelming vulnerable to the recurrent droughts and land degradation. Rapid population increase and growing demand posed a greater pressure on land resources, leading to severe soil erosion and land degradation in various parts of the country.

To cope with the worsening environmental problems, a series of Soil and Water Conservation (SWC) programs have been launched in Ethiopia since the 1970s and 1980s. Despite conservation measures taken over the past decades, land degradation is continued to threaten crop production and land productivity potential, and negatively affecting livelihood systems, food security, and the country's economy. It was estimated that the land degradation cost to an annual agricultural GDP range from 2% to 6.75%. The loss of topsoil by water erosion in Ethiopia was ascribed at 1.5 billion tons per annul with a mean erosion rate of 42 t ha^{-1} y^{-1}.

However, the magnitude of soil erosion rates varies across the physiographical regions in the country. The Ethiopian highland, which covers about 44% of the country's total geographical area and sustains the livelihood of about 87% of the population, is the most eroded physiographical regions in the country. The estimated annual soil loss from the highland areas varies widely from 200 t ha^{-1} y^{-1} to as high as 300 t ha^{-1} y^{-1}. Intense rainfall, low vegetation cover, an Oriental rug topography, and anthropogenic factors are thought to be the most important factors contributing to a higher rate of soil erosion. Deforestation, agriculture land and urban expansion, cultivation in up slope areas, uncontrolled and overgrazing were the major anthropogenic drivers of soil erosion in the highland areas of the country (FAO, 2015).
A report from the Soil Conservation Research Program (SCRP) indicates that almost 50% of the Ethiopian highlands were seriously eroded, while 4% of the highland areas have reached a level of irreversible that they will no longer give economic productivity in the foreseen future. (Molla.T, Sisheber.B, 2017).

Even though Ethiopia (largest country in east Africa) is endowed with an enormous land resource potential, agricultural production is held back by land degradation (Adugna et al., 2015). As it is indicated in many research works, land degradation in Ethiopia has started with the history of the country's agriculture. It is highly affecting the livelihood of the rural people as well as the economy of the nation. (Adugna et al., 2015).

2.3 Chemical and physical properties of soil fertility

Soil is consisted of minerals, soil organic matter (SOM), water, and air and the composition and proportion of these components greatly influence soil physical properties, including texture, structure, bulk density (BD), and porosity. Chemical properties of soils such as pH, nutrients, soil carbon, soil salinity and in turn, control nutrient availability and transformations and can affect physical properties and thus plant growth. Soil BD is a basic soil property influenced by some soil physical and chemical properties such as SOM. It is the oven-dried weight of that sample divided by the bulk volume of the soil sample and is normally expressed in g cm-3. BD is a dynamic property that varies with the structural condition of the soil and can be altered by cultivation, trampling by animals, agricultural machinery, and raindrop impact (Sebhatleab. M, (2014), Rakesh . K., et al., (2012).

2.3.1 Chemical properties of soil fertility

In general, The chemical properties of soil like, total Nitrogen, availability of phosphorus, organic carbon and cation exchange capacity /CEC/ like Ca2+, Mg2+, Na+, K+, etc. are also important soil chemical parameters (Rakesh . K., et al., 2012).

2.3.2 Physical properties of soil fertility

Soil erosion the main cause brings changes in physical properties . These changes have negative effect on most of the soil ecological function. The contributing factors for soil erosion in most parts of the country are poor agriculture activities (including intensive tillage, complete removal of crop residues, low levels of fertilizer application), lack of appropriate soil conservation measures and cropping practice. In general, the soil texture, structure,pH, bulk density etc. are important soil physical parameters. (Abebayehu and Eyassu, 2011).

CHAPTER THREE

3 MATERIALS AND METHODS

3.1 Site Description

The study will be conduct in Ejere District, which have an area of 592.19 square km, is located in West Shewa Zone of Oromia National Regional State, from the capital located at50 km west of Addis Ababa. The district has a total of 30 kebeles of which 27 are rural based kebele administration areas and 3 are town kebele. Total human populations of the district is estimated at 89,168 of whom 45,352 are males and 43,816 females. Of the total households 88.36% are rural agricultural households. The altitude of the district varies from 2,060 meters to 3,185 meters above sea level. It receives an annual rainfall of 900-1,200 mm, and has an annual temperature range of 90c-180c. The district has two agro-ecologies which is Dega (45%) and WeinaDega (55%) (Fanos, 2012). The soils types in the district are predominantly red (58%), black (32%) and mixed (10%). The district is characterized by subsistence mixed farming system in which production of both crops and livestock is common economic activity. The total land of the district is estimated to be 56,918 ha, out of which 40,985 ha is cultivated land, 4,446 ha is grazing land, 4,456ha is forest and 7,031 ha is covered with others (EWAO, 2015).

(Figure 1)

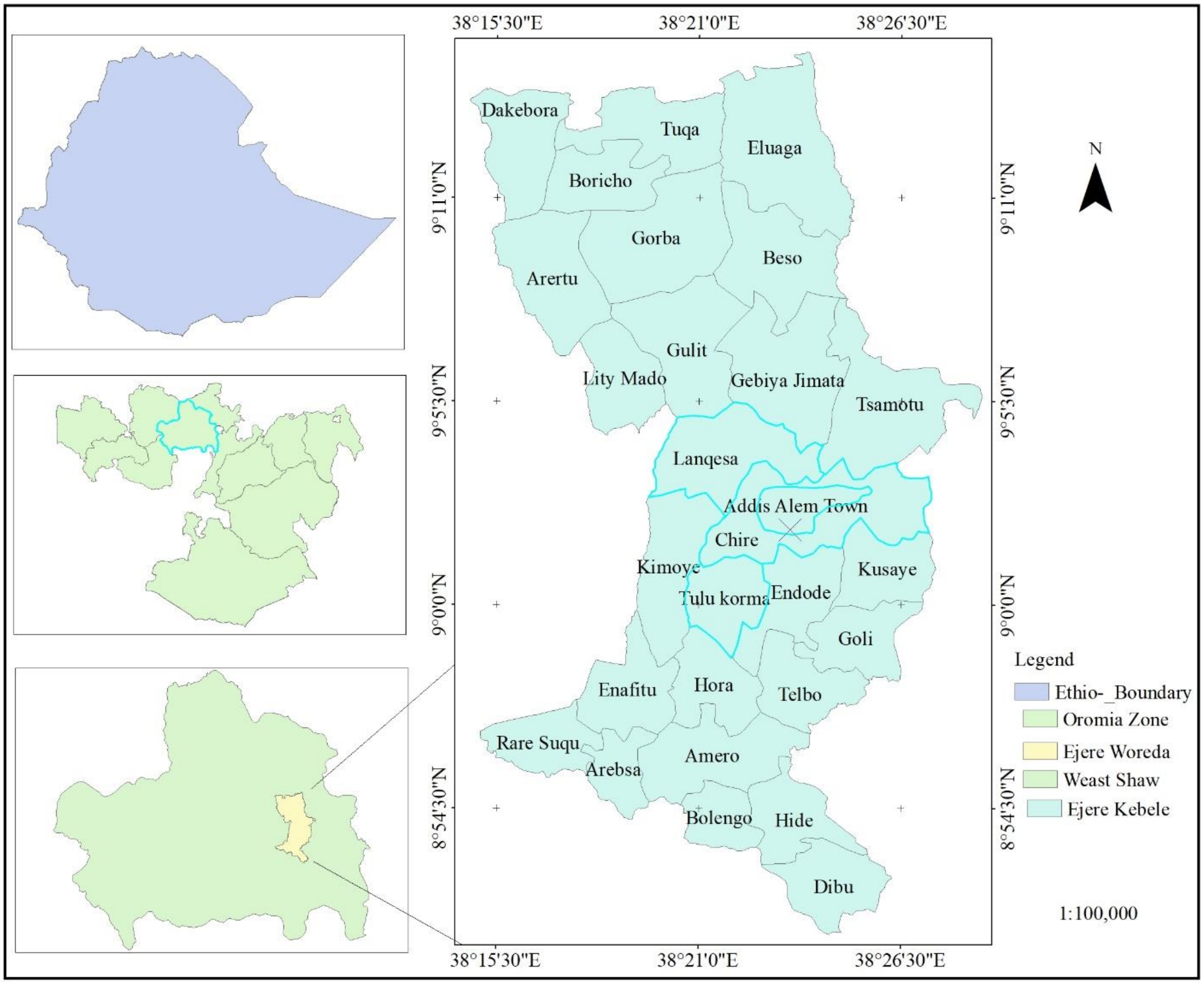

Figure 3.1, Land use and land cover map of Ejere district.

3.2 Sampling Design

For this study, from the district area three kebele namely Tullu korma, Lanqisa and Geba Jimatawill be purposively selected. because higher soil degradation due to Continuous cultivation, inappropriate use of fertlilizer and overgrazing with little protection measures exacerbated the level of soil degradation. and soil erosion problems are commonly observed in this area which has a deleterious impact on soil physical and chemical properties under different land use types.Representative soil sampling site will be selected based on vegetation cover and cultivation history. Following this, the representative sample area under different land use systems in the study area will be selected and Global Positioning System (GPS) and clinometers will be used to identify the geographical locations and slopes of the for cultivated, grazing, forest of study area.

Using Geographical Information System (GIS) and geographical coordinates for each sampling site, the sample area having the area of (20m2x 20m2) totally 400m2 by systematic sampling method will be separated. From the 600m2 sample area, the sample size of one plot will be done by soil depths (0-20 cm) and from four corners 4-soil sample, from the center 1soil sample using random sampling method one composite soil sample which is mixed firmly will be prepared. For one land use types 4 plot with the distance of 200mwill be prepared and 4 composite soil sample size will be collected. From one kebele under different land use systems 8 composite soil sample size will be collected.

According to the above mechanism from three kebeke (8x3) 24 total composite soil samples number will be collected. Then the soil sample packed in a plastic bowl, and About 1 kg of the composite soil will be properly labeled and transport to soil testing center for further analysis. Undisturbed soil samples will be taken by core sampler to measure the soil bulk density of soil physical properties, whereas the disturbed soil samples will be taken by using an auger to measure the chemical properties.

3.3 Data Collection Method

Representative sample area will be selected proportionally from each category with the help of Holeta agricultural research center, which have extensive experience and knowledge of the study. The analysis of physical properties like soil texture, Bulk density and the PH of soil result will be accepted from the sample. The chemical properties of soil like, total Nitrogen, availability of phosphorus, Organic carbon and cation exchange capacity /CEC/ like Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}, will be obtained from soil samples data analysis. The primary data will be obtained through structured questionnaires administered to respondents selected randomly from selected area. The questionnaire will be prepared, tested, and amended to fulfill the objectives of the study. It will be intended to gather information about the extent of cultivated, forest and grass land, type of soil conservation and fertility maintenance. Data will be also generated by observations and interviewing with kebele elders, farmers groups, and village scholars will be conducted using a checklist of topics to guide the whole data gathering.

3.4 **Soil Laboratorial Analysis**

3.4.1 Soil texture:

(**Bouyoucos hydrometer method**)

As with soil organic matter content, texture can be telling about the physicochemical properties of a soil. Water-holding capacity, aeration, ease of handling,tendency to crust, and cation exchange capacity (CEC) are properties determined in some degree by particle size distribution. Soil texture will be determined by the Bouyoucos hydrometer method after destroying organic matter and dispersing the soil by using sodium hexametaphosphate. The hydrometer method, using the Bouyoucos hydrometer calibratedin g/L, is the most frequently used method because of its ease of operation and adequate results.

In 2 hour and with two hydrometer readings,the percentage of sand, silt, and clay in a dispersed soil can be determined and the textural class of the soil identified (Steinhardt, 1979).

3.4.2 PH (Buffer pH method)

The negative logarithm to the base 10 of the reciprocal of the hydrogen (H+) ion concentration in solution on a scale of 1 to 14. PH -H2O

PH determination in water Soil water pH is an important test parameter, determined by placing a soil sample into a specified volume of water and measuring the pH of the resultant slurry. Normally, the ratio of soil to water is 1:1. If buffer pH is also to be determined, the sample size and the amount of water added will be determined by the buffer pH method to be used. The soil–water slurry is saved for the determination of the buffer pH if the soil–water pH is less than 6.0.

3.4.3 Bulk density:

The bulk density (BD) of the soil will be determined from undisturbed soil samples which will be collected using a core sampler after drying the core samples in an oven at 105 °C (Black, 1965). The total porosity of soil samples will be calculated from the values of bulk density (BD) and particle density (PD) (assuming an average particle density of mineral soil is 2.65 g cm-3). Then the total porosity (TP) will be calculatedas,

TP (%) = (1-Bulk density/Particle density) x(100).

3.4.4 Soil organic carbon:

(Walkley and Black (1934) method)

To determine organic carbon, the Walkley and Black (1934) method will be used in which the carbon will be oxidized under standard conditions with potassium dichromate ($K_2Cr_2O_7$) in sulfuric acid solution. Finally, the organic matter content of the soil will be calculated by multiplying the organic carbon percentage by 1.724 following the assumptions that OM will be composed of 58% carbon.

3.4.5 Total nitrogen

(Kjeldahl digestion, distillation and titration method)

the total nitrogen content in soils will be determined using the Kjeldahl digestion, distillation and titration method by oxidizing the OM in concentrated sulfuric acid solution (0.1N $H2SO4$) as described by Black (1965). Thenafter, C: Nwill be calculated by dividing organic carbon to total nitrogen. The available P will be calculated by the Olsen method using sodium bicarbonate (0.5MNaHCO3) as an extraction solution (Olsen et al., 1954).

3.4.6. Cation Exchange Capacity

(Ammonium Acetate Method)

The spectrometry will be the instrumental procedure for determining cation concentration in soil sample. Flame emission EDTA Titration (El Mahi et al.,1987) will be the instrumental procedure for the determination of K and Na by flame emission spectrophotometr.

. **whereas** Ca and Mg will be determined by atomic absorption spectrophotometry.

General Soil laboratory analysis putted in table 3.1 as follows

Table 3.1 Parameters and methods adopted for the laboratory analysis of Soil.

S.N.	Parameters	Units	Methods
1.	Soil texture		Hydrometer (Bouyoucos, 1962)
2.	Soil pH		Potentiometric 1:2.5 (Jackson, 1973)
3.	Bulk density		Core sampler at 105 °C (Black, 1965)
4.	Soil Organic carbon	%	Walkely and Black (W and B, 1934)
5.	Total N	%	Kjeldahl (Bremner and Mulvaney, 1982)
6.	vailability of phosphorus,	ppm	Bray P2 (Bray and Kurtz, 1945) method
7.	Exchangeable K & Na	ppm	Ammonium acetate (Jackson, 1973), (AAS), (EDTA Titration (El Mahi et al.,1987)
8.	Exchangeable Ca &Mg	ppm	Ammonium acetate (Jackson, 1973), (FES), (EDTA Titration (El Mahi et al.,1987

3.5 Soil Statistical Analysis

The general linear model (GLM) ANOVA procedure of statistical analysis system SAS will be used for performing the significance of differences in soil parameters. A post hoc separation of means will be done by least significant difference (LSD) test after main effects is fined significant at $P \leq 0.05$. The analysis will have been performed for each land use types (cultivated, grass and forest lands).

4 WORK PLAN AND BUDGET

Table 4.1 Work Plan

Major Activities	Implementation period 2021 -2022 GC									
	Oct	Nov	Dec	Jan	Feb	Apr	Mar	may	June	July

Title selection x
Literature search x x
Proposal Writing
and submission x x
Proposal Defense&
correcting comments x x
Collection sample
and satellite images x x
Data entering x
Data Organization,
rewriting& cleaning x x
Data processing, Analysis, &
interpretation of data x x
First draft report preparation &
submission to advisor x x
Correcting comments &
re submission x x
Internal defense x
Compiling comments x
External defense from External &
Internal examiner x x
Organization comments from

External &Internal examiner	x	x	
Final thesispaper submission			x

5 Budget break down/Logistics/

Table 5.1: Field Material Cost

No	Item description	Unit of Measurement	Quantity	Unit Cost	Total Cost	Remark
1	Gag	number	1	1500	1500	
2	sacks	number	1	30	30	
Subtotal (birr)		-	3	1530	1530	

Table 5.2: labor Cost and payment to:

No	Item description	Unit of Measurement	Quantity	Unit Cost	Total Cost	Remark
1	site selection & survey	Day	4	144O	1440	
2	costs for researcher	Day	2	1000	2000	
3	Cost for field Assistance	Day	2	1000	2000	
	Subtotal (birr)	-	18	5440	5440	

Table 5.3: Travel Expense and Premium Cost

No	Item description	Unit of Measurement	Quantity	Unit Cost	Total Cost	Remark
1	Premium for soil sample preparation	sample	24	400	1600	
2	Premium for lab. assistance	sample	24	500	12000	
3	Assistance for data entry And Analysis	sample	24	1000	6000	
Subtotal (birr)		-	3	1900	19600	

Table 5.4: stationery Cost and miscellaneous

No	Item description	Unit of Measurement	Quantity	Unit Cost	Total Cost	Remark
1	Printing and Photocopy paper	ream	1	400	400	
2	pen number		1	30	30	
3	Flash disck (16 GB)	Pcs	1	300	300	
4	Digital camera	number	1	3000	300	
Subtotal (birr)		-	4	3730	3730	
Total (Birr)					=300,300	

6. References

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