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DEPARTEMENT OF ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

ASSESMENT OF FARMERS PERCEPTION AND DRIVERS OF THE CHELELEKA WETLAND DEGRADATION IN ADEA WOREDA EAST SHOA ZONE OROMIA REGIONAL STATE.

THESIS SUBMITTED TO SCHOOL OF DEVELOPMENTAL STUDIES OF ADDIS ABABA UNIVERSITY FOR PARTIAL FULFILMENT OF REQUIREMENT OF DEGREE OF MASTERS OF ENVIRONMENT AND SUSTAINABLE DEVELOPMENT.

BY

AZENEGA SEIFU

DECEMBER 2021

ADDIS ABABA, ETHIOPIA

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DECEMBER 2021

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This is to certify that project prepared by Azenega Seifu entitled:-Assessment of farmers perception and drivers of wetland degradation in Adea woreda, East Shoa zone, Oromia regional in partial fulfilment of the requirement for awards of a masters in environment and sustainable development.

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List of Acronyms and Abbreviation

BCA	Bishoftu City Administration
CRGE	Climate Resilience Green Economy
DA	Developmental Agents
FAO	Food and Agriculture organization
GFOI	Global Forests Observation Initiative
GIS	Geographic Information System
GOs	Government Organizations
Ha	Hectare
IGBP	International Geosphere–Biosphere Program
IHDP	International Human Dimension Program.
LULCC	Land Use Land Cover Change.
LULC	Land Use Land Cover
NGOs	Non -Government Organizations
PASDEP	Plan for Accelerated and Sustained Development to End poverty.
Q-GIS	Quantum Geographic information system
SPSS	Statistical Package for Social Sciences
UN	United Nation

Abstract

Wetlands are one of the fundamental natural assets from which a country benefits a lot .They provide invaluable biodiversity resources, support in water quality improvement, support ground water recharge, moderate climate change, and flood control. Wetlands of Ethiopia are under continuous degradation due to human and natural factors. The study intended to assess the perception of farmers and drivers of Cheleleka wetland degradation in Adea woreda east Shoa zone Oromia region Ethiopia .The study employed data collected from 400houshold surveys of seven kebeles and 52 key informant interview, FGD and personal observation.

From the logistic regression the probabilities of the cause of wetland degradation for farmers those reported that farm land expansion is not the cause for wetland and water body degradation in cheleleka are exp(-44.245) less likely to the probabilities of the cause of wetland degradation for farmers those reported that farm land expansion is the cause for wetland and water body degradation in cheleleka wetland and Majority of household (96.3%) responded that population growth is the drivers for Cheleleka wetland degradation.

In conclusion majority of respondents (86%) confirmed that cheleleka wetland became shrinking during last two decades.

Key words;-*wetlands, households, cheleleka wetland*

CHAPTER ONE

INTRODUCTION

1.1 Background

Wetlands are the most dynamic ecological unit, helping as a habitat for a different variety of flora and fauna. They encompass both terrestrial ecosystems that are powerfully influenced by water and aquatic ecosystems with exceptional characteristics due to shallowness and closeness to terrestrial. Wetlands are sponges they stock surface water, and gradually release surface water, rain, underground water. Wetlands maintain stream flows (Abraham, 2015) Wetlands are complex ecological unit that serve a variety of ecological, biological, and hydrologic purposes (Heimlich et al.1998). Wetlands provide habitat for aquatic birds, other animals, and plants, as well as fish production, biodiversity, food production, water storage (including flood and drought mitigation), groundwater recharging, and water purification nutrient cycling, sediment retention and export, recreation and tourism, climate change mitigation, education and investigation, aesthetic and cultural value (Mitsch, 2010).

For a long time, a wetland was thought to be a small piece of land enclosed by water with little economic value. By ignoring the significance of wetlands in the whole ecosystem, people assumed it was simply a refuge for hydrophytes and insects (Shi, 2013).In Ethiopia, wetlands account for around 2% of the country's total land area. Wetland assets in Ethiopia could be considered an important part of the country's environment, providing a variety of social, economic, and ecological benefits. However, it is a common incident that many of these resources are exposed to exploitation and signs of wetland degradation have become widespread across the country (Tadesse,& Degefu, 2015).

Society does not have a comprehensive understanding of the level of the problem, because information about the wetlands degradation remains so limited. This calls for a systematic framework for the assessment of wetland spatial and temporal changes. Wetland was indiscriminately and knowingly destroyed with a short-sighted vision for immediate profits due to lack of understanding. Inadequate information is a common problem in less developed countries, creating difficulties in evaluating existing and evolving environmental conditions, and

eventually contributing to a lack of decision-making or uninformed decision-making (Abunje et.al, 2003). This absence of information is critical since wetlands play a dynamic role in many people's livelihoods in developing countries through a variety of ecological services (Finlayson et al., 2005, Dixon, 2008).

Wetlands require special attention, so that they are conserved, wisely used, restored and their advantages are appreciated by all (Denyer & Robertson, 2016).Wetlands have the potential to play a vital socioeconomic and ecological role in the survival of humans, plants, and animals (Ramsar Convention, 2006). Wetlands have all inclusive and spatial size since the inundated area changes on a regular basis, and often seasonally (Hess et al., 2015).Assessment about perception of farmers and drivers of wetland degradation is crucial because most wetlands are currently in poor condition as a result of ineffective land management, urban growth, poverty, and a lack of awareness (Hailu, Mammo, & Kidane, M., 2020).

1.2 Statement of the Problem

Wetlands are change over time due to subsidence, drought, erosion, and siltation. Natural change is common and anticipated, but the essential functions, values and qualities of wetlands are greatly affected by direct and indirect anthropogenic activities. Degradation of wetlands may lose the ability to perform its valuables and functions. Loss of even small wetlands would have great environmental impacts and it is serious that the few remaining wetland assets of Ethiopia were threatened and preserved (Tekaligne, 2003).

The effect of environmental changes on wetland habitats (from both natural and human causes) is poorly understood and even decision makers have inadequate understanding of the true values of wetlands and the effects of alternative management and policy regimes on wetland functioning, ecosystem services and human well-being (Barbier, 1994; Schuyt, 2002; 2005). Similarly, Empirical knowledge about wetland degradation and its impact on the whole ecosystem were important and influence people’s decisions on the wise use of wetland resources. Therefore however these studies used for academic purpose it is also explain the root cause of wetland degradation in the study area to fill gap and indicate wise use of wetland.

In Ethiopia, natural resources are the basis of the livelihoods of local communities. People usually use various services of these natural resources and also change their nature through, e.g.,

expansion of agriculture, urban settlement and overgrazing. Wetlands are important ecological unit that supports various components of natural resources.

According to Cowardin et al., (1979), wetlands are valuable land resources that realize various natural, social and economic functions. They also provide a variety of ecological unit and its services. They regulate water and nutrient flows and provide important habitats for wildlife. Wetlands are important habitats because the heterogeneity in hydrology and soil conditions which they support results in broad variety of ecological niches, and they usually support enormous biodiversity (Zedler, 2000). They are, however, prone to changes due to population growth whereby their size and pristine nature change through time. As indicated in the background section of this paper, wetlands are a source of livelihood for many citizens in Ethiopia as elsewhere in different parts of the world. However, unregulated and unwise resource use from the wetland ecosystem, lack of appropriate policies and institutional setup that controls and regulates proper utilization and management of the resource, among other problems, has resulted in a serious degradation of wetlands and wetland resources, and eventually led to their disappearance in Ethiopia (Afwork,2006).

Wetlands in Ethiopia are currently being lost or changed by over exploitation and unregulated management (Abunie, 1990), as it is in Bishoftu town, Cheleleka wetland is also one of the misused wetlands (BCA). At present, excessive vegetable and crop farming practices around wetland and the resulting use of inorganic fertilizers, insecticides, herbicides, as well as uncontrolled household, industrial, poultry and dairy farms by-products disposals are the main challenges of the wellbeing of this wetland (BCA report). Thus, unless the concerned stakeholders come together and try to rescue it, this great natural treasure was under serious treat and extinct soon.

Although, several sectors tries to have been done regarding wetland management, restoration, conservation, and natural resource managements at national level. But farmer's perception and drivers of cheleleka wetland degradation was not conducted. Therefore, in this study perception of farmers and drivers of cheleleka wetland degradation was assessed and analyzes to fulfil the gap.

1.3 Objectives of the research

1.3.1. General objectives

The main objective of this study is to assess farmers' perception and the drivers on Cheleleka wetland degradation.

1.3.2. Specific objectives:-

The specific objectives of this thesis were to:-

- Assess farmers perception toward cheleleka wetland degradation.
- Identify cause of chelelaka wetland degradation.
- Analyse the land use land cover change of wetland cheleleka.

1.4. Research questions.

- Do farmers surrounding cheleleka wetland understand the value of wetlands?
- What are the causes for Cheleleka wetland degrdation?
- Is there land use land cover change for the last two decades in the research area?

1.5 Significance of the research

Several dramatic changes are currently taking place in Ethiopia, such as agricultural expansion, rapid urbanization, and establishment of industry near the wetland to reduce the feature of the environment, human health as well.

Basically, the research study is undertaken for academic purpose. Despite its limited area coverage, the result of the findings believed to add some insight related to perception of farmers and wetland degradation, and its implications at national /country/ level in general and in research area in particular. Climate resilience green economy (CRGE) has been one of the priority agendas of the Ethiopian government. Hence, the finding of the research can contribute to create awareness on wise use of wetland. The study would also benefit policy makers, NGO and other researchers and organizations who may intend to conduct further study on related issues are believed to the main importance of this research.

1.6 Limitation of the research

The researcher were encountered some of problems during data collection period. They were Lack of the necessary data on the history of the Cheleleka wetland, lack of willingness of respondents to provide actual information, respondent's awareness about wetland degradation, clarity of images while detecting the wetland area of Cheleleka could be some of the possible problem**.**

1.7 Scope of the research

The study was conducted on Cheleleka wetland located near Bishoftu town, in East Shewa Zone of Oromia Regional State. The targeted respondents of the study are farmers who are currently living around the wetland and earning a living from it, and the concerned government officials. Moreover, the study tries to assess the perception of farmers and drivers of cheleleka wetland degradation.

Thus, the scope of the study limited to assess the perception of targeted local farmers and responsible government office such as, woreda agricultural, environmental, water and irrigation office experts and(DAs) developmental agents which are closely work with local farmers are included in the sample in order to make the study controllable; however, other impacts such as political and technological impacts were not be considered because of implausibility of accomplishing many issues within the given time.

1.8 Organization of the research

This thesis consists of five chapters. The first chapter is aimed at introducing the background, information of the study that consists introduction, objectives (general and specific), and research questions, significance of the study, limitation and scope of the study. The second chapter reviews related literature, other countries experiences. The third chapter describes the methodology ,study area (i.e., location and climate), explain the research design, population sampling procedure, data collection tools and techniques, the ethical consideration, the fourth chapter is about result and discussion and the fifth chapter is about conclusion and recommendation.

CHAPTER TWO

LITERATURE REVIEW

2.1. Land use land cover change

Since 1995, when the International Geosphere–Biosphere Program (IGBP) and the International Human Dimensions Program on Global Environmental Change (IHDP) proposed a scientific study program on land use and land cover change (LUCC), Turner et al.1995).change in Land use land cover are know one of the most significant indicators in understanding the interfaces between human activities and the environment (Dewan et al. 2012). As a vital land cover type, wetlands cover 6% of the Earth's surface and play a central role in regulating climate change and avoiding or reducing the flood severity (Mitsch and Gosselink 2007). Wetland ecosystem is not only an ordinary ecological landscape with rich biological diversity but also an environment for human being's existence and development. However, the value and amount of wetlands in developing countries is gradually affected by human activities in the modern periods due to human population growth and economic development (Zedler and Kercher 2005).Within this context the key challenges of wetlands are how to conserve and protect the wetland from degradation and more about how to ensure the ecosystem service and livelihood benefits can be sustained for the future in the face of shock and pressure.

The outdated analysis methods can no longer capture the change trends at the regional scale. However; application of remotely sensed images offers a remedy to monitor wetland landscape changes due to their wide variety of observation and convenience within short time steps (Liu, Zhang, Zhang, et al., (2014).

2.2 Wetlands

Wetlands are terrestrial and aquatic intermediate lands where the water table is frequently at or above the surface, or where the ground is submerged by shallow water (Cowardin & Golet, 1995).Wetlands, according to Banner (2000), are regions where the water table is at, near, or just above the surface, and where the soil has been water-saturated for a long enough period of time that excess water and low soil oxygen levels are a primary determinant of vegetation and soil growth.

Under the Ramsar International Wetland Conservation Agreement, wetlands are defined as an area of marsh, fen, peat-land or water, whether natural or artificial, permanent or temporary, with water that is stagnant or flowing, fresh, brackish or salty, including areas of marine water, the depth of which at low tide does not exceed six meters (Finlayson and Davidson, Report of the MEA).

Wetlands, as areas where land and water meet, deliver unique and specialized habitat for a wide variety of organisms that cannot exist anywhere else. If wetlands small and large cannot survive in reasonable abundance across the landscape, their dependent species was decrease in quantity and finally disappear. Wetlands' survival helps in the preservation of ecological processes and functions that ensure and protect the quality of the environment in which humans and other organisms must coexist (Hawkins, 2016).

2.2.1. Functions of wetland/wetland Value

Wetlands are crucial for human survival because they are the most productive environments on the planet; they are maintenance of natural diversity that deliver the water and productivity on which numerous kinds of plants and animals depend on for existence. Wetlands can be described as “biological supermarkets “that yield abundant quantities of food that provide for many animal species. Many wetlands are perfect for the development of organisms that form the base of the food web, such as different species of insects, mollusks, and crustaceans, due to the combination of shallow water, high levels of inorganic nutrients, and high rates of primary productivity (the synthesis of new plant biomass through photosynthesis).Some animals consume the above-ground live vegetation (herbivore-carnivore food web); others consume the dead plant leaves and stems, which breakdown in the water to form small, nutrient-enriched particles of organic material called wastes(Mitsch and Gosselink 1993).

Wetlands have been also described as "kidneys of the landscape" because of the functions they perform in hydrological and chemical cycles (Mitsch and Gosselink, 1993). Wetlands are essential for the abundant benefits, or ecosystem service that they provide humanity, ranging from fresh water, food, building materials and biodiversity, to flood control, groundwater recharge, and climate change mitigation .Wetlands directly or indirectly support millions of people in providing services such as rainstorm and flood control, clean water supply, food, fiber

and raw materials, scenic beauty, educational and recreational benefits (Mitsch & Gosselink, 1993).Wetlands play an important function in ecosystems because they prevent flooding by absorbing water like a sponge (Abraham, 2015).The main importance's and functions of wetlands are given below;

1. Hydrological function*:* wetlands deliver a number of significant roles in regulating water flow through hydrological system. They slow the speed of water moving through system and act as natural reservoirs, storing large quantity of water. This controls the downstream flow; maintain it during the dry season and controlling flooding during the wet season. Large wetlands also can have an influence on precipitation, humidity, and stabilization of local microclimate through high potential evapotranspiration rates of dense wetland vegetation (Fisseha , 2003).

1.1 Water balance: is a hydrologic function of wetlands and playing a critical role in regulating the movement of water with in watersheds as well as in in the global water cycle (Mitsch and Gosse link, 1993).

1.2 Climate control: climate control is additional hydrologic role of wetlands. Many wetlands return over two-thirds of their yearly water contributions to the atmosphere through evapotranspiration (Richardson and Mc carthy, 1994). Brinson (1993) perceived that wetlands might also act to moderate temperature extremes in adjacent uplands.

2. Water supply: wetlands performances as reservoirs for the watershed and they discharge the water they retain from precipitation, surface water and ground water.
3. Flood protection*:* wetlands protect nearby and downstream properties from potential flood damage.

4. ***Erosion control*****:** wetland plants hold the soils in place with their roots absorb wave energy and decrease the speed of watercourse or river flows. Coastal wetlands buffer shore lines against the wave action produced by hurricanes and tropical storm (Mitsch and Gosse link, 1993).

5. Regulation function**:** refers to the central role of wetlands play in regulating ecological and biophysical processes. Several regulating services that wetlands provide are related to their capacity to purify water, retain flood waters and provide a buffer to terrestrial parts at risk of flooding or pollution.

***5.1 Ground water recharge*:** wetlands may have significant influence on the recharge or discharge of ground water. Ground water recharge refers to the movement of surface water down through soil in to zone in which penetrable rocks and overlying soil are saturate.

***5.2 Ground water discharge*:** ground water discharge in contrast, refers to the movement of ground water out in to the soil surface. Although poorly understood, it appears that most wetlands are ground water or through flow areas.

***6. Carrier functions*:** wetlands provide services to human beings like, agriculture, irrigation, stock farming (grazing), wildlife cropping/resources, transport, energy production, tourism and recreation and human habitation and settlement.

***7. Production function*:** wetlands give production functions for human beings such as, water, food, fuel wood, and raw materials for buildings.

8. Research and recreational function: wetlands give information functions like, research, education, recreational function and role in cultural heritage.

2.2.2 Overview of Ethiopian wetlands Classification

Wetlands were defined by the Ramsar Convention into five major wetland systems, while others categorized in seven main groups (Dugan 1990; Roggeri 1995). Moreover, others are divided into more than 30 sub-divisions and nine man-made ones defined by physical, chemical or biological characteristics. The main Ramsar categorization are Marine (coastal wetlands), Estuarine (deltas, tidal marshes and mangroves), Lacustrine (lakes and associated wetlands), Riverine (rivers, streams and associated wetlands) and palusterine (marshes, swamps and bogs).Therefore, different studies tries have been made to categorize the Ethiopian wetlands using several criteria. For example, only two kinds of wetlands are recognized by the FAO land use map of 1984, Swamps & Marshes but all types of wetlands are available in Ethiopia, except for coastal and marine related wetlands and extensive swamp-forest complexes (IUCN 1996; Tilahun et al. 1996; Leykun 2003).

Ethiopian wetlands are also divided by biomes, such as the Afro-tropical Highlands, Somali-Masai, Sudan-Guinea, and Sahelian Transition Zone (Tilahun et al. 1996; Leykun 2003)

2.2.3. Wetland policy and legal frame of Ethiopia

Ethiopia's wetlands are the most diverse habitats, considering their low area coverage, and have remarkable environmental, social and economic benefits. The significance of wetlands goes beyond the status of many threatened plant and animal species as habitats, but they are an important element of national and global ecosystems.

Wetlands are exceptional habitats for native birds and are provided with many natural attractions that offer remarkable tourism growth potential in Ethiopia (Amsalu, and Addisu, 2014) .Wetlands are relevant and dynamic, but the wetland issues are addressed in Ethiopia's Environmental Policy (1997) in integrated across different sectors to indicate wetland restoration, protection, conservation, and management such as under water, Environment and biodiversity sectors. These policies documents, however, indirectly address wetland-related concerns, while wetland protection and management is not clearly expressed as an independent environmental policy.

Wetlands touching ideas are combined in different policies and strategies, for instance wetland in water, agriculture and environmental sector have been try to address wetland-related issues, but absence of a separate wetland policy and combined with weak policy implementation, may bring pressure on the wetlands. However; the government has stated its commitment to environmental conservation in various policy documents, starting from the Constitution and the Environment Policy, different competing national priorities, such as agricultural intensification to increase food production, relocation of landless people and investment activities near wetland areas, are increase or speeds up degradation of wetlands in different areas (Abebe and Geheb 2003).

2.2.4. Challenges of Ethiopian wetlands

Ethiopia is known as Africa's water tower because of its diverse landforms and climatic circumstances, which have resulted enormous wetland system. The values of the wetland environment vary from tangible uses of subsistence and intangible products and services to meet human needs, however the wetlands are the most productive ecological unit on the earth; they are also the most threatened, this indicates that there is very little understanding of wetlands and their significance (Barbier et al.1997).

2.2.5. Agricultural practices and its debate

In Ethiopia, there is a difference of opinion about the consequences on the one hand, the interest of the government and farmers on the other. The state and farmers needs convert wetlands for increasing production productivity while Environmentalist gives priority for our environment and sustainable development. Southwest Ethiopia's high lands (Illubabur) and Awash Valley swamps are clear examples of where government and farmers are more interested in more productivity than sustainable use of resources (Dixon 2002; Dixon and Wood 2007).

2.2.6 Urbanizations and Industrialization

Wetlands are not only source of water, but also provide environmental, economic and social services (Dugan 1993). Accordingly, considerable numbers of wetlands are nearby rural towns and cities, where commercial activities are expanding in many sectors. The growing sectors sources are having a negative impact on wetlands surrounding cities (e.g. hotels, health centers, households and factories). For example, the volume and mix of solid and liquid waste generated by various sources is growing. The majority of trash generated in underdeveloped countries are organic more severe, although toxic inorganic and pathogenic wastes are not absent (Lardinois and Klundert 1993).Organic waste stocking in such systems disturb diverse ecological units and its elements, including organic assets (Cunningham and Saigo 1995; Miller 1995).

2.2.7. International convention on wetland

On February 3rd 1971, in Iranian town the representatives of 18 nations sign an agreement of a notable treaty. The Ramsar Convention was the first of the modern mechanisms try to find to conserve natural resources on a global scale. It is still the only world-wide agreement which confines the countries joining it from the unthinking, selfish exploitation of their sovereign and natural property. It was concerned with about most vulnerable habitats (Halls, 1997).

For centuries mankind had seen wetlands as spaces to drain and convert to more observable uses, such as farming, but the process had gone so far in the advanced countries that the degradation of wetlands was leading to adverse consequences to the degradation groundwater assets and, the consequent need for irrigation, to flash floods, to shoreline destruction, to the accumulation of pollutants and to other indirect disturbances. Many useful plants and animals

dependent on wetlands were disappearing with them, degradation was speed up as extremely efficient machinery and techniques for draining wetlands were invented (Halls, 1997).

It was important for developed countries to help avoid making the same mistakes and to treat their resources wisely. International intervention would be necessary for many reasons. Many wetlands have national borders or have obtained their water source from neighboring countries. In the atmosphere, the circulation of water was truly international. Fish hatched in one country's wetlands could be caught in another's wetlands, or seas, as adults. Water birds, migrating twice a year for thousands of kilometers, often ignored boundaries and required wetlands in many countries where they could rest, eat and breed (Ramsar, 1993).

2.3 Empirical literature review

2.3.1. Global outlook of wetland.

Wetlands provide us with water, they safeguard us from floods, droughts and other catastrophes, and they deliver food and livelihoods to lots of people and provide rich biodiversity. Up to 87% of the global wetland reserve has been lost since 1700. We lose wetlands three times faster than natural forests (Davidson, 2014).

Wetland-dependent species are in serious decline. Since 1970, 81percent of inland wetland species populations have declined, whereas 36percent of coastal and marine species have declined (Stewart, and Harman, 2020). Healthy, functioning wetlands are important to delivering a range of global targets, including the UN Sustainable Development Goals, the Aichi biodiversity targets, the Paris Agreement on Climate Change and Land Degradation Neutrality (Gardner, and Finlayson, 2018).

2.3.2 Global experience of wetland

Among developed countries like U.S.A and Canada both are member of Ramsar convention that signed and ratified laws and regulation related to wetland conservation (North America wetland conservation act P.L. 101-233 December 13, 1989), migratory bird act, of February 18, 1929 and fresh water act preserve the purity and integrity of freshwater wetlands from random, unnecessary or undesirable alteration or disturbance.

China is also a member of the Ramsar Convention and have wetlands of international, regional, national importance, it's have 27 wetlands of international importance, 43 natural wetland nature reserves and 86 national wetland parks. (Xu, T.et al., 2019).

In Africa Kenya and Uganda are members of the Ramsar Convention that have a duty to take legal action and political commitments to protect their wetlands. Kenya has laws and policies that aim to tackle wetland management and wise use. These include the Act on the conservation and coordination of the environment, the Water Act and the Wildlife Act (Conservation and Management).

Government of Uganda has recently been initiated a program for the protection of wetland resources this is the first of its kind in Africa to be formulated in accordance with the Ramsar Convention's guidelines. It covers wetlands in protected and non-protected areas and provides a clear political commitment to preserve wetlands and their biodiversity as the best example in Africa. Therefore, inventories and monitoring systems that help protect wetlands from the adverse effects of natural and anthropogenic influences are available for countries with good legislative and environmental acts.

2.4 Conceptual frame work

In regions where agricultural expansion remains to be a great danger to wetlands, the development, assessment and diffusion of technologies that could increase the production of food per unit area sustainably, without harmful trade-offs related to excessive consumption of water or use of nutrients or pesticides, would expressively pressure on wetlands" (Millennium Ecosystem Assessment 2005b, p. 66).

Reasonable knowledge of their status and role is required in order to manage wetlands effectively and to make informed and sound decisions that improve the livelihoods of wetland-dependent local people while safeguarding wetland functions, values and attributes including biodiversity. According to (Mengistu 2008), Wetland information database, which is currently not-existent in Ethiopia, provides a critical basis for realising objectives related to wetland protection and wise use, Ethiopia lacks not only appropriate information, but also awareness and understanding of wetlands at all levels.

It is important to empower ages of cumulative information structures regarding wetland perceptions and management from those who use them. (Tilahun et al. 1996; Leykun 2003; Mengistu 2008).

Recently in cheleleka wetland due to developmental activities, such as, agricultural activities, and other related issues the wetland become in threaten, these wetland is the home/breed/hatched place for 106 species of migratory birds some of these birds are seasonally migrate from Europe and other countries(BCA socio economic report,2020). However; the main driving forces for wetland degradation is population growth, others may exacerbate the rate of wetland degradation such as, agricultural activities, irrigation and over exploitation water, unwise use agricultural inputs like pesticide, herbicide ,inorganic fertilizer , low enforcement lack of awareness about wetland functions are major gap for degradation of wetland.

Conceptual frame work

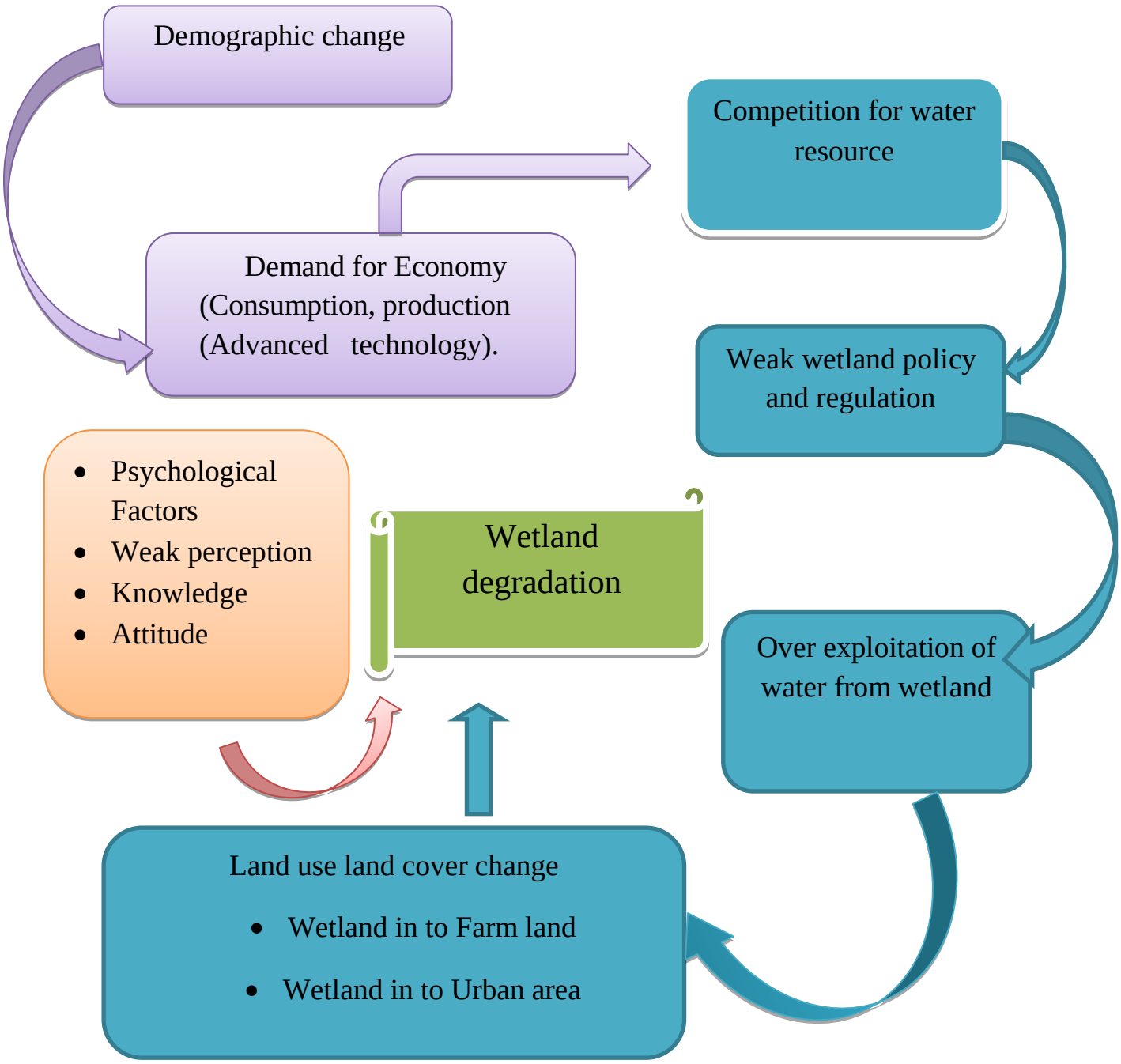


Figure 1. Conceptual frame work wetland degradation.

CHAPTER THREE

METHODOLOGY

3.1. Description of the study area

Bishoftu town is one of the so-called rail way towns of Ethiopia established along the construction of Ethio-Djibouti railway in 1917. The town is located 47 km South East of Addis Ababa in East Shewa zone of Oromia Regional State. It is among the fast growing industrial towns in the country. Bishoftu is a city of numerous lakes and Cheleleka wetland is the natural gifts of the town. The town and the Cheleleka wetland are situated in the series of Great Rift Valley at an altitude of 1680m.a.s.l.

Geographically, the Cheleleka wetland is found in Adea district and surrounded by both Kebeles from Bishoftu town (kebele 01, 05, 09) and the nearby farmers associations (Gendegorba, Side, Kurkura and Dembi). According to Wikipedia free encyclopaedia, 2018, the it is situated at a latitude and longitude of 8°45 ′ N and 38°59 ′ E/8.75°N and 38.983°E, respectively.

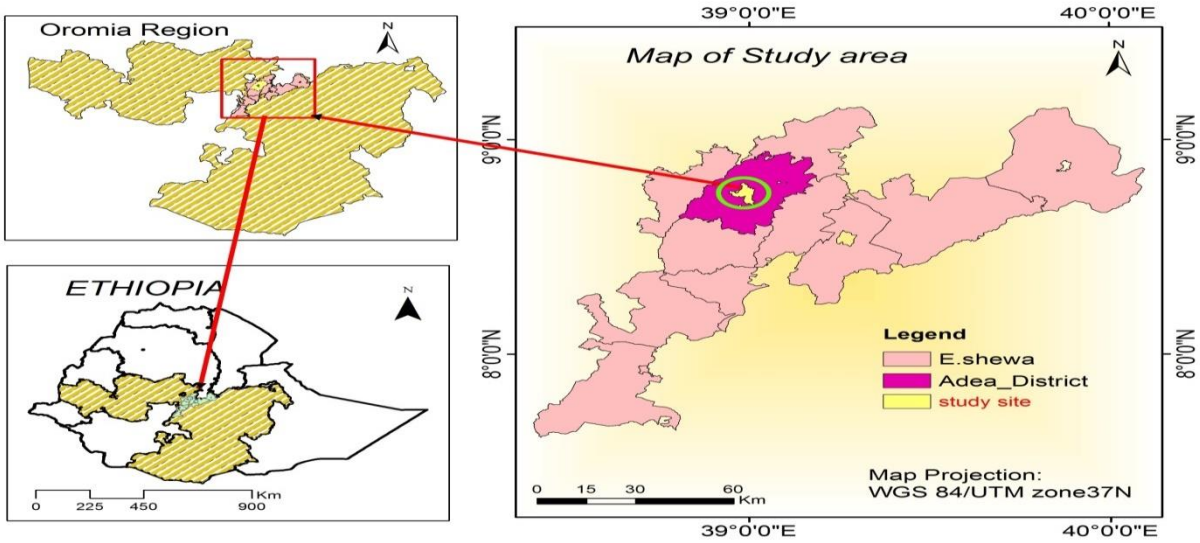


Figure 2. Geographical Location of cheleleka Wetland

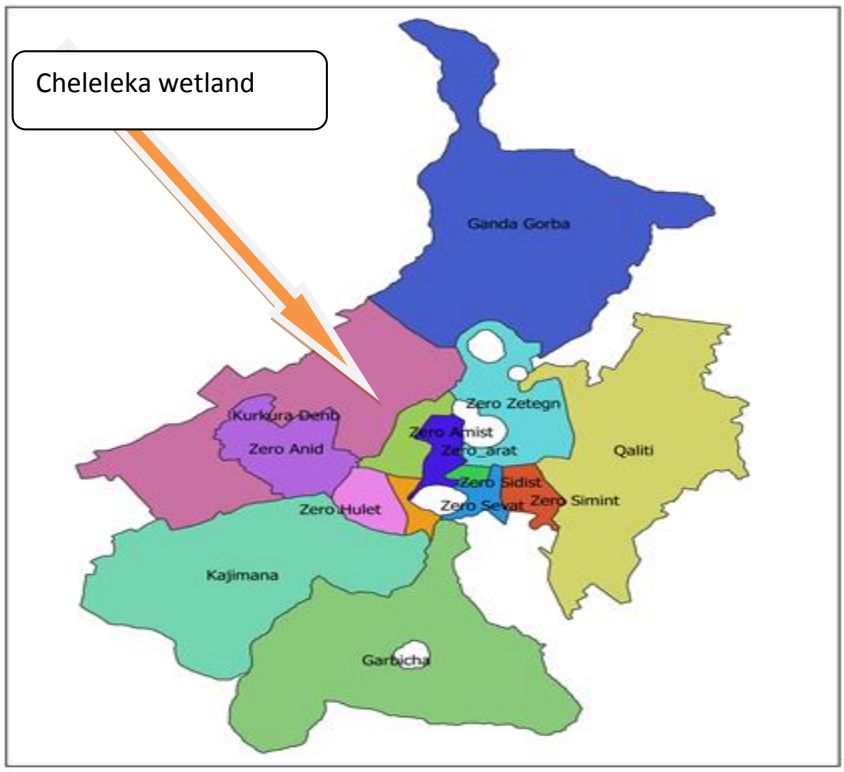


Figure 3. Location of cheleleka Wetland and surrounding kebeles.

3.1.1 Climate

The altitude of the city ranges from 1900-1995m above sea level. Thus, it belongs to Woina Dega (Moderate Zone). According to the 2014 data from the Bishoftu Agricultural Research institute, April is the hottest month of the year (31.1^0C), while December is the coldest month (5.3^0C) in the city. November is the driest months while August is the rainy month (209.9 mm) of the year in the city.

3.1.2 Means of living /livelihood source of income/

Both rural and urban dweller's lives in the area ,for rural house holds the main livelihood source of income is agriculture ,in the area teff (adea Teff) is widely produced and the source of income for rural households, in addition to these vegetable like tomato, and different cabbages produced using irrigation during dry season for additional source of income.

3.1.3 Total population of the area

Demographic data and Population growth rate of Bishoftu town projection

Table 1 demographic data

Year	male	Female	Total
2007	47,860	52,068	99,928
2014	66,496	73,543	140,039
2015	69,803	77,261	147,064
2016	72,995	80,852	153,847
2017	76,529	84,825	161,354
2018	80,576	89,338	169,915
2019	84,766	94,042	178,888
2020	89,127	98,904	188,032

(Source: Central Statically Agency (CSA)

As shown from table (1) population growth rate of Bishoftu town projection indicated that there is increasing in an alarming rate

3.1.4. Farming system in the area.

In the area are two types of farming system,the first one is a subsistence farming that the local farmers practices farming activities to produce adea teff(the major cereal crop in the area) for their consumption and the second one is produce tomato and different types of cabbages and others using small irrigation for local market to increase their own income.

3.1.5 Rain fall patterns of area

Ethiopia has a tropical climate that is strongly a function of altitude .The mean annual rain fall study area is less than 200mm based on rainfall distribution Adea woreda has two major seasons Kiremt(June-September)the main rainy season and Bega(October-may)the longest dry season. Crop production, mainly rainfed cereal-based production systems and modest livestock rearing are the mainstays of livelihoods for households in the CRV. The major crops are cereals, mainly teff (Eragrostis tef), maize (Zea mays) and wheat (Triticum aestivum).

3.2 Approach of the study

In this study, both quantitative and qualitative approach was being employed as it is more appropriate to describe of the farmers perceptions and cause of cheleleka wetland degradation.

Both quantitative and qualitative approaches were being followed. Burns and Grove (1993:777) define quantitative research as a formal, objective, systematic process to describe and test the relations and study cause and effects interactions between variables. Surveys may be used for descriptive, explanatory and exploratory research. A descriptive survey design could be used. A survey is used to collect original data for describing people too large to observe directly (Mouton 1996:232). A survey obtains evidence from a sample of people by means of self-report, that is, the people respond to a series of questions posed by the researcher (Polit & Hungler 1993:148). In this study the information were being collected through self-administered questionnaires distributed personally by the researcher. A descriptive survey was carefully chosen because it provides an accurate interpretation or account of the characteristics, for example perception, behaviour, opinions, abilities, beliefs, and knowledge of a particular individual, situation or group. procedures in quantitative research in which researcher manage a survey to a sample from whole population to define the attitudes, opinions, behaviours, or features of the population. In this process, survey researchers collect quantitative, numbered data using questionnaires (e.g., mailed questionnaires) or interviews (e.g., one-on-one interviews) and statistically analyse the data to describe trends about responses to questions and to test research questions or hypotheses. It is also interpret the meaning of the numbers by linking outcomes of the statistical test back to past research studies.

Therefore, both qualitative and quantitative research approaches were being used to collect, analyse and interpret the collected data.

3.3. Sampling and Sample size.

Total Population targeted are farmers adjacent practice agricultural activities near cheleleka wetlands are, Gendgorba, Bishoftu (01,05,&09) ,Side ,Kurkura and Dembi and total households(farmers) are **2250** hhs and the sample size are 400hhs in addition to these 52 KII and FGD from developmental agents(DA) those helps the farmers in agricultural activities and woreda Environment ,water and agriculture sector experts.

Sample size of respondents

Table 2: Sample size of respondents

Living area of respondents	Population size		Sample size hhs
Dembi	185	185/2250x400	33
Genda Gorba	292	292/2250x400	52
Side	169	169/2250x400	30
Kurkura	394	394/2250x400	70
Bishoftu 01	421	421/2250x400	75
Bishoftu 05	338	338/2250x400	60
Bishoftu 09	450	459/2250x400	80
Total	2,250		400

KII and FGD respondents

Table 3 -KII and FGD respondents

Sector	Sample size	Remark
Agriculture Sector	24	14 DAs from each kebeles ,10 woreda Agri sector expert, and 1 director
Water Sector	16	1 woreda water sector representative,15 Water and Irrigation sector Expert
Environment Sector	12	1director and 11 environmental experts.
Total	52	

Source: Compiled from survey data August, 2021

The Population is the group of individuals having the same characteristic that distinguishes them from other groups. Purposive sampling (also known as judgment, selective or subjective sampling) is a sampling technique in which researcher relies on his or her own judgment when choosing members of population to participate in the study.,then the target population or sampling frame is the definite list of sampling units from which the sample is selected finally researcher generalizes as the population. Therefore the sample size of this study were being determined or calculated using the following formulas of sample size determination which was adopted. The sample sizes were being estimated using equation 1 following Taro Yamane (1969) sample size determination formulas.

$[n = N/(1+N(e)^2$ ……1.

Where 1]

n- Is the required Sample size from the population under study?

N-is the whole population under study

e- is the precision or sampling error which is 0.05

Similarly, the marginal error (e) of this study was 5%, which is equal to 0.05.

N=2550

e=0.05 therefore 2250/ (1+2250(0.05)2= 399.8 respondents

2250/400=5.627therefore 1, then 6^{th}, 12, 18 ……..respondents sequences.

3.4 Methods of Data Collection

Data were being generated from both primary and secondary sources to realize the objective of the study.

3.4.1 Primary Sources of Data

The primary data should being collected through various data collection methods such as field observation, surveys, focus group discussion and key informant's interviews.

3.4.2. Field Observation

Observation of the study wetland area was carried out before and during the study period. Information regarding the cause of wetland degradation was obtained from personnel observation and by talking informally with peoples in their site.

3.4.3 House Holds Survey

To generate quantitative and qualitative information about perception of farmers on wetland degradation survey were undertaken by developing structured questionnaires. The developed structured questionnaire was clear for the convenience of data collection during the survey.

3.4.4 Focus Group Discussion

In the study area, there was being a total of only one focus group discussions were being undertaken due to COVID 19 pandemic. Focus groups make available insights into how people think and provide a deeper thoughtful of the phenomena being studied. These focus group discussion were conducted with farmers near the wetland Cheleleka ,woreda developmental agent ,woreda environment , water, agriculture sector experts respectively.

3.4.5 Sources of secondary data

Secondary source of information were reviewed to supplement the primary sources of information. Some documents available at Bishoftu district agricultural office, water and irrigation office, environment office were reviewed and used to generate secondary source of information. Moreover, books, journal, articles, different GOs and NGOs documents and publications, and academic research papers were being reviewed to understand perception and situation of Cheleleka wetland.

3.5 Methods of data analysis

Data for this study was generated through qualitative and quantitative method. Hence, qualitative and quantitative techniques were used to analyze data. Information that generated from key informant interview, focus group discussion and personal observation could be analyzed qualitatively. The quantitative data generated from farmer's survey were being coded and entered into computer for analysis. Hence, quantitative data were being analyzed using computer software, Statistical Package for Social Sciences (SPSS) and to identify the land cover change of Cheleleka wetland, satellite imagery and image processing technique were done in three date of 2000,2010and 2020 using Landsat TM 15m resolution. The data that entered into the program were studied using descriptive statistics such as frequencies, percentage, chart and tables were being used.

3.5.1 Binary Logistic Regressions

Logistic regression is a popular modeling approach when the dependent variable is dichotomous. This model allows one to predict the log probabilities of results of a dependent variable from a set of variables that might be continuous, discrete, categorical, or a mix of any of these. Hosmer

and Lomeshow (2000) have described logistic regression concentrating on its theoretical and practical aspect.

Often the outcome variable in social data is, in general not continuous, instead is binary. In such a case, binary logistic regression is a suitable way of describing the connection among one or more independent variables and a binary outcome variable that has only two possible values. Certainly, a generalized linear model is used for binary logistic regression. The most interesting feature of a logistic regression model is that it neither undertakes linearity in the relationship between the covariates and the outcome variable, nor does it require normally distributed variables. It also does not assume homoscedasticity and in general has less stringent requirements than linear regression models. Thus logistic regression is used in a wide range of applications leading to binary dependent data study (Hilbe, 2009; Agresti, 2002).

A binary logistic regression is a special type of logistic regression model which is used to define the relationship between one or more independent variables and a binary outcome variable that has only two possible values. The response variable in this study is dichotomous which is Bernoulli random variable with two possible values, $y_i = 1$ with probability of the wetland degradation $Pi = P(y_i = 1|X_i)$ and $y_i = 0$ with probability of the no wetland degradation, $1 - P_i = 1 - P(y_i = 1|X_i)$.

The logistic model is defined as follows. Let $n \times 1$ Y be a dichotomous outcome random variable as described above and let X $(n \times (k+1))$ indicate the collection of k-predicator variables.

$$Pi = \text{Logit}[Pi] = \log\left(\frac{pi}{1-pi}\right) = B_0 + B_1 x_{1i} + B_2 x_{2i} + \ldots B_k x_{ki} \quad i, 1,2,\ldots, n \quad \text{---- (3)}$$

Where $P(y_i = {}^{1}/_{Xi})$ is the possibility of i^{th} individual is given his/her individual characteristics $\mathbf{x_i}$, and $\beta = (\beta 0, \beta 1 \ldots \beta k)^{T}$ is a vector of unknown numbers with dimension of $(k + 1) \times 1$.

However, the relationship among the probabilities of i^{th} individual who did not know wetland degradation and its characteristics are nonlinear. In order to make meaningful interpretation, it should be written as a linear combination of predictors. This is computed using the logit transformation which is

$$\text{Logit}[Pi] = \log\left(\frac{pi}{1-pi}\right) = B_0 + B_1 x_{1i} + B_2 x_{2i} + \ldots B_k x_{ki}$$

The parameter βj refers to the effect of X_j on the log odds that Y = 1, controlling the other X‟s in the model.

The Hosmer and Lemeshow Test Statistic

This goodness-of-fit statistic is used to assess the fit of a logistic regression model. Hosmer and Lemeshow goodness of fit test divides subjects in to declines based on predicted probabilities and then computes a chi-square from observed and expected frequencies. Using this grouping strategy, the Hosmer and Lemeshow goodness-of-fit statistic, $\hat{C}$ is obtained by calculating the Pearson chi-square statistic from the x^2 table of observed and estimated expected frequencies.

Tests of individual Predictor

The Wald Test

For each descriptive variable in the model there was related parameter. This test is used to test the numerical importance of each coefficient in the model. The Wald test described by Agresti, 1996; is one of a numbers of ways of testing whether the parameters related with a group of descriptive variables are zero. If for a particular descriptive variable,or a group of descriptive variables, the Wald test is significant, then would conclude that the parameters associated with these variables are not zero, so that they should be incorporated in the model. If the Wald test is not significant then these variables can be omitted from the model. Wald X^2 statistics can be used to test the significance of individual coefficients in the model and are calculated as follows.

$$Z^2 = \left(\frac{\beta^{\wedge}}{SE(\beta^{\wedge}} \right)^2$$

Hypothesis testing

The hypothesis testing for the i^{th} explanatory variable was; -

- Ho: $\beta i = 0$
- H1: not Ho($\beta i \neq 0$)

Wald test statistics $Z = \left(\frac{\beta^{\wedge}}{SE(\beta^{\wedge}} \right)$

A) If the Wald test statistics is greater than 1.96 we reject Ho (Wald> $z_{\alpha/2}$).

B) If p-value is less than α value (p-value <0.05) we reject Ho.

C) If the confidence interval of the odds ratio excludes one, we can reject Ho.

3.6 Methods of Data acquisition for land use land cover change

3.6.1. Satellite imagery

Primary and secondary data about land use land cover change were collected and used for different data source to produce the required information .Remote sensing and geographic information system were used in this research to produce information on the trend and the amount of change taking place for the last twenty years from USGS earth explorer observation (http//www.earth explorer usgs.gov) of the year 2000, 2010, 2020, used to produce adequate information to meet the major issues related to Cheleleka wetland degradation.

Table 4. Description of Satellite imageries.

Image type	Path and row	Resolution
Land sat ETM	168/54	15mx15 m
Landsat 8	168/54	15mx15 m
Landsat 8	168/54	15mx15 m

3.6.2. Ground truth

Data acquired from satellite image sensor should be supported and checked with reality using ground truth information .Hence, ground truth date were collected from field using hand held (GPS) software.

3.6.3. Demographic data

Demographic data projection of Bishshoftu town and its surrounding was obtained from central statics agency (CSA).

3.6.4. Image pre-processing

Digital image pre-processing is the improvement of digital image for human interpretation (Richards, and Jia, 1999).after downloading and extracting the satellite image pre-processing activities have taken place, this including atmospheric correction, layer stacking and other image enhancement pre-processing activities were applied to advance the quality of interpretability of the image so that the image became and ready for more analysis.

3.6.5. Image classification

Image classification is a procedure use to produce the thematic maps from the satellite image the themes can vary from general categories to detail description of specific class (Yang, and Liu, 2005).Hence different classes from pre-processed image where identified through supervised classification (maximum likely hood algorism to produce primary LULC map. This map was used to collect data to have clear understanding of the features and location of classes during field work.

Table 5.Conceptual definition of the land use land cover classes.

Land use land cover class	**Description**
Wetland	a place where water covers the soil or is near the soil surface. It is a generic term that includes a wide variety of habitats of various types such as lakes, marshes, swamps,
Water body	Any significant accumulation of water, generally on a planet's surface. ... Some bodies of water collect and move water, such as rivers and streams, and others primarily hold water, such as lakes and oceans.
Urban area	A region nearby a city. Most inhabitants of urban areas have non- agricultural jobs. Urban areas are very developed, meaning there is a mass of human structures such as houses, commercial buildings, roads, bridges,
Shrub land	a plant community characterised by vegetation dominated by shrubs, often also including grasses.
Farm land	land used for agriculture, the organised and well-ordered use of other forms of life—mainly the rearing of livestock and production of crops—to produce food for humans
Grazing land	Lands where grass or grass-like vegetation grows and is the dominant form of plant life, and are used mainly for animal production.

Based on the result of the classification land use land cover data the rate of LULC change was calculated and analysed based on the formula of (Suleiman et al., 2017) as follows

$$R = \left(\frac{a_2 - a_1}{t}\right) \quad (1)$$

Where R is the rate of change a_2 is the recent year land use land cover in ha,a_1 is initial year land use land cover in ha and t is interval year between initial and recent year .

To compute the percentage of change in each land use land cover for the study area, targeted land use land cover was in to two change period of image analysis from equation (1) relation for estimating percentage change detection period under study was established (Suleiman et al.,2017) Equation 2.

$$\%\Delta inl = \left(\frac{a2 - a1}{A}\right) \times 100 \quad (2)$$

Where initial change in the target land use land cover under study $a_1$and a_2 are the area (image based estimated areas) of the targeted land use land cover at the beginning and of the change detection analysis and A is the sum total area.

3.6.6. Image Reclassification

One of the objectives of the present study was to quantify the total of wetland cover change for the last twenty years (2000, 2010, 2020), therefore from the satellite image roaster map was produced as six land use land classes where reclassified in to wetland, water body, farm land, shrub land, urban area, grazing land .The thematic map was asses and analyse wetland degradation of the research area specifically Cheleleka wetland and its change detection.

3.6.7. Accuracy assessment

To improve the uncertainty, an accuracy evaluation was carried out to collect better data from the sample point (ground control point) using a Global Positioning system and comparing it to map classification. The necessity of accurate data combined with map assessment through GPS for improving categorization uncertainty is underlined (FAO,2016) Because each LULC sample is separately sampled, each pixel element is assigned to a specific class, and no pixel element is left to assign, stratified random sampling techniques were chosen (FAO and GFOI,2016). The

sample was distributed using proportional allocation procedures, with the number of samples being determined by the size of the class area. The overall accuracy is the proportion of area categorized, and hence refers to the chance of accurately classifying a randomly picked sample on the LULC map. The proportion of area labeled as class that is also class in the reference data is the user's accuracy (ground data).

$$A = \sum_{J=1}^{q} Pjj \quad (3)$$

$$Ui = \frac{pii}{pi} \quad (4)$$

$$pi = \frac{pjj}{p.i} \quad (5)$$

Where, A is overall accuracy, Pjj and Pii diagonal values, Ui is users accuracy, Pj is producers accuracy, P.j is column total and Pi is row total.(attached in appendix one)

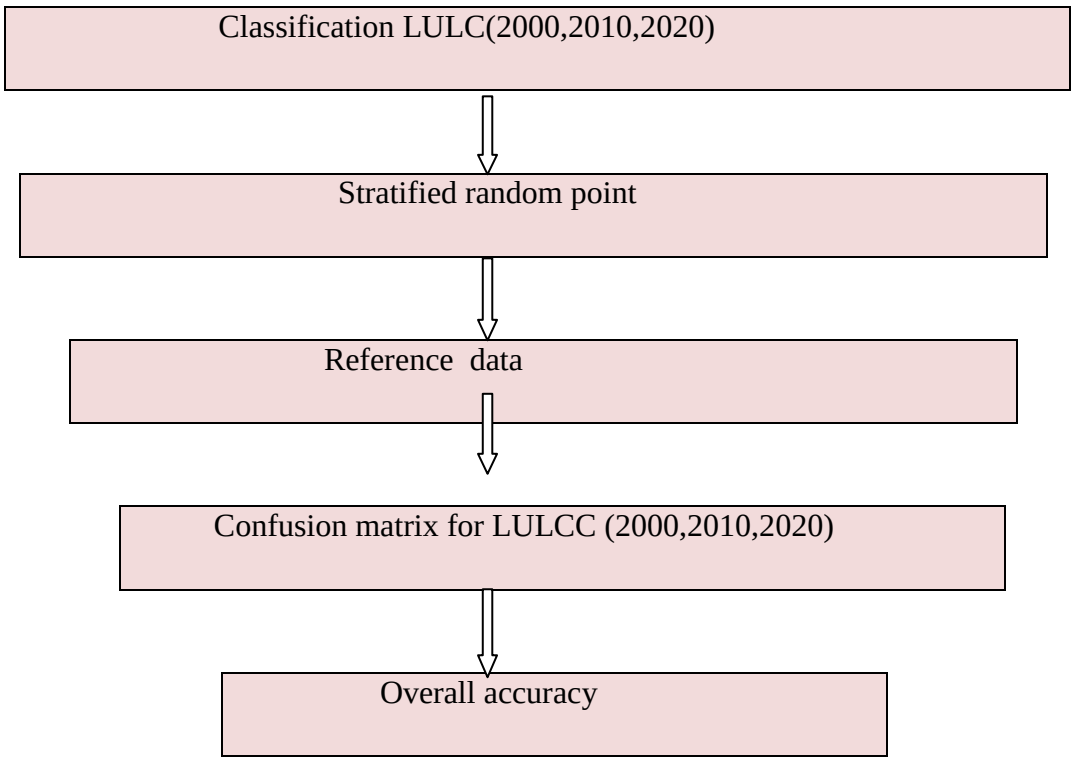


Figure 4. Accuracy assessment work flow

3.7. Ethical consideration

The primary data were being collected by communicating the responsible government and private organizations about wetland through a formal letter from the Environment Forest and Climate change commission and Addis Ababa University. The collected data were being analyzed without any biases and exaggeration. Those data taken from any other secondary sources and previous studies were being cited and acknowledged.

CHAPTER FOUR

RESULT AND DISCUSSIONS

4.1 Demographic and socio-economic characteristics of respondents.

Descriptive statistics for demographic and socio-economic characteristics of the survey respondents showed that 77.3% are male-headed households while 22.7% are female-headed. About 78.9% of sampled respondents are male married, while female married, single male and single female accounted for about 21.1%, 65.3% and 34.7%. It is also found out those male respondents of 20-40 ages constituted 72.5% of the samples while 20.3% those male in the 41-60 age and old age groups for male accounted for 100% and 0% for female. Accordingly, male participants who attended secondary (Grade 9-12) education constituted 81.3% and while those who attended primary (Grade 1-8) education and those who attended formal under graduate represented 100% .And female respondents who attended primary, secondary and under graduate are 18.8%, 24.9% and 0% respectively.

Table 6: Socio-economic and demographic status government of employers and farmers engage in farming activities adjacent to wetland cheleleka.

Variables	**Responses**	**Gender**		**Total**
		Male	**Female**	
Marital status	Single	32	17	49
	%	65.3%	34.7%	100.0%
	Married	277	74	351
	%	78.9%	21.1%	100.0%
Age	20-40	119	43	162
	%	72.5%	27.5%	100.0%
	41-60	177	45	222
	%	79.7%	20.3%	100.0%
	Above 60	6	0	6
	%	100.0%	0.0%	100.0%
Educational level	Primary (1-8)	231	79	310
	%	75.1%	24.9%	100.0%
	Secondary (9-12)	65	15	80
	%	81.3%	18.8%	100.0%
	Under graduate	10	0	10
	%	100.0%	0.0%	100.0%

Table 7-Residence area of respondents

Male respondents that accounted for about 78.8% , 69% , 76.7%, 73%, 78.7% , 81.8%, and 80% were residents of Danbi Kebeles, Ganda gorba, Side, kurkura, Bishoftu 01, 05 and 09 respectively while 21.2 %, 31%, 23.3%, 27%, 21.3% 18.2% and 20% of the female respondent live in danbi Kebeles, Ganda gorba, Side, kurkura, Bishoftu town 01, 05 and 09 respectively.

Variables	**Responses**	**Gender**		**Total**
		Male	**Female**	
Living Area	Danbi	26	7	33
	%	78.8%	21.2%	100.0%
	Ganda gorba	34	18	52
	%	69.0%	31.0%	100.0%
	Side	23	7	30
	%	76.7%	23.3%	100.0%
	Kurkura	50	20	70
	%	73.0%	27.0%	100.0%
	Bishoftu 01	59	16	75
	%	78.7%	21.3%	100.0%
	Bishoftu 05	51	9	60
	%	81.8%	18.2%	100.0%
	Bishoftu 09	64	16	80
	%	80.0%	20.0%	100.0%

Source: Compiled from survey data August, 2021

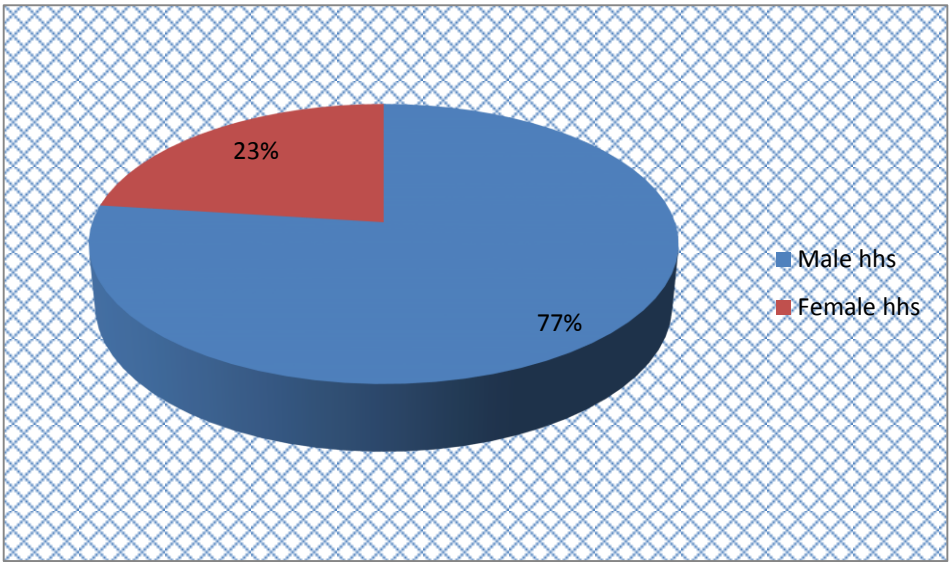


Figure 5 Sex of respondents

Working position of the respondents for KII and FGD

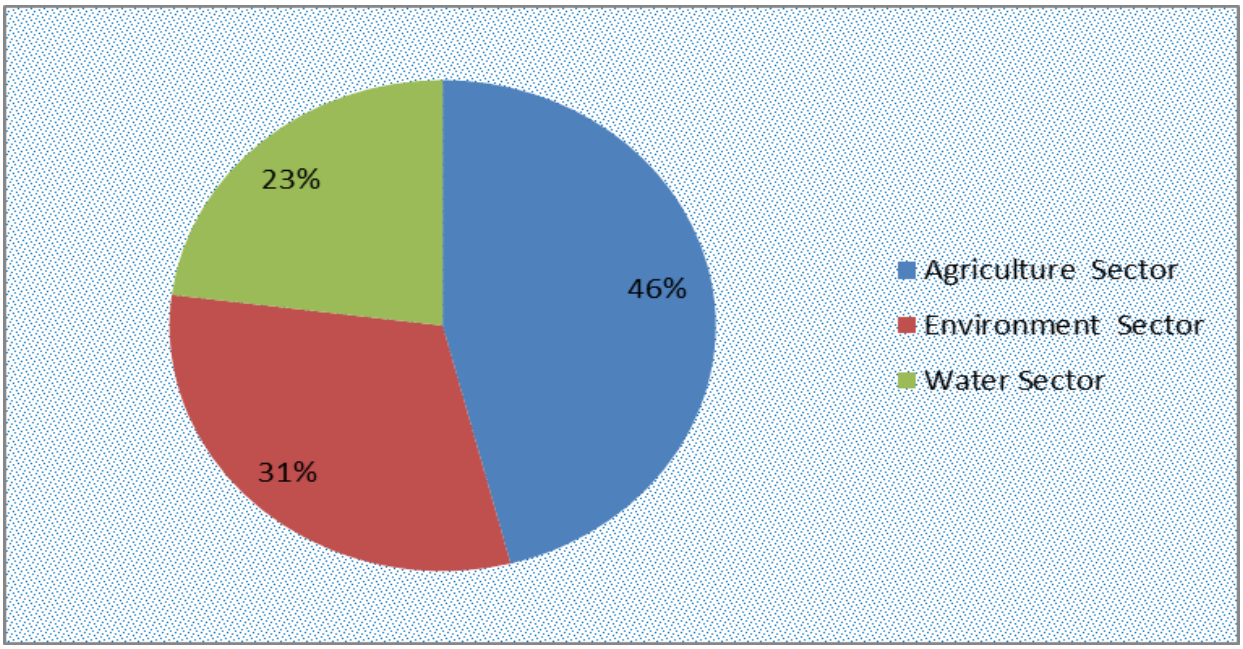


Figure 6.Working position of respondents

Figure (6) shows that majority of working position of the respondents are from Agricultural (46%) followed by Environment sector office (31%) and water sector (23%).

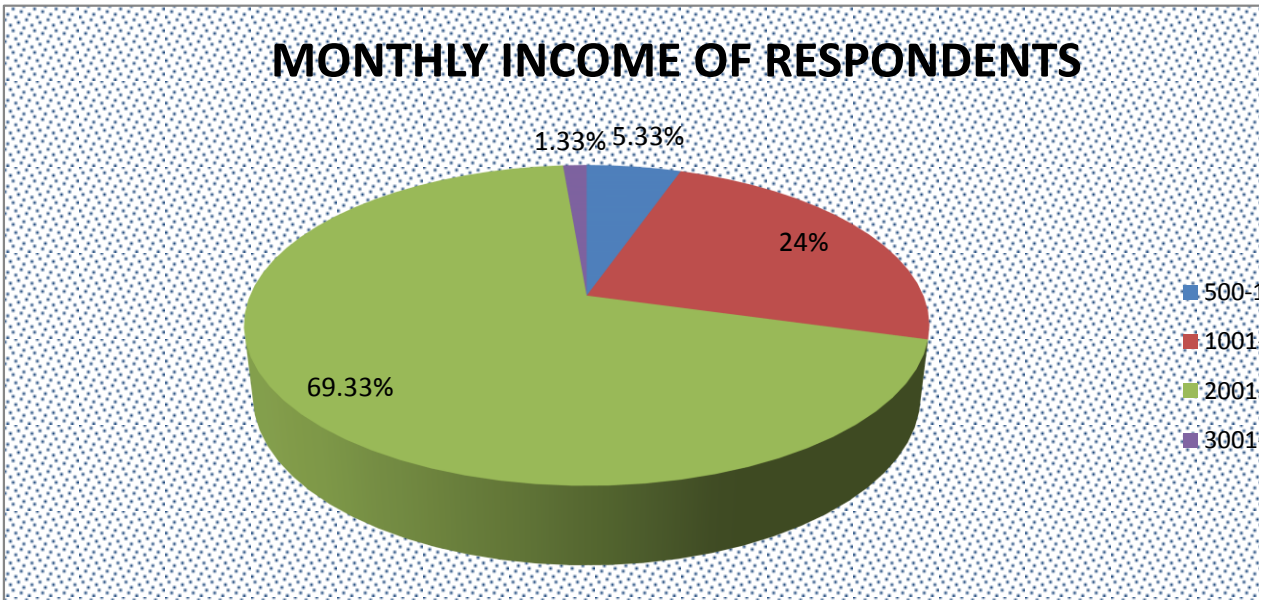


Figure 7 .monthly incomes of (hhs) respondents

Source: Compiled from survey data August, 2021

Figure (7) shows that 69.3% of the respondents that who had 2001-3000 monthly income followed by the respondent who had 1001-2000 monthly income (24%) and 5% who had 500-1000 monthly income followed by 1% who had 3001-4000 monthly income.

Farm land status of respondent

As shown from table eight the respondent (87%) responded that they have farmland. Of the total of respondents considered in this study 85.3% have their own private farmland and 38.3% has inherited in farmland and gifted farmland, rented farmland and sharecropped farmland were 0%, 54.3%, 15% respectively.

Table 8. Farm land status HHs

Variables	Responses	Frequency	Percentages
Do you have farmland?	Yes	348	87
	no	52	13
private farmland	no	59	14.7
	yes	341	85..3
inherited in farmland	no	247	61.8
	yes	153	38.3
Gifted farmland	no	400	100.0
rented in farmland	No	183	45.8
	Yes	217	54.3
sharecropped in farmland	No	340	85.0
	Yes	60	15.0

Source: Compiled from survey data August, 2021

4.2. Perception of farmers toward chelelekа wetland.

Majorities of the respondents (80.8%) they know before about the wetland while 19.3% of them don't know before about wetland. And also most of the respondents (65.8%) they know before about drivers of wetland degradation while 34.3% of farmers don't know before about the drivers of wetland degradation. Majority of respondents 70.8% agreed that educating young people about wetland value is important for the future successes while 6.8% of farmers disagreed on it. As shown in table (9) majority of the respondents (87.5%) they don't have information about a sector which is accountable for wetland degradation while 12.5% have information about a sector which is accountable for wetland degradation. And also 85% of respondents reported

that they don't involve stakeholder consultation about wetland degradation while 7% of them involve in it and 8%of then not answered.

Table 9. Perception of farmers

Variables	Responses	Frequency	Percentages
Do you hark before about wetland?	No	77	19.3
	Yes	323	80.8
Do you hark before about drivers of wetland degradation?	No	137	34.3
	Yes	263	65.8
Do you think that educating young people about wetland value is important for the future successes?	strongly disagree	5	1.3
	Disagree	27	6.8
	Agree	283	70.8
	strongly agree	85	21.3
Do you hark before a sector which is accountable for wetland degradation?	No	350	87.5
	yes	50	12.5
Do you involve stakeholder consultation about wetland degradation?	no	340	85.0
	yes	28	7.0

Source: Compiled from survey data August, 2021

Knowledge about wetland resources

As it shown in table nine 75.8% respondents reported that wetlands are lands periodically or permanently covered by water while 24.2% 0f them don't know. Majority of respondents (60.8%) reported that wetlands are not wasteland while 22.8% of them said that wetlands are wasteland and 16.5% of them don't know. As shown in table nine 75.8% farmers' respondent reported that wetlands provide habitats for a wide variety of animal and plant species while 24.2% of the farmers don't know. Of the total 92.5% reported that draining wetlands speed up the drying of the ecosystems while 7.5% don't know. Majority of farmer respondents (92.5%) reported that wetlands retain sediments and thus protect siltation in to the lakes or dams while 7.5% of them don't know. Of the total 100% of farmers reported that wetlands serve as sources of water and fodder to both domestic and wild animals. And also 83.2% of the farmers indicated that wetlands control flooding by collecting and holding floodwaters back and keep rivers at normal levels while 16.8% of them don't know. Of the total 84.8% respondents reported that wetland ecosystems can easily be degraded and loss their natural characteristics due to overstocking or year round grazing in the wetlands while 15.2% of them said that no. And also majority of respondents 92.3% reported unwise use of fertilizers, herbicides and pesticides from

agricultural land to wetland areas could reduce the water quality and affect aquatic lives while 7.7% of them said that it has no effect. Of the total 60.5% reported that cheleleka wetland used for migratory birds' destination recreational value while 39.5% of the farmers said that not used for migratory birds' destination.

Table 10. Knowledge about wetland resources

Variables	Responses	Frequency	Percentages
wetlands are lands periodically or permanently covered by water	Yes	303	75.8
	don't know	97	24.3
wetlands are wastelands	No	243	60.8
	Yes	91	22.8
	don't know	66	16.5
wetlands provide habitats for a wide variety of animal and plant species	Yes	303	75.8
	don't know	97	24.3
Draining wetlands speed up the drying of the ecosystems.	Yes	370	92.5
	don't know	30	7.5
Wetlands retain sediments and thus protect siltation in the lakes or dams.	Yes	370	92.5
	don't know	30	7.5
wetlands serve as sources of water and fodder to both domestic and wild animals	Yes	400	100.0
wetlands control flooding by collecting and holding floodwaters back and keep rivers at normal levels	Yes	333	83.3
	don't know	67	16.8
wetland ecosystems can easily be degraded and loss their natural characteristics due to overstocking or year round grazing in the wetlands	No	61	15.3
	Yes	339	84.8
release of fertilizers, herbicides and pesticides from agricultural land to wetland areas could reduce the water quality and affect aquatic lives	No	31	7.8
	Yes	369	92.3
Does cheleleka wetland used for migratory bird's destination?	Yes	242	60.5
	don't know	158	39.5

Source: Compiled from survey data August, 2021

4.3. Factors and drivers for cheleleka wetland degradation

As it shown in table eleven , of the total of farmers respondents 86.3% responded that for the last two decades there is the a real extent shrinking of the wetland cheleleka while 5% of them responded that there is no the real extent shrinking of the wetland cheleleka and the left are not responded. Majority of the farmers (96.3%) reported that population growth is the reason for cheleleka wetland wetlands loss while 1.3% of them reported that population growth is not the reason for cheleleka wetland degradation and 1.3% of them responded that they are not sure. Of those farmers reported that population growth is the reason for cheleleka wetlands loss were 50.7%, 23.8% and 19.3% through urban settlement expansion, through expansion of farmland and through rural settlement expansion respectively. As shown in table nine 90% of the farmers responded that farm land expanded to wetlands in (cheleleka area in particular) while 8.8% of them are reported that they are not sure. Majority of the farmers (95%) reported that Agricultural land expansion is the cause for water body and wetland degradation in cheleleka wetland, while 3.5% of them are responded that Agricultural land expansion is not the cause for wetland and water body degradation in cheleleka.

From respondents 21.3% reported that both farmer and private agricultural investors involved in irrigation while 70% of them are reported that they are not sure and 8.8%of them reported that both farmer and private agricultural investors are not involved in irrigation.

As shown from table nine majority of the farmers (65.3%) reported that introduction of pumping technology increased expansion rate of irrigation while 23% of them are reported that they are not sure and 11.8% of them are responded that introduction of pumping technology is not increased expansion rate of irrigation. Of the total farmers 98.8% of them reported that settlement expanded and affect wetland while 1.2% of them are revealed that they are not sure. Of those respondents who responded that settlement expanded and affect wetland majority of them (51.7%) of them are revealed that the wetland result of settlement expansion is shrinking of wetland and others 6.5%, 18.8%, 11.3%, 2.5% and 6.8% of them are reported that the wetland results of settlement expansion is shrinking of wetland area, increased runoff and sediment incoming to cheleleka, increased frequency flooding, shortage of water supply and loss of agricultural land respectively. Majority of the farmers (95%) revealed that quarry site

development practiced near wetland catchment while 1.3% of them are reported that they are not sure. As it shown in table most of the farmers (76%) responded that overgrazing is practiced in wetlands of the catchment while 12.5% of them responded that overgrazing is not practiced in wetlands of the catchment.

Table 11. driving factors for wetland degradation (Source: Compiled from survey data August, 2021).

Variables	**Responses**	**Frequency**	**Percentages**
For the last twenty years, is there the real range shrinking of the wetland cheleleka?	No	20	5.0
	Yes	345	86.3
Population growth is the reason for cheleleka wetland wetlands degradation?	No	5	1.3
	Yes	385	96.3
	not sure	5	1.3
Did farm land expanded to wetlands in (cheleleka area in particular)?	Yes	360	90.0
	not sure	35	8.8
Did agricultural land expansion is the cause for wetland and water body degradation in cheleleka?	No	15	3.8
	Yes	380	95.0
Farmer and private agricultural investors involved in irrigation?	No	35	8.8
	Yes	85	21.3
	not sure	280	70.0
Pumping technology introduction increased expansion rate of irrigation in the area?	No	47	11.8
	Yes	261	65.3
	not sure	92	23.0
Did Settlement expansion affects wetland?	Yes	395	98.8
	not sure	5	1.3
If your response yes, for question what happened to the wetland a result of settlement expansion?	shrinking of wetland	207	51.7
	shrinking of lake area	26	6.5
	increased runoff and sediment entering cheleleka	75	18.8
	increased frequency flooding	45	11.3
	shortage of water supply	10	2.5
	loss of agricultural land	27	6.8
Quarry site development practiced near wetland catchment?	Yes	380	95.0
	not sure	5	1.3
Overgrazing is experienced in wetlands of the catchment?	No	50	12.5
	Yes	304	76.0
	not sure	40	10.0
Sedimentation reduced the level and depth of	No	10	2.5

wetland?	Yes	385	96.3
	not sure	5	1.3
Industrial and urban discharge affects wetland cheleleka?	Yes	395	98.8
Nonpoint source of agricultural inputs such as fertilizers; herbicides and pesticide affect biodiversity in wetland cheleleka?	No	235	58.8
	Yes	160	40.0
Wetland cheleleka is habitat for migratory birds June to October each year?	No	20	5.0
	Yes	355	88.8
Wetland cheleleka used for tourism, specifically for bird watcher?	No	95	23.8
	Yes	305	76.3
Agriculture and urban expansion affect wetland cheleleka?	Strongly disagree	5	1.3
	Disagree	5	1.3
	Neutral	15	3.8
	Agree	365	91.3
	Strongly agree	10	2.5
Do you think that excessive water pumping for agricultural activities affect wetland cheleleka?	strongly disagree	20	5.0
	Disagree	10	2.5
	Agree	355	88.8
	strongly agree	15	3.8
Do you think that overgrazing affect wetland cheleleka?	strongly disagree	10	2.5
	Disagree	10	2.5
	Neutral	10	2.5
	Agree	322	80.5
	strongly agree	48	12.0
The number of water pump used for water extraction for agriculture per day?	No	50	12.5
	Yes	350	87.5
If your answer is yes how much?	below 50	250	62.5
	from 51-100	100	25.0
Diversion of water due to as railway and high way construction affect the inflow of water to cheleleka wetland?	strongly disagree	5	1.3
	Disagree	15	3.8
	Agree	300	75.0
	strongly agree	80	20.0
Have you ever been trained about wetland value and impact of wetland degradation?	No	332	83.0
	Yes	68	17.0
Farmers nearby cheleleka wetland used agricultural inputs such as fertilizer, herbicide and pesticide for production?	Yes	395	98.8
Clear demarcation between wetland cheleleka and agricultural land near the wetland?	No	193	48.3
	Yes	156	39.0
Governmental authority has taken proper action against the impacts related wetland degradation in the past?	strongly disagree	40	10.0
	Disagree	188	47.0
	Neutral	142	35.5
	Agree	30	7.5

Picture 1: Overgrazing around cheleleka wetland

As shown from table nine majority of the respondents (80.5%) revealed that overgrazing affect wetland cheleleka. Of the total respondents 96.3% reported that sedimentation decreased the extent and depth of wetland. As shown in table nine 98.8% of the respondents agreed that industrial and urban discharge affect wetland cheleleka. Of the total respondents 58.8% of them responded that nonpoint source of agricultural inputs such as fertilizers, herbicides and pesticide not affect biodiversity in wetland cheleleka while 40% 0f the reported that nonpoint source of agricultural inputs such as fertilizers, herbicides and pesticide affect biodiversity in wetland cheleleka.

Picture 2. Agricultural inputs that is hazardous for aquatic animals (insecticide)

From table nine majority of the respondent (88.8%) indicated that wetland cheleleka is habitat for migratory birds from June to October each year while 5% of them are responded that wetland cheleleka is not habitat for migratory birds from June to October each year. Of the total 76.3% responded that wetland cheleleka used for tourism, specifically for bird watcher while 23.8% of them are reported that wetland cheleleka not used for tourism, specifically for bird watcher?

Majority of the respondents (91.3%) agreed that agriculture and urban expansion affect wetland cheleleka and 88.8% of the respondent found that excessive water pumping for agricultural activities affect wetland cheleleka and 87.5% of the respondents responded that they know the number of water pump used for water extraction for agriculture per day and of those respondent 62.5% responded that below 50 number of water pump used for water extraction for agriculture per day while 25% of respondents responded that 51-100 number of water pump used for water extraction for agriculture activities per day.

Picture 3-Agricultural and urban expansion near cheleleka wetland

As shown in table nine majorities of the respondents (75%) agreed and 20% of them are strongly agreed that diversion of water due to as railway and high way construction affect the inflow of water to cheleleka wetland while 5% of them disagreed. Of the total 83% responded that they have not ever been trained about wetland value and impact of wetland degradation on environment while 17% of the respondents revealed that they have ever been trained about wetland value and impact of wetland degradation on environment.

Picture 4. Diverted water flow of (iyyitu) river due to (Addis-Adama) high way construction.

Majority of the respondents (98.8%) indicated that farmers nearby cheleleka wetland used agricultural inputs such as fertilizer, herbicide and pesticide for production. 48.3% of respondents reported that there is no clear demarcation between wetland cheleleka and agricultural land near the wetland while 39% of them reported that there is clear demarcation between wetland cheleleka and agricultural land near the wetland. And also majority of the respondents (47%) disagreed and 10% of them are strongly disagreed that the governmental authority has taken proper action against the impacts related wetland degradation in the past while 35.5% of them are responded that they are neutral (either agreed or disagreed).

Population growth rate of Bishoftu town increasing at an alarming rate as from table nine show that Majority of the farmers (96.3%) reported that population growth is the cause for cheleleka wetland degradation.

Many findings suggest that population density influences the amount of available land per person and the proportions of different land use competing for space. On the other hand, the dominant land class determines which land use would have an advantage by encroaching on all others (Ehrenfeld and Schneider, 1991). As more people move into the wetland area, this has become increasingly apparent. This is because more people are moving to the area, either through birth or other population expansion mechanisms, with the intent of participating in the current land use activities.

As a result, the burden of land use needs for farming has recently been pushed to the available wetlands nearby, which were once considered waste and useless land in Europe due to their damp nature, however perceptions have evolved. In Africa, wetlands provide a vital supply of water and nutrients for biological productivity and, in certain cases, human existence (Kachali, 2009).

Wetlands are sought by a variety of interest groups for a variety of objectives; most notably in metropolitan areas, when wetlands are sand filled for development purposes, which frequently include settlement demands. And other anthropogenic land uses, including urban farming in some circumstances.

Wetlands are heavily utilized for the aim of wetland farming in the production of vegetables all year in the research area, with no exceptions. Rapid rates of wetland drainage are primarily due

to population increase in these adjacent areas. This is consistent with a higher anthropogenic effect expected in areas such as human population growth and economic activities that are known to together place great stresses on local hydrology, such as the draining of marshes and wetlands for constructions and water withdrawals for agriculture and human needs (Prigent et al., 2012).

By identifying population as a proximate and important element responsible for wetland dynamics in the research area and the study of wetlands degradation gave insight into the response of wetland degradation to population changes.

4.4. Conservation attitude of respondents

It shown in table eleven majorities of the respondents (54.8%) agreed that investment in wetlands conservation practice is important to prevent wetland degradation while 7.5% of them disagreed and 15.3% of them answered neutral. Of the total 54.5% of the farmers strongly disagreed ,23.0% of the respondents disagree that people should be allowed to farm in any of the areas of wetlands and 7.5%of them neutral while 15% of them are agreed. Of the total 38.3% of the farmers responded that they are strongly agreed that uncontrolled livestock grazing around wetland cheleleka should be prohibited while 16.5% answered neutral and 15.3% answered strongly disagreed. In the table (11) 24% of the respondents strongly agreed that trees should be planted to prevent erosion and siltation on the wetlands and majority of the respondents 56% agreed that release of agricultural chemical and nutrient runoff into the lake's waterway should be restricted to protect the lake's water quality while 15% of them answered neutral and 7.8% of them disagreed.

Table 12 conservation attitude of HHs

Variables	Responses	Frequency	Percentages
Investment in wetlands conservation practice is important to prevent wetland degradation	Disagree	30	7.5
	Neutral	61	15.3
	Agree	219	54.8
	strongly agree	90	22.5
people should be allowed to farm in any of the areas of wetlands	strongly disagree	218	54.5
	Disagree	92	23.0
	Neutral	30	7.5
	Agree	60	15.0
uncontrolled livestock grazing around wetland cheleleka should be prohibitted	strongly disagree	61	15.3
	Neutral	66	16.5
	Agree	121	30.3
	strongly agree	152	38.0
trees should be planted to prevent erosion and siltation on the wetlands front	Agree	310	77.5
	strongly agree	90	22.5
release of agricultural chemical and nutrient runoff into the lake's waterway should be restricted to protect the lake's water quality	Disagree	31	7.8
	Neutral	60	15.0
	Agree	212	53.0
	strongly agree	97	24.3

Source: Compiled from survey data August, 2021

4.5 Legal related issues

As it shown from table thirty of the total 60.8% respondent agreed and 21.8% responded strongly agreed that national wetland policy is important. Majority of the respondents (61.8%) reported that institutional arrangement is important to control wetland degradation and 34.3% of participants disagreed that the existing wetland institutional arrangement properly functional while 43.3% of the respondents responded that neutral(either agreed or disagreed). As shown from table thirty 42% of the participants strongly agreed and 24.3% of them agreed that absence of separate policy of wetland can affect management of wetland while 32.5% of respondent responded that neutral (either agreed or disagreed).

Table 13 Legal related issues

Variables	Responses	Frequency	Percentages
Do you think that national wetland policy is important?	strongly disagree	5	1.3
	Disagree	5	1.3
	Neutral	60	15.0
	Agree	243	60.8
	strongly agree	87	21.8
Do you think that institutional arrangement is important to control wetland degradation?	Disagree	35	8.8
	Neutral	103	25.8
	Agree	247	61.8
	Strongly agree	15	3.8
Do you think that the existing wetland institutional arrangement properly functional?	strongly disagree	25	6.3
	Disagree	137	34.3
	Neutral	173	43.3
	Agree	65	16.3
Do you think absence separate policy of wetland can affect management of wetland?	Disagree	5	1.3
	Neutral	130	32.5
	Agree	97	24.3
	strongly agree	168	42.0

Source: Compiled from survey data August, 2021

Logistic regression fitted model

Table 14 : Hosmer and Lemeshow test.

Hosmer and Lemeshow Test			
Step	Chi-square	df	Sig.
1	13.916	8	.084

The above output shows as that, the model is significant since the non-significance of hosmer and lemeshow test indicates the significance of the model. Means that the Hosmer-Lemeshow statistic indicates a poor fit if the significance value is less than 0.05. Here, the logistic regression model adequately fits the data.

Table 15: binary logistic regression model

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test			Odds Ratio
			Lower	Upper	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	-105.265	1.7649	-108.724	-101.806	3557.231	1	.000	1.923E-46
[gender of respondents=1]	-.996	.2217	-1.430	-.561	20.179	1	.000	.369
[gender of respondents=2]	0[a]	.	.	.	.	.	.	1
[Working position of respo=0]	.206	.5030	-.780	1.191	.167	1	.683	1.228
[Working position of =1]	.070	.6495	-1.203	1.343	.012	1	.914	1.073
[Working position of respo=2]	.091	.4238	-.739	.922	.047	1	.829	1.096
[Working position of respo=3]	0[a]	.	.	.	.	.	.	1
[Monthly income of respo=0]	2.850	1.0289	.834	4.867	7.675	1	.106	17.295
[Monthly income of respo=1]	-12.112	.5477	-13.185	-11.038	489.024	1	.051	5.496E-6
[Monthly income of respo=2]	0[a]	.	.	.	.	.	.	1
[Do you have farmland?=1]	0[a]	.	.	.	.	.	.	1
[private farmland=1]	-.649	.3743	-1.382	.085	3.003	1	.083	.523
[private farmland=2]	0[a]	.	.	.	.	.	.	1
[inherited farmland=1]	-.023	.2547	-.523	.476	.008	1	.927	.977
[inherited farmland=2]	0[a]	.	.	.	.	.	.	1
[rented in farmland=1]	-.212	.2493	-.701	.276	.726	1	.394	.809
[rented in farmland=2]	0[a]	.	.	.	.	.	.	1
[sharecropped in farmland=1]	1.121	.2749	.583	1.660	16.641	1	.000	3.069
[sharecropped in farmland=2]	0[a]	.	.	.	.	.	.	1
population growth is a reason wetlands degradation ?=1]	0[a]	.	.	.	.	.	.	1
urban settlement expansion	-8.233	.5355	-9.282	-7.183	236.322	1	.000	.001
expansion of farm land	9.450	.5854	8.302	10.597	260.579	1	.000	127.582
rural settlement expansion	0[a]	.	.	.	.	.	.	1
cultivation land?=0]	-44.245	1.1443	-46.488	-42.002	1495.086	1	.000	6.090E-20
[Farming land expansion?=1]	0[a]	.	.	.	.	.	.	1

[introduction of pumping technology increased expansion rate of irrigation?=1]	9.694	.5365	8.642	10.745	326.486	1	.000	162.550
[pumping technology introduction increased expansion rate of irrigation?=2]	0[a]	.	.	.	.	.	.	1
[settlement expanded and affect wetland?=1]	0[a]	.	.	.	.	.	.	1
[If yes, what happened to the wetland a result of settlement expansion?=1]	29.676	.7811	28.145	31.207	1443.555	1	.000	224.177
[If your response yes , what happened to the wetland a result of settlement expansion?=1]	-41.535	.7051	-42.917	-40.153	3469.590	1	.000	9.156E-19
[If your response yes, wetland a result of settlement expansion?=2]	-22.740	.5629	-23.843	-21.636	1632.127	1	.000	1.331E-10
[If yes ; what happened to the wetland a result of settlement expansion?=3]	8.882	.6688	7.571	10.193	176.355	1	.000	7202.957
[If yes, what happened to the wetland a result of settlement expansion?=4]	0[a]	.	.	.	.	.	.	1
[Did overgrazing is experienced in wetlands of the catchment? =1]	-6.795	.7970	-8.357	-5.233	72.690	1	.000	.001
[overgrazing is practiced in wetlands of the catchment? 2]	0[a]	.	.	.	.	.	.	1
wetland cheleleka used for tourism, specifically for bird watcher?=1]	-12.376	.5782	-13.510	-11.243	458.138	1	.000	4.217E-6
wetland cheleleka used for tourism, specifically for bird watcher?=2]	0[a]	.	.	.	.	.	.	1
(Scale)	1[b]							
Dependent variable : wetland degradation								

NB. **-0[a]** -Reference category for one independent variable

-Dependent variable wetland degradation.

- Independent variable –all the models are independent variable

-Exp(B)=Odds ratio or represents the ratio-change in the odds of the event of interest for a one-unit change in the predictor

As shown above the meaning of a logistic regression coefficient is not as straightforward as that of a linear regression coefficient. While B is convenient for testing the usefulness of predictors, Exp(B) is easier to interpret. Exp(B) represents the ratio-change in the odds of the event of interest for a one-unit change in the predictor. For example, for gender of respondent is equal to exp(-0.99) which means that the odds knowing about the drivers of wetland degradation for a male respondent/farmers are exp(-0.99)=0.369 times the less likely to odds of knowing about the drivers of wetland degradation for a female respondent/farmers, all other things being equal. This means that female respondent is more likely knowing about drivers of wetland degradation than male respondents/ farmers.

In general, if the significance level of the Wald statistic (which tests the effect of individual predictor while controlling other predictors.) is small (less than 0.05) then the parameter is useful to the model. As it shown in table (15) the positive coefficient of predictors are more likely to odds of having information about drivers of wetland degradation when we compare them with their corresponding reference category and the negative coefficients of the predictors are less likely to odds of having information about drivers of wetland degradation when we compare them with their corresponding reference category.

As it shown in Table (15) indicated that the respondent they hadn't sharecropped in farmland are exp(1.12) = 3.069 times more likely to odds of knowing about the drivers of wetland degradation than that they had they had sharecropped in farmland. The odds of wetland degradation for the farmers they reported that population growth is the reason for cheleleka wetland degradation are more likely than to the odds of wetland degradation for the farmers that responded that population growth is not the cause for cheleleka wetland wetlands loss. The odds of wetland degradation for the farmers responded that population growth is the reason for cheleleka wetland wetlands loss through urban settlement are less likely to population growth is the cause for cheleleka wetland loss through rural settlement expansion while through expansion of farm land is more likely than that of through rural settlement expansion.

As it shown in table (15) the odds of the cause of wetland degradation for farmers those reported that farm land expansion is not the cause for wetland and water body degradation in cheleleka are exp(-44.245) less likely to the odds of the cause of wetland degradation for farmers those reported that farm land expansion is the cause for wetland and water body degradation in

cheleleka wetland. The odds of the cause of wetland degradation for those respondent they answered that introduction of pumping technology increased expansion rate of irrigation are 162.5 times more likely to the odds of the cause of wetland degradation for farmers those responded that introduction of pumping technology not increased expansion rate of irrigation. Odds the cause of wetland for those respondents responded that they did settlement expanded and affect wetland are more likely than for those responded that they didn't settlement expanded and affect wetland. Of those respondents who did settlement expanded and affect wetland, the result of settlement expansion such as shrinking of wetland, shrinking of lake area, increased runoff and sediment, increased frequency of flooding, shortage of water supply, loss of agriculture land and loss of grazing land are significant.

As it shown in table (15) the odds of the cause of wetland degradation for the respondents those responded that overgrazing is not practiced in wetlands of the catchment are less likely than overgrazing is practiced in wetlands of the catchment. Lastly the odds of the cause of wetland degradation for the farmers those not agreed that wetland cheleleka used for tourism, specifically for bird watcher less likely than those agreed that wetland cheleleka used for tourism, specifically for bird watcher.

4.6. Land use land cover change and dynamics

4.6.1 Land use land cover of 2000

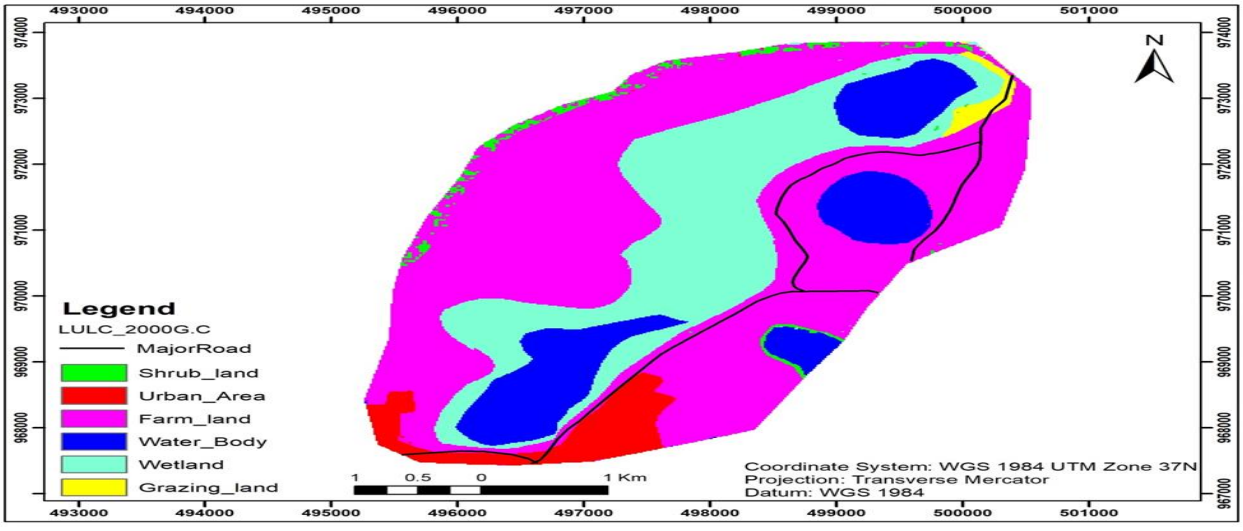


Figure 8: Land use Land cover image of 2000

Land use/ Table 16: Percentage and Absolute area coverage of LULC (2000)

Land use land cover 2000			
S/N	Class_name	Area(ha)	%
1	Shrub_land	31.16	1.69
2	Urban_Area	116.08	6.28
3	Farm_land	970.60	52.54
4	Water_Body	332.60	17.46
5	Wetland	376.60	20.39
6	Grazing_land	20.23	1.09
	Total	1,847.3	99.45

Source: Compiled from data August, 2021

Land cover of 2000 represented on table (16) shows that land use land cover (LULC) of the target area. In this year farm land cover was the highest coverage of the total area of the target place. It constituted comparatively larger sizes which was farmland 52.54% of the total area. Relatively considerable amount of the area was covered by shrub land (1.69 %), grass land (1.09 %), water body (17.46%) urban area (6.28%) and wetland (20.39%). In this year grazing land area covered the smallest share of the total area which was (1.09%).

4.6.2 Land use land cover of 2010

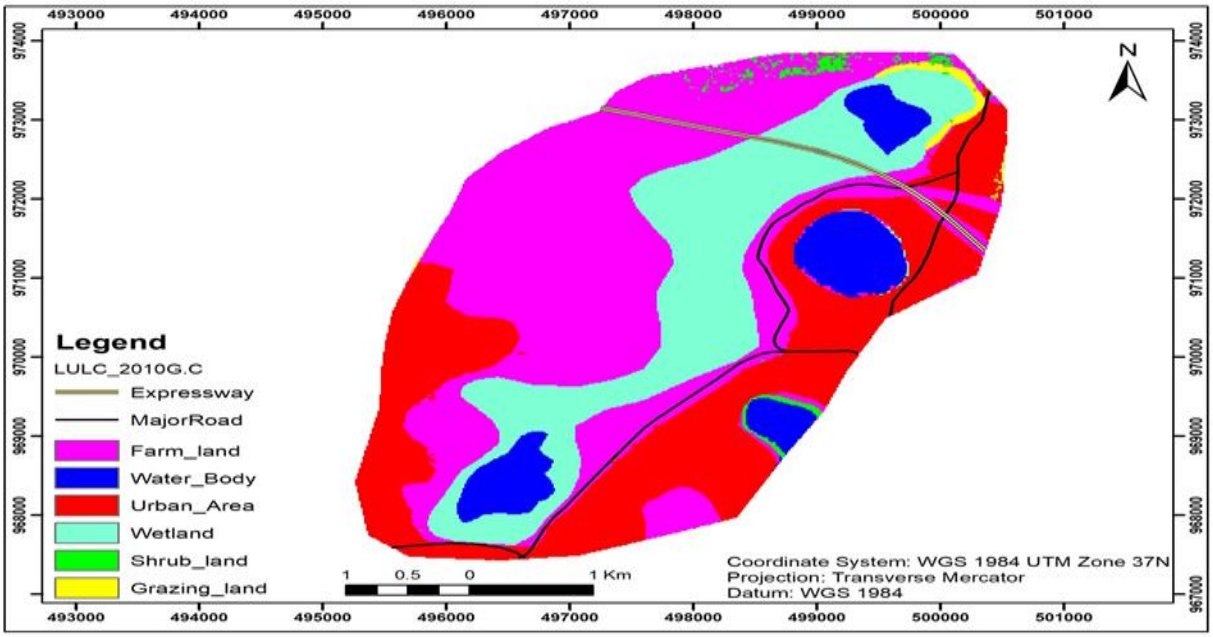


Figure 9 Land use Land cover image of 2010

Table 17 : Absolute area and percentage coverage of LULC (2010)

Land use land cover 2010			
S/N	Class_name	Area(ha)	%
1	Shrub_land	20.70	1.23
2	Urban_Area	125.00	7.44
3	Farm_land	1,000.60	59.55
4	Water_Body	188.80	11.24
5	Wetland	329.00	19.58
6	Grazing_land	16.04	0.95
	Total	1,680.1	100.00

Source: Compiled from data August, 2021

In2010 (after 10 years), the land use land cover classes that covered the highest share of total area was farm land like that of in 2000. The share of farm land coverage was 52.54%. However, when it was compared with that of 2000 whole LULC areal extent share, urban, farm land in this year increased by 7.44 %, and 59.55% respectively. whereas wet land, grazing land, shrub land and water coverage were reduced by 19.58 %, 0.95%, and 1.23% and water body 11.24%respectively (table 16). This showed that study area has undergone significant modifications and conversions in this study year. Because largely it was wetlands and water body that were changed in to other LULC classes. In general in this year, relatively wetland and water body showed reduced while compared with their corresponding LULC class areal extent of 2000.

4.6.3 Land use land cover in 2020

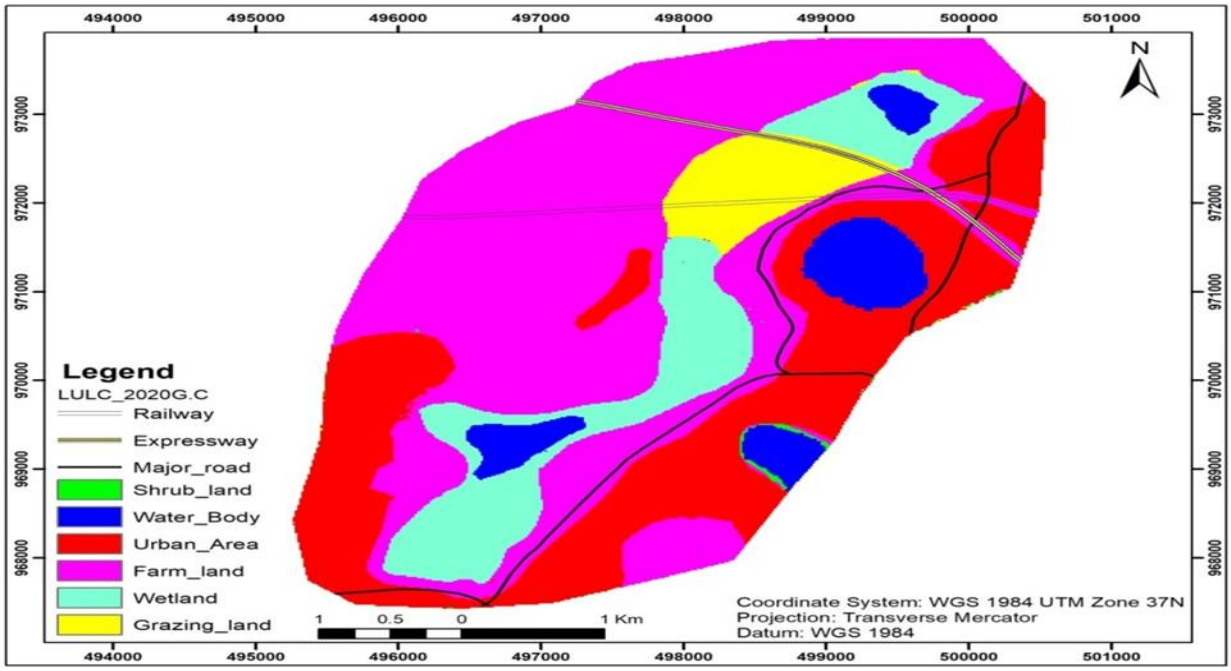


Figure 10. Land use Land cover image of 2010

Table 18: land use land cover 2020.

Land use land cover 2020			
S/N	Class_name	Area(ha)	%
1	Shrub_land	5.22	0.29
2	Urban_Area	142.00	7.95
3	Farm_land	1,070.00	59.92
4	Water_Body	141.98	7.95
5	Wetland	305.00	17.08
6	Grazing_land	121.41	6.80
	Total	1,785.6	100.00

Source: Compiled from data August, 2021

In 2020, also the land use land cover classes that covered the highest share of total area were farm land and urban area. The shares of farm land and wetland were 59.92% and 7.95 % respectively (Table17). However, when it was compared with that of 2010 entire LULC proportion in2020 farm land and urban area in this year increased but Wetland, shrub land, grazing land and water body were decreased by 17.08 %, 0.29%, 6.8% 7.95 % respectively. This

indicated that study area has undertaken significant modifications and conversions in this study year.

4.7 Rate of dynamics of land use land cover

As shown from table (18) rate of dynamics of water body and wetlands with in twenty years from 2000-2020 reduced by 190.6ha) and (71.60ha) respectively. This indicated that if we didn't take mitigation measure wetlands and water bodies became conversed in to other land use land cover.

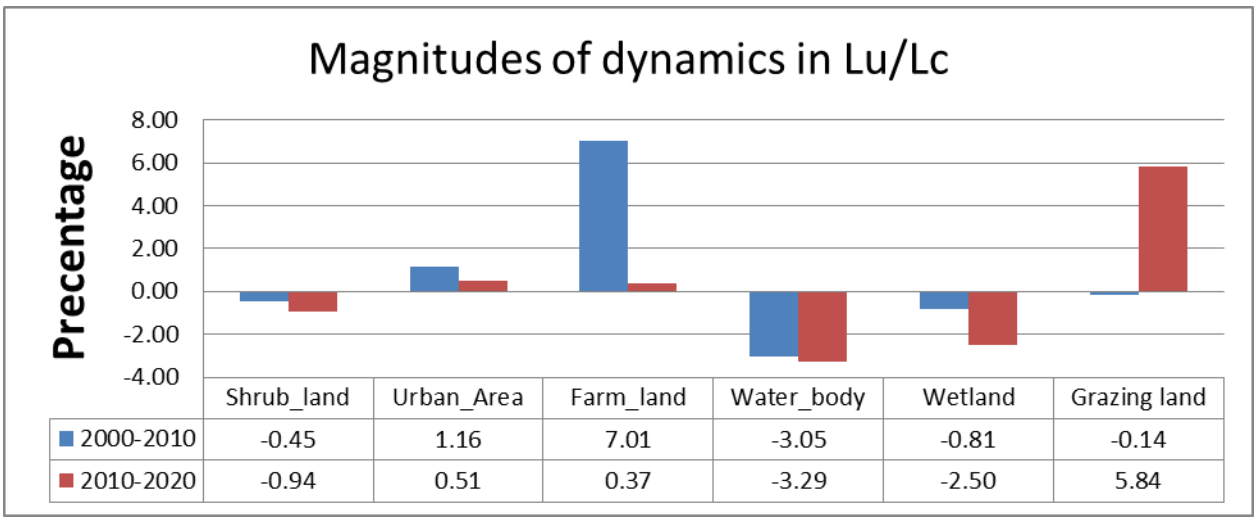
Table 19: Rate of dynamics of wetland and water body in hectare

	Rate of dynamics of land use land cover change					
LuLc class	2000-2010		2010-2020		2000-2020	
	Area (ha)	%	Area (ha)		Area (ha)	%
Shrub_land	10.46	0.45	15.48	0.94	25.94	1.39
Urban_Area	8.92	1.16	17.00	0.51	25.92	1.67
Farm_land	30.00	7.01	69.40	0.37	99.40	7.38
Water_Body	143.80	3.05	46.82	3.29	190.62	6.33
Wetland	47.60	0.81	24.00	2.50	71.60	3.31
Grazing_land	4.19	0.14	105.37	5.84	101.18	5.70

4.8 Magnitude of land use land cover change

As shown in figure(13):Magnitude of dynamics in land use land cover from 2010 – 2000 and 2020-2010 coverage of shrub land water body, wetland and grassland decrease whereas urban settlement and farmland increased in coverage respectively. In general wetlands and water body decreased as an alarming rate.

As shown from figure (18) from 2000-2020 shrub land water body, and wetlands reduced by (25.94 ha),(190.6ha),(71.60ha) respectively and farm land and urban area increased by (99.4ha) and (25.92 ha) respectively



	Shrub_land	Urban_Area	Farm_land	Water_body	Wetland	Grazing land
2000-2010	-0.45	1.16	7.01	-3.05	-0.81	-0.14
2010-2020	-0.94	0.51	0.37	-3.29	-2.50	5.84

Figure 11: Magnitudes and dynamics of land use and land cover change

4.9. Extent and trends of land use land cover change

The study area's land use and land cover patterns suggest that water bodies and wetlands were reduced by 190.6ha) and 71.60ha) respectively in the twenty years from 2000 to 2020. According to the findings, the area of wetlands has decreased by 47.6 (ha) hectares in the first ten years and by 24 (ha) hectares in the second ten years, indicating that if responsible bodies do not take any mitigation measures, wetlands and water bodies will be changed/converted/ into other land use land cover.

4.10 Classification accuracy assessment.

Accuracy assessment result for the land use land cover shows that for 2000 over all accuracy was (92.68%) for 2010 the overall accuracy was (91.3%)and by 2020 the overall accuracy was (92.15 %)(see appendix two).According to (Anderson et.al.1967), as the result of the overall accuracy is 85% and above the result of the map was acceptable.(accuracy assessment tables attached in annex one.

4.11 Discussion

4.11.1. Community perception about wetland.

Wetland resources in Ethiopia are considers as a significant part of the country's environment, providing a wide range of public, financial, and environmental benefits (Tessema et al., 2013).

Wetlands are originating all over the country, from the afar lowlands to the highlands of the Bale Mountains (FAO, 2008).

Changes in land use to fulfil the demands of a growing worldwide population are triggering a shift in the values and functions of wetlands, according to reports (Villa, 2014). Its dynamics are widespread, quick, and significant processes that are fuelled by human activity while also causing changes that affect humanity (Ali, 2009).

Wetlands bring vast benefits to millions of people in different ways. Wetlands appear to be the main source of livelihood in nations like Ethiopia, where agriculture plays a significant role in the economy (FAO, 2008).It is obvious that, its social, cultural, and economic benefits, as well as the immense ecological benefits, can serve as life savers for both the community and the environment if present mismanaged practices are changed in a sustainable way.

Even though wetlands are the sources of invaluable a benefit, their destruction around the world has often been common and is mostly caused by land reclamation and drainage due high human population density (Junk et al., 2013).Wetland ecosystems in Ethiopia are under a big threat (Yilma and Kim, 2003; EWNRA, 2005; Tessema et al., 2013,). Wetlands are altered in a number of ecological ways by changing normal hydrologic patterns and direct and indirect measures to clearance of biodiversity. In Ethiopia there is a massive degradation of wetlands overtime and yet managing of these ecosystems didn't get prioritization (Hailu, 2007).The irresponsible attention given by individuals and policymakers to wetlands is highly damaging these ecological units. Therefore, more rapid dissemination of the existing information on the interaction of community and wetlands could drastically reduce the risk of degradation and leads to a more sustainable management plan. Such actions to be taken in countries like Ethiopia, therefore; in addition to academic purpose the aim of the thesis were being tried to address the status of cheleleka wetlands and information for community as well as policy makers.

4.11.2. Drivers of cheleleka wetland degradation.

Most of the interviewed respondents (98%) and the participants of the focused group discussion reach agreement that wetlands in the area are being influenced over time by the local community and other investment activities. The major activating factors of wetland degradation which were

well-known by the interviewed respondents and from discussions are population growth which leads to farm land scarcity, overgrazing due to shortage of grazing land and urban expansion toward the cheleleka wetlands, sedimentation due soil erosion from the catchment, direct drainage and conversion of wetlands in to other land use types, lack of awareness, unwise use of agricultural inputs such as fertilizers, herbicides, pesticide , and introduction of pumping water for agricultural activities are the major driving factors for wetland cheleleka degradation. This indicates that, conversion of wetlands is becoming very rapid due to different reasons mentioned in the above together with the lack of regulations and strategies to control wetland degradation.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

Wetlands are facing loss (degradation) due to direct and indirect threats of human day to day action. The major problem for cheleleka wetland degradation perception of farmers about wetland degradation even majority of the farmers didn't hear about wetland value and they did not conscious about drivers and pressures of wetland degradation.

Agricultural expansion in Upper watershed causes land degradation which resulting flooding and sedimentation of Wetlands in downstream, converting the Wetlands to crop production and over exploitation of Wetlands` resources (flora, fauna, water and soil), overgrazing, settlement and urban expansion, pollution and water diversion, lack of appropriate national policy on wetland conservation and management, conversion of wetlands to tree plantation site and exotic invasive species are major cumulative threats to Ethiopian wetlands.

To be concerned about the future generation, educating young people about wetland value is important for future success and appropriate policy on conservation and management, rule and regulations are essentials to establish and the action should be taken, if it needed to sustain the potential and life span of the existing wetlands.

Wetlands are shrinking in surface area across the country and in the research area as a result of population growth and demand for farm land and urban expansion, overgrazing and sedimentation.

Based on the findings of the field work and discussions with the woreda developmental agent, water, environmental experts, community members, and environmental management personnel in the study area, it is now more than ever important to further integrate and save the cheleleka wetland with the local community to come up with improved livelihoods for the people with a sustainable wetland managements.

5.2 Recommendation

Wetlands and environmental resources provide means of livelihood for the people and all ecological unit depend upon it in the study area in particular and our country in general.

- Majority of the respondents in the study area point out that, cheleleka wetland are being depleted from time to time due to both climatic as well as anthropogenic pressures mainly the later one are obviously observed in the area. Even if there are many reasons that push the community to encroach in to wetlands, such an action would be a short term gain and a long term loss.

- Therefore it is suggested that community-based participatory wetland management approaches, similar to those used in forest management, be implemented in some sections of the country, where they have proven to be beneficial.

- Aside from wetland management, the most important factor is that our country needs its own wetland policy, strategy and regulation, to reduce the changes of wetlands and its surrounding environment and for creating the way of protection of natural resources from degradation and enable sustainable use of the resources, and the following recommendations are suggested.

- The government and community of those kebeles in particular, must pay attention wise use wetlands and defined duties and responsibilities for wetlands management and natural resource conservation should be formed and strong linkages between federal and regional agencies should be formed to engage on community awareness-building efforts through formal and non-formal education.

- Watershed management, such as afforestation initiatives, green legacy, soil and water conservation activities, and other associated actions that have shown beneficial results in various regions of the country, should be intensified in order to reduce the burden of sediment that enters to the wetland and there should be a clear demarcation between wetlands and other land use types so that wetlands cannot be degraded or converted as desired.

- The government should begin restoration initiatives that involve local community participation in order to promote wetland management based on the interest of the community on basis of economically viable plus environmentally sustainable way.

Moreover international agreement about wise use of local national and international importance of wetland should promote to safe guard the wetland and biodiversity depending up on the country's interests. Finally I recommended that data about wetlands should be organized and Separate wetland policy and strategy are crucial to save wetlands from degradation.

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ANNEX ONE

Appendix 1.

I. **Statistical information of accuracy assessment for the year 2000, 2010 and 2020.**

	2000		2010		2020	
	Producers Accuracy (%)	User"s accuracy (%)	Producers Accuracy (%)	User"s accuracy (%)	Producers Accuracy (%)	User"s accuracy (%)
Farm_land	93.75	93.75	84.21	94.1	100	91.66
Grazing	100	100	100	100	100	100
Shurb	100	100	50	50	66.66	--
Urban_Area	50	50	100	75	100	83.33
Water_Body	88.88	100	100	85.71	83.33	100
Wetland	100	90.9	100	100	100	100
Overall accuracy (%)	**92.68**		**91.3**		**92.15**	

II. **Confusion matrix for LULC map of 2000**.

Reference Data								User accuracy(%)
Map Data	Farm_land	Grazing Land	Shrub Land	Urban Area	Water Body	Wetland	Grand Total	
Farm_land	15	0	0	1	0	0	16	93.75
Grazing	0	3	0	0	0	0	3	100
Shurb	0	0	1	0	0	0	1	100
Urban_Area	1	0	0	1	0	0	2	50
Water_Body	0	0	0	0	8	0	8	100
Wetland	0	0	0	0	1	10	11	90.9
Grand Total	16	3	1	2	9	10	41	
Producer ac	93.75	100	100	50	88.88	100	**92.68**	

III. **Confusion matrix for LULC map of 2010.**

Reference Data								User accuracy(%)
Map Data	Farm land	Grazing Lan	Shrub Land	Urban Area	Water Body	Wetland	Grand Total	
Farm land	**16**	0	1	0	0	0	17	94.1
Grazing Land	0	**1**	0	0	0	0	1	100
Shrub Land	1	0	**1**	0	0	0	2	50
Urban Area	2	0	0	**6**	0	0	8	75
Water Body	0	0	1	0	**6**	0	7	85.71
Wetland	0	0	0	0	0	**12**	12	100
Grand Total	19	1	2	6	6	12	**46**	
Producer accurac	84.21	100	50	100	100	100	**91.3**	

IV. Confusion matrix for LULC map of 2020.

Map data	Reference Data							User accuracy(%)
	Farm land	Grazing lar	Shrub land	Urban Area	Water Bod	Wetland	Grand Tota	
Farm land	22	0	1	0	1	0	24	91.66
Grazing land	0	7	0	0	0	0	7	100
Urban Area	0	0	2	10	0	0	12	83.33
Water Body	0	0	0	0	5	0	5	100
Wetland	0	0	0	0	0	3	3	100
Grand Total	22	7	3	10	6	3	51	
Producer accuracy(%)	100	100	66.66	100	83.33	100		**92.15**

V. Land use land cover change 2000-2010

Year	LULC_2000													
		Farm_land		Water_Body		Urban_Area		Wetland		Shrub_land		Grazing_land		Class Total
	Class_Name	Area(ha)	%	Area(ha)	%	Area(ha)	%	Area(ha)	%	Area(ha)	%	Area(ha)	%	
L	Farm_land	714	56.39	6	1.93	4	3.45	192	34.18	21	67.94	3	13.24	940
U	Water_Body	4	0.29	182	54.80	0	0.00	1	0.14	2	6.64	0	0.00	189
L	Urban_Area	511	40.36	5	1.48	112	96.53	9	1.58	4	13.79	11	56.29	652
C	Wetland	20	1.57	136	40.85	0	0.00	376.6	62.82	0	1.23	1	2.67	533.6
_	Shrub_land	14	1.10	3	0.95	0	0.02	0	0.05	3	9.53	0	1.78	21
2	Grazing_land	4	0.29	0	0.00	0	0.00	7	1.22	0	0.87	5	26.03	16
0	Class Total	1267	100.00	333	100.00	116	100.00	586	100.00	31	100.00	20	100.00	0
1	Class Changes	552	43.61	150	45.20	4	3.47	209	37.18	28	90.47	15	73.97	0
0	Image Difference	-326	-25.72	-144	-43.24	536	462.07	-52	-9.32	-10	-33.57	-4	-20.69	0

VI. Land use land cover change 2010-2020

Year	LULC_2010													
		Shrub_land		Water_Body		Urban_Area		Farm_land		Wetland		Grazing_land		Class Total
	Class_name	Area(ha)	%	Area(ha)	%	Area(ha)	%	Area(ha)	%	Area(ha)	%	Area(ha)	%	
L	Shrub_land	3	16.30	0	0.25	1	0.11	1	0.06	0	0.03	0	0.00	5
U	Water_Body	1	5.33	112	59.54	0	0.00	0	0.00	28	5.58	0	0.00	142
L	Urban_Area	0	1.96	6	2.99	576	88.33	65	6.87	7	1.30	4	27.07	658
C	Farm_land	16	76.30	0	0.02	75	11.48	869	92.39	124	24.38	12	72.93	1096
	Wetland	0	0.00	70	37.20	0	0.04	3	0.28	329	45.72	0	0.00	306
2	Grazing_land	0	0.11	0	0.00	0	0.05	4	0.41	117	23.00	0	0.00	121
0	Class Total	21	100.00	189	100.00	652	100.00	940	100.00	510	100.00	16	100.00	0
2	Class Changes	17	83.70	76	40.46	76	11.67	72	7.61	277	54.28	16	100.00	0
0	Image Difference	-15	-74.78	-47	-24.80	5	0.84	155	16.51	-204	-39.95	105	656.80	0

VII. Land use land cover change 2000-2020

Year	LULC_2000													
		Shrub_land		Water_Body		Urban_Area		Farm_land		Wetland		Grazing_land		Class Total
		Area(ha)	%	Area(ha)	%	Area(ha)	%	Area(ha)	%	Area(ha)	%	Area(ha)	%	
L	Shrub_land	1	2.53	2	0.51	0	0.02	3	0.21	0	0.02	0	0.00	5
U	Water_Body	2	7.51	137	41.08	0	0.00	1	0.08	2	0.36	0	0.00	142
L	Urban_Area	2	6.57	11	3.22	104	89.82	497	39.30	30	5.25	14	68.41	658
C	Farm_land	26	83.39	23	7.00	12	10.12	753	59.51	275	48.88	6	31.59	1096
	Wetland	0	0.00	155	46.71	0	0.04	1	0.07	305	26.65	0	0.00	461
2	Grazing_land	0	0.00	5	1.48	0	0.00	11	0.84	106	18.84	0	0.00	121
0	Class Total	31	100.00	333	100.00	116	100.00	1266	100.00	562	100.00	20	100.00	0
2	Class Changes	30	97.47	196	58.92	12	10.18	513	40.49	412	73.35	20	100.00	0
0	Image Difference	-26	-83.25	-191	-57.31	542	466.76	-170	-13.46	-256	-45.54	101	500.22	0

ANNEX TWO
Questionaries'

I. close ended Questionnaire for the community

Dear respondent, the main objectives of this questionnaire is to obtain data on assessing, the farmers perception about wetland degradation which practice agricultural activities near adjacent to wetland cheleleka. The data will be analyzed to examine for potential better improvement of the farmers perception about the impacts of wetland degradation. The quality of the research work highly depends on your genuine responses. Thank you in advance for your commitment & truthful responses.

1. Socio-economic and demographic status Farmers engage in farming activities adjacent to wetland cheleleka and government Employers.

General information:

I. Age: _____ □ 20-40 □ 41-60 □ above 61
II. Educational background): _____□ Primary school) 1-8 □ High school graduate) 9-12 □ Undergraduate level □ Masters Level)
III. Working position): _____□ Agricultural sector office □ water sector office) □ Farmer □ Environmental protection sector office.
IV. Living area): _____.income (EBT/month A. 500-1000 B. 1001-2000 C. 2001-3000 D. 3001-4000 E. >4000

1.1. Sex of household head?			1= Male 2= Female
1.2. Marital Status of the household head?			1= Single 4= Widowed 2= Currently Married 5.if other please specify 3=Divorced/Separated _____
1.3. Does your household have farmland? (If 'No" skip to Q. No 1.3)			1.Yes. 2.No
1.4. If your answer for Q. No 1.3 is 'Yes', which type is your farmland? (More than one choice is possible) Specify the size?			
1= Private	1=Yes	2=No	
2= Inherited	1=Yes	2=No	
3= Gifted	1=Yes	2=No	
4= Rented in	1=Yes	2=No	
5= Sharecropped in	1=Yes	2=No	
6= If other, please specify _____			

2. Perception of farmers to ward cheleleka wetland

2.1 Do you hark before about wetland? □ Yes (አዎ/eyyee) □ No (የለም/lakki)

2.2 Do you hark before about drivers of wetland degradation? a)Yes b) No .

2.3 Do you think that educating young people about wetland value is important for future successes? □ SD- Strongly Disagree □ D- Disagree □N- Neutral □ A- Agree), □ SA- Strongly Agree

2.4 Do you hark before a sector which is accountable for wetland degradation? □Yes □ No

2.5 Do you involve stakeholder consultation about wetland degradation? □ Yes □ No 2.6 For the last two decades, is there a real extent shrinking of the wetland cheleleka? □Yes □No □Not sure

2.7 Do you think that wetland cheleleka is habitat for migratory birds June to October each year? □ Yes □ No

2.8 Do you think that wetland cheleleka used for tourism, specifically for bird watcher? □A. yes □No

2.9 Do you think the governmental authority has taken proper action against the impacts related wetland degradation in the past? □ SD- Strongly Disagree □ D- Disagree, □N- Neutral □ A- Agree), □ SA- Strongly Agree

2.10 Does introduction of pumping technology increased expansion rate of irrigation? □. Yes □ No □ Not sure

3. Factors and drivers for cheleleka wetland degradation related .

3.1 Do you think that population growth is the cause for cheleleka wetlands loss? A. Yes B. No C. Not sure; If your response is yes for Q no 2.1 how? A. through urban settlement expansion. B. through expansion of Farm land. C. through Rural settlement expansion D. through Road construction and other infrastructure development.

3.2 Did farm land expanded to wetlands in (cheleleka area in particular)? A. Yes B. No C. Not sure

3.3. Do you think that farming land expansion is the cause for wetland and water body degradation in cheleleka? (A. Yes B. No; if your response is yes for Q.no 3.3 how? -------.

3.4. Did both Farmer and private agricultural investors involved in irrigation? A. Yes B. No C. Not sure If your response is yes for Q.no 3.4 did they invest on existed irrigation land or expanded to new land of wetland?----------.

3.5. Did settlement expanded and affect wetlands? A. Yes B. No C. Not sure. If your respond yes, for Q no 3.5 what happened to the wetland a result of settlement expansion? A. shrinking of wetland B. increased runoff and sediment entering cheleleka C. increased frequency of flooding D. shortage of water supply E. loss of agriculture land F. loss of grazing land.

3.6 Did quarry site development practiced near wetland catchment? A. Yes B. No C. Not sure .If your response is yes for Q no 3.6 what happened as a result?---------- 3.7 Did overgrazing is practiced in wetlands of the catchment? A. Yes B. No C. Not sure ,If your response is yes for Q no 3.7 what happened as a result of overgrazing practice on wetland?----------

3.8 Do you think that sedimentation decreased the extent and depth of wetland? A. Yes B. No C. Not sure .If your response is yes for Q no3.8. what happened as a result?---

3.9 Do you think industrial and urban discharge affect wetland cheleleka? Yes □ No

3.10 Do you think that non-point source of agricultural inputs such as fertilizers, herbicides and pesticide affect biodiversity in wetland cheleleka ? □ Yes □ No

3.11 Do you think that Agricultural and urban expansion affect wetland cheleleka? (□ SD- Strongly Disagree □ D- Disagree, □N- Neutral □ A- Agree), □ SA- Strongly Agree

3.12 Do you think that excessive water pumping for agricultural activities affect wetland cheleleka?□ SD-Strongly Disagree□ D-Disagree □N-Neutral □ A-Agree,□ SA-Strongly-Agree

3.13 Do you think that overgrazing affect wetland cheleleka? □ SD- Strongly Disagree □ D-Disagree, □N- Neutral □ A- Agree, □ SA- Strongly Agree

3.14Do you know the number of water pump used for water extraction for agriculture per day □ Yes □ No .If your answer is yes how much? □ Below -50 □ from 51-100), □ from 101-150 □ above -151

3.15Do you think that diversion of water due to as railway and high way construction affect the inflow of water to cheleleka weteland? □ SD- Strongly Disagree □ Disagree, □ Neutral, □Agree □ SA- Strongly Agree.

5.16 Have you ever been trained about wetland value and impact of wetland degradation on Environment? □ Yes □ No .

1.17Do you think that farmers nearby cheleleka wetland used Agricultural input such as fertilizer, herbicide and pesticide for production? □ Yes □ No

3.18 Do you think that there is clear demarcation between wetland cheleleka and agricultural land near the wetland? 1. yes 2.No

4. Knowledge about wetland.

Here under are statements which relate to wetlands and their ecosystem services. After reading each statement please specify your response either 'Yes' (Y), 'No' (N) or 'don't know' (DK).

		Y	N	DN
1	Wetlands are lands periodically or permanently covered by water			
2	Wetlands are wastelands.			
3	Wetlands provide habitats for a wide variety of animal and plant species			
4	Draining wetlands speed up the drying of the ecosystems			
5	Wetlands retain sediments and thus protect siltation in the lakes or dams.			
6	Wetlands serve as sources of water and fodder to both domestic and wild nimals.			
7	Wetlands control flooding by collecting and holding floodwaters back and keep rivers at normal levels			
8	Wetland ecosystems can easily be degraded and loss their natural characteristics due to overstocking or year-round grazing in the wetlands			
9	Release of fertilizers, herbicides and pesticides from agricultural land to wetland areas could reduce the water quality and affect aquatic lives.			
10	Cheleleka wetland used for recreational value			
11	Cheleleka wetland used for migratory birds destination			

4. Conservation Attitude.

Hereunder are statements that relate to your personal outlook to wetland degradation of. After reading each statement, please specify whether you: 'strongly agree' (5), 'agree' (4), 'don't know' (3)'disagree' (2), or 'strongly disagree' (1) with the statement. (Put a check mark √) .

	statement	5	4	3	2	1
1	Investment in wetlands‘ conservation practices is important to prevent wetland degradation ,					
2	People should be allowed to farm in any of the areas of wetlands.*					
3	Uncontrolled livestock grazing around wetland cheleleka should be prohibited.					
4	Trees should be planted to prevent erosion and siltation on the wetlands front					
5	Release of agricultural chemical and nutrient runoff into the lake's waterway should be restricted to protect the lake's water quality					

4. Legal related questions

4.1 Do you think that national wetland policy is important.□ SD- Strongly Disagree, □ D- Disagree □N- Neutral,□ A- Agree, □ SA- Strongly Agree

4.2 Do you think that institutional arrangement is important to control wetland degradation? □ SD- Strongly Disagree □ D- Disagree □N- Neutral □ A- Agree □ SA- Strongly Agree

4.3 Do you think that the existing wetland institutional arrangement properly functional? □ SD- Strongly Disagree □ D- Disagree, □N- Neutral, □ A- Agree, □ SA- Strongly Agree

4.4 Do you think absence separate policy of wetland can affect management of wetland? □ SD- Strongly Disagree □ D- Disagree □N- Neutral, □ A- Agree □ SA- Strongly Agree

Checklist for Feld Observation and key informant interview KII Perception of farmers about wetland degradation (2021)

	Issues to be Observed	**Responses from interview and field observation**	**Remarks**
1.	Are there any regulations under the organization to manage Wetland degradation?		
2.	Do the industry and urban near the wetland have awareness about the cause and effect of wetland degradation?		
3.	Do farmers use advanced technology to extract Excess water from the wetland for irrigation?		
4.	Do your organizations have Annual report waste minimization and water pollution prevention plan regarding discharge into wetland?		
5.	Does cheleleka wetland become shrinking in size in the previous two decades? How much per annual?What are the determinant factors,Please list the major ones?		
6.	Does the industry have Annual Report on Waste Minimization and Pollution Prevention Plan regarding on lead by products?		
7.	Does wetland near urban areas have been altered by human activites		
8.	Is there clearly demarcated buffer zone in between agricultural area and wetland?		
9.	Does your Organization have skilled manpower /wetland Expert?		
10.	Do cheleleka important for migratory birds destination?		
11	Do cheleleka wetland used for tourism attraction?		