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# Resettlement and its impacts on Socio Economic Wellbeing and Land Use Land Cover change in Hawa Galan District, Kellem Wollega Zone, Oromia Region

Lalisa, Eliyas

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**BAHIR DAR UNIVERSITY**  
**INSTITUTE OF LAND ADMINISTRATION**  
**DEPARTMENT OF LAND ADMINISTRATION AND**  
**SURVEYING**

**Resettlement and its impacts on Socio Economic wellbeing  
and Land Use Land Cover change in Hawa Galan District,  
Kellem Wollega Zone, Oromia Region**



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**June, 2017**  
**Bahir Dar, Ethiopia**

**BAHIR DAR UNIVERSITY INSTITUTE OF LAND ADMINISTRATION**

**DEPARTMENT OF LAND ADMINISTRATION AND SURVEYING**

**Resettlement and its impacts on Socio Economic Wellbeing and Land Use  
Land Cover change in Hawa Galan District, Kellem Wollega Zone, Oromia  
Region**

**Thesis Submitted to Bahir Dar University Institute of Land Administration  
Department of Land Administration and Surveying in Partial Fulfillment of the  
Requirements for the Degree of Master of Science in Land Administration and  
Management**

**By: Lalisa Eliyas Wagayo**

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## **DECLARATION**

I, the undersigned, declare that this thesis entitled “Resettlement and its impacts on Socio Economic Wellbeing and Land Use Land Cover change in Hawa Galan District, Kellem Wollega Zone, Oromia Region” is my original work and has not been presented for a degree in any other university and that all sources of material used for this thesis have been dully acknowledged.

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**June, 2017**

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## **ABSTRACT**

*This study attempted to assess the impacts of resettlement on socio economic wellbeing and land use land cover change in Hawa Galan District. For this study mixed research design was employed. The study utilized household questionnaire, key informant interview, a focus group discussion and observation. A total of 96 household sampled respondents were randomly selected from the 2 kebeles. For the identification of land use/ land cover change land sat imagery of 2002 ETM+ and 2016 OLI/TIRS were used to determine the change in land use/land cover using objective based classification. Most sample respondents were confirmed that resettlement completely changed land use practices in Mada talila and Ifa bas resettlement kebeles. The current constitution shows that resettlement as negative impact to the land use land cover. Also not only changed land use and land cover change but highly influenced the way of the life of the resettlers. As explained by most respondent deforestation was the consequence of resettlement at the study area, which was the most measurable process of land use and land-cover changes at the study area. Not only deforestation but also land degradation by itself affected indirectly by resettlement. Depending on this finding the researcher conclude that unplanned and unregulated forest cuttings and land cover changes within the study area have had an impact on land degradation, deforestation and seasonal variations of rainfall and drought conditions were serious problems to wellbeing of the resettler.*

Key words: Population pressure, Resettlement, Land use and Land cover changes, Deforestation and Land degradation

## ACRONYMS AND ABBREVIATIONS

AESE	Agricultural economics Society of the Ethiopia
AFD	Action for Development
CSA	Central Statistical Agency
DA	Developmental Agents
EFAP	Ethiopia Forestry Action Program me
ERDAS	Earth Resource Data Analysis System
ETM+	Enhanced Thematic Mapper
FAO	Food Agricultural Organization
FAOUN	Food and Agricultural Organization of United Nations
FDRE	Federal Democratic Republic of the Ethiopia
GCP	Ground Control Point
GEF	Global Environmental Facility
GPS	Global Positioning System
HHHs	House Hold Heads
HGWARDO	Hawa Galan Woreda Agricultural and Rural Development Office
LULCC	Land Use and Land Cover Changes
OLI/TIRS	Operating Land Imager/Thermal Infrared Sensor
PSNP	Productive Safety Net Program
TM	Thematic Mapper
UNFAO	United Nations Food and Agricultural Organization
UNHCR	United Nations High Commissioner for Refuges
USGS	United States Geological Survey
WCED	World Commission on Environment and Development

# CHAPTER ONE: INTRODUCTION

## 1.1. Background

Due to its mountainous topography, the land resource of the Ethiopia is also one of the most fragile. The soils are eroded and degraded particularly in the high land areas. Natural forest cover is shrinking from time to time. The problem is more acute and pressing in some parts of the country where there is high population density. The socio-economic challenges are also complicated and pressing.

The government of Ethiopia has been taking various remedial measures in order to sustainably solve the problems. Resettlement has been one of the most important measures that are believed to address the multi-faceted problems of the country. Resettlement have been sought as a means to utilize the unused land for the development by settling landless peasants, unemployed persons and farmers from drought prone and over populated high land areas (Kloos *et al*, 1990 ). It has also served as a basic tool to settle pastoral nomads and to ensure continuation of farming in private and state farms.

Even though there are some variations in the scale, population resettlement has been generally adopted as a major and essential component of strategic endeavors aimed at addressing the paramount socio-economic and food insecurity problems in different periods in modern history of Ethiopia (Solomon, 2005).

Recently the federal government of Ethiopia has adopted resettlement as a part of national socio-economic development policy by incorporating it within the ten years development plan (1984-1993). The intention of the resettlement program during this time was ensuring food self sufficiency of the settlers and increasing their productivity by providing adequate agricultural land for those people whose agricultural productivity is deteriorated largely due to ecological problems.

Resettlement in Ethiopia the past as well as the present were hastily conceived, poorly planned and executed, and resulted in considerable hardship. It is due to this reason that resettlement in Ethiopia not only destroys the flora and fauna and exacerbates the environmental degradation but also claims the life of the people. Some environmentalists argue that resettlement is destroying

the remaining natural resources of the country and thereby aggravating the environmental degradation problem (Ahmed, 2005). Due to this reason land use and land cover changes are accelerating from time to time as a result of resettlement.

The study was conducted in Hawa Galan District in the Oromia National Regional State of Ethiopia. Hawa Galan District is one of the 11<sup>th</sup> districts of Kellem Wollega Zone of Oromia Regional States. At present, the district has 31 administration kebeles out of which 29 are rural kebeles and the remaining two are urban center. From 29 rural kebeles seven of them were resettled kebeles. As a result the present deforestation is high in the resettled kebeles which is resulted from cutting of trees and resettlement program.

Therefore, this study aims to assess the impacts of resettlement on land use land cover changes and socio-economic well being and it was focused on Mada talila and Ifa bas resettlement kebeles of Hawa Galan woreda area of Kellem wollega zone in Oromia Regional State.

## **1.2. Statement of the problem**

Ethiopia is experiencing an unprecedented increase in population size as a consequence of which it is becoming increasingly vulnerable to all the problems associated with an imbalance between population growth and resources necessary to sustain it. By and large, the rapid population growth particularly in rural areas has decreased the size of land holding leading to landlessness and deterioration of the environment which were considered as causes of migration and resettlement (Ahmed, 2005).

To understand the land use and land cover change of both the origin and destination regions, information is needed to know the interaction between the environmental systems and the social and geophysical factors that drive the change. The inability of the country to balance environmental and production needs, as well as land cover capability and anthropogenic stress, has made the country to practice resettlement as a mitigation option. The lack of current knowledge of the extent and magnitude of land use and land cover change due to resettlement to promote sustainable land management encouraged the researcher to address the problem. Therefore, Land use/Land cover change and promotion of sustainable land management due to resettlement remain the main problem of the interest of the research.

This study entirely focused in the Hawa Galan District resettlement site particularly Mada talila and Ifa bas resettlement kebeles , therefore the outcome of the study may be contextual, and should not be generalized as if the same holds true for all places with resettlement kebeles.

The results of the study can contribute meaningfully to the following areas of concern: the debate on impacts of resettlement on socio economic wellbeing and land use land cover change to provide planners and policy makers with important lessons for solving the problems associated with resettlement programs and it could be used as an important indicator for decision makers to make Land use/land cover change impact analysis of current resettlement programs in the various areas.

### **1.3. Objectives**

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

The overall objective of this study is to assess the impacts of resettlement on socio economic wellbeing and land use land cover change in Hawa Galan Woreda, Oromia Region.

The specific objectives of the study are:

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

- ✚ To assess LULC change before and after the resettlement.
- ✚ To examine the impact of resettlement on the living condition of the settlers.
- ✚ To assess the management of land during the resettlement.

### **1.4. Research Questions**

1. What is the pattern of LULC before and after the resettlement takes place?
2. What are the impacts of resettlement on the living condition of the settler population?
3. How do the community managing their land during the resettlement?

## 1.5. Definition of Terms

**Resettlement:** - is the voluntary change of their original place to the newly established area for the sake of free land for agriculture and grazing (Yntiso, 2004). For the purpose of this research work the author has preferred the definition given by (Mengistu, 1992), Resettlement is the process by which individuals or groups of people leave spontaneously either voluntarily or involuntarily their original settlement sites to resettle in new areas; where they can begin new trends of life by adapting themselves to the biophysical, social and administrative systems of the new environment.

**Land use:** - is an approach defines as a series of operations on land, carried out by humans, with the intention to obtain products and/or benefits through using land resources (Duhamel, 1998).

**Land cover:** - refers to the area of the land that covered by natural or manmade vegetations (Coffey, 2013).

**Deforestation:**-is the cutting down and clearing of trees for different purposes.

**Land degradation:** -defined as the loss of utility or potential utility or the reduction, loss or change of features or organisms which cannot be replaced (Taffa, 2002).

## 1.6. Significance of the Study

This investigation would have been provided information for intellectual framework for the temporal and spatial aspects of contemporary land use change in relation with resettlement. The results of the study could also contribute meaningful feedback to the local and woreda government including farmers concerning on land use and land cover changes. Land-use and land cover data are important for the study area, woreda as well as regional activities which were undertaken (e.g. the frequently planted crops, deforestation and the role of local government on halting against deforestation. This research is also important to assess how farmers benefited from resettlement compared to their original place. This might help to evaluate the way of the life of the people at the new destination and to assess ways of living conditions of the people at the resettlement village.

Land use and land cover change studies provide information for concerning the current use of the land, the impact of population on natural resources in relation with resettlement. Information on



the rates, driving forces, and consequences of land use and land cover changes were important in addressing issues ranging from the human population to natural resources. Thus, **knowledge of current land use and land cover changes** (land resources) are needed for formulating changes leading to sustainable use of resources by minimizing deforestation and land degradation.

### **1.7. Scope of the study**

This study was confined at woreda level particularly at the newly emerged resettlement kebeles in 2002/03, which of them are known as Mada talila and Ifa bas resettlement kebeles. This study area was the only resettlement village in Hawa Galan woreda in Kellem wollega zone in Oromia regional state. Therefore, this study focused on Resettlement and its impacts on Socio Economic Well being and Land Use and Land Cover Changes.

### **1.8. Organization of the study**

The Research was organized in to five chapters. The first chapter deals with the general introduction about background of impact of population dynamics, resettlement and land use and land cover change, statement of the problem to conduct the study. Furthermore, this chapter contains objective of the study, research questions, significance of the study, scope of the study and as well as the definitions of operational terms and organization of the study. The second chapter contains conceptual and related literature works. Moreover, this chapter contains detail discussion about each topic from global level to local level as listed in this chapter. Chapter three contains research methodologies including description of the study area such as research design, sampling size and sampling techniques which encompasses sample size and sampling techniques, data sources, instruments of data collection such as questionnaire, interview and observation methods and methods of data analysis and presentation are explained in chapter four. At last, conclusion and recommendation are described under chapter five of this paper.

## **CHAPTER TWO: REVIEW OF LITERATURE**

### **2.1. The Definitions and Concepts of Resettlement**

Resettlement is equivalent with the term relocation. However, these two terms are different for one is narrower while the other is broader. According to Yntiso, (2001) resettlement is different from relocation in that it is more than change of place and for it consists of all the social, psychological, moral and spiritual values carried with the victim unlike change of place for the other inanimate materials.

For the purpose of this research work the author has preferred the definition given by Mengistu, (1992) for it incorporate all the necessary concepts related in the process from the beginning to the end. According to him Resettlement is the process by which individuals or groups of people leave spontaneously either voluntarily or involuntarily their original settlement sites to resettle in new areas; where they can begin new trends of life by adapting themselves to the biophysical, social and administrative systems of the new environment.

Resettlement is a complex process that involves intricate combination of social, economic and political factors that renders the outcomes. The process involves a range of factors with constructing and contradictory view often resulted in tensions and conflict among the resettles and host community on natural resource use. Let alone improving the economic conditions of the displaced population, the past and different sources of literature explained resettlement is costly and risky activity which often fails to restore full social and economic cost of the resettlement ( Pankhurst, 2003).

These findings have led to the general conclusion that resettlement is a threat rather than an opportunity to improve wellbeing and insure optimal biodiversity conservation. But there is subtlety in the origin of resettlement. As Yntiso (2002), pointed out the voluntary resettlement may be a better option as people are found to be re-established sooner than involuntary resettlement.

The movement of peoples and the establishment of resettled communities have always been the dynamic feature of history and had resulted in the culturally diverse world we know today (David, 2002). It is a feature of many parts of the third world, especially in the more remote and

ecologically marginal areas, that human activity is to a large extent controlled by nature. Involuntary displacement, on the other hand, is commonly planned and executed by external agencies without peoples' genuine consent. In an attempt to tackle this limitation (Yntiso, 2004), has proposed a modified conceptual scheme which identifies four major types of relocation. However, for this study two important types of resettlements were convenient. These are voluntary and induced-voluntary resettlements: Voluntary resettlement: occurs when the migrants have the power to make informed and free relocation decisions and the willingness to leave their original place. Induced-voluntary: movement takes place when people leave their home place to resettle elsewhere due to deliberate acts of inducements coming from outside agencies. Although the migrants may maintain decision-making power, the facts on the basis of which their decisions are made are provided and analyzed by other agencies.

### **2.1.1. Resettlement at the Global level**

If resettlement is effectively used, it is important to understand each of these concepts, and to proactively plan for resettlement as part of operational protection strategies. An assessment of the protection environment in the host country and region, as well as the country of origin, is a key step in identifying appropriate durable solutions, including whether to pursue resettlement for a given case (UNHCR, 2012). Resettlement has frequently been undertaken to rehabilitate populations that have been adversely affected by natural disaster, unfavorable climatic conditions and/or political conflict. The current intra-regional resettlement program (including the case discussed here) comes into this category. The official objective of the current resettlement schemes, as stated in various documents, is to prevent famine (or attain food security) by moving people from drought prone and overcrowded areas to sparsely populated regions and unoccupied virgin lands (Yntiso, 2002).

Along with the concrete strengths outlined by the American resettlement model has a key, identifiable challenge. Some are pervasive throughout the resettlement and integration process while others are unique to a particular phase of the process. This section first highlights the overarching challenges. It then examines each phase of the resettlement model, both to identify specific issues and how the overarching challenges manifest (Kate, 2010).

Poor preparation had been one of the major factors that led to the failure of resettlement programs and poor performances of many resettlement schemes around the world. Due to this many resettlement researchers stress the importance of adequate preparation if the implementation of resettlement programs is an unavoidable necessity. When we speak of preparation, it may include different activities that are required to be performed before moving the resettles to the resettlement sites. Such activities as infrastructures i.e. schools, health service centers, accessible roads, and individual shelters, pre-positioning of food rations and basic necessities, consultation with the local population in the area are included in the preparation stage. Serious preparations at this stage can influence the aftermath of resettlement conditions which are characterized by a number of complications (Mellese, 2005).

### **2.1.2. Resettlement in Africa**

Demonstrate understanding of different applicable legislation requirements regarding land access and resettlement processes applicable in different African countries (PMM, 2014). Infrastructure improvements are vital to development in Africa. Unfortunately, these projects regularly require the relocation of people living in the area. The term “resettlement” implies this logistical challenge, but even projects run by the most capable and conscientious companies have adversely impacted populations because two fundamental components of resettlement are often overlooked: extensive communication with affected communities throughout the resettlement process and ensuring the restoration of their livelihoods after relocation. Too frequently these elements are considered secondary. To Affricate, they are essential. The minimum standard in resettlement work is to restore the livelihoods of affected persons to pre-project levels. Affricate knows resettlement is an opportunity to do more. Resettlement can improve lives. Affricate combines logistical proficiency with more than four decades of experience earning the trust of local communities and implementing livelihood-enhancing programs to ensure that infrastructure projects do not negatively impact the people they often intend to benefit (URL, 2013).

With population increase due partly to in-migration of Africans from neighboring areas, and with mal-distribution of population in reserves from the start, the population density in the African reserves soon exceeded the carrying capacity of the land. In some cases, local congestion was so serious that people were no longer able to produce enough food to feed their families and had to be assisted with food by the government (Mwiza, 2010).

The farmers in the sub-region grew mainly food crops during the second season with very few cases where cash crops like cotton were planted. The major food crops planted were sorghum, groundnuts and pigeon peas which occupied the largest area of cropped land during the second season. Cassava, sorghum, and groundnuts were the most produced crops. Given that own production contributes not only the largest proportion of the households food sources through direct consumption of the produced crop but also the greatest percentage as a source of income for the households through sale of crops. It is therefore, not surprising to see that groundnuts, sorghum and millet which were the main crops sold for cash income were also the most produced food crops in the region (Aziz, 2011).

### **2.1.3. The Ethiopian experience of resettlement**

In Ethiopia resettlement of people from North to South in search of Agricultural land has been practiced for hundreds of years (Kloos *et al.*, 1990). During the Imperial regime in 1959, a resettlement program that accommodated about 700 farmers from the over populated upland areas were made at Abela in Sidama province (Mengistu Wube, 1992). The spontaneous resettlement carried on between 1940s and 1970 was resulted in the movement of more than one million people from the chronically overpopulated and environmentally degraded highlands of central and north Ethiopia to less populated frontier lowlands (Kloos *et al.*, 1990). However, the program failed due to improper planning, limited fund lack of stakeholder's participation, and it's semi-voluntary and semi-involuntary nature.

The socialist government has initiated planned resettlement programs between 1975-83 and 1984-91 as a means of dealing with famine, overpopulation, land degradation, environmental rehabilitation, food security and socio-economic problems (Kloos *et al.*, 1990; Janson, 1987).

The Federal Democratic Republic of Ethiopian government has launched what it calls 'intra-regional voluntary settlement schemes' where farming households are moved within the existing administrative regions (Alemneh, 2004). Resettlement has been resurrected as part of lasting solutions to the continual impoverishment and destitution of Ethiopian rural communities. The voluntary resettlement program is one of the most important food security strategies of the Federal Government of Ethiopia under the general coordination of the Ministry of Rural Development (Abraham, 2003).

The last three governments of Ethiopia have all carried out resettlement projects with different objectives and with varying intensity. But, broadly speaking, the premises on which each justified the need for resettlement were similar, at least in theory. It was recommended as a means of creating employment and solving the problem of the growing excess labour force. The settlers comprised landless peasants, evicted tenants, pastoralists and shifting cultivators, urban unemployed and ex-servicemen. However, the government believed that resettlement would provide a “lasting solution” for the ‘hard-pressed’ peasantry, and particularly for the population living in the drought prone areas (Dessalegn, 2003).

Over the last few decades, resettlement in Ethiopia has been adopted as a strategy to alleviate various socio-economic problems. The resettlement programme that was in progress during 2003-2005 was intended to provide food security for those suffering from a lack of food due to land shortage and the ecological deterioration of their home areas (Asrat, 2009). In addressing food shortage problem, Ethiopia has developed and been exercising arrays of development policies and strategies, among which resettlement is the one to be mentioned. Resettlement as a policy practice has been used to attain various objectives with different success stories. In the recent year (2004) food security strategy of the country, about 2.2 million people were planned to be relocated with the bold objective of attaining food security through improved access to land (Dessalegn, 2005).

In this study the investigator had been recognized that whether a citizen initiated resettlement program could be a supportive or not for conservation option for the future and as well as to overcome food shortage. The central issue is whether and how the citizen-initiated resettlement program is contributing to socio-economic wellbeing as well as conservation of the natural vegetations? That is why resettlement program is uncompromising issue with conservation of the natural resources. But sometimes resettlement served as a remedy to shortage of land.

#### **2.1.4. Causes of the resettlement in Ethiopia**

Experiencing an unprecedented increase in population size and environmental degradation as a consequence of which it is becoming increasingly vulnerable to all the problems associated with an imbalance between population growth and resources necessary to sustain it.

By large, the rapid population growth particularly in rural areas has decreased the size of land holding leading to landlessness and deterioration of the environment which were considered as causes of migration and resettlement (Ahmed, 2005).

Famine is the recurring, especially for those who are living certain vulnerable regions of the Ethiopia which suffer from high demographic pressure on land. Due to a long history of improper land use the soil in these regions unwisely used infertile and in capable of supporting productive capacity of the land (Asrat, 2009).

The current resettlers' livelihood strategies are found to be crucial driving force for the existing rapid LU/LC changes. Agricultural activities and firewood/charcoal production are among such fundamental conversion forces. Farmers are currently alarmingly converting the land into plots of farmlands in order to increase their crop output and cope up with the problems of food shortage. Meanwhile, some rural households are increasingly engaged in charcoal preparation and firewood extraction as lucrative livelihood strategies. Particularly, those economically dejected households are highly dependent on charcoal and firewood sale to fulfill the livelihood requirements of their family. The combined effect of these factors certainly results in rapid conversion and/or modification of the "village" LU/LC (Messay and Bekure, 2011).

Resettlement programmes in Ethiopia are taken as part of rural development strategy. They are used to move people from disaster prone, environmentally degraded and densely populated areas to places where is relatively better rainfall distribution and more better and sufficient farm land for resettles (Pankrust, 2004). Resettlement programmes undertaken by different Ethiopian regimes have a declared objective of improving the life of the rural people affected by drought induced famines, among others. However, failures of the relocation attempts of past regimes have been experienced. It seems that it is this issue that has been attracting the attention of researchers to examine the processes involved regarding past resettlement programmes (Misganaw, 2005).

Population growth increases the demand for land and contributes to farming on steep and fragile soils, also leading to erosion problems. It increases demand for biomass as a source of fuel, leading to deforestation and increased burning of dung and crop residues, thus increasing the problems of erosion and nutrient depletion. Population growth increases demand for livestock

products and therefore leads to increased livestock numbers causing overgrazing and consumption of crop residues by animals (Shibru, 2010).

Increasing population pressure will lead to adjustments in production and hence the quality and productivity of the land improves. This has been true because agricultural production managed to outpace population growth due to green revolution, which allowed for a much increased productivity. Hence, growth in agricultural production exceeded population growth for almost three decades (Squire, 2000).

At present, there is enough food produced around the world, the problem is that the food is unevenly distributed. However, others argue that there are ecological limits to food production which may provide little scope for future expansion (Ehrlich and Holder, 1971). In any case, population growth has an important influence on land use, even though other influences, such as increased per capital income (and hence consumption), governmental policies and instabilities, technological change, national and international markets for goods and agricultural products, are also likely to play key roles in land use changes. The direct impact of population growth is increased consumption of resources which would lead to increased demand for food and fiber and necessitate more intensive use of agricultural land.

In the Ethiopian highlands for example, increased population has led to more widespread use of marginal land in order to meet the increased demand of human needs. In this respect, different land uses compete with one another, and can degrade the future productivity of the land and the quality of the environment in general. Contrary to this, case studies have highlighted situations where population growth and agricultural intensification have been accompanied by improved rather than deteriorating soil and water resources (Tiffen *et al.*, 1994). Experiences from this study in Machakos, Kenya proved opposite to what has been discussed in the preceding paragraphs. Similar trends may also be witnessed in the highlands of Ethiopia, even though what is commonly known about rural Ethiopia is environmental and social crisis due to population pressure and stasis in peasant farming technologies. However, despite of continuity of backward farming practices; farmers in some parts of Wollo have innovated and responded well to physical and social environment (Crummey and Winter-Nelson, 2003). In addition, in the enset base farming systems, especially in Welyta, Kembata, Sidama and others, the number of trees and vegetative cover in general, has been increasing or at least has been maintained, despite these



areas being few of the highly populated in the country. On the other hand, Konso, which is semiarid and with relatively high population and marginal lands, the area is still productive and supportive of the population due to the indigenous knowledge of the people on soil conservation effects. On the other hand, some of the northern highlands are degraded almost beyond recovery, despite the long history of government efforts to arrest soil erosion. This is because these areas were settled early and support high population, in addition to the nature of their topography and geology, which make them prone to this phenomenon.

In Ethiopia, population pressure is inducing, the clearing of forests for agriculture and other purposes, and the attendant accelerated soil erosion, is gradually destroying the soil resource (Hurni, 1990). This is because natural forests are the main sources of wood for fuel, construction and industry, even though plantation forestry is also increasingly becoming important. According to Kahsay (2004), in Ethiopia forests may have existed long before history was recorded, but the present day forest cover does not correlate with human population in recorded history, even though environmental problems such as droughts may have also contributed to this phenomenon. Furthermore, the annual loss of natural forest cover has been estimated to be 150,000 - 200,000 ha/yr-1 and in 1989 forest cover estimated was only 2.7% of the Ethiopian land mass (EFAP, 1993). It is clear that increasing population is causing LUCC in the Mada talila and Ifa bas resettlement kebeles in particular and in the country in general. The trend of shifting from natural vegetation cover in to farm land was considered as a result of resettlement in the study area.

## **2.2. Definitions and Concepts of Land Use and Land Cover Changes**

In definition, land use is straightforward: it is the purpose for which land is used. A more detailed description provided by FAO, (1995) states that "land use concerns the function or purpose for which the land is used by the local human population and can be defined as the human activities which are directly related to land, making use of its resources or having an impact on them"). In reality, the choice of how landowners use land is a complex interaction that includes the characteristics of the land, the landowner and economic situation in which the choice is made. Complexity arises in part because land is an economic resource and has many distinguishing characteristics. The location of the land to an important feature such as a transportation links or a city center, its productivity, erodibility, and topography all determine its agricultural value and future returns to crop production. In addition, "land may simultaneously

pose characteristics that are favorable to and detract from its value for a particular use, creating tradeoffs in land-use decisions” (Vesterby, 2001). Management skills, tendencies, preferences, present situation, and economic expectations of individual landowners affect how these factors are evaluated. Other factors that also influence land-use choices are likely to include expectations of future income, level of risk aversion, and age (Daugherty, 1997).

Land use is the human use of land. Land use involves the management and modification of natural environment or wilderness into built environment such as resettlement and semi-natural habitats such as arable fields, pastures, and managed woods. It also has been defined as "the arrangements, activities and inputs people undertake in a certain land cover type to produce, change or maintain it"(FAO/UNEP, 1999). ). Land use: the sequence of operations carried out with the purpose to obtain goods and services from the land, characterized by the actual goods and services obtained as well as by the particular management interventions undertaken by the land users. Land use is the single most important driver of land degradation as it focuses on interventions on the land which directly affect its status and impacts on goods and services (Ballayan, 2008).

Many of us regularly read and hear the words land use and land cover, but do we really understand what these words mean? These terms are often erroneously used interchangeably however; each term has a very specific meaning. Land use is commonly defined as a series of operations on land, carried out by humans, with the intention to obtain products and/or benefits through using land resources.

Whereas cover change is commonly defined as the vegetation (natural or planted) or man-made constructions (buildings, etc) which occur on the earthy surface. Water, ice, bare rock, sand and similar surfaces also count as land cover. Land use and land cover have some fundamental differences. Land use refers to the purpose the land serves, for example, recreation, wildlife habitat or agriculture; it does not describe the surface cover on the ground. For example, a recreational land use could occur in a forest, shrub land, grasslands or on manicured lawns. Land cover refers to the surface cover on the ground, whether vegetation, urban infrastructure, water, bare soil or other; it does not describe the use of land, and the use of land may be different for lands with the same cover type. For instance, a land cover type of forest may be used for timber

production, wildlife management or recreation; it might be private land, a protected watershed or a popular state park (Coffey, 2013).

Land use/land cover data is essential for many fields of science, industry and management. Land cover describes which surface a certain area on the Earth has. For example, cotton fields, wetland and concrete highway. While land use describes for which human activity the land is used. For example, commercial, industrial and residential land uses (Lillesand, 2007). Human activities and natural disasters are the main causes of modern, dramatic changes in land use land cover types.

The focus was the adverse impact of these global and regional changes on society and environment. Empirical studies by researchers from diverse disciplines found that land use /land cover changes and its change had become key to many diverse applications. These applications referred to urban expansion, deforestation, crop land loss, water quality change, soil degradation etc (Turner, 2002).

Global LU/LC conversions affect global environmental sustainability, which makes the analysis of these changes essential for future well-being of the mankind (Muttitanon *et al.*, 2004). In order to meet the demands of a rising and more affluent global population, agriculture will need to continue to grow. Agriculture and associated land use and land use change contribute about 35 to 40 per cent of total anthropogenic greenhouse gas emissions. Emission sources include 36 agricultural operations (enteric fermentation, manure management, soil, and fertilizer applications), land use change (deforestation and land burning and clearing). Emissions are expected to increase substantially in the coming decades as population and income growth increase global demand for food, especially for meat, dairy products, and other high value products. Much of the increase in agriculture-related emissions will take place in Asia, Latin America and Africa (FAO, 2009).

International Geo-sphere and Biosphere Programme (IGBP) and International Human Dimension Programme (IHDP) co-organized a working group to set up research agenda and promote research activity for land use /land cover changes. The working group suggested three core subjects for land use /land cover change research, such as situation assessment, modeling and projecting and conceptual scaling. Land use and land cover changes are driven by: (1) natural

processes, such as climate and atmospheric changes, wildfire, and pest infestation; (2) direct effects of human activity, such as deforestation and road-building; and (3) indirect effects of human activity, such as water diversion leading to lowering of the water table. Natural processes and human activities can both improve or degrade the state of the land, so it is essential to distinguish beneficial from detrimental changes (Turner and Meyer, 1991).

Land use and land management practices have a major impact on natural resources including water, soil, nutrients, plants and animals. Land use information can be used to develop solutions for natural resource management issues such as salinity and water quality. For instance, water bodies in a region that has been deforested or having erosion will have different water quality than those in areas that are forested. Forest guarding, a plant-based food production system, is believed to be the oldest form of land use in the world (UN, 2007).

Land use data are important for many of the regional to global activities currently undertaken by FAO (*e.g.*, the validation of agricultural land utilization; the preparation of perspective studies on agricultural production and food security; farming systems studies; policy formulation). Thus, knowledge of current land use (land resources) is needed for formulating changes leading to sustainable use of the resources (FAO, 2013).

According to the Ministry of Agriculture and Rural Development of the Ethiopia (2005) remainder of this report defines the research problem lays out a plan that addresses the human causes of global land-cover change. This plan includes the development of a global land cover and land use model that can link to other global models central to the study of global environmental change. The report reviews the importance of modification and conversion of land cover to the functioning of the Earth system. It then discusses the relationship between human uses of the land and changes in land cover; reviews what is known about the human forces that determine land use; and proposes a conceptual system for relating these driving forces to changes in land cover (CBD, 2009).

Land use practices vary considerably across the world. The United Nations' Food and Agriculture Organization Water Development Division explains that "Land use concerns the products and/or benefits obtained from use of the land as well as the land management actions (activities) carried out by humans to produce those products and benefits. As of the early 1990s,

about 13% of the Earth was considered arable land, with 26% in pasture, 32% forests and woodland, and 1.5% urban areas (UN, 2007).

These decisions are based on the appreciation of the available land resources, the response to these resources are conditioned by the knowledge passed from generation to generation and the appreciation of demand for various agricultural commodities in the market. The cumulative effect of farmer's decision regarding the choice of crops, the method of tillage and his appreciation of the land resources is reflected in the spatial as well as temporal variation in land use (Gomase, 2010).

Land degradation is a potential threat to half of the world's poor people who live in dry land areas with fragile soils and unreliable rain, especially in Africa. Declining soil fertility has a severe impact in global case, particularly in Africa. Average yield losses are estimated at 8 percent, with up to 50 percent productivity losses in certain areas of Africa. Traditional systems of land use are either breaking down or are no longer appropriate due to population pressure, and the management and technology needed to replace them is often not being applied (FAO, 2000).

In the face of looming water shortages, and with crop and grazing land constituting a large and growing portion of critical watersheds, it is becoming a priority for lands under agricultural use to be managed in ways that enhance watershed function. This means the retention of riparian vegetation; the retention of other natural or planted vegetation to slow movement of water across fields and micro-watersheds; the maintenance of year-round vegetative cover to protect soils from erosion, and the maintenance of soil organic matter and physical structure to facilitate infiltration of rainfall. In the rainforests of the Congo Basin and Madagascar, the savannah woodlands of southern Africa, and many African coastal per-urban zones, land conversion for agriculture is a major threat to globally and nationally important biodiversity resources (Sara, 2010).

### **2.2.1. Land Use and Land Cover Changes in Ethiopia**

These can be identified by the researcher or the farmer, or examined more analytically through the use of a model. Variables that may affect a farmer's decision making include household assets (both human and non-human) plus the qualities and assets of the farm itself. While there are many endogenous and exogenous factors that may influence why farmers cultivate land as

way they do, ultimately it is the farmer who makes the final decision on how to use the land (Puhalla, 2009).

Ethiopian agriculture is still predominantly a traditional farming system defined by uneconomic farm land conditions and size with small holder working on continuously degraded and over grazed farm land. The production is largely for subsistence, and not for commercial purposes. As a result, the static performance of this sector limits its contribution to the overall economic growth over the past forty years, as reflected by previous analysis of overall economic and exports (Beyene *et al.*, 2008).

There is no disagreement about current dreadful state of resource scarcity; expressed in terms of cultivated land per household in rural Ethiopia. It has reached an alarming lower level exposing millions of rural households, to vulnerability to food insecurity. As households fail to meet the requirement of their household members and get more impoverished, they are faced to strip the land of its resources. They cut trees for fire wood, charcoal making and construction poles, leaving the hill slope bare, exposing it to erosion (AESE, 2006).

In Ethiopia, agricultural productions and rural livelihoods are directly dependent on natural environment (Bio-physical and climatic). The production process is characterized as a process of constant human interactions with natural environment. In this process, the manner in which resources are utilized would determine the sustainability of rural livelihood system itself (AESE, 2003). Because of the direct dependency on the natural resources, the proximate causes of land cover change particularly natural vegetations destructions are highly expanding, both through shifting cultivation and the spread of sedentary agriculture; the demand for increasing amounts of construction material, fuel wood and charcoal. Charcoal production is common place in the arid, semi-arid and dry sub humid parts of the country. Using fire to fumigate bees and to facilitate hunting is also very common, which results forest fire and destructs natural forests (Kahsay, 2004). To stop and reverse further land degradation, Sustainable Land Management (SLM) is crucial to minimizing land degradation, rehabilitating degraded areas and ensuring the optimal use of land resources for the benefit of the present and future generations (FAO, 2008).

Integrated crop and land management programmes should provide short-term and tangible benefits to farmers, such as increased yields and reduced risks. In many countries, security of

tenure should be improved to encourage farmers to practice effective land management, and access to land and resources should be made more equitable to promote sustainable rural livelihoods. Local institutions should be strengthened to enable rural communities to improve their land use and land tenure arrangements through participatory processes (FAO, 2000).

The most cited causes of land cover change in many literatures are population increase. However, the relationship between population and land cover change is debatable issue. Some argues that increase in population has positive effect on resource available. Similarly, studies in different parts of Ethiopia have shown that population pressure has been found to have negative effect on scrublands, riparian vegetation and forests (Amare, 2013).

### **2.2.2. Environmental Concern in Ethiopia in Relation with LU/LC**

#### **Changes**

Globally, about 29 percent of the land surface was originally under forest cover. Presently, however, it is only a fifth of this original which remains undisturbed (FAO, 2001). It is estimated that in Ethiopia, 40 percent of the country was covered with forests at the beginning of the 19th century (Dudgeon, 2003). Being a tropical country, land use dynamics including forest cover change is one of the major environmental problems in Ethiopia. In relation to this, recent studies showed that LU/LC change is brutal and there has been agricultural land size expansion at the expense of natural vegetation cover lands and marginal areas without any appropriate conservation measures (Amsalu *et al.*, 2006; Gessesse and Kleman, 2007).

Very important factor that aggravated land degradation in Ethiopia is deforestation. The forest cover went down from 40% at the beginning of this century to 12.5% at present. Deforestation accelerated land degradation in many ways. Firstly deforested land is easily susceptible to erosion; both wind and water, and hence cause a considerable nutrient movement. Secondly the amount of litter that could have contributed for maintaining the soil organic matter is considerably reduced. Thirdly deforestation in the highlands caused lack of fuel wood, and hence farmers use manure and crop residue as cooking fuel, which otherwise could have been used for soil fertility replenishment (Shibru, 2010).

Ethiopia is also noted by severe environmental degradation of which the most notable ones are soil erosion, water depletion (such as the disappearance of Haramaya Lake, near the town of

Harar), and shrinking vegetated lands. Historical documents show that forest and woodlands once covered over 40 percent of the total area of the country (Badege, 2005). Presently this figure is estimated at 12.5% percent. As Woldeamlak (2009) cited in FAO (1999), the country's annual deforestation rate is estimated to be about 62,000 hectares, attributed primarily to the increased demand for farmland, fuel wood, and settlement sites. This has resulted in severe soil degradation (about 2 billion tons per year), alteration of hydrologic regimes, disturbance of local and/or regional climates, loss of biodiversity, and expansion of desert ecological conditions.

Deforestation is a major issue in Ethiopia, since it is one of the main causes of the prevailing land degradation and loss of biodiversity and vegetation cover. The impacts of deforestation from time to time in Mada talila and Ifa bas resettlement kebeles have been experiencing a full range of the known deforestation-related problems like shortage of firewood, timber, soil erosion and landslides. Firewood and timber deficit were increasing because of deforestation. This is because of destruction of natural vegetation.

Land degradation is broadly defined as any form of deterioration of the natural potential of land that affects ecosystem integrity either in terms of reducing its sustainable ecological productivity or in terms of its native biological richness and maintenance of resilience. It is a worldwide phenomenon substantially affecting productivity in over 80 countries on all continents. Land degradation damages soil structure and leads to the loss of soil nutrients through processes such as water or wind erosion; water logging and Salinization; and soil compaction. The main causes of land degradation are inappropriate land use, mainly unsustainable agricultural practices; overgrazing; and deforestation. These practices are most prevalent in places where land, water, and other natural resources are under-priced. In addition, people who do not have land tenure security and/or water rights have little or no incentive to invest in sustainable land management. Instead, they tend to focus on meeting their short-term economic needs, to the detriment of the environment (GEF, 2003).

Land degradation has been exacerbated where there has been an absence of any land use planning, or of its orderly execution, or the existence of financial or legal incentives that have led to the wrong land use decisions, or one-sided central planning leading to over utilization of the land resources for instance for immediate production at all costs. As a consequence the result has



often been misery for large segments of the local population and destruction of valuable ecosystem. Such narrow approaches should be replaced by a technique for the planning and management of land resources that is integrated and holistic and where land users are central. This will ensure the long-term quality of the land for human use (UN/FAO, 2007).

Studies indicate that for the successful rehabilitation of degraded lands in developing countries local concerns about immediate tangible benefits must be integrated into global concerns about the environment. This can be accomplished by building on indigenous knowledge and traditions and by involving the whole village community in decision making or representing them through traditional organization. Local management by those who are familiar with the ecosystem and have a personal interest in the well being of the natural resources appears to be the most effective procedure for conservation and sustainable development in developing countries (Saxena *et al.*, 2001).

Generally, resettlement schemes in Ethiopia in the past as well as the present were hastily conceived, poorly planned and executed, and resulted in considerable hardship. It is due to this reason that resettlement in Ethiopia not only destroys the flora and fauna and exacerbates the environmental degradation but also claims the life of the people. Some environmentalists argue that resettlement is destroying the remaining natural resources of the country and thereby aggravating the environmental degradation problem (Ahmed, 2005).

### **2.3. Remote Sensing as a Tool for Land use/land cover Study**

The collection of remotely sensed data facilitates the synoptic analyses of earth-system function, patterning, and change at local, regional, and global scales over time. Such data also provide a vital link between intensive, localized ecological research and the regional, national, and international conservation and management of biological diversity (Ernani and Gabriels, 2006).

Remote Sensing is the science and art of obtaining information about an object, area, or phenomenon through the analysis of data acquired by a device that is not in contact with object, area, or phenomenon under investigation (Lillesand and Kiefer, 2004). It provides a large variety and amount of data about the earth surface for detailed analysis and change detection with the help of various space borne and airborne sensors. It presents powerful capabilities for

understanding and managing earth resources. Remote Sensing have been proven to be a very useful tool for LULC change detection.

Change detection and monitoring involve the use of several multi-date images to evaluate the differences in LULC due to various environmental conditions and human actions between the acquisition dates of images (Singh, 1989). Successful use of satellite Remote Sensing for LULC change detection depends upon an adequate understanding of landscape features, imaging systems, and methodology employed in relation to the aim of the analysis (Yang and Lo, 2002).

With the availability of historical Remote Sensing data, the reduction in data cost and increased resolution from satellite platforms, Remote Sensing technology appears poised to make an even greater impact on monitoring land-cover and land-use change (Rogan and Chen, 2004). In general, change detection of LULC involves the interpretation and analysis of multi-temporal and multi-source satellite images to identify temporal phenomenon or changes through a certain period of time. Remote Sensing data are the primary source for change detection in recent decades and have made a greater impact for different planning agencies and land management initiatives (Yang and Lo, 2002).

Remotely sensed satellite images provide valuable datasets that can be used to analyze, evaluate, and monitor changes in ecosystems through change detection. One of the major hurdles of any satellite image analysis is how to accurately compensate for atmospheric effects. Several studies have investigated the ability of satellite imagery, including Land sat MSS, TM and ETM+, to perform change analysis. The most commonly used remote sensing data for the extraction of earth surface feature for the classification of LULC are: Land sat, SPOT, Radar, Aerial Photography, IKONOS, MODIS, AVHRR, etc.

## **CHAPTER THREE: RESEARCH METHODOLOGY**

### **3.1. Description of the study area**

#### **3.1.1. Location and Topography**

The study was conducted in Hawa Galan District in the Oromia National Regional State of Ethiopia. Hawa Galan District is one of the 11<sup>th</sup> districts of Kellem Wollega Zone of Oromia Regional States. At present, the district has 31 administration kebeles out of which 29 are rural kebeles and the remaining two are urban center. The administrative center of the Woreda is Gaba Robi 28 km far from Zonal capital (Dambi Dollo town) in the North-Western part. Hawa Galan district is located at about 624km away from West of Addis Ababa, in Oromia National Regional States Kellem Wollega Zone. The Woreda is bordered by Illu ababor zone in the south and South-East, Seyo district in the South and South-West, Dale Wabara district in the north- East and Yemalagi Walal district in the North.

The district covers a total area of 795.49 or 79549.03 hectares. The district is generally characterized by low relief features with few areas having high relief. The topography of the Woreda is rigged with elevation varying between 1200- 2200m.a.s.l. (HGWARDO, 2017). Its lowest and highest point lies in specific areas of Tulama and Fincho respectively. According to (HGW LAEPO, 2017), the relief of the woreda consists of mountain, plain, undulating hills, valley sides and land also covered by water. Regarding to their spatial distribution by percentage the district has ranges of micro land forms such as 5% plain (flat), 55% gentle rolling (undulating) and 40% steep slope.

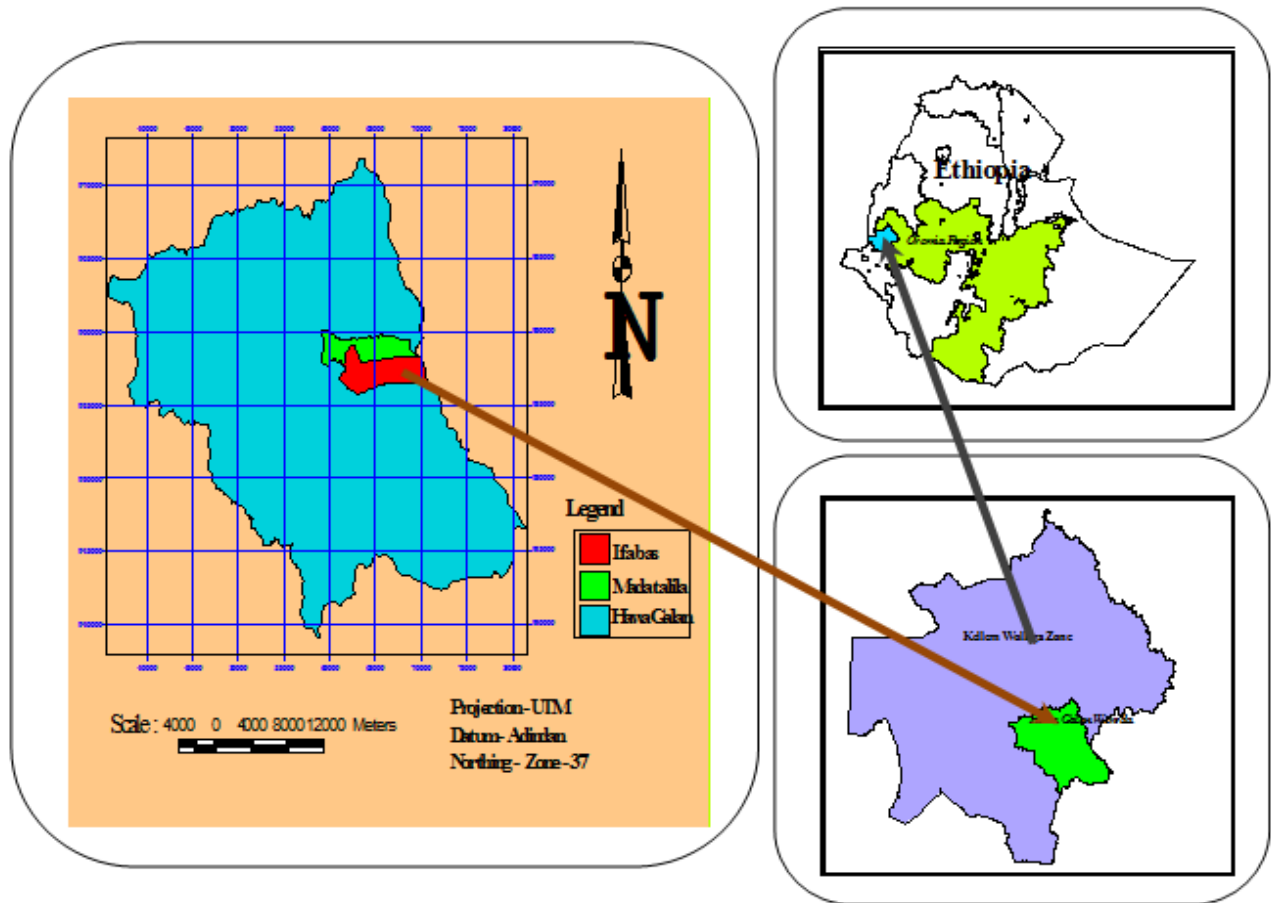


Figure 3.1 Location map of the study area

### 3.1.2. Climate

There are two agro-climatic zones in the study area. These are Woina Dega (temperate) and Kolla (hot tropical) agro-ecological zone, with an elevation of 1500-2300 and 500-1500 m.a.s.l respectively HGWARDO, (2017). There is no recorded data the existence of Dega (Wurch) agro- ecology in the Woreda. The dominant agro- ecology of the Woreda is the “hot to warm moist lowlands (kola) which covers about 63.7% of the total area of the district. This zone lies at an altitude range of 500-1500 m. a. s. l and has an average annual temperature that ranges from 20-28. It is reported to have an estimated average annual mean potential evapo-transpiration rate about 1800mm.

This zone is suitable to wide ranges of low land crops including cereals, pulses and oil seeds. The Woina- Dega (temperate) agro- ecology of the district accounts for about 36% of the total area having an altitude range of 1500-2300 m. a. s. l and mean annual temperature for this area

range from 16-20. This zone is suitable for the production of all kinds of annual and perennial crops such as cereals, coffee, pulses, different vegetables and fruits. The Woreda receives annual rainfall ranges from the minimum of 500mm to the maximum of 1200mm. The major rainy season in the district include spring (April-May), summer (June - August) and autumn (September-November). The average annual temperature of the district is about 27 (HGWARDO, 2017).

### **3.1.3. Drainage and Soil**

The major rivers that drain the district include Keto, Hindina, Chokorsa, Konbolcha, Yanqina and etc. They are mostly used for irrigation (mostly traditional), drinking and power of source for flour mills planted on the rivers. According to the information obtained from HGWARDO (2017), there are three types of soil exist in the district that is loam soil, sand soil and clay soil. In terms of color, soil of the district are generally classified as Black(68%) and Red (32%).According to the GIS team of the current study, soil types of the Woreda is dominated by Dystric Nito soils 98.62% and followed by Orthic Solon chacks 0.63% of the district. As to suitability for agriculture, the loam soil is highly suitable while the remaining ones are also suitable to some extent. Soil fertility is maintained by using both traditional methods (such as organic compounds, animal manure and crop rotation) and modern methods (application of chemical fertilizers). Similarly, soil conservation is practiced by using both traditional (such as contour plotting and modern methods (terracing, plantation and the like) (HGWARDO, 2017). The data from the same office reveals that soil erosion in the area is so severe. This is mainly because the vast proportion of the land is uncovered by vegetation and improper land use systems in the districts.

### **3.1.4. Vegetation and Wild life**

According to the information obtained from Hawa Galan Woreda Agricultural and Rural Development office Forestry Department (2017), out of 51,011.03 hectares of the district, which is about 240 hectares of the total area of the district, is covered by natural vegetation out of which high forest constitute about 5.07 km<sup>2</sup> while 2.05km<sup>2</sup> man made forest. Wood land, riverine and shrubs and bushes constitute about 16km<sup>2</sup>. The major type of trees available in the district includes ficus vista, Albia, acacia, Kararo and Eucalyptus trees and etc.

As to wild life, there are different species of wild animals in the district. Therefore some major types of wild animals in the district include lion, leopard, buffalo, pig, warthog, hyena, and apes and monkey (HGWARDO, 2017). However, there are no reserved areas for wild life conservation in the district. According to the information obtained from Forestry Development and protection Department of the District office of Agriculture FDPDOA (2017), the forest resource of the woreda are the center of diversity for many different species such as coffee and root crops known as anchote. However, the major portion of the forest has been destroyed in the last 20 years, some still remain. This threatened by miss management, specifically through rapid expanding off- farm land and settlement program takes place in different times in the area. As it is true for most areas of Ethiopia deforestation has been cleared for the purpose of settlement, fire wood, constructional material and farm land in the District.

### **3.1.5. Land Use**

Available data on land resource utilization shows that in Hawa Galan District out of the total area of the district (510.11) km<sup>2</sup> land under crops (both annual and perennial crops) and grazing land was about 6387.2 ha and 5468ha respectively. The respective areas under forest, swampy and marsh land were 240, 1300 ha and 2200 ha respectively. The remaining, about 927.74 hectares and 1180.09 hectares were stated to be land to institution and arable land and land under other uses HGWFEDO (2017).

### **3.1.6. Demographic and Socio-Economic Characteristics**

#### **3.1.6.1. Demographic Characteristics**

Population is a part of socio-economic information dealing with people of certain locality in relation with environmental trends. According to the HGWFED office (2017), the district has a total population of 118552 of whom 109362 are rural population.

Table 3.1 Population Density of Hawa Galan Woreda

Name of Woreda	Male	female	Total population	Total area( $km^2$ )	Population Density $p/km^2$
Hawa Galan	60812	5770	118552	795.49	149

Source: HGWARDO, 2017

According to Hawa Galan Woreda Finance and Economic Development office HGWFEDO (2017), out of the total population of the Woreda 60812 are males and 57740 are females and also, out of the total population 109362 are rural and small scale farm holders. Population density in 2017 was about 149 persons per kilometer square. The ethnic composition of the Woreda includes peoples of Oromo, Amhara and Tigre.

There are three major religious groups such as Orthodox Christians, Muslims and Protestants can exist (HGWFEDO, 2017). In Hawa Galan Woreda the resettlement areas include seven settlement villages or rural kebeles which occupied the area in 2003/04. Therefore, a total of 6841 house hold (6595 male and 246 female) and 29908 persons (14884 males and 15024 females) resettled in resettlement areas of Hawa Galan. The current settlers in the district where came from the different Zone of Eastern and Western Hararghe area of Oromia Region. According to HGWARD office (2017), the recent resettlement program of 2003 and 2004 took place in Hawa Galan resettlement site are drawn from six districts of East Hararghe and ten districts of West Hararghe Zone.

### 3.1.6.2. Socio-economic characteristics

The major livelihoods of the population of the district are mainly dependent on subsistence mixed agriculture that entirely depends on seasonal rain fall and related activities. Over 93% of the Woreda population is rural resident, the rest being urban dwellers sustaining their livelihoods on different trades and permanent and temporary employments. The rural populations in the Woreda are predominantly engaged in agriculture, crop production and livestock rearing or both. In the study area, agriculture is dominantly relied up on the seasonal rain fall and uses old traditional method of farming. Because of its favorable climatic condition and fertile soil in the Woreda many types of the crops are cultivated.

The major crops grown in the study area includes cereals (maize, sorghum, wheat, barley, finger millet and teff ), Pulses (field peas, haricot beans, tebabin, and Soy able horse beans), Fruit trees (mango, banana, papaya, sugar cane), root crops or tuber crops ( onion, potato, yam, inset, carrot and anchote, Oilseeds ( Noug, groundnut, sesame, rape seed and linseed) are common. Wheat and Barley are crucial crops grown Woina dega areas of the Woreda while finger millet, sorghum and maize are grown in Kola areas.

### **3.2. Research Design**

Research design implies the methods and procedures for collecting, processing and analyzing the required data to answer the research questions. The research approach that was employed in this study is mixed method. According to Creswell (2003) mixed method research approach is the collection and analysis of both quantitative and qualitative forms of data in a single study. Data acquisition would be crosschecked by triangulating and substantiating through different data collection methods from different data sources.

### **3.3. Sampling Size and Sampling Techniques**

The study District was selected purposively based on the prior knowledge of the area. In Hawa Galan District there are 29 rural kebeles. Among these, seven rural kebeles are resettlement sites in the District. But due to the shortage of resource and time the researcher obliged to purposefully select two specific rural kebele administrations (Mada talila and Ifa bas) were selected based on the level of degradation of forest lands that converted to Agricultural and settlement land. Therefore, from these Mada talila kebele is represent highly degraded land and Ifa bas kebele is moderately degraded land according to the data obtained from RLAUPO, (2016) of the district. Also in the stage of Household sampling, the researcher design to randomly selecting the respondents from household resettler of selected rural kebeles. This procedure of sampling techniques was employed for the purpose of giving equal chance for all household kebles to be selected.

Relies on the available time and resource the sample size of the study was determined by using the following formulas of sample size determination which is adopted from Kothari (2004).



$$n = \frac{N}{1+N(e)^2} = \frac{2200}{1+2200(0.1)^2} = 96 \text{ therefore, from the size of the target population of 2200}$$

the 96 sample size of household respondent were selected randomly from designed sample frame.

Where: **n**- designates the sample size the researcher will use.

**N**- designates total number of households within study area.

**e** - designates maximum variability or margin of error 10% (0.1).

**1**- Designates the probability of the event occurring.

Table 3.2: Statistical population and Sample Size of the study.

Name of the kebele	Number of house holds	Sampled house holds	Percentage
Mada Talila	1200	52	54.2
Ifa Bas	1000	44	45.8
Total	2200	96	100

Source: HGWARDO (2017)

### 3.4. Data source and data collection techniques

#### 3.4.1. Data source

The process of data collection and data collection techniques /tools such as survey questionnaire, semi- structured interview, focus group discussion, field observation and satellite image were used to strengthen the data.

In addition to primary data, secondary data from various sources such as published and unpublished documents were used to supplement previously prepared literature review.

In order to examine the impact of resettlement on socio economic well being and land use land cover change of the study area a cross sectional research design were used. To generate appropriate information from the local community, local and woreda administration and as well as satellite image of different years were use. To maximize the generation of reliable data for analysis, the research design were compliment by proper research methods and techniques for

data generation and collection. To address the stated objectives, broad based information were gather.

To get real Land use and Land cover change in the area the researcher were use 14 years medium resolution satellite image. A spatial database depicting the land use patterns of the 2002 and 2016 will develop using Land Sat imagery.

Major works were be:

- ❖ Acquisition of a semi-processed satellite image of the study area of 2002 and 2016 years.
- ❖ Identification of Ground Control Points (GCP's) before interpretation of satellite images commences. At each GCP location, Handle GPS measurements were taken in a field work in as to verify and confirm the information gathered through remote sensing.
- ❖ Geo-referencing (Geo-rectifying) the 2002 and 2016 satellite image using the same imagery will remapped and projected to UTM ground coordinates.
- ❖ Producing land use and land cover maps of 2002 and 2016 organization of the maps for further processing.

### **3.4.2. Data collection Techniques**

*Household questionnaire* were be designed to encompass a range of issues that could provide an insight into the socio-economic system of the household and its impact on Land use land cover change and so encompasses all areas of the kebeles. After setting the questionnaire a formal pilot test were be carried out on 5 to 10 households to check the case with which respondents answer to the questions and also to make sure the validity of the questionnaire.

*Focus Group discussion* be included to supplement and confirm information that generated in questionnaire and in-depth interviews with key informants. Discussions using semi structured or open ended questions held with the men and women group and the kebele leadership, and rural Land administration committee. Elders, religious leaders, and the agricultural development extension workers involved in the group discussions. Staffs of these institutions are assumed to have extensive experience and knowledge about land use activities in their localities as well as the management of the lands.

Group discussions points though may vary across different groups be designed to have communities as the focus of the discussion is exploring what are the major impact of resettlement on socio economic well being and Land use land cover change in the kebeles. Notes taken from a group discussion and key informants be summarized the same day and also issues arising in one group discussion used for further discussion in the following group discussions.

*Key informant interview* attempts to explore facts on the ground makes it a rational approach to include key informant interviews by involving selected group of individuals who are likely to provide needed information, ideas, and insights on the proposed research. Key informants selected with the help of the Kebele administration and agricultural development agents.

A total of four (4) Key informants (two per kebele) in the kebele were a check list of open ended questions prepared and presented to them in a simple and understandable manner. The time and place for key informant interview guided by the Key informants themselves.

*Field observation* were conducted in the two study Kebeles to observe the physical and socio-economic infrastructures, patterns of land use and the condition of the woodland and grazing lands as well as farm lands. This helped the researcher to gather reliable primary data and information and understand the general condition of the environment.

### **3.4.3. Data Consolidation and Method of Data Analysis**

Data collected from different sources were analyzed in quantitative and qualitative approaches. Data obtained through household survey analyzed using the latest version of SPSS for windows. Contingent tables, line graphs, and other descriptive statistical techniques used to present and consolidate the data.

To complement this, qualitative data from field observation, focus group discussion, and key informant interviews also consolidated. Data collected from group discussions immediately summarized through discussion with an assistant note-taker. Prominent issues screened by checking how many of the speakers reiterated the same issue in the process of the discussion. Both diverging and converging issues on particular issues identified and used for analysis in line with the research objectives. Data which extracted from the satellite image organized and analyzed by using ERDAS IMAGINE 2013 and Arc GIS 10.3 software's.

## CHAPTER FOUR: RESULT AND DISCUSSION

This part attempts to explain characteristics of the settlers household respondents in terms of sex, age, marital status, religious, educational status and family size. Secondly, it looks in to the impacts of resettlement on Socio-economic well being and land use change. It identifies the major drivers of Land use/Land cover change in the area. Thirdly, it presents the impact of resettlement on the living condition of the settlers. Forth, it presents the socio-economic factors initiating forest degradation. Therefore, the distribution of different demographic and socio-economic variables related to resettlement and resettlement was analyzed by descriptive statics by percentage. Lastly, the management of land during the resettlement was analyzed.

### 4.1. Demographic and socio-Economic Characteristics

#### 4.1.1. Sex composition of the households

Table 4.1: Respondents sex composition

Sex of the respondents	Frequency	Percentage
Female headed	26	29.0
Male	70	73.0
Total	96	100

Source: Field survey (2017)

According to the survey result, about 68% were male headed households while 32% were female headed household. In the study area, both genders are responsible for the impacts of resettlement. The focus group discussion with household's participants revealed that women's are responsible for most of the household activities and collection of fire wood and small timber from forest. This result is in line with the finding of Panda et al (2005) showed that in developing areas of the world, women are considered the primary users of natural resources ( land, forest and water) because they are the ones who spend of their time working on fire wood, fuel and fodder. Similarly, the participants revealed that males are also responsible for the forest removal for the purpose of expanding agricultural land and settlement expansion as well as for house construction in the study area. Generally, the study from the survey result shows that in the study area both genders are responsible for the resettlement issue.

### 4.1.2. Marital status of the respondents

Table.4.2.Marital status of sampled households

Marital status	No.Respondent			Percentage
	M	F	Total	
Married	58	21	79	82
unmarried	12	5	17	18
Total	96			100

Source: Field survey (2017)

As referred in Table 4.2, about 82% of the household respondents were married and the remaining 18% of them were unmarried. As information obtained from the key informants, in the study area, the majority of the sampled household reported that the respondent households were married in the early stage.

### 4.1.3. Household family size

The majority of the respondents 53.1% of the sampled households have the family size of 5-8 and 42% of them had 2-6. It is only 5 percent of the sampled households had more than 8 family in the study area.

Family size of the respondents was one of the factors that affect land holding size and agricultural expansion of the farm households in this study. With increasing numbers of household size, there has been a related change in the pattern of agricultural, which is essential small holder depends on expanding the cultivated area, often in to vegetation cover areas rather than adopting intensification technique in the study area. This result is in line with the finding of Thapa (2003) that shows local people with small land holding depend on forest product than those with relatively large land holdings.

#### 4.1.4. Educational status of respondents

Table 4.3: The educational attainment of respondents in the study areas

Educational status	Frequency	Percentage
Illiterate	41	42.7
Read and write	45	46.9
Primary school	8	8.3
Secondary school	2	2.1
Total	96	100

Source: Field survey (2017)

Educational levels of the society affect household decision which determines the welfare of the society such as health, and their attitudes towards using forest resources. Most of the time educated societies are more likely to use forest wisely than non educated one. This is in line with (chalachewu, 2004 as cited in Berhanu, 2007) farmer with higher educational levels are expected to be better in perception and response to soil conservation and deforestation problem.

The education figure (Table 4.3) revealed that 45% of the household respondents had no formal education while 40.8% of them were able to read and write. It is only 10.8% of the heads of households who have attended primary school. The remaining 1.7% of the household respondents was attended secondary school in the selected kebeles. From the survey result it is may to conclude that the educational level of the household respondents can determine the level of the utilization of forest and protection of the environment through their unhealthy agricultural practices and unwise use of these resources in the study area.

#### 4.1.5. Age distribution of the sample households

Table 4.4: Age distribution of the sampled households

Respondents Age groups	No. of Respondents	Percentage
30-45	40	41.7
46-60	52	54.2
Above 60	4	4.1
Total	96	100

Source: Field survey (2017)

As it referred in Table 4.4, about 52% of the heads of households respondents were within the age group of 46-60 years followed by those in the age group of 30-45 years 40%. One can understand from the survey result the majority of the resettlers household lies between the productive age group (30-65) who has a great potential in production activities. Furthermore the settlers originally come from East and West Hararghe with almost similar cultural and psychological set up. The in-depth interview with Development Agents of the study area revealed that aged farmers have better perception on resettlement and forest conservation methods.

#### **4.1.6. Livelihood Strategies**

Mixed subsistence farming and the animal husbandry were mutually interdependent kind of livelihood for all households at the study area. However, all household heads were mentioned that crop production is more important than livestock production to them in terms of immediate food supply and income to the household. Rearing of livestock is considered as a supplementary and also an important means of survival in case of unexpected crises and shock such as natural or manmade problems. Rearing of animals also were sources for household consumption and sold to market such as milk, and milk products and for agricultural purposes. Agriculture in the study area is highly subsistence-oriented and more of households managed to be self sufficient in food supply. Out of the surveyed 96 households more than 80% of the household heads reported that they were food self-sufficient. According to results of the survey, farm household heads mentioned number of problems that were constrain their agricultural livelihoods such as shortage of labor, crop and animal disease, pest, drought and Shortage of land were some of hindrance mentioned by the surveyed households.

The leaving conditions of the people at the resettlement village Vary from households to households which were highly influenced by livelihood strategies of the individual households. Livelihood strategies or carefully devised plan of action served as a measure for favor or disfavor for everybody in the study village.

Table 4:5 Compare and contrast living conditions of HHHs respondents at the origin and destination

	Households	Very good	Good	Medium	Poor	HH respondents
						Total
The Living condition of the origin	Respondent HH' s in No	-	-	5	91	96
The Living condition of the destination	Respondent HH' s in No	6	60	22	8	96

Source: Field survey (2017)

As referred on Table 4.5 situation of life at origin was very difficult compared to life at destination. According to Table 4.5 only (5) 5 % of HH heads reported that their leaving condition at the origin was more or less medium while, the rest (91) 95% of HH heads responded that the way of life was poor at the origin.

But reversely at about (7)8% resident HH heads were very interested at new resettlement village. At about (60) 79% households were happy at the new destination. However, rest (22)22.91% household heads were being in between or neither very interested nor satisfied. Lastly the small number of household heads particularly (8) 8.33% were not happy at the destination. This is because of they did not equally owned the land by the government compared with other residents and also they have not agricultural inputs.

#### **4.2. The impact of resettlement on the living condition of the settlers**

Resettling people to less populous and moisture sufficient areas has been one of the policy ideal that the Ethiopian Government has introduced to manage and prevent famine. Therefore, the majority of the 1984/85 and the current government resettlement program of 2003/2004 national resettlement programs were implemented in South-West in general and Wollega in particular. Hawa Galan resettlement scheme is one of the state-sponsored resettlement programs for settlers



who came from the degraded Northern highlands and for settlers who came from the lowlands east and west Hararghe Zone of Oromia Region. Even though the large scale resettlement scheme practiced in the district during the Derge regime and the current government in 2003/04. According to information obtained from HGWARD Office (2017) report among other place in Ethiopia Hawa Galan Woreda was receiving large numbers of resettlers from the degraded high land of the northern part and south-Eastern part, particularly from Western and Eastern Hararghe Zones by clearing a large part of the forested areas.

According to the report of the office the new resettlers household occupied the area during the current government of Ethiopia in 2003/2004 when the government launched the voluntary or intra-regional resettlement program through planned resettlement program. However, currently many resettlers sent to the forested areas of the district through migration without any governmental plan. According to Hawa Galan Finance and Economic Development Statics Department (2017) reported that in this site about 36740 (male, 21479 and female 15270) families of the new settlers of Harar People resettled the area in 2003/04. Accordingly, this situation can make a great pressure on the forest, and the wood land has been replaced by arable land for the cultivation of food crops. The focus group discussions with household participants in the study area revealed that all the respondents confirmed that they came to Hawa Galan resettlement site by their own decisions without any enforcement. They were convinced by the government plan and by their own initiative.

This might be one indicator of the fulfillment of the pillars of resettlement, i.e. voluntarism that the government has respected.

#### **4.2.1. Environmental impacts of resettlement in the study area**

Concerning to the impacts of resettlement Ahmed (2006) argued that resettlement is destroying the remaining natural resources of the country and there by aggravating the environmental degradation problem. In most resettlement areas in the district much emphasis is given to land distribution without giving due consideration to the forests and land management. As a result much area previously covered by natural forest and grass lands is under degradation in the resettlement site of the study area. Despite differences in the scale, there were huge losses of forest and other natural resource with enormous negative impacts on the sustainability of

environment. Contrary to what has been set out in the resettlement program Implementation Manual (PIM), forest and wild life resources were not protected in the recipient area nor were the resettlers provided with education and advice.

As the interview made with the experts of Agricultural and Rural Development Forestry Department of the District revealed that the species of flora and fauna found in the wood land ecosystem could be subjected to threat and eventually extinction because of increased pressure from the resettlement scheme, which may have many economic and ecological implications in the study area. Additionally, the interviewer said that resettlement caused migration and destruction of wild animals. The survey result attempted to assess some environmental issues related to forest resource utilization and level of forest resource as well as soil erosion. From the survey it was observed that all households fully depend up on the natural forest of the area for their fire wood consumption, agricultural land, and settlements. In line with this, Getachew (2005) stated that the environmental consequences involved in the current resettlement as the small holder farmers clear the area for house construction and agricultural land expansions. During the field survey, the majority of the resettlers household revealed that due to their high dependency on the natural forest the area was largely exposed to degradation, soil erosion and forest degradation. This is in line with Makuria (2005) argued that resettlement in forest region causes considerable damage of natural resource base.

After the resettlement program in the study area the role of vegetation in maintaining macro climate of the area could also be lose due to by wood vegetation degradation. Due to this climatic change is a serious problem in the study area. This is in line with Mangistu (2005) that indicate deforestation may result in local environmental changes. The in-depth interviewee with key-informants and kebele leaders of the study area, revealed that due to improper implementation of resettlement program in the study area for long period of time at different time various environmental resources were affected by the resettlers. Another point mentioned by the key-informants was the high encroachments of the resettlers on the natural environment could resulted the destruction of large hectares of forest resource, loose of many wild animals, soil erosion, land degradation and climatic change in the study area. From the survey result we may conclude that resettlement was experienced extensive destruction of woody plants and resulted environmental degradation in the study area.



Figure 4.1: Degradation of land in the resettlement site (Mada talila kebele)

#### **4.2.2. Loss of wild animals in the resettlement areas**

As the data obtained from Hawa Galan Agricultural and Rural Development office (2016/17) before two-decades there were large number of wild animals and also there were a variety of plant species but recently, only few of wild animals and few variety of plant species were found on the study area. As the in-depth interview with the key-informants of the Agricultural and Rural Development office of Forestry Department previously in the resettlement site there were large hectares of forest coverage. This forest is important habitants for a great diversity of wild animals previously. This result is consistent with the findings of Asefa (2000) that showed the recent resettlement program conducted in different parts of the country may have involved environmental damages despite, differences in scale which includes huge loss of natural forest with great impact on sustainability of the environment and wild animals.

With regards to the status of wild animals about 88.3% resettlers respondents stated that previously there were wild animals in the resettlement site. The focus group discussions with household participants revealed that previously the survival of many wild animals such as lion, tiger, buffalo, pig were among the wild life species are exist in the resettlement sites of the study area. But now a day there are only few of wild animals which survive in the area such as pig, monkey and hyena. The in-depth interview with key informants also revealed that currently due to destruction of habitats for the purpose of resettlement program most of the wild animals have already disappeared from the area. This result line with Ahmed (2005) that argued the resettlement program has resulted in large damages to the natural forest of the resettlement area

as well as killing and fleeing of wild animals. In general, from the field survey result we can conclude that many wild animals are extinct and migrate to other area from the resettlement site of the study area. This situation was occurred due to the destruction of forest resources for the purpose of resettlement program in the study area.

### **4.3. Resettlement and its impact on land use/land cover change**

In this case, household operating small farm land may not produce agricultural products sufficient to sustain their household members throughout the year may depend on forest product to fill their food gap. This result is supported by the findings of Thapa (2003) that indicated land –poor household relies more on forest activities. The focus group discussions with households in the study area revealed that the majority of the household participants have no sufficient farm land. The in-depth interview with the development agent in the study area also revealed that, settlers can clear their surrounding forest and grass land for the purpose of expanding farm lands rather than using intensifications. This situation was resulted forest degradation in the study area.

Usually, natural vegetation is cleared for farm land expansion in the study area. This result is supported by the findings Asfawu (2005) that showed even the settlers were given plot sizes ranging from 0.4 to 1 hectare per household, which is far less than the two hectare that was planned. The in-depth interview with key informants of the officials revealed those households cultivating small land are more dependent on forest than household cultivating large farm land.

Land in the study area is scarce mainly due to high population pressure of settlers. The majority 98.3%, of the resettlers respondents revealed that they have no sufficient land for farming . The survey result indicated that the majority 96.7% of the new sampled resettlers farmers own less than 2 hectares of farm lands while 3.3% own 3-4 hectares of farm lands. As the survey result shows the average of the size of the land between the resettlers household is only one hectare. With regarding to land holding size in the study area there is no significant difference in land holding per household, this is due to the fact that for every household it was given equal land size regardless of family size. According to HGARD Office (2017) in the study area, government sponsor resettlers had get only 1-1.5 hectares of farm land per person but through processes resettlers farm land might be increased to 3 to 4 hectares by clearing of forest.

### 4.3.1. Land Use Land Cover change before and after

Based on information from local inhabitants, agricultural land, vegetated land, bare land, Water body, bush land and Built up lands were the major land use and land cover classes under this study periods. Land use classification requires a classification scheme and algorithms. The AFRICOVER land use/land cover classification scheme was applied to define the land use/land cover classes of the study area. In order to facilitate the task of mapping relatively homogeneous areas over different time periods to enable spatio-temporal analysis, geospatial tools are very essential. The presence of multi-temporal satellite data also provided an opportunity to generate land use/land cover maps of the resettlement areas in these two kebeles to observe the changes.

The area coverage of each land use class for different land use feature classes of the study area from different Landsat satellite images was calculated in ERDAS IMAGINE\_2013 software. Accordingly, the result from satellite image analysis of 2002 shown below indicates that, different land use classes of the study area analyzed.

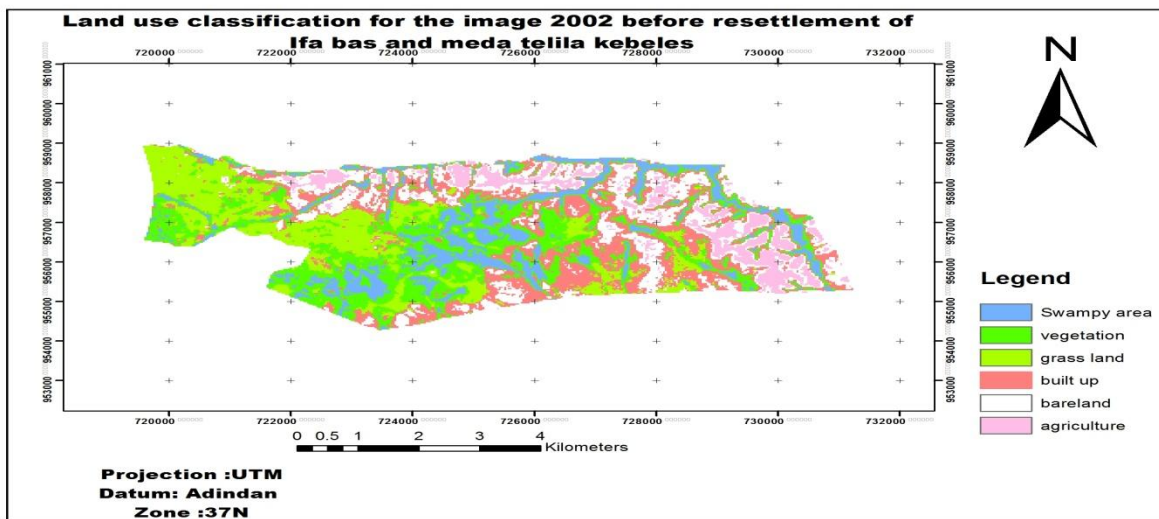


Figure 4.2: Land-use classification of the image 2002

Table 4.6 LU/LC of study area in 2002

No	Land use cover types	Area coverage of in ha.	Area coverage in Percent
1	Built up area	733.86	21.22
2	Agriculture	284.80	8.24
3	Vegetation area	804.5	23.27
4	Swampy	455.67	13.18
5	Grass land	615	17.79
6	Bare land	563.76	16.30
	Total	3457.59	100

Source: Extracted from Land sat satellite image of 2002

Comparatively, the results from Land sat satellite image classification of 2002 above indicated show that, out of the total study area 3457.59ha vegetation coverage was 804.5ha and the built up area was 733.86 which covers the highest part of the study are and the rest were covered by cropland or agricultural land and grass land. According to the image analysis made, vegetation takes the largest part and Agricultural land was the lower one. Due to this, resettlement increased in the area and contributed the degradation of the forest cover for the sake of agricultural land.

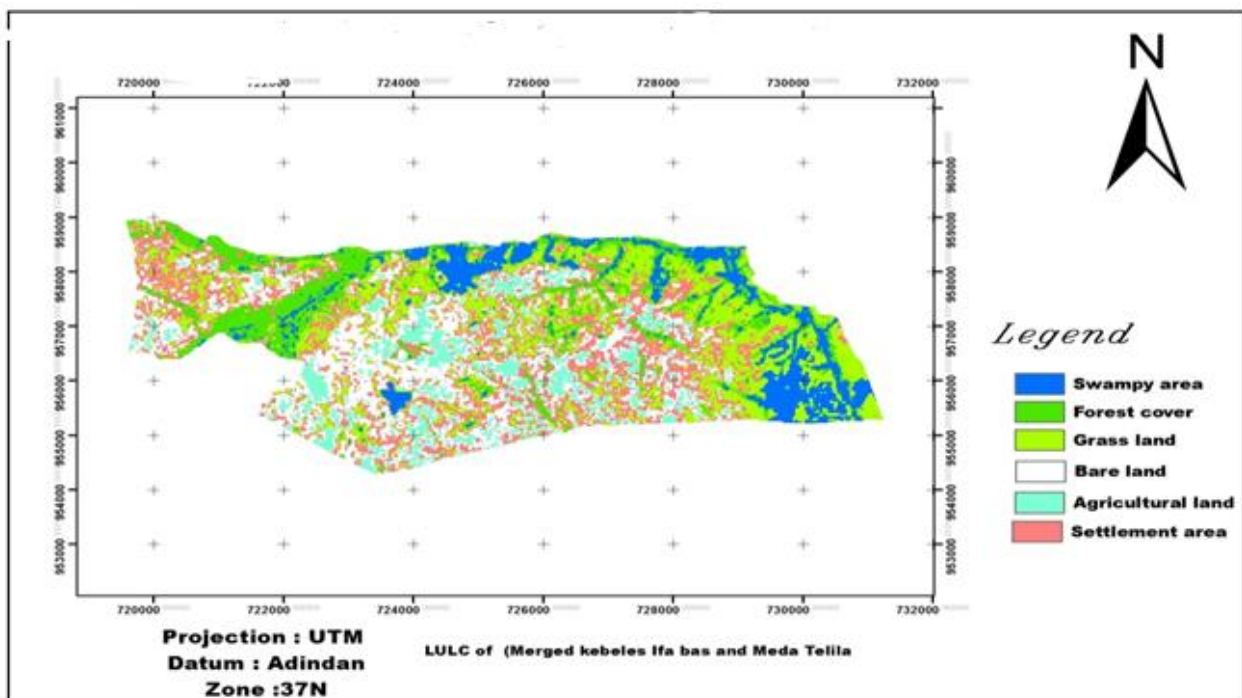


Figure 4.3: Land-use classification of the image 2016

Table 4.7 LU/LC of study area in 2016

No	Land use cover types	Area coverage of in ha.	Area coverage in Percent
1	Built up area	967.77	27.99
2	Agriculture	191.83	5.60
3	Vegetation area	737.18	21.32
4	Swampy	455.67	13.18
5	Grass land	615	17.79
6	Bare land	490.14	14.12
	Total	3457.59	100

Source: Extracted from Landsat satellite image of 2016

An important aspect of change detection is to determine what is actually changing to what i.e. which land use class is changing to the other. This information will reveal both the desirable and undesirable changes and classes that are “relatively” stable overtime. This information will also serve as a vital tool in management decisions. This process involves a pixel to pixel comparison of the study year images through overlay. Therefore, land use land cover change detection was carried out based on the classified images and the change detection matrix of the images over the study period are described as follows.

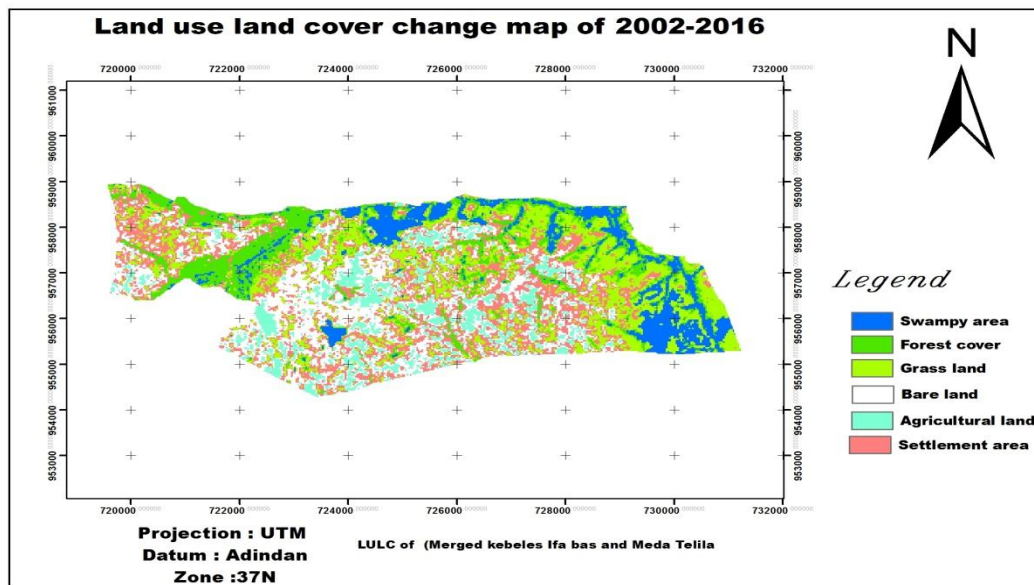


Figure 4.4 Land-use/land cover change map of 2002- 2016

As referred on the table 4.7 above the land in the analysis (between 2002 and 2016), the resettlement expansion was contributed by Agricultural land which 92.97 ha and forest cover 67.32 ha and bare land 73.62 ha conversion of to the built up area. The bare land and vegetation land cover in this analysis period was negatively affected due to the expansion of the agricultural and resettlement which shows an increasing of land degradation and land use change because of the population growth and declining of settlement land to accommodate the existing community. Therefore, the increased land cover in this analysis period indicated that, the built up area and agricultural land decreased by from 284.83 ha to 191.97 ha over these analysis period. This was because in first year period of study there was large area of bare land for resettlement, but currently the removal of vegetation coverage which were converted to agricultural land and built up land use conversion was considered as a factors for the environmental degradation.

### 4.3.2. Land for grazing and deforestation

Settler farmers rear live stock for various purposes including milk, meat, egg, transport and other purposes. The main sources of feed for live stock in the study area include straw and grazing land. The surveyed resettlers stated that 98% sample household rear live stock as one of the source of livelihood activities.

Table 4.8 Responses of resettlers on live stock and availabilities of grazing land

No. of RHH domesticated animals			No. of RHH have sufficient grazing land	
	Frequency	Percentage	Frequency	Percentage
Yes	70	72.9	-	-
No	26	27.1	96	100
Total	96	100	96	100

Source: Field Survey, (2017)

With regards to the availability of sufficient grazing land in the study area, all 100% of the resettlers household revealed that there is a shortage of feed or grazing land for their animals (Table 4.8). The in-depth interview with key informants also revealed that due to the existence of insufficient grazing land for animals in the area, the resettlers clear the surrounding forest for getting additional grazing land. As the key informants explained that this situation can results extensive forest destruction in the study area. This result is consistent with the finding of Reusing



(2000) that stated the natural regeneration of forest resources is difficult due to high population of grazing and browning live stock within the forests.

The focus group discussion with resettlers households also indicated that the majority of participants have complained about the scarcity of grazing land in the resettlement area. From this we conclude that the insufficient grazing land has influence on intact and forest according to household survey and implying that there is a gap in the land use system of the area.

### **4.3.3. Perception of Settlers on Effects of Deforestation**

Deforestation in the study area devastated increased run of and increased soil erosion and reduction in land productivity. This is consistent with EPA (2008) stated that deforestation leads aggravated soil erosion, deterioration of water quality further drought and flooding, reduction of agricultural productivity and finally to an increasing poverty. During the field survey, almost all 100% resettlers household revealed that deforestation have an influence on the environment. As can be observed from Table 4.9, the majority 44.17% sampled resettlers revealed that soil erosion was a problem in their surrounding area. Additional evidence to this assumption is the explanation given by the farmers during informal discussion about decline in fertility levels of their land. They generally agreed that there had been a decreasing trend in fertility levels of their plots of land due to extensive erosion in the study area.

The focus group discussion with resettlers indicated that soil erosion is an important agricultural problem, yet the majority again was not willingly participating in the construction of different bunds. Although they stated that soil erosion is the major environmental problem in the resettlement area which was aggravated by their high dependency on forest resource and destruction of forest for long period. Therefore, the sampled resettlers population perceived that their activities with natural environment particularly, forest resource was aggravated soil erosion in the study area. This result is in line with the findings of Demel (2001) that argued deforestation continuously to causes environmental degradation in the form of land degradation.

Table 4.9 Resettlers perception on the effects of deforestation

Major effects of deforestation	No. of respondents	Percentage
Climate change	20	20.8
Loss of plants and animals	54	56.3
Soil erosion	22	22.9
Total	96	100

Source: Field Survey, (2017)

As shown in Table 4.9, about 35.83% of the sampled household respondents revealed that the consequences of deforestation were loss of plants and animals. Lastly, 20% of them responded that one of the effects of deforestation in their surrounding environment is climate change. This result was strengthening by key-informants during interviewee. The key-informants, revealed that the current serious issues in the study area was higher increase of temperature and climate changes, which affect the day-to-day activities and continued impact on social, economic and environment. This result is in line with Makuria (2005) that indicated deforestation may result in local environmental change.

The in-depth interview with key informants also revealed that climate change was being taken place due to higher increase of populations, frequent use of forests resource for agricultural expansions and resettlement program which were some of the major factors highly accelerated temperature to be raised and as a result climate change in the study area. In addition, the key informants stated that the region temperature is increasing from time to time and the amount of rain fall has decreased during the past 14 years. This change in climate is associated with deficiencies in physical environment which is created by human intervention such as deforestation. From the survey result, it was possible to conclude that the sampled resettlers argued that soil erosion, climatic change (an increasing of temperature and decreasing of rain fall), loss of different species of plants and animals are the main result of deforestation in the study area. In general from the survey result we can conclude that forest degradation was results a negative impact on the environment.

## **CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS**

### **5.1. Conclusion**

Resettlement program is condemned to have negative impacts on the ecosystem unless it is carried out carefully. The basic premises for government sponsored resettlement program are to secure food in the country. However, little attention was given to the impact of resettlement on land use land cover change of District. Currently, what is observed in Hawa Galan resettlement area is that the program has precipitated some negative effects on the natural forest and soil resources of the area. The current LULC change of the study area has a visible environmental impacts on the surrounding ecosystems, land resources and hence quality of life.

There has been considerable land use/land cover change in the study area between 2002 and 2016. The most significant of these changes accounted about 70 per cent of land was prepared for agriculture but the rest 30 per cent of land under vegetation cover. This could be the reason why cultivated areas show a reverse trend to that of vegetation cover within a decade. There was land cover change in the study area because of demand for agriculture and settlement land for sustaining increasing population. Local government was given attention to distribute land for landless households rather than conserving land resources.

To the settlers their livelihood relatively has shown an improvement after resettlement as compared to before resettlement. This can be manifested in different manner in the study. For instance, in holding of basic livelihood assets especially land, the average holding of land at the area of resettlement was 1.5 hectares. Therefore, this entails that the majority of the settlers at Mada talila and Ifa bas have acquired more farmland as compared to their area of origin which enables them to produce more than before. It can be seen that the major source of income for the majority is farming. This is true not only for crop production but also livestock rearing.

LULC Changes shows vegetation, cultivated land, as well as degraded lands. Unsustainable and improper land use and land cover changes were the major causes of deforestation and land degradation. Therefore, changing from forest cover to farm land led to land degradation. In this way the major findings of this study revealed that there were no any counteractive measures taken place against deforestation and land degradation in the study area.

## 5.2. Recommendation

Based on the finding of the study, the following points are recommended to tackle the resettlement and its impact on socio economic wellbeing and land use/land cover change.

- ❖ Population increase has played a major role on land use and land cover changes and there should be strategies that are proposed to strengthen family planning programs.
- ❖ Local institutions should be strengthened to enable resettlers to improve their land use and land cover changes through participatory processes.
- ❖ Under the present population pressure in the study area, intensification of farming methods was recommended in order to sustain the productivity.
- ❖ Most part of the area may be entirely deforested and converted to plots of farmlands within very short period of time unless appropriate environmental protection and rehabilitation measures are taken. Hence, it is imperative to take all the necessary measures by the local government officials, NGOs, and other concerned bodies to rehabilitate the deforested environment.
- ❖ Analysis of the political economy, institutions and stakeholders in land use decision making is critical and provides insight into what types of appropriate coping strategies might be taken at the local scale and studies on local attitudes towards the environment are crucial for education and community conservation-based programs;
- ❖ The resettler need better livelihood strategies that are diversified within and outside of their current livelihoods. Promotion of small economic activities such as fattening, organized fishing, petty trading and artisanship could be potential areas to be explored outside of farming.

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**Appendix-I**  
**BAHIRDAR UNIVERSITY**  
**INSTITUTE OF LAND ADMINISTRATION AND SURVEY**  
**DEPARTMENT OF LAND ADMINISTRATION AND SURVEY**  
**STREAM OF LAND INFORMATION SYSTEM**  
**QUESTIONNAIRE TO BE FILLED BY HOUSEHOLD HEADS**

**Dear Sir/Madam,**

Kebele name/Village Name \_\_\_\_\_

Name of the person who filled the questionnaire: \_\_\_\_\_

Date on which the questionnaire was filled: \_\_\_\_\_/\_\_\_\_\_/2009 E.C.

Cluster ID: \_\_\_\_\_

House Hold ID: \_\_\_\_\_

**HOUSEHOLD QUESTIONNAIRE FOR LAND USE AND LAND COVER  
CHANGE STUDY**

**BASIC HOUSEHOLD INFORMATION (Fill appropriate information or tick by putting (“√”))**

1. Occupation: \_\_\_\_\_
2. Age: \_\_\_\_\_
3. Sex: 1. Male \_\_\_\_\_ 2. Female \_\_\_\_\_
4. Marital Status: 1. Married \_\_\_\_\_ 2. Unmarried \_\_\_\_\_ 3. Divorced \_\_\_\_\_  
4. Separated \_\_\_\_\_ 5. Other (specify) \_\_\_\_\_
5. Total family size by age group and gender:

Age group	Male	Female	Total
0-14			
15-64			
65+			

6. To what Ethnic group do you belong? 1. Oromo\_\_\_\_2.Amhara\_\_\_\_3. Other(specify)\_\_\_\_\_
7. Educational status: 1. Can't read and write\_\_\_\_ 2. Can read and write\_\_\_\_ 3. Primary (1-8)\_\_\_\_\_ 4. Secondary (9-12) \_\_\_\_ 5. Tertiary (12+)\_\_\_\_\_
8. Status in the kebele: 1. Migrant\_\_\_\_\_ 2. Non-Migrant\_\_\_\_\_
9. If you answered "Migrant" to question No. 9: how long have you been here? \_\_\_\_\_
10. If you answered "Migrant" to question No. 9 where did you live before? \_\_\_\_\_

**Population Dynamics over time (years in E.C.)**

	How do you	current	2004s	1993s
12	perceive population growth in the area between 1995s and now	1. very high 2. high 3. low 4. no change 5. don't know	1. very high 2. high 3. low 4. no change 5. don't know	1. very high 2. high 3. low 4. no change 5. don't know
13	If your answer is "very high or high" which factor is most important for the increase	1. in-migration 2. Excess of births over deaths (natural increase) 3. Due to Immigration and natural increase	1. in-migration 2. Excess of births over deaths (natural increase) 3. Due to Immigration and natural increase	1. in-migration 2. Excess of births over deaths (natural increase) 3. Due to Immigration and natural increase

✧ **Land use/cover change**

14. How do you perceive the change in the following land use/cover in the last 16 years or between 1995 and now? (years in E.C.).

**1. Increased 2. Decreased 3. No change 4. Don't know**

Land use/cover types	Current (2009)	2004s	1995s	Comment, if any
Bamboo and thicket				
Cultivated land				
Grazing land				
Grassland				
Settlement				
Wildlife				
Other, specify_____				

15. If you perceive an increase in land use/cover change in the last 16 years, what factor or factors do you think might have caused it? (You may give multiple answers)

1. Population increase
2. Expansion of agricultural land.
3. Introduction of new development projects
4. Deforestation
5. Other, specify \_\_\_\_\_

16. List the problems you are personally faced with due to increases in land use/cover change. List them in order of importance).

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✧ **Land holding and property ownership**

17. Total land holding in hectare. 1. Now \_\_\_\_ 2. 11 years ago \_\_\_\_ 3. 16 years ago \_\_\_\_

18. Is it common to have more children in order to obtain more land?

1. Yes 2. No 3. Don't know

19. How often did you use your farmland 16 years ago?

1. Once in a year 3. Always
2. Twice a year 4. Shifting cultivation 5. Other, Specify \_\_\_\_\_

20. How do you use your farm land currently?

1. Once in a year 3. Always
2. Twice a year 4. Other, Specify \_\_\_\_\_

21. Do you think that land is becoming scarce in your kebele?

1. Yes, it is becoming scarce \_\_\_\_ 2. No, it is abundant \_\_\_\_ 3. No Change \_\_\_\_

22. If your answer for question 21 is yes, why is land become scarce (You may give multiple answers)?

1. Because of population increase
2. Because the proportion of fertile land is diminishing
3. Land has fallen in fewer hands

4. Land has been converted to non-agricultural uses

5. Land has been given to developers

6. Other, Specify \_\_\_\_\_

23. How do you rate your crop production from your plot(s) over the last 16 years?

1. Increasing 2. Decreasing 3. No change

24. What is the estimate (in quintals) of your household production of crops for the years below (years in E.C.)

Crops	Current (2009)	2004 s	1995s
Maize			
Sorghum			
Millet			
Sesame			
List all the crops produced			

25. Do you practice fallow method to recover the fertility of your plot of land?

1. Yes \_\_\_\_\_ 2. No \_\_\_\_\_

26. If your answer is 'Yes', how long (in years) does it rest before being used again?

✧ **Use \_\_\_\_\_ of \_\_\_\_\_ inputs**

27. Could you tell us whether you used the following modern agricultural inputs in the years mentioned below? (Years in E.C.) Use code:

1=Yes

2. =No

Use of inputs	Current (2009)	2004s	1995s	Comment( if any)
Fertilizer				
Improved seed				
Insecticides				
Other, specify				

Extension of agricultural plots into forest fields

28. Have you opened up woodlands for cultivation since 1980s? 1. Yes \_\_\_ 2. No. \_\_\_

29. If the answer is "Yes" continue to answer questions 29.1 if the answer is "No" go to question

29.1. Extension of agricultural plots in virgin woodland in 2004 s (E.C)		No. of plots
	Number of plots extended	

✧ **Perception of Land Sufficiency in the kebele**

30. Is there enough land for everybody in the kebele? 1. Yes\_\_\_ 2. No\_\_\_\_\_

31. If the answer is “no” how did you solve the problem? (or how do you solve land shortage)?

1. Clear more wood lands\_\_\_\_\_
2. Plough steep slopes\_\_\_\_\_
3. Look for off-farm employment\_\_\_\_\_
4. Other, specify\_\_\_\_\_

✧ **Breeding of animals**

32. How many animals did you own in the years indicated below? (years in E.C.)

Animal	1. current	2. 2004 s	3. 1995 s
Goats			
Cattle			
Sheep			

33. Is there enough grazing land in the kebele? 1. Yes 2. No

34. If your answer is “No”, how do you feed your herds?  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

✧ **Environmental Issues**

35. Say YES (1) or NO (2) if the following are major environmental problems in the area? (Multiple answers are possible).

1. Deforestation\_\_\_\_\_ 3. soil erosion\_\_\_\_\_
2. Deterioration of water points\_\_\_\_\_ 4. Inadequate rainfall\_\_\_\_\_
5. Other, specify\_\_\_\_\_

36. If deforestation is one of your answers for No. 35, what might have caused this problem?

1. An increasing demand for firewood\_\_\_\_\_
2. Expansion of agricultural land\_\_\_\_\_
3. Cutting of trees for construction\_\_\_\_\_
4. Cutting of trees to generate income\_\_\_\_\_
5. Other, specify\_\_\_\_\_

✧ **Resource Management (forest, soil, water etc)**

37. Did you make an effort to manage resources (Forest/Woodlands, Soil etc)?

1. Yes\_\_\_\_\_
2. No\_\_\_\_\_

38. If your answer for question no 37 is No, why? (Multiple answers is possible)

1. My subsistence income does not allow me
2. Fear of further land redistribution
3. Lack of ownership feeling
4. Other, Specify\_\_\_\_\_

39. Do you think that the productivity of your land has decreased for the last 16 years?

1. Yes
2. No

40. If your answer for question number 39 is yes, what is /are the main reasons (multiple answers is possible)

1. Aging of the land
3. Loss of nutrients
2. Little or no use of fallow
4. Other specify\_\_\_\_\_

41. How do you improve the fertility of your land?

1. Use manure
2. Add commercial fertilizer
3. Rotate crops
4. Other, Specify\_\_\_\_\_

42. How often do you receive government advice on natural resources conservation and management?

1. Every six month
2. Every three month
3. Every month
4. Every week
5. Other, Specify\_\_\_\_\_



**CHECKLIST FOR FOCUS GROUP DISCUSSION AND IN-DEPTH  
INTERVIEW**

**Elderly**

1. How do you see the population changes since the 1995s?
2. What effect does this result on the ecology, population?
3. What is the major land use and land cover types some 14years 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. From the three regimes, when did population grow fast? Why?
9. What were the most important economic activities 14 years ago?
10. Explain the current economic activities in the kebele?
11. What effects they bear on you (if any)?
12. How did you rate quality of extension and development work services in the PA?

**Experts**

- A. How do you rate population dynamics in the PA (for the last 16 years or so)?
- B. What effect(s) did population dynamics impose on the PA?
- C. How do you rate the extent of land use/cover change in the PA?
- D. Would you please explain the pattern of change in land use/cover in the PA?
- E. Which factors did you expect play a prominent role?
- F. How do you explain the livelihood changes occurred in the PA?
- G. In which one of the three regimes that land use/cover change was high? Why?
- H. Would you list down the major extension and development works in the woreda?

**Check list for field observation**

Investigator put a tick mark (✓) if he observed facts about somebody/something at the space provided below:-

1. The pattern of distribution of population in the resettlement village is \_\_\_\_\_
2. Is there any rehabilitation efforts taking place by local residents on vegetation cover? \_\_\_\_\_
3. What impact dose farming on the environment? \_\_\_\_\_
4. Living conditions of the people: - \_\_\_\_\_
5. Land cover of the study area:- \_\_\_\_\_
6. what about the current vegetation cover? \_\_\_\_\_
7. Land use of the individual HHs:- \_\_\_\_\_

Questions include how people felt about the resettlement program?; what are the challenges of resettlement projects?; and what suggestions do they provide for future resettlement planning?