JIMMA UNIVERSITY

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IMPACTS OF POPULATION GROWTH ON THE HOUSEHOLD FARM LAND SIZE AND LAND MANAGEMENT AMONG GIDA AYANA WOREDA RURAL FARM HOUSEHOLDERS IN EAST WELLEGA ZONE

BY: GIRMA ALEBACHEW

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ADVISOR: TESFAYE DEBELA (ASSISTANT PROFESSOR)

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The Impacts of Population Growth on the Household Land Size and Land Management: The Case of Gida Ayana Woreda

By: Girma Alebachew

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Advisor: Tesfay Debela (Assistant Professor)

Co-advisor: Wondeafrash Genet

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Approval Sheet

Approved by Board of Examiners

Advisors

Name _____Signature _____Date_____

Name_____ Signature _____Date_____

Internal Examiner

Name _____ Signature _____Date_____

External Examiner

Name _____ Signature _____Date_____

Declaration

I, the undersigned graduate student, hereby declared that the thesis is my original work. I have duly acknowledged any reference materials used in this work. I have followed all ethical and technical principles in the preparation, data collection, data analysis, and completion of this thesis.

Name: GirmaAlebachew

Signature_____ Date_____

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Abstract

The objective of this study was to investigate the impacts of population growth on household land size and land management system. To address the objective a cross-sectional survey design was used with mixed data analysis method; 881 sample was taken from three different kebeles under multistage sampling techniques while the sample size of the study was determined by using Taro Yemane's (1967) sample size determination formula; questionnaire, key informant interview and focus group discussion were employed to gather data from the participants; the gathered data was analyzed under descriptive data analysis method where frequency, percentage and correlation were used. The analyzed data revealed that the family size has been increased within ten years almost by 10% (33.3%-42.1%) but the land size of the households within the same years. Although most households indicated they have land but this land is not enough to support their family adequately. Further, the study revealed that most households (83.4%) have small sized land which was minimized by the family size increment; according the analyzed data the land size of most households become less than half an hectar; the study also found that though most households have hints to manage their small size land, their annual crop production (particularly consumption product, teff and maize) showed decrease from year to year; contrary to this the market based crop (oil crop, nug) increased which in turn fluctuated the annual income of the households; in a nutshell, the study identified that there is negatively significant relationship between the population growth and the land size of the households. As a result, it was concluded that as the population increases the land size of the households decreases and vice versa which also fluctuates the production amount of the households. Therefore, it was recommended that the concerned bodies should work in advance to train the households manage their small land towards increase its production particularly by increasing its fertility through scientific techniques.

***Key terms: household, land size, land management**,*

CHAPTER ONE

Introduction

1.1. Background

The relationship between rapid population growth and the capacity of our earth has been a matter of controversies for a long time and would continue so in the future. The controversies stated that the interaction between population growth and environment can have one of the two general dimensions: human actions negatively affect the environment and the environment negatively affects human activities. However, many of the increasing concern relates to the first dimension as production potential of the environment has been largely damaged by high population pressures (Cuffaro, 2011; Bielli, Berhanu, Isayas, & Orasi, 2011). In response to increasing human-induced environmental change, understanding the relationship between human population growth and cultivated land on temporal scale is imperative and of great concern of the scientific community.

Global land use has significantly changed during the Kebelest decades. Historically, the driving force for most of land use changes is population growth. Population growth is often used as a proxy for land use change (Kok, 2004) but at lower scales, a set of complex drivers are important too (Maksym & Zhang, 2018). Increasing demand on food as a result of population growth has created more pressure on land resources (Mohawesh, Taimeh & Ziadat, 2015).

Objectives for land use change differ between the developed and developing countries. In developed countries, land use change is based on economic reasons such as large scale farming or urban development and an increasing need to conserve biodiversity and environmental quality for current and future generations (Ningal, Tine, Hartemink, & Bregt, 2018) whereas in the developing countries, rapid population growth, poverty and the economic situation are the main driving forces (Lambin, Geist, & Lepers, 2013).

Moreover, agriculture as a primary economic activity is the major economic base of the world's population. More than 60 percent of the world population depends on agriculture for their livelihood. It employs a high proportion of people especially in the developing world (BinyamMoreda , 2016). World Bank report of 2001 indicated that in many poor countries,

agriculture accounts for 80% of employment and contributes 40% of GDP (Muluneh Woldetsadic, 2003). However, agricultural production is very poor in developing countries particularly in sub-Saharan African countries. According to Markos Ezra (1997) although in global terms the world food situation has improved, in sub-Saharan Africa it has worsened for the last few decades . The same source revealed that, after independence between 1961-2001, sub-Saharan Africa faced the highest rate of population growth at an annual rate of nearly 3%, whereas the crop output decreased by 13% (Binyam Moreda , 2006) FAO also noted in sub-Saharan countries, overall per capita yields declined from 1970 to 1980 and have stagnated ever since.

On the other hand, the global human population is growing at accelerating rate compared to agricultural land resource availability and its productivity to sustain people. World population was 6 billion just before the end of 20th century. It is projected to grow from 6.83 billion in 2009 to 8.5 billion in 2025 and 10.5 billion in 2050 with most of the increase coming from developing countries (UNO, 1993).

High growth rate of population has necessitated global increase in food production. More and more land has been taken over for food production to feed the growing population. World bank report of 2007 indicated worlds demand for food is expected to double within the next 50 years while the natural resource that sustain agriculture will become increasingly scarce and degraded (Samuel Girma, 2007). This problem is serious particularly in the highland area of Ethiopia. The high growth and concentration of the population in the highland and hence ever decreasing per capita land has led to the expansion of agricultural activities into the marginal areas as the result the forest coverage depleted. Farming in the steep slopes would lead to accelerated soil erosion eventually decrease the productivity of the land (Binyam Moreda , 2006).

Relation between population growth, agriculture and natural resource management is a controversial issues and it has been debated since the time of Malthus. Many studies have found population growth to be associated with various aspects of resource depletion, including deforestation, overgrazing, soil erosion, soil nutrient depletion, land fragmentation and other problems (BinyamMoreda , 2006). On the other hand, many other studies disputed this idea and they found positive association between population growth, agricultural

intensification and land conservation. However, it has been globally recognized that high population growth or density has negative impact on agricultural production and environmental security (Binyam Moreda , 2006).

Writers postulate as this relationship between population growth and land use is not a new phenomenon to our planet. For instance, according to (Daniel, 2008) the nature of land use had been started to be changed over the 6,000 years that associated with the growth of human population (Wolman, 1983). For many years, the growth of agricultural production related to the expansion of population, together took place through the extent of land under cultivation indicating that different population densities and different population growth rates produce different land use over time. More people means, more food which can come only from either of agriculture into new lands, or use of existing agricultural land more intensively (Theodore, 2000). As Daniel (2008) explained rapid population growth exerts pressure on the existing land resources through increasing the demand for food, wood for fuel and construction purposes, and other necessities.

Ethiopia is an agrarian country and agriculture is the only source of livelihood for the majority of people. It accounts for about 50% of the GDP, provides employments for 85% of the country's total population and supplies about 90% of the total foreign exchange earnings (MOFED, 2008). Despite its dominant position both in the national economy and in the life of the majority of Ethiopian people, the stage of agricultural development is very stagnant with low productivity and unable to feed the rapidly growing human population sufficiently (Wondwosen Abera, 2010).

Based on the above concern, therefore, this study intends to investigate the impacts of population growth on household land use and management in Gida Ayana woreda rural householders. To achieve this objective this study will be segmented in to different chapters. Chapter one will be focused on the background, statement of the problem, basic research questions, objectives, significance of the study, operational development. Chapter two will emphasis the related review literature while chapter three will present the method, design, population, sample, and sampling techniques, data gathering techniques, data analysis and ethical consideration. Chapter four will present results of study where chapter five presents conclusion and recommendation of the study.

In Ethiopia over the last 100 years, the population growth rate had shown dramatic changes. Its growth rate was very low at 0.2 percent in 1900. It increased to 1 percent in 1925 and to 2 percent in 1950. But after 1950 the population growth rate increased until it reached its peak of 3 percent in 1990. The population of Ethiopia has experienced steady growth over the years from 53.4 million in mid 1990s to 63.5 million in 2000 at an average annual increasing rate of 2.8 percent (Hiruy Mitiku, 2008). Total population projected to reach 71 million in 2004/05, 75.1 million in 2005/06 and 83.5 million by 2009/10 (Muluneh Woldetsadic, 2003).

In Ethiopian human population has grown fast on the limited land area and almost every piece of land is converted into cultivated land to produce food (Badege, 2005). Kindu (2013) also highlights growing of population is one of the most critical drivers of the observed land cover dynamics because the livelihood of almost the entire rural population depends on it.

Oromia is one of the eleven Ethiopian regions characterized by dense population concentration. As the 2007 census conducted average population density is 76/ sqkm (World Bank, 2005). Further, Gidda Ayana is one of the woredas in the Oromia located in eastern Wollega zone where of more than half of the population engaged in agricultural activities (TWRAO, 2009). In the woreda, agricultural lands are found under heavy stress due to continuous cultivation imposed by population pressure over limited plot of land and increased land fragmentation. As a result, the available farmland size of households is not enough to operate the basic economic activities in order to support family members (Goran Djurfeldt& Holmen, 2005).

Generally, population growth is a critical challenge facing sub-Saharan Africa countries including Ethiopia (Population Reference Bureau, 2012) because the majority of people in sub-Saharan Africa countries that live in rural areas, which are experiencing rapid population growth and declining per capita farm sizes. Therefore, the influence of population growth on household land size will have a large on the ability of smallholder farmers to feed themselves and their families. Despite its importance, there is little empirical evidence on how rural population affects household land use and management system. Having this in mind, therefore, this study intended to investigate the impacts of population growth on household land use and land management system in Gidda Ayana woreda, eastern Wollega zone of Oromia regional state.

1.2. Statement of the Problem

Land degradation has been the critical challenge for Sub-Saharan African countries. The causes of land degradation are complex and vary from place to place. The major drivers of land degradation are generally grouped into two: proximate and underlying causes (Belay et al. 2015; Pingali, 2014). The proximate causes are more or less natural factors such as biophysical conditions, topographic and climatic conditions, and inappropriate land management practices, whereas the underlying factors are mostly anthropogenic, which include population growth, land tenure, and other socioeconomic and policy related factors (Belay et al. 2015; Pingali, 2014). From the former cause land management and from the later major cause population growth will be the critical business of the current study.

The key drivers of land degradation in Africa in general and in sub-Saharan Africa in particular are similar to that of a global scale which include high demographic growth, weak incentive policy, poor legal and institutional frameworks, limited availability of grazing land, and poor knowledge regarding the environment (Diagana, 2003; Hurni & Wiesmann, 2010).

Population growth, therefore, is a critical challenge facing sub-Saharan Africa in the twenty-first century, as the region's population currently stands at 900 million people, and is projected to double by 2050 (Population Reference Bureau, 2012). The majority of people in sub-Saharan Africa live in rural areas, which are experiencing rapid population growth and declining per capita farm sizes. Therefore, the influence of population growth on agriculture will have a large impact on the ability of smallholder farmers to feed themselves and their families. Despite its importance, there is little empirical evidence on how rural population density affects household land use and management. Especially in countries with limited cultivable land and high population growth rates, fallow periods are no longer sufficient to allow soil fertility to be restored. For instance, countries like Kenya, Ethiopia, Malawi, Burundi, and Rwanda are examples of this where crop yields have fallen consequently.

Moreover, it is an obvious fact that the Ethiopian economy is predominantly rural. Agriculture in the Ethiopian economy has been the only most important variable in explaining the fluctuation (ups and downs) of aggregate economic performance over the years. The impacts of the economy and the improvement of the standard of living of the vast majority of Ethiopians are

mainly influenced by the efficiency of the agricultural sector. Consequently, there is a need to investigate the problem of agricultural productivity which may in turn requires understanding of varying characteristics of Ethiopian Agriculture at large and regional farming systems in particular. Out of the numerous factors, therefore, those affect agricultural development.

Land is the basic resource in which Ethiopian society depends for the production of food and other requirements. However, many Kebele of the country are facing agricultural land shortage due to various factors including rapid population growth (Addisalem Ammbaye, 2010). For example, in an agrarian country like Ethiopia, where the vast majority of the people are engaged in agricultural land and the increasing farming population is not matched by adequate land, the structure of agriculture is typified by small and fragmented.

Fast growing rate of population density in Ethiopia is the indicator of the above issues. For instance, the simple person land ratio at national level increased from about 22 person per square kilo meter in 1975/ 76 to 41 in 1987 (CSA, 1990). It also grew from 76 persons per square kilo meter in 1999 to 79 in 2007 (World Bank, 2005). This has led to reduced farm size, reduction of fallow intervals and soil fertility, which resulted in declining of yields per capita and per hectares.

Further, food production in Ethiopia has failed to keep up with the increasing population of the country for about 2 and half decades now. While the country's population is estimated to be increasing at the rate of 3 % a year, the per capita and total crop yield levels are very fluctuating from time to time and continue on a substantially declining trend (Markos, 1997). According to Markos, population pressure has resulted in reduced farm size, land fragmentation, over-cultivation, over-grazing, etc.

Therefore, in Ethiopia, average cropped land holdings are low throughout the country. This is especially true throughout Southern Oromia (CSA, 2006/07). Further, many studies report that the rapid population growth has resulted in land scarcity, extension of cultivated land, change of cropping, reduction of grazing land, increasing of landlessness. As most of these studies noted, declining land holding size because of deteriorating soil fertility was among the biggest challenges facing agriculture production system in Ethiopia (KumelaGudata, 2007). Nevertheless, it is asserted by some researchers that regions with higher population growth

sometimes have higher yields per hectare of cultivated land (Chaudhury, 1981). On the other hand, some recent research findings on Ethiopian agriculture show the negative consequence of population growth. Abbi (1995) for example, argues that population growth accomplished by increased food demand leads to increased land fragmentation and intensive use of land. As a result, cultivation will be persistent and, fallow periods will be too short to allow soil to regenerate. Therefore, population pressure impedes agricultural land size and land management of households by aggravating less land access to them. For instance, a study conducted in Arsizone, particularly in Chilalo district (based on farm level data) suggested that as demographic pressure increases through time more farmers will be moved to operating at high risk of guaranteeing their basic subsistence (Amare, 1995). Nevertheless, only few peoples conducted research on certain areas of our country. Hence, this study aimed at assessing the Impacts of Population Growth on the Household Land Size and Land Management in Gida Ayana Woreda, Eastern Wollega Zone.

1.3. Objectives of the study

1.3.1. General objective

The general objective of this study was to investigate the impacts of population growth on household farm land size and management in Gidda Ayana Woreda, East Wellega.

1.4.2. Specific objectives:

The specific objectives of this study will be:

1) To explain the relationship between population growth and household land size in Gidda Ayana woreda;
2) To discuss the perceived impacts of population growth on household annual agricultural production in Gidda Ayana woreda;
3) To analyze the effects of land size variation on household-income in Gidda Ayana woreda;

1.4. Basic Research Questions

a) What is the relationship between population growth and household land size in Gidda Ayana woreda?
b) How impacts of population growth on household annual agricultural production perceived in Gidda Ayana woreda?
c) How land size variation effects of on household-income in Gidda Ayana woreda?

1.5. Significance of the Study

This study is designed to thoroughly assess the impacts of population growth on the household land size and management in Gida Ayana woreda and will attempts to provide insight on the possible direction(s) that help to address the problems.

The study will also contribute towards the understanding of the magnitude of change from the population dynamics point of view and household land size and land management skill and how they could cope up with these problems.

Furthermore, the results of the study will generate relevant information that will contribute to the development plans of the woreda in terms of planning land use planning and management. The Kebeles of the woreda are the least studied parts as compared to the other woreda's. The result of the study can be used to inform and influence researchers at different jurisdictions on development interventions and policy discussions related to population environment nexus of the woreda.

1.6. Scope of the Study

This study was carried out in Gida Ayana woreda Kebeles particularly in Andode Dicho, Gute Gudina and Haro Misoma Kebeles. Further, it was demarcated from the study variable perspective in studying the in Kebele of population growth in household land use and management in the sampled Kebeles. In this case family size, and land use were independent variables while land size and land management were predictor variables.

1.7. Limitations of the study.

The major limitation of the study was resources in terms of time and finances. In addition, the sample size of the respondents had to be small due to the constraints in financial resources. The researcher could not reach a bigger population of farmers compared to population size of the woreda. However, despite the various constraints, the study population sampled was representative enough to avoid bias and to enable the researcher acquire some useful information, draw some conclusions and also make some recommendations.

1.8. Organization of the study

This study was organized under five chapters. Chapter one presented the background, statement of the problem, objectives of the study, basic research questions of the study, scope of the study and the limitation of the study. Chapter two presented the important and appropriate review literature on the issues. Chapter three presented the methodology where study design, population, sample, sample size determination, sampling techniques, data gathering techniques, data analysis method and ethical consecrations were included; chapter four consisted the data organizing, analyzing, and interpreting; while chapter five consisted of conclusion and recommendation of the study.

1.9. Operational definitions

Household: for this study the concept of household based on the arrangements made by persons, individually or in groups, for providing themselves with food and other essentials for living; it may also may be either a person household, that is to say, a person who makes provision for his or her own food and other essentials for living without combining with any other person to form a multi-person household or a multi-person household, that is to say, a group of two or more persons living together who make common provision for food and other essentials for living in the study area.

Land size: the land amount in hectare that a household owned in the study areas

Population Growth: Refers to the increase in the number of family members that reside within a household in the study areas

CHAPTER TWO

2. Review of Literature and Conceptual Framework

2.1. Introduction

This chapter reviews the existing literature on different thematic areas of focus in this study to fully address the objectives and identify the gaps. It includes literature on the impacts of human population growth on land resources which include land use, land management, and population growth.

2.2. Population Pressure on Land and Agricultural Resources: Global Context

Population increase in many parts of the world has consequential effect on agricultural resource because an excessive growth of population can drastically minimize agricultural land throughout the world. It is reportedthat agricultural land which extracts food and cereals contain only 12% of the total land area of the planet which does not seem to be sufficient in terms of covering the subsistence of such a huge incumbent population. Of the remaining total 24% are arid grass land which is used for pasturing and grazing purposes, and another 30% is covered by forest necessary to protect the environment from greenhouse effect and other climatological imbalances. The remaining 34 per cent of the total land of the planet is fully unusable for any crop production as they are stony, are exposed to extremely dry, cold and wet atmospheric conditions (Buringh, 1989).

These lands are simply geologically infertile, unusable for pastures as grass land, and climatically unsuitable for crop production (Pimentel, 1989). Thus, it becomes logical that when population grows at an unlimited rate, it obviously puts pressure on our marginally available 12% of useable agricultural land, the supply of which is also shrinking day by day.

An extreme growth of population also squeezes the per capita availability of cultivable land. Based on evidence, it is calculated that at present, we require 0.5 hectare per capita crop land as a minimal requirement to sustain a proper diet and nutrition. But due to continuous population growth and also rapid land degradation, theavailability of per capita land is reduced to an

extreme point day by day (Leach, 1995). In many Third Worldcountries, it is far below the global average, putting people under serious food shortage and effectual causationof poverty and hunger. An example can be found in Honduras where John Pender (1999) formulated a hypothesis on the impact of rural population on productivity, poverty and natural resource management. Pender's argument seems to be relevant for this research which also has shown the implications of demographic pressure on the farm-based agrarian households in rural Bangladesh. There is however, another research conducted by D.G. Satihal, L.D. Vaikunthe and P.K. Bhargava (n. d.) which documents those rapid demographic and agricultural changes in various parts of Karanataka District for the last few decades. The paper has however, shown that there is a large variation in the general land utilization pattern and availability of cultivated land in different parts of the district. Bivariate analysis of data however, suggests that agricultural growth in all cropped areas of the district largely lag behind population growth, except in a few areas where there are higher growths of food crops.

We know that land and its terrestrial environment is essentially an important natural resource which provides 99% of humans' food requirement (Pimentel & Marcia, 2006). Thus logically, it is quite likely that when this land is under serious threat due to population growth, farmers need to use the same land repeatedly through intensive multi-cropping production. When farmers go for intensive cultivation, they have to utilize mechanized farming and make an abrupt shift from their traditional indigenous farming system. The introduction of mechanized farming provides a sharp increase of crop production which is essential to support a growing population. Traditional subsistence farming in Asia and Africa in the past involved the rotating cultivation or mono-cropping, keeping the land fallow for some time, which as a matter of fact allowed the land to be revitalized and regain its nutrients. But with the increase of population, people put continuous pressure on land, without allowing them any time off. The resulting consequence is the deterioration of the soil which keeps the land fully dependent on chemical fertilizer and uncontrolled irrigation. Therefore, peasants moving towards mechanized farming no longer depend on seasonal rain and also at the same time, are totally dislodged from indigenous farming mechanisms. Due to mechanized farming, crop production increases, yet a complimentary notion develops when people usually care less about reducing the population(Pimentel & Marcia, 2006).

2.3. Population Pressure and Agricultural Development

Most of the population in the least developed countries like Ethiopia resides, works, and consumes in agricultural areas. Today, there is a tendency in modern development studies to give more focus on agriculture as the foundation of national economic growth in these countries. The knowledge about the impacts of population growth on agricultural production is of a paramount importance due to the complex relationship that both exhibit.

While there is a general understanding that rapid population growth and consequently high population pressure have been the basic factors behind land use changes, the manner and direction of linkages have not been investigated in detail. There has been little research that systematically analyzes the relationships between population pressure and growth on changes in agricultural practices. For instance, a recent article by Bilsborrow and Geores (1994) focuses on an entire lack of research in this area. After reviewing the available literature on the relations between population and agricultural practices, Bilsborrow and Geores write:

> "... existing knowledge of these relationships is almost entirely a descriptive, ad hoc nature. . .. While dramatic changes in agricultural methods are occurring in many areas of developing countries, their possible relationship to population factors has been examined hardly at all. ... there has been particularly no research on the relationship between demographic processes and the use of chemical fertilizers or other modern chemical inputs.

Different World bank projections show that if past trends of population growth and food production persist, the gap between Africa's food production and consumption will increase rapidly in the coming decades. It is expected that the economy of a country should grow three times the rate at which the population is growing for a sustainable development and achieve the same standard of living (Ominde and Ejiagu,1981). Population growth may also determine the type of crop grown. In China, for instance, there was modest substitution of rice for other grains and introduction of new crops, particularly corn. Their importance was their much higher yields. Similar evidence can be observed in Africa today where cassava has substituted traditional yams. These changes were all stimulated by the increased population per unit of land (Grigg, 1980).

2.3.1. Land Management

Human beings have made some notable progress in their quest to achieve sustainable land management. Sustainable land management entails the use of land resources, including soils, water, animals and plants, for the production of goods to meet changing human needs, while simultaneously ensuring the long-term productive potential of these resources and the maintenance of their environmental functions (FAO, 2011). The main objectives of sustainable land management include maintaining and enhancing production, reducing level of risk and enhancing soil capacity to buffer against land degradation, economic viability of land and equitability of land (CIESIN, 2017).

Sustainable land management requires collaboration of all stakeholders and the bottom-up approach is crucial. FAO (2011) asserts that the four main principles of sustainable land management are land-user driven and participatory approaches, integrated use of natural resources at ecosystem and farming system levels, multilevel and multi-stakeholder involvement and targeted policy and institutional support including development of incentive mechanisms for sustainable land management adoption and income generation at local level.

Creation of awareness is important especially among the women folk who do a lot of farming in Kenya. Some ways of achieving sustainable development include efficient water use, proper soil management and proper farming practices. These can be achieved through reduction of water loss, harvesting water, maximizing storage and managing excess water. Climate variability over the years has led to erratic rainfall.

This has affected crop production as the rains come earlier than expected or later after planting, at times they fail completely. It is important to dig wells that serve as water storage facilities or put up tanks that can collect the rain water. This will ensure that there increase productivity in rain fed and irrigated agriculture.

2.3.2. Benefits of Sustainable Land Resources Management

Sustainable land management is an integrated process that requires collaboration among all stakeholders for maximum benefits to be accrued. United Nations Convention to combat desertification, points some of the benefits of sustainable land management to be increase food

security especially for smallholder farmers. Increase soil productivity means that more yields are recorded. Secondly, household energy is readily available, primarily in rural households that rely on fuel wood. Agroforestry through the growing of fast growing tree species like grevillea provides not only fuel wood but also fodder for on-farm animals. Increased tree cover changes the microclimate of an area is created. Fresh air and clean water are available as a result of this. Cultural and natural landscapes have been restored through sustainable land management. This preserves the indigenous knowledge and also enhances tourism in an area.

2.3.3. Policies and Frameworks that Promote Sustainable Land Management

Kenya has adopted various policies, laws and frameworks that provide clear guidelines on how to manage land sustainably. However, poor implementation due to political interference, mismanagement of funds and lack of goodwill hinders the achievement of the desired goal. A lot of co-operation among all stakeholders is necessary coupled with proper planning and monitoring is essential for sustainable land management in all parts of the country. Some of these important frameworks, laws and policies include:

2.3.4. Sustainable Development Goals (SDGs)

Sustainable development goals are the post-millennium development goals. It is a result of agreement of nations to set a path for sustainable development after 2015. Many nations committed themselves to achieving the seventeen goals by the year 2030. Attaining these goals will be a positive thing all over the world. The main beneficiaries will be developing countries which Ethiopia as nation GidaAyana as a woreda part is of. Most of the goals are directly linked to sustainable land management. Goal number 15: 'Life on land' is more focused on land resources. It calls for protection, restoration and promoting sustainable use of terrestrial ecosystems, sustainably managing forests, combating desertification, halting and reversing both land degradation and biodiversity loss. Other goals that feed directly into land management include Goals 6, 12 and 13. These call for clean water and sanitation, responsible consumption and production; and climate action respectively (United Nations, 2016).

Availability of water and sustainable management of this resource will ensure that human beings have enough water for activities like farming and household use. Sustainable consumption and

production patterns are essential for proper use of land resources. Climate variability and change is a serious threat to the environment. It is believed that global temperatures have been increasing in the last decade. Kenya has made strides in her fight towards climate variability and change with the existence of National Climate Change Response Strategy and National Climate Action Plan. Implementation of these important policies should take place (United Nations, 2016).

2.4. Population Size and Environment

World population size is permanently connected to land, air, and water environment. Each and every individual uses environmental resources and contributes to environmental degradation. While the scale of resource use and the level of wastes produced vary across individuals and across cultural contexts, the fact remains that land, water, and air are necessary for human survival (Hunter, 2000). Population pressure has both positive and negative impact on the environment in a given area or in global level. Since environment and population are closely interrelated they cannot be studied separately. Population and environment have a complicated relationship. There are different debates in the interaction of population and environment. Controversy on the population and environmental interrelationships has been between those who consider rapid population growth, increases demand for resource and environmental degradation, and those who emphasize opportunities rather than problems (Markos, 1998).

According to Population Action International (2012), historical population growth leads to improvement of the living condition. He suggested that population growth induces sufficient technological change to expand food output faster than population.

More people means more food, which can come only from either expansion of agriculture into new lands, or use of existing agricultural land more intensively (Theodore, 2000). As Daniel (2008) explained rapid population growth exerts pressure on the existing land resources through increasing the demand for food, wood for fuel and construction purposes, and other necessities. Farmers convert the remaining patches of forest in to field and fallow their lands for shorter period's thereby increasing soil erosion.

2.5. Population and Agriculture in Ethiopia

According to the 2007 population and housing census, about 84 % of the country's population resides in rural areas primarily engaged in subsistence agriculture. In Ethiopia agriculture supports some 85% of the working force, produces about 50% of the gross domestic product and generates over 90% of the country's export earnings and is, thus, credited with being the single largest source of employment and foreign exchange(CSA, 2008a) .

Ethiopia is a country endowed with a variety of resources. Of these, land on which millions of rural residents depend on is the most important one. The country has extensive marginal and non-arable land which approximates 62%, leaving the remaining 38% of the total area being potentially cultivable. Of the latter, vertisols and steep slopes, which together account for 11%, are cultivated in areas of heavy population pressure whereas the remaining 27% of the land is appropriate for cultivation. The lowland parts of the country are drained by major rivers. Ideally, this area, which is estimated to cover 3,495,795 ha or 3% of the total area of the country, is suitable for irrigation. This would increase the arable land stock of the country to 33,685,795 ha or nearly 30% of the total area (UNDP/FAO cited in Gebregziabher, 1994).

2.6. Proximate Driving Forces

Agricultural Activities: Subsistence rain-fed farming and livestock husbandry are the major livelihoods of the rural community in the Modjo watershed. As the study area is a typical rain-fed farming system, smallholder agricultural land expansion at the expense of other land covers is by far the most widespread proximate driver of land use dynamics and related land cover and ecosystem changes. The change detection analysis based on remotely sensed data showed that 294 km areas of grass, forest, plantations, shrub and marsh land coverswere changed into cultivated land between 1973 and 2007 (Table 3). Moreover, extensive areas of private woodlots, grazing lands, communal shrub and woodlands, state forests and plantation were changed to cultivated land as reported by 94.2% of respondents (Table 4). Free grazing in vulnerable steep slope sites is also one of the major drivers of land cover change. As shown in Table 5, 74.4% of respondents reported that increasing livestock population and livestock density along with prevalence of free grazing system are major causes of land cover change and land degradation. Shiberu and Kifle (1998), Badege (2001), MoARD and WB (2007), and MoARD and SLM

Secretariat (2008) also concluded that the dominant mixed farming practices in the highlands of Ethiopia without appropriate and integrated land management practices were major driving forces of vegetation cover loss and land degradation.

Wood Extraction: Wood extraction to fulfill the demand of fuel and pole woods is one of the major drivers for clearing extensive area of vegetation cover and trees in Ethiopia in general. Felling of trees for firewood, charcoal and constructional materials without replacement is a critical problem contributing to the loss of various forms of vegetation in general and native tree species in particular. In this regard, a study conducted by Geist and Lambin (2001) indicated that harvesting of fuel and pole woods for commercial purposes and domestic uses were the leading causes of deforestation in Africa, Latin America and Asia. As Table 3 shows, between 1973 and 2007, forest, shrub and grasslands declined by 74.7%, 74.8% and 40.9%, respectively. About 340 km of vegetation cover was converted into other land-use systems like cultivated land and built up areas. A large number of respondents (90.2%) suggested that wood cutting for the fulfillment of domestic uses was the most prevalent driving force of vegetation destruction. The majority of the surveyed farmers (87.6%) also noted that some households that are very poor were engaged in cutting and selling of trees for income generation. Discussion with elders and local natural resource conservation experts also confirmed that the increasing demand of tree products such as fuel wood, construction materials and charcoal for domestic uses in and around the Modjo watershed was one of the major driving forces of land cover change. Therefore, the findings of this study support the assumption that poverty is a cause for land resource degradation, as argued by the political ecology school of thought advocates such as Jolly (1994), De Sherbinin et al. (2007) and Andersson et al. (2011) just to mention a few.

Infrastructure and Settlement Expansion: Information derived from change detection analysis using remotely sensed data confirmed that the expansion of infrastructure such as urban and rural settlements, road network and reservoir construction (e.g. Wedecha and Belbela reservoirs) increased by 38% at the expense ofother LULC units in the Modjo watershed since the 1970s (Table 3). Some 82% of the respondents also argued that the expansion of built-up areas was a cause of LULC change in the Modjo watershed. Previous studies also highlighted that better market and road infrastructure availability were driving forces of LULC changes (Lambin et al. 2003, Geist and Lambin2004, Geist et al. 2006). In this respect, 85% of respondents argued that

road accessibility and better market opportunities for pole wood, fuel wood and charcoal as well as various forms of agricultural outputs are also the conditioning factors for land cover change in the study site. Based on reconnaissance field survey almost all parts of the watershed have become accessible by all-weather roads and there are big markets nearby like Addis Ababa, Bishoftu and Adama. This market accessibility stimulates the expansion of crop and grazing lands into vegetation covers like natural forest, plantations as well as shrub lands, and consequently leads to the change processes.

Underlying Drivers

Demographic Factors:The demographic characteristics mainly population growth and density are indirect factors for LULC conversion through the growing needs for additional lands for farming and grazing as well as demands for tree products(fuel and construction wood). In this regard, recent studies concluded that land cover conversion due to demographic pressure is more serious largely in tropical regions such as Latin America, Africa and Southeast Asia (Lambine et al. 2003, Geist and Lambin 2004, Geist et al. 2006). The land cover conditions of the Ethiopian highlands have also been modified or significantly transformed by the rapidly increasing population pressure and growing livestock population. Human population in the highlands has grown fast on the limited land area and almost every piece of land is convertedinto cultivated land to produce food (Solmon 1994, Badege 2001, Woldeamlak 2002, Alemneh 2003, Hurni et al. 2005). Like elsewhere in the country, the study area watershed has experienced fast population growth (CSA, 2010).

The high population growth increases the demand for land for agricultural activities and biomass as the source of fuel and construction materials. Due to the increase in food and fuel wood demands resulting from population pressure, local farmers are forced to push farm lands at the expense of vegetation cover (forest, shrub lands and grasslands) in the more marginal and fragile landscapes, for instance, along the buffer zones of highly degraded lake, Lake Chelekleka and even above the timberline of the Yerermountain. Over 82% of the surveyed farmers indicated that rapidly growing population pressure is one of the major driving forces of LULC change and related land degradation in the study area (Table 5). Key informants also asserted that land holding per capita had declined due to the increasing population pressure. This situation has created pressure on the limited land for agricultural production. This is a clear evidence in favor

of the Malthusian and Neo-Malthusian theoretical premise and the stand of political ecologist school of thought regarding population dynamics, land system change and resource degradation (Malthus1798, Jolly 1994, Panayotou, 2000; Geist et al., 2006; De Sherbinin et al., 2007; Andersson et al., 2011).

Population Growth and Non-Income Indicators

So far, we have focused on the impact of population growth on per capita economic growth and poverty reduction. But high population growth is also likely to affect other development goals other than economic growth. Most importantly, high fertility is likely to reduce progress on achieving mortality reductions and education improvements. At the household level, a large number of children are associated with low human capital investment in each child. This is what Becker called the quantity-quality trade-off. As a result of many children, households have fewer resources to send children to school, they have fewer resources to afford health care, and they have even fewer resources to save or invest in productive activities.

This is not only true at the household level, but similarly applies to the provision of public services. In a high population growth environment, it is extremely difficult to extend services to the rapidly rising population. This is particularly the case for education and health services for children. As shown in Table 1, in 2000 there were about 9 million children for whom one would need to provide education to ensure universal primary and secondary education. By 2050, this number will have increased to over 34 million. At the same time, the tax base in a country with many young people is particularly small as only working age people are contributing to taxes (particularly income and consumption taxes). Thus in a high growth scenario, the state will be hard-pressed to assist parents in investing in human capital. For instance, Uganda has embarked on a policy of free universal primary education. The costs of this will mount rapidly and options to extent it to secondary education will not be fiscally possible given current population growth rates. Thus not only households, but also public services, will face a quantity-quality trade-off.

If large families are poorer and worse off in terms of health and savings, the obvious question arises why families choose to have many children given that they appear to be well aware of these connections (MFPED, 2003). To some extent, they may not have chosen such large families if access to family planning is not available (at costs affordable to the poor). In African countries,

the findings from the DHS suggest that this is playing a role. It shows that the Wanted Fertility Rate (based on fertility preferences) stood at 5.3 in 2000, compared to an actual TFR of 6.9 (UBOS, 2001). This differential (or 'unmet need') is particularly large among poorly educated women in rural areas. In addition, there are other factors that relate to the importance of children as 'investment goods.' Parents want a certain number of surviving children to ensure support as workers and in old age. Given the high prevailing infant and child mortality, they must, ex ante, plan to have large numbers of children to achieve their reproductive goal with a high degree of certainty. Ex post, however, many parents will find themselves with more surviving children than anticipated. So the number of children ex post is too high for many families. It may also be the case that social norms maintain high fertility rates even if everyone would be better off if all couples simultaneously chose smaller family sizes.

Population and Technical Change: Demand Side Arguments

One powerful counterargument to the discussion above is a theory put forward by Esther Boserup (1965) arguing that high population growth increases the pressure to use available resources more efficiently and innovate in order to be able to supply the population with food and other necessary resources. While this argument is likely to have some force in the very long term in many contexts, it is unlikely to play a large role currently in Uganda. Unlike other African countries, Uganda already uses its agricultural resources quite intensively (there is little extensive livestock farming) and the gains from further intensification are not as large as elsewhere. Second, it is doubtful that technological innovations materialize in the short term just because of population pressure particularly if most of these people are too poor to be able to purchase new technologies, let alone engage in costly innovations themselves.

The Population Density Argument

Countries with low population density have their own problems. Innovations spread very slowly, there is little contact between population groups (allowing ethnic diversity to persist for longer), interaction with the world economy is difficult and costly, and the provision of infrastructure (such as roads, grid electricity, etc) is particularly costly on a per capita basis. Gallup, Sachs, and Mellinger (1998) argue that not all types of population density have the same beneficial effect. In fact, while they show that coastal population density boosts per capita growth, they find that

interior population density (i.e. high population density far away from the coast or in a landlocked country) is associated with lower per capita GDP growth which they attribute to the fact that population density is particularly beneficial when it helps to increase interaction with the outside world through trade and technology transfer. Inland density does not carry these benefits and may in fact divert a country from greater integration with the world economy.

While the positive growth impacts of higher population density may again be relevant for many African countries (including some of Uganda's neighbors such as Tanzania), they are unlikely to be of great relevance in today's Uganda. As shown in Table 1, Uganda's population density in 2000 is, at about 100 people per square kilometer, already much higher than the average population density prevailing in industrialized countries (31 people/square kilometer in 2000, see World Bank 2002) or in Europe (32 person/square kilometers in 2000, see United Nations (2003)), and it will rapidly become a very densely populated country. Moreover, in today's age, the spread of technologies is no longer greatly determined by physical distance as it is by means of communications. In addition, all of Uganda's population density is inland density which has been found, if anything, to reduce, rather than increase economic growth.

Empirical Estimates: Effects of Population Growth on Economic Growth and Poverty: Economic Growth

In principle, one could investigate the linkage between population growth and economic growth in a time series analysis for a single country such as Uganda, in a cross-section analysis, or, in a combination of the two, a panel analysis. The first type of estimation is extremely difficult as one has to deal with severe conceptual and econometric problems, among them the high fluctuation of income growth on an annual basis (in contrast to the great inertia of population growth), the long-term nature of the impact of population growth on economic growth, the problem of non-stationary of dependent and independent variables, the identification problem of separating influences due to population growth and due to other extraneous factors. Uganda is a perfect example of such problems. Per capita economic growth has fluctuated wildly over the past 40 years in Uganda, on average being low and negative throughout most of the 1970s and 1980s, and being highly positive throughout the 1990s. Disentangling the long-term impact of population growth on economic growth from other more short-term influences (such as presence or absence of conflict, economic policies, coffee prices, etc.) would be very difficult indeed. As a result,

virtually all of the studies on such long-term determinants of economic growth are done in a cross-section framework or in a panel framework where the dependent variable is usually growth over a 5-10 year interval.

2.7. Conceptual Framework

Figure 1shows the relationship between different variables in the research. Integrating the study objectives, the study envisages that; population growth (Independent Variable) plays a major role in the increase or decrease of land size and management skills. The increase in population puts immense pressure on land size leading to deforestation, land degradation, and decreased crop production.

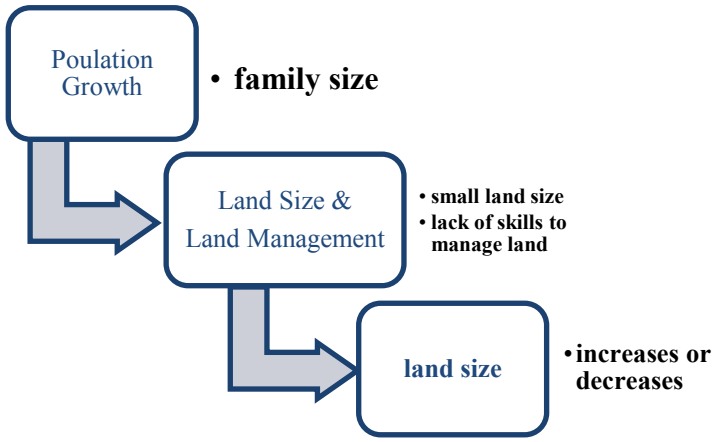

Figure 1: conceptual framework (source: developed for this study

CHAPTER THREE

3. Description of the Study Area and the Research Methodology

3.1. Description of the Study Area

3.1.1. Location of the study area

Gida Ayana is one the eastern Wollega zone woredas that located 440km from the capital of Ethiopia. It is situated on the main road from Nekemte from Oromia toBure from Amhara regional states

Gida Ayana is one of Woredas in Gida Ayana Woreda, East Welega Zone Oromia Regional State. It is bordered on the south by Guto Gida, on the west by Limmu, on the northwest by Ebantu, on the east by Horo Gudru Welega Zone, and on the north by the Blue Nile River. The administrative center of the woreda is Gida Ayana. There are also other towns in the woreda like Gutin.

3.1.2. Topography of the Woreda

This district is characterized by undulating hills north of Dicho Ridge and by plains south of it; it was once covered by extensive forests, but as of 2005 only a few fragments remain. Rivers within the woreda include the Werabessa, Wajja, Chinia and Werabu. A survey of the land in this woreda shows that 65.7% is arable or cultivable (61% was under annual crops) 8.7% forest, and the remaining 2.8% is considered unusable. Sesame and khat are two important cash crops. Another one is Coffee, but less than 20 km^2 is planted with this crop.

Industry in the district includes 13 grain mills; granite has been identified as a potential commercial resource. There were 22 Farmers Associations with 19,168 members and 14 Farmers Service Cooperatives with 9,982 members. Gida Ayana has 143 kilometers of all-weather road, for an average of road density of 60.3 kilometers per 1000 square kilometers. About 27% of the total population has access to drinking water. Astronomically, Gida Ayyana is found between 90 490 30”N-90 590 36” N Lattitudes and 360 40’ E-36043’E Longitudes.

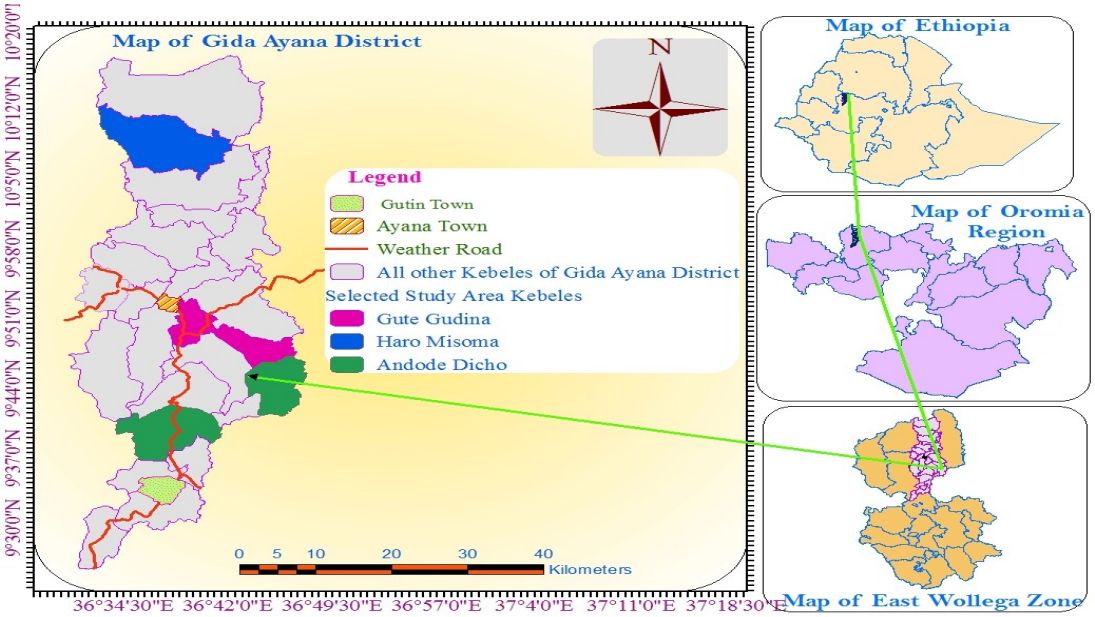

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Figure 2: Location of the study area (source: Ethio-GIS)

3.1.3. Climate and topography of the study area

Climatically Gida Ayana Woreda consists of more than two types of climate. On the basis of traditional climate classification, we have three agro-climatic zones in this district. They are Dega, woina dega and kolla. The annual average temperature of Gida Ayana district is about 19.1^0c with maximum temperature of 28.6^{00} c in March and minimum temperature is about 12.2^0c in August. Temperature increases as one move from dega (highland), woina dega (midland) then kola (lowland). Moreover, the total annual rainfall in Gida Ayana Woreda is about 1,281.0mm and it decreases based on geographical variation. The maximum rainfall is 242.2mm in July and minimum is 0.0mm in December and January, while no or very minimum precipitation in November and February because those months are dry season even in many Kebele of the country. Generally, both temperature and rainfall distribution is depend up on the geographical variation in elevation (Gida Ayana Woreda Meteorology Station, 2022).

3.2.2. Population Composition of the Study Area

This Woreda is divided into 28 Kebeles of which 21 of them are settled by peasants engaging their livelihood by the means of agriculture and 5 urban center of which one urban center, Ayana Town of Gida Ayana Woreda serving as Capital Town and center of administration. Based on a

population and housing census of 2007 GC, the total population of this Woreda was about 187,432 with the composition of 97798(52%) of male and 89634(48%) of female population of 86% local and 24% urban residents. The total area of this Woreda is about 183,063.73 hectare sharing 13% of the total area of Eastern Wollega Zone (Gida Ayana district rural land administration and Agricultural Development Office, 2018).

3.2. Research Design Methodology

3.2.1. Research design

To conduct this study, a cross-sectional survey design was employed. This design helps to have amble data on the identified problem from sampled within a short time. That means a cross-sectional study is one that produces a 'snapshot' of a population at a particular point in time.

3.2.2. Research Approach

This study employed a mixed research approach to offer logical ground, methodological flexibility and an in-depth understanding of smaller cases (Maxwell, 2016). In other words, a mixed- research method enables researchers to answer research questions with sufficient depth and breadth (Enosh, Tzafrir, & Stolovy, 2014) and helps to draw a sound generalization about the issue under consideration as the research involves the collection of both quantitative and qualitative data. .

3.2.3. Sample Size Determination and Sampling Techniques

From the Kebeles of the woreda only three of them namely Andode Dicho, Haro Misoma and Gute Gudina were purposely included in the study where they included based on the density of population they held as from highly, medium and sparsely dense Kebeles. This helps the study to identify the Kebeles of population growth on the household's land use and management by Kebele the Kebele from the less dense to highly dense populated Kebeles. The sample size of the study was determined by using Taro Yemane's (1967) sample size determination formula. The formula is:

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

- n is the required sample size;
- N is the total household of a Kebele (the target Population); and
- e is the margin of error.

n = $\frac{3827}{1+3827(0.05^2)} \cong 881$

In this way, the total sample size of the study will be **881** households as clearly indicated in the under table:

Table 1: the sample size of the study

No	Kebele	Number of household	Determined sample size by n = $\frac{N}{1+N(e^2)}$ formula
	Andode Dicho	1933	331
	Gute Gudina	1257	303
	Haro Misoma	637	246
Total sample size		3827	881

(Source: the survey, 2023)

To address this, the study employed a multistage sampling technique. That is it involved a combination of purposive, stratified, and simple random sampling procedures to select the study area and sample households. To select sample household heads three Kebeles were selected based on population density. The selected Kebeles were densely populated Kebele, moderately populated Kebele and sparsely populated Kebele. The Kebeles were selected by stratification because stratifying involves classifying sampling units of the population into relatively homogeneous groups before selecting sample units; then systematic sampling method used to select the targeted Kebeles. Systematic sampling frame is first divided into a number of segments called intervals. Then, from the first interval, using the systematic sampling technique, one house-hold was selected. The selection of subsequent elements from other intervals

depended upon the order of the element selected in the first interval. To carry out the systematic technique, first the list of households was taken from each Kebele. Then after the name of a household heads are listed, and the beginning number was randomly drawn and then after the n^{th} values were included until the required sample size fulfilled for the strata.

3.2.4. Major Data Sources

The data for this study were generated from both primary sources focusing on both qualitative and quantitative data. The primary data sources were the data that were gathered along that was filled with sampled households heads, key informants interview (that included model farmers, elders and agricultural extension exerts of the sampled Kebeles) ; and focus group discussion that was made with the selected farmers were employed where needed.

The secondary sources include research journals and articles, internet sources, different agriculture and rural development office reports, reports and document were reviewed as needed.

3.2.5. Methods of Data Collection

As illustrated here under, three different data gathering techniques were used to collect the relevant data include the following:

3.2.5.1. Questionnaire

In this study, questionnaire was one of the methods used for data gathering. Applicable questions were developed and arranged in a manner that could yield meaningful results in a cost effective manner. These household-based questionnaires were provided regarding the basic population characteristics such as sex, age, household size, marital status and educational background. More specifically, the questionnaires included the household's perceptions towards the in Kebeles of population growth on their land use and management, annual crop productivity level, and challenges the household faces to use land effectively.

3.2.5.2. Key Informant Interviews

Key informant interview was conducted with different individuals at different levels. To address this, three Model farmers, Kebele chairpersons, Kebele agricultural extension experts and agricultural & Rural Development Office experts were interviewed to get the really lived experiences of their area.

3.2.5.3. Focus Group Discussions (FGDs)

Two focus group discussions for the three Kebele were carried out. Each group consisted between 8-12 individuals.

3.2.6. Data Analysis and Presentation

Mixed analysis approach was employed. That means both quantitative and qualitative techniques were used. Data that were made available through different instruments were analyzed using descriptive statistics techniques. The study used a mixed approach for data analysis techniques. Descriptive statistics was used descriptive statistics such as frequency; percentage, mean, and standard deviation values were used. Further, the quantitative data analysis was carried out by SPSS software version 23. Besides, the qualitative data, which were generated from different sources, were analyzed qualitatively by sentences that explained what is true about the study on the ground, and the results of the key findings were displayed in the form of narrations that helps to provide concrete evidence and to support the quantitatively analyzed data.

3.2.7. Ethical Consideration

Firstly, the written permission was taken from Jimma University, college of social sciences and humanities, Department of Geography. In order to protect respondents from risk and show them utmost respect, researcher used written and verbal informed consent from each Kebele. The objectives and purposes of the research were spelled out to them. Respondents were informed to Kebele voluntarily and free to withdraw from the study at any time if they feel to do so. The researcher implemented principles of confidentiality and anonymity throughout the research process accordingly.

CHAPTER FOUR

4. Data Analysis, Presentation and Interpretation

4.1. Introduction

The intention this study was to investigate the impacts of population growth on the household land use and management. To achieve the intention of the study, data were collected from the sampled participant. And the collected data were analyzed in line with the purpose of the study by using the SPSS version 23software. Accordingly, this chapter consists of data presentation, analysis, discussion, conclusion and recommendations given.

4.2. Demographic characteristics of the study participants

Table 2: Social-demographic characteristics of the respondents

Sex Of respondents (heads of sampled households)		Educational Level of the households					Marital status the households				
		Read	Write	Complete	Complete	Total	Single	Married	Divorced	Widowed	Total
Male headed	Frequency	120	305	194	55	674	7	463	122	82	674
	Percent	13.6	34.6	22.0	6.2	76.5	.8	52.6	13.8	9.3	76.5
Female headed	Frequency	25	112	47	23	207	0	159	37	11	207
	Percent	2.8	12.7	5.3	2.6	23.5	.0	18	4.2	1.2	23.5
Total	Frequency	145	417	241	78	881	7	622	159	93	881
	Percent	16.5	47.3	27.4	8.9	100	.8	70.6	18	10.6	100

(Source: the survey, 2023)

As table 4.1revealed most (47.3%) households heads are able to read and write while few (16.5%) of them were unable read and write; about 27.4% households heads are primary school

complete while the rest about 9% are secondary school graduates. Furthermore, most households heads (70.6%) are married whereas the other (18%) are divorced and the rest few (10.6%) are widowed. To this end, it is possible to conclude that the participants of the study can complete questionnaires by themselves and they can also speak about their family members in relation to their land size and management. Generally, most participants are educated and married which is the important input to this study.

Table 3: The family size characteristics of respondents

Statistics	Family size of households				Age ranges of the family size			
	<5	5-10	>10	Total	0-14	15-30	>30	Total
Frequency	295	439	147	881	284	363	234	881
Percent	33.5	49.8	16.7	100	32.2	41.2	26.6	100

(Source: the survey, 2023)

Table 2 above showed that most (39.8%) households' had5-10 family members while others had less than 5 family members; the rest households had more than 10 family members. Moreover, most households (41.2%) consist of family size whose age range is between the ages of 15-30; while most others hold between the age-range of less than 14. This again indicates that most family members are at the age of having farm land independently. Furthermore, most families are feeding more than what their farm land size can support. This means that their farm land size is becoming less and less to feed the households as effective as possible. Even families who are feeding family members of less five family size are under question to feed the family effectively because the reality beyond indicates as the most farm lands are not fertile enough to produce the needed amount of crops for the family.

Table 4: Land size characteristics of respondents

	Land owner		The amount of land the households possess				
	Yes	No	<0.25 hectare	0.25-0.5 hectare	0.5-1 hectare	> 1hectare	Total
Statistics							
Frequency	776	105	147	352	201	76	776
Percent	88.1	11.9	18.9	45.4	25.9	9.8	100

(Source: the survey, 2023)

This item was presented to the sample household heads to identify whether they do have their own farming land or living by renting from the other land owners. As a result, most households heads (88.1%) indicated that they do have their own farm lands while others (11.9%) do not have their own farm land so that they live by buying the land from those having extra land with annual payment and return it back to the owner next farm year and buy other or continue to buy it again with other decided price. This indicates that stile there are farmers who are lacking farm land because of the small land size their family held to share them. This indicates that as the family size increases some family do not get change to have farm land independently.

On the other hand, the households' heads were asked about the amount of farm land they do have in hectare. Based on this questions most households (45.4%) identified that they do have less than a hectare while few of them (9.8%) have farm land more than a hectare. This shows that households are facing challenges to have enough land size to feed their family accordingly. That means the family sizes of the households does not match with the land size they do have.

4.3. Household Land size and management

4.3.1. Land owing status of the households

Table 5: Land owing status of the households

The item	Response	Frequency	Percent
Do you have enough land for your household?	yes	129	16.6
	No	647	83.4
	Total	776	100
Did your family size affect your land use?	yes	580	74.7
	No	196	25.3
	Total	776	100

(Source: the survey, 2023)

The firs most important item that presented to the participants was "Do you have enough land for your household?" that intended to identify whether the household heads' farmland size is enough for them or not. As one can understand from the table),most (83.4%) of participants suggested that they do not have enough land size to feed their family while only 16.6% household heads reported that they have enough farmland size to feed their family as possible. This indicates that the households are facing a grave challenges from the population growth to have enough land. Furthermore, the households asked whether their family size affected their land size and use where most (74.7%) showed that their family size affected their land size and use.

4.4. Households' Land Use/Management Activities

In order to identify the way the households use or manage their farmlands, different items were developed and presented to them. Accordingly, most of the respondents filled the questionnaires and returned it back. The results were presented in the table below. As the table revealed, the first item presented to the households heads was "What are the strategies you have used to solve the land scarcity caused by population density in your Kebele?" Accordingly, most of the respondents (53.3%) stated that they have ideas on how to use land in their Kebele; while

most others did not get education on how to use and manage their land whereas the few households given land by resettlement strategy.

Table 6: Households' land management system

Items	Alternative	Frequency	Percent
What are the strategies you have used to solve the land scarcity caused by population density s in your Kebele?	Training on land use	470	53.3
	I do not know	316	35.9
	Resettlement program	95	10.8
	Total	**881**	**100**
Which of the following soil and water conservation measures do you undertake on your farm land to increase your productivity?	Agro-forestry	18	2.0
	Mulching	69	7.8
	Crop rotation	242	27.5
	Applying fertilizers	481	54.6
	Applying organic manure	71	8.1
	Total	**881**	**100**
For which of the following activities do you use your land for?	Cultivation of crops	638	72.4
	Grazing	49	5.6
	Fallow (unused)land	191	21.7
	Forest development	3	.3
	Total	**881**	**100**
What do you think should be done to reduce the changes over land shortage?	Provision of education	61	6.9
	Encouragement of	145	16.5
	Family planning	245	27.8
	Intensive cultivation	430	48.8
	Total	**881**	**100**

(Source: the survey, 2023)

Furthermore, the other important item presented to the participants was "Which of the following soil and water conservation measures do you undertake on your farm land to increase your productivity?" for this question, most (54.6%) participants responded that they use fertilizer to boost their yield from small plot of land, while about 27.5% of them stated as they use crop

rotation to manage their farmland and to increase their annual production; a few of them (8.1%) replied that they are applying organic manure, still very few (2%) of them reported that they are using agro-forestry to manage their farm land and its effectiveness. Additionally, the question read as "For which of the following activities do you use your land for?" was presented to the participants. Accordingly, most of them (72.4%) sated that they mostly use their land simply for cultivation of crops whereas about 21.7% of them reported that they fallow. (They let their lands till it restores fertility. They do so when they may face different challenges including lack fertilizers and other mechanisms to manage their land fertility and production.

On the other hand, the participants were asked to react to the question "What do you think is the measure to reduce the challenges of land shortage?" Therefore, about 48.8%of them replied that intensive cultivation mechanism should be applied to reduce their land shortage; while others stated that Family planning (27.8%) should be practiced.

To cross check this finding the interview participants were asked "How do you rate the extent of land use/cover change of households?" Accordingly, one of the interviewees stated that the land management and use is less implemented in their Kebele. According to the interviewee, most households do not have awareness and basic skills to manage their lands because of this most of them traditionally manage their farm lands. Additionally, the interviewees were asked to respond to the interview question says "Which factors did you expect play a prominent role in household land size and management in your local areas?" based on this the major determinants factors that the interviewees stated are family size, small land size, and lack of land management skills. According them, family size is the main determinant factor to affect households land size because the parents share their land to their children step-by-step where their land become minimizes from time to time. At this time the shared land becomes small in size.

4.5. Productivity of the household from land use

The intention of this point was to identify the extent of the household productivity. To address the intention therefore, different questionnaire items were presented to the participants and the stated their understanding as presented in the table hereunder.

Table 7: productivity of the households from their small land

Items		Frequency	Percent
How do you rate your crop production from your plot(s) over the last 5 years(before 2005 -2015 E.C)?	Increasing	121	13.7
	Decreasing	563	63.9
	No change	197	22.4
	Total	**881**	**100**

(Source: the survey, 2023)

As the table 7 indicated most of the household heads replied that their crop production status is decreasing over last five years while 22.4% of stated that their yield remained unchanged whereas about 13.7% of the respondents identified that their annual cross production is increasing over last five years. The critical reason why the land size of the households fluctuates may be due to increasing number of family members whereas the family size increases; they forced to share the land in hand which may not enough to feed the family throughout production year.

To cross check this result, the FGD members asked a question says "How do you evaluate the population growth rate in your local areas? (E.g. could you evaluate from the last five years?)" and they mostly agreed as the number of population is increasing in the woreda. The important indicator that the participants used was that the land size for every household is not the same with the previous years. One of the FGD members indicated this in his words like this: "*everything before ten years not here today. Everything became scared. Even the land that gifted from God becomes expensive to get easily. Because of its scarcity land size is becoming the source conflict in our villages"*. Based on the finding therefore, it possible conclude that the

population growth of the woreda and the land size of the households are not matching. As a result, in the study area, family size and land size of the households have inverted relationships where the family size impacted the land size to be owned by the households. Supporting this interviewed participants informed that the family size of households in the study areas is changing. According to one of the interviewees, the population size in their Kebele is more dynamic after the last ten years. The interviewed individuals indicated as these in turn are creating challenges to households' land size and use. The interview participants further elaborated this case that it is becoming a challenge to accommodate for family cases in relation to land size and managements because most families are required to share their lands for their children. They replied that the challenge is taking place for most adolescents are asking the parents to share their land and the family is refusing their request. The participants put the reason behind this conflict as it is for the land in the hand the family cannot serve the family members as equal as possible.

The other important question raised to the household participants was "What is the estimate (in quintals) of your household production of crops for the years below (years in E.C.?)" as the table showed there is difference between the productions of the two segment farming years (before five years and after five years). In this case, most participants reported that their teff production decreased. Before five years 28.5% participants produce less than five quintals while 48% of them produce less than five quintals currently. Before five years, 31.8% household heads' produced more than ten quintals of teff from the same line while after five year 12.3% of them only produce more than ten quintals per farm year from the same area of land.

Furthermore, 15.8% households' heads indicated that their maize production before five years (before 2005 E.C)was less than five quintals from one hectare? In this case43.9% of the respondents produce less than five quintals at the moment. Similarly, before five years (before 2010 E.C) 42.9% households' heads produced maize while only 16% of them produce it after five years (from 2005 -2015 E.C). Contrary to teff and maize production, the production of Niger showed increment and about 42.5% of the households used to produce less than five quintals while after five years (2005 -2015 E.C) 22.4% producing it. It indicates the nug production of the household increased at least by half compared to the rest production; only 18.5% of the households produced nug while 36.4% of them are producing it where it showed increment by

50%. This result may because of the households are focusing nug production for two reasons. First, it does not need fertilizers in relation to teff and maize and secondly currently it is becoming the market-based production.

In line to this the interview question that says “In your local, does every household have enough land size to feed its family members? Why you said?” was presented to the interviewees and focus group discussion members where most participants are agreed that most households cannot secure their food from year to year. However, few households can secure it accordingly. This is because of two important reasons: the family size that minimized the land size to produce more and the cost of fertilizers is becoming unaffordable. Even, since they need no fertilizer, most participants from the group session explained that most households are focusing on producing oil crops such as nug, telba and others. According to the participants, the oil crops are becoming income generation for most households for sell it and buy teff, maize, and others for food consumption. Generally, the focus group discussion session identified that except few most households are becoming to face challenges from food security.

Furthermore, the data taken from FGD members were asked to indicate the extent or amount of the households’ annual crop production; they revealed that it is not similar from place to place and household to household. According the data taken from the FGD sessions it has been found the Kebeles near to the town are decreasing their annual productions while these far from the town are to some extent increasing their annual production but it depends on the type crops they produce. Accordingly, those households who cultivate maize their annual production is becoming increase from year to year particularly around Andode Dicho Kebele. According the both interview and FGD participants this increment of maize production is due the fertility of the land.

Contrary to this, other participants (particularly the data from Dega kebeles) raised that oil crops are becoming increase for they do not require fertilizers and they are becoming commercial crops for the households. They indicated that the productions like teff and maize are decreasing on the woyna dega areas while the nug products are increasing. Contrary to this maize product is increasing on kola areas for the natural fertility of the land.

Table 8: Year-based productivity of the households

Type of crops		Production in Qt from 2005to 2010			Production in Qt from 2010to 2015		
		<5k	5-10k	>10k	<5k	5-10k	>10k
Teff	Frequency	251	350	280	423	350	108
	Percent	28.5	39.7	31.8	48.0	39.7	12.3
Maize	Frequency	139	364	378	387	353	141
	Percent	15.8	41.3	42.9	43.9	40.1	16.0
Nug	Frequency	374	344	163	197	363	321
	Percent	42.5	39.0	18.5	22.4	41.2	36.4

4.7. Perception of Household Land Sufficiency and its impacts in the Kebele

Perception is critical in the land use and management of a society because where there is good perception there will be effective land use and management. To assess this case the households heads were asked to reflect their perception on the way they manage the land in their Kebele.

Table 9: Perception of households on the land sufficiency

Items		Frequency	Percent
Is there enough land for everybody in the Kebele?	Yes	334	37.9
	No	547	62.1
	Total	881	100
Do you ever have a hard time stretching your food budget to the end of the month?	Yes	716	81.3
	No	165	18.7
	Total	881	100
Does your household have a vegetable garden or fruit treesor bushes?	Yes	166	18.8
	No	715	81.2
	Total	881	100

To identify their perception the households asked that whether there is enough land that could possibly be held by every member of a household in their Kebele. Therefore, most of the respondents (62.1%) replied that there is no enough land in their Kebele to be held by every member of the households as equally as possible. Moreover, the households were asked whether they cannot cover their annual food requirement from the land they have. To identity the truth of this idea they were asked a question that can be read as "Do you ever have a hard time stretching your food budget to the end of the month?" and 81.3% of them replied (that they face a serious problem of food security throughout the farming year. Moreover, as the table 9 revealed most households (81.2%) do not have the land for garden vegetables or fruit trees or bushes. This may be for there is shortage land. This again exposes them for extra economic vacancy when the household wants to have fresh vegetables at home. Again this type production supports the farmer the support his/her food security as much as possible.

Inline to this the data taken from FGD via the question says "How do you evaluate the food security status of households of your local area? (is it increasing or decreasing) why?" where they responded that most households are facing challenges from food security problem. According to the results from the FGD sessions, the food security of the study areas is becoming under question because of different factors including the expensive price of fertilizers, and

decreasing land sizes of the households. This household's land size decrement is because of the increment of the family size from time to time.

4.8. The Income Status the Households

Table 10: the income status of the households

Items	Alternatives	Frequency	Percent
What is the annual income in your household?	Under birr 10,000	725	82.3
	birr 10,000- birr 24,99	126	14.3
	birr 25,000 - birr 39,999	30	3.4
	Total	**881**	**100.0**
What is the share of the income from crops in your household income?	Up to 25 %	737	83.7
	26 – 50 %	144	16.3
	Total	**881**	**100.0**

This table revealed that the annual income of most households (82.3%) from their land is less than birr 10, 000 while very few (3.4%) of the stated that their annual income from their land is birr 25,000 - birr 39,999. Moreover, the income of the household is supported by crop results (83.7%) while it is less supported by other income resources.

4.9. The relationship between family size and land size of the households

Table 11: the computed relationship between population growth and land size

Family size variation					**Land size variations**				
Value	**Family size before 10 years**		**Family size after 10 years**		**value**	**Land size before 10 years**		**Land size after ten years**	
	f	*%*	*f*	*%*		*f*	*%*	*f*	*%*
< =3	288	31.9	4	.5	<= 1 hectare	36	4.1	512	58.1
3-5	151	17.1	381	43.2	2-3 hectare	394	44.7	337	38.3
5-10	136	15.4	441	50.1	> 3 hectares	451	51.2	32	3.6
>=11	76	8.6	285	32.3	Total	881	100.0	881	100.0
Total	881	100.0	881	100.0					

As table 11 revealed the family size before and after 10 years showed great variation where about 17.1% and 15.4% households had family size of 3-5 and 5-10 respectively while it has increased respectively to 43.2% and 50.1%. Consequently, the land sizes of the households during this time decreased from 44.7% to 38.3%.

The table also revealed that the households that hold land size less than a hectare increased after 10 years (from 36% to 58% before and after 10 years respectively); where the households that have land size more than three hectares decreased from 51.2% to 3.6 before and after 10 years respectively. In generally speaking, the population growth or the increasing family size impacted the land sizes of the households to be decreased after these 10 years.

Table 12: correlation between family size and land size

		Land size before 10 years	Land size after 10 years
Family size before 10 years	***P***	-4.12	-3.1
	Sig	.002	.001
Family size after 10 years	***P***	-3.44	-3.21
	Sig	.001	.003
	N	881	881

As the table of Pearson's correlation product indicated there is relationship between the increment of family size and the land size of the households. In this case there significant relationship between the family size and the land size of the household based on the year variation. As the table showed there negative relationship between family size and land size of households. This negative correlation indicates that as the family size increases the land size of the households' decreases because that the family share their land for their children who became independent for the parental controls. Supporting this qualitative data identified as most interviewees agreed that most parents shared their land for their children who are more than 14 years old and their land size becoming decrease from time to time.

CHAPTER FIVE

2. Conclusion and Recommendation

5.1. Conclusion

The intention of this study was to investigate the impacts of population growth on the household land size and land management. To address the intention, quantitative research design has been used where data were collected using questionnaire, interview and focus group discussion techniques. The collected data were analyzed both quantitatively and qualitatively based on the nature of the data collected. The analyzed data indicated different results.

Most households have small land size and in most cases the land size of most households (HHs) ranges between 0.25-0.5 hectares. This indicates that the land size that the households have is not enough to serve the ever increasing family size because the family size of most households is getting increase from year to year. Furthermore, this land size does not serve the households because the product that the households are getting from it is becoming decrease from time to time. Even some households do not have their own land but they rent it from those who own the land. This indicates there are households who could not easily serve their family members in food security because still land size is not large enough to serve their family accordingly. Besides, most households do not have skills to manage even that small land size to scale up its productivity. This again impacts their annual food security. That means most households are fallowing their land because lack management skills. For instance, they do not have skills to scale up their land fertility by using different scientific approaches including composting it. The only approach they use to do this is fallowing or using the cow's dung results rather than using other approaches.

The reason behind the decrement of the households' land size is children share the lands of the parents among themselves upon the death of their parents and so that the land becomes small and small from time to time. This shows that as the family size increases the land size of the household to decreases. Besides, there is no improvement in land management skills where the family member who becomes independent from the household again continues the situation in

which he came across. This again impacts the food security status of the newly formed household in that particular area.

Furthermore, because of the reasons aforementioned the annual crop production in the study areas is decreasing yearly. According to the analyzed data, the households indicated the reason of the decreasing production including decreased land fertility, unaffordability of the prices of the fertilizers, lack of land management skills to grade up the fertility of the land particularly inability to focus on effective traditional land fertility scaling up methods. Besides, the continually cultivating on the land without giving resilience to the land is one of the factors to the decreasing of annual production of the households.

In summary, the population growth in the study areas is directly impacting the household land size and land management skills. This shows that there is direct relationship between the population growth, household land size and land management skills.

5.2. Recommendations

Based on the aforementioned findings and conclusions the following recommendations have been given:

1. Every household should get land management skill training in advance. If this is done accordingly the households may get enough products from the small land size. The agricultural and extension experts that assigned at the Kebele level should work hard to accommodate these issues for the households. To do this all stakeholders of agriculture and extension should work together as effective as possible.
2. Every household should consult the agriculture and extension experts which help them to identify the way they can use to scale up the fertility of that small size of land and which possibly increases the productivity of the land. Besides, they should reuse traditional land treatment mechanisms from their own lived experiences. For instance, the households should use shifting approach in which cultivate a crop for a year the shift the crop to keep the fertility of the land-cultivating teff for this year and then niger the next time and maize for the third farm year. In this case they may easily scale up the fertility of their small land size.
3. The government should focus on the household who do not have their own land because there are large number of households who are without farm land and rent farmland from those

having extra farm lands. These are farmers who are not able stretch their food security to the end the farm year. Hence, they become credit takers or sellers of what they have at hand like their cows. Therefore, these households seek due attention from the government, the society and other concerned bodies.

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Jimma University

College Social Sciences and Humanities

Department of Geography and Environmental Studies

A survey questionnaire

Dear Respondent,

I am collecting data for a research. You are selected for this study only by chance and contribute in this survey. Your response is confidential. Your genuine response is highly appreciated.

Thank you in advance!!

1) **Code of the respondent the Household**: _____
2) **Gender**: A. Male B. Female
3) Number of family members: **male _____ female _____**
4) Total family size by age group and gender:

Age	**Sex**		
	Male	Female	Total
0-14			
15-64			
65+			

5) Education:

A. Illiterate
B. Literate
C. Primary school complete
D. Secondary school complete
E. Higher education graduate

6) Marital status

A. Single
B. Married
C. Divorce
D. Widow

E. Widower

Information Related to the Study Topic

1) Do you own land?
   A. Yes, B. No
2) If your answer is yes for the above question, please indicate land size you have.
   A. Below than 0.25 acres
   B. Between 0.25 to 0.5 hectares
   C. Between o. 5 to 1 hectare
   D. More than 1hectare
3) Do you have enough land for your household?
   A. Yes B. No
4) Did your family size affect your land use?
   A. Yes B. No

Please give reasons for your answer _____

Section 2: land use activities/ uses of land resources

1) Forwhich of the following activities do you use your land for?
   A. Cultivation
   B. Livestock rearing
   C. Fallow (unused) land
   D. Plantation forest
2) Which of the following soil and water conservation measures do you undertake on your farm land to increase your productivity?
   A. Agroforestry
   B. Mulching
   C. Crop rotation
   D. Applying fertilizers
   E. Applying organic manure
   F. Erosion control
3) What are the strategies were used to solve the land scarcity/population density constraint issues in your Kebele?
   A. Education on land conservation
   B. I don't know
   C. Resettlement program
4) What do you think should be done to reduce the changes over land shortage?
   A. Provision of education on land use and conservation
   B. Encouragement of resettlement program/redistribution of new land
   C. Family planning
   D. I don't know

Productivity the household from land use

1. How do you rate your crop production from your plot(s) over the last 5 years?
   A. Increasing C. No change
   B. Decreasing
2. What is the estimate (in quintals) of your household production of crops for the years below (years in E.C.?)

Crop type	Before five years	After five years
Teff		
Maize		
Others		

Perception of Land Sufficiency in the Kebele

3. Is there enough land for everybody in the Kebele?
   A. Yes B. No
4. Do you ever have a hard time stretching your food budget to the end of the month?
   A. Yes B. No
5. If your response for the above question is yes, what do you do in those months?

   _____

   _____
6. Does your household have a vegetable garden or fruit treesor bushes?
   A. Yes B. No
7. If your answer for question numbers 6 is yes, do you share with family/friends/neighbors?
   A. Yes B. No
8. What is the annual income in your household?
   a) Under birr 10,000
   b) birr 25,000 - birr 39,999
   c) birr 10,000- birr 24,99
   d) birr 40,000 - birr 54,999
   e) more than birr 55,000

What is the share of the income from **crops** in your household income?

A. Up to 25 %
B. 26 – 50 %
C. 51 – 75 %
D. 76 – 100 %

Checklist for focus group discussion and in-depth interview

For elderly

1. How do you see the population changes since the lasts five years**?**
2. What effect does this result on the ecology, population?
3. What are the major land use and land cover types some 5 years ago?
4. Is there land use and land cover change in the Kebele?
5. Would you explain the extent of the change?
6. Which resources are more affected due to land use and land cover change?
7. In your opinion what are the factors /reasons for these significant changes?
8. How did you rate population change in the Kebele?
9. Why many people are coming to this area?
10. From the three regimes, when did population grow fast? Why?
11. What were the most important economic activities 20years ago?
12. Explain the current economic activities in the Kebele?
13. What effects they bear on you (if any)?
14. How did you rate quality of extension and development work services in the Kebele to support the households' land use and management?

Interview guide questions for agricultural Experts

1. How do you rate population dynamics in the Kebele **(**for the last 20 years or so**)**?
2. What effect(**s**) did population dynamics impose on the Kebele?
3. How do you rate the extent of land use/cover change in the Kebele?

4. Would you please explain the Kebele Pattern of change in land use/cover in the Kebele?

5. Which factors did you expect play a prominent role?

6. How do you explain the livelihood changes occurred in the Kebele?

7. In which one of the three regimes that land use/cover change was high? Why?

8. Would you list down the major extension and development works in the woreda?