Addis Ababa University

Institute of Regional and Local Development Studies

UNDERSTANDING THE IMPACT OF LAND COVER DYNAMICS ON SUSTAINABLE LIVELIHOOD STRATEGIES OF LOCAL PEOPLE IN MENAGESHA SUBA

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List of Acronyms

CLUE- Conversion of Land Use Effect

DFID_ Department of International Development

EMA-Ethiopian Mapping Agency

ETM-Enhanced Thematic Mapper

FAO- Food and Agriculture Organization

FDRE-Federal Democratic Republic Ethiopia

FAWCDA- Forestry and Wildlife Conservation and Development Authority

GIS- Geographic Information System

ILRI_ International Livestock Research Institute

IMF-International Monetary Fund

KII- Key Informant Interview

LUCAS- Land Use Change Analysis System

LULCC-Land Use and Land Cover Changes

MSS_ Muliti- Spectral Scanner

MSSF- Menagesha Suba State Forest

NGOs- Non-Governmental Organizations

PAs- Peasant Associations

PIPs- Political, Institutional and Processes

RS- Remote Sensing

SLM- Sustainable Livelihood Model

SPOT- Syste'me Pour l'Observation de la Terre

SPSS- Statistical Package for Social Sciences

™- Thematic Mapper

TPM- Transition Probability Matrix

UNEP-United Nations Environmental Program

ABSTRACT

Human actions through settlement expansion, searching of crop land and other development activities are altering the ecosystem of the land at unprecedented rates (Walker, 2001). These interactions of human being with the natural environment have been the core causes for loss of forest and land resources in the form land use/ land cover changes since civilizations in the river valley. The current issue is that rapid population growth fuelled with the need for expansion of agricultural land; expansion of human settlement and the leaning for development activities all together are aggravating the land covers changes processes and switching the livelihood strategies of local people. The land cover changes, which are followed by multiple of processes, have both positive and negative impacts on the socio-economic; livelihood strategies of local people; and local environmental conditions. This research focuses on the impact of land use and land cover changes on the socio-economic conditions and the general environment of the local inhabitants in Menagesha Suba. This research met the multiple aims of analyzing the land cover changes; exploring the drivers of the changes and evaluating the impacts of the changes. In doing so the research employs analysis of satellite images for the years 1973, 1986 and 2007 in Menagesh Suba; key informant interviews and socio-economic survey of the livelihood strategies of the local people in the area. This research produced a number key finding which includes a decrease in the size of the forest cover by 36.61% and the grazing/open land cover by 1.99%; and an increase in agricultural land by 54.47% and the human settlement by -0.91% from 1973 to 2007. These increase and decrease in the size of the land was aggravated by a number of socio-economic and socio-cultural factors both at the local and national level. This change again impacted the local people in terms of their socio-economic condition and in terms their livelihood strategies. The main conclusion drawn from this research was land cover changes in Menagesha Suba have impacted the local people in many ways but particularly in their livelihood strategies. This research argued for proper land use planning which can be used to reduce the land cover changes in the research area.

Key Words: *Land Use/Land Cover Changes, Proximate and Underlying Causes; Livelihood Impacts of LULCC*

Chapter One

1. Introduction

1.1 Background

Human actions through settlement expansion, searching of crop land and other development activities are altering the ecosystem of the land at unprecedented rates (Walker, 2001). These interactions of human being with the natural environment have been the core causes of land use and land cover changes. This has often been leading to land degradation; land use/ land cover change and local climate alteration since civilizations in the river valley. Ethiopia has faced such a devastating deforestation and loss of affluent natural resources as a result of human induced actions in the past so many years (Tadesse, 2002).

The traditional agricultural land use practice together with the fragmented land tenure rights have been acted as the major forces of land cover dynamics for several millennia in the country. In recent years, land use for settlement particularly of the urban land expansion has began to aggravate the land cover dynamics through encroaching agricultural lands and protected natural forest areas. Many researches conducted in the field have shown that land use change has been increasingly devastating the land resources and become one of the growing concerns of local environmental problems for the past few decades (Daba, 2000).

Over 60% of the country's forest cover of the highland plateau has lost during the last thirty years mainly due to man made demolition (Tadesse, 2002). According to Daba (2000), about 50% of the natural highland forests were found to have been degraded to slightly or heavily disturbed forestlands in the period from 1971 to 1997 mainly due to human actions and for the seek of agricultural lands and establishment of settlements. Such ecological alteration of the forest ecosystem particularly is an indication of the persistence of the problem to date.

These days, rapid population growth twined with fast urbanization and search for agricultural land are compelling the land and forest resources and resulting in a range of socio-economic and environmental problems to local people. However, the effort to get land for agricultural practices, which is still the foremost livelihood strategy for the majority of the nation; a source of food for the people and an engine of the economy of the country, is one of the major driving forces of land cover change in many parts of Ethiopia. Some local researches of land use and land cover changes of different parts of the country show that agriculture is the dominate factor for land cover dynamics in Ethiopia (Solomon, 1994; Engdawork, 1997 Atakilte, 2003; Dawit, 2009).

Though land use/ land cover changes had been a process for thousand years in Ethiopia, it is now becoming one of the most sober environmental phenomena that need a growing concern of researchers from a range of fields of study. It is due to the fact that in recent years the human induced activities are highly related with the natural environment particularly of land resources. The demand of a burgeoning population, economic development and global markets has accelerated the unprecedented land use changes in many places (UNEP, 2007).

The whole process is aggravated by the unsustainable land use which is the major driving force of land cover changes in many parts of the country. For instance, the forest ecosystem services are threatened mainly by increasing human demands and imprudent utilization of the reserves. Therefore, these days exploitation of forests has been at the expense of biodiversity and natural regulation of water and climate, and has undermined subsistence support and cultural values of local people who are dependent on them for their livelihoods (UNEP, 2007).

Moreover, in recent years the human induced actions are slightly shifted from agricultural practices to other forms of land use such as human settlements expansion and implementation of several development projects towards the remaining confined forest areas of the country. Such land use changes at the cramped forest areas have considerable consequences on the remaining biodiversity, environment and ecosystem services, local

community livelihoods and land use and land tenure rights and traditional knowledge base of ecosystem of the local community (Agarwal and et. al. 2002).

Despite a few past studies in the field of land use and land cover changes, most of them restricted their inquiry to agricultural induced shifting of the land ecosystem in Ethiopia (Yohannes, 1988; Solomon, 1994; and Tsegaye, 2006). Therefore, there is a need to include other forms of human activity in the study of land use/land cover changes to understand more about the process and its multitude impacts on the local community.

1.2. Statement of the Problem

The current issue is that rapid population growth fuelled with the need for expansion of agricultural land; expansion of human settlement and the leaning for development activities all together are aggravating the land covers changes process and switching the livelihood strategies of local people. The land cover changes, which are followed by multiple of process, have both positive and negative impacts on the socio-economic, and livelihood strategies of local people, and local environmental conditions. This in turn plays a role in changing the land use/land cover of an area.

The debate continues between scholars that on the one hand the on going land cover changes is the result of development activities from the ancient time till now and it is to the advantage of human wellbeing. And it is to the improvement of the living standard of human-beings. On the other hand, though development is to the improvement of the life of human beings, it should not be underway at the cost of their existing natural environment and socio-economic systems of the local people. This extreme view resulted in brining a third and a mediating idea called sustainable development. As human activity is underway in a sustainable manner considering the need and demand of both the present and the future generation, environmental changes such as land use/ land cover changes would have been managed.

Previous researches, which have been produced on the issue of the link between land cover changes and socio-economic changes, have focused on particular issues such as land degradation, soil erosion and agricultural land expansion in connection with

livelihood strategies of local people. These researches have found out that there has been agricultural land expansion at the expense of other natural resources such as forest and soil and there has been land and soil degradation too due to the land cover dynamics occurring in different parts of the country (Solomon, 1994; Engdawork, 1997; Tsegaye, 2006 and Tsegaw, 2007).

Others however, have studied land cover changes in association with soil conservation and agricultural productivity and development (Yohannes, 1989; Atakilte, 2003; Alemu, 2007). There are few attempts to relate land use and land cover changes with environmental vulnerability, such studies particularly have shown vegetation vulnerability and biodiversity loss in different parts of the country and their link with changes in local people livelihood strategies (Belay, 2002; Alemu, 2007; and Taddesse, 2007).

Supplementary research outputs have extended their investigation of land use and land cover changes in relation to urban land expansion and its effect on peri-urban agriculture and livelihoods of people in Addis Ababa and Alemgena town, respectively (Feyera, 2005; Sheshegu, 2007). Equally important to mention is the link between land cover changes as a result of agricultural activity and livelihood strategies of local people in Tigray and Afar regional states, respectively, which were dealt in the works of Tekleweniy (2009) and Dawit (2009).

On this ground, this study attempts to scrutinize the impact of land cover changes as a result of farm land expansion, spreading human settlements and deterioration in composition and size of protected forest area on socio economic prolongation of local people in Menagesha Suba of Welemera Wereda in Oromiya regional state. The study area is experiencing land use/ land cover dynamics, on the one hand due to the expansion of the agricultural farm land, which is shrinking the preserved forest area, threatened the biodiversity, the local environment and the ecological services of the forest as well as the traditional knowledge base of the local people. On the other hand, the increased human settlement is invading the surrounding farm land and threatening the naturally protected

forest area. Moreover, there are also endeavor to expand plantations so as to sustain the forest ecosystem and the bio-cultural diversity, which is taking place at the disbursement of the agricultural land of the local farmers.

The processes all together are challenging the present livelihood strategies and the long run sustainable livelihood circumstance of the people through loss of its naturally existing bio-cultural diversity and long standing socio-economic existence of the local community. Hence, sustainability and sustainable use of natural resources such as land and forest reserve is maintained mainly through proper land use planning and appropriate exploitation of traditional local knowledge and relevant management of the local community's perception. No doubt, the need for research out in the area of man-nature interaction is worth essential form the perspective of connecting environmental changes with socio-economic settings of local community.

Therefore, understanding the livelihood strategies of the local people in Menagesha Suba who are experiencing all these momentum of land use processes would put in new knowledge to the academic world, new thought to researchers, new strategy to decision makers in the area and new familiarity to land planners as well new intervention for non-governmental organizations which have great concern for both environment and society. To this end, the following general and specific objectives are set.

1.3. Objectives of the Study

The overall objective of the study is to assess the effects of land use/ cover changes on the socio-economic conditions of the local inhabitants and the general environment in Menagesha Suba. In order to achieve this general objective, the following specific objectives are outlined.

The specific objectives of the study are:

- To analyze the temporal and spatial distributions of the land use/ cover dynamics happening between 1973 and 2007;

- To explore the historic and contemporary processes and the underlying and proximate natural and human drivers of land use/ cover changes which took place over the last 30 years; and
- To critically examine the social, economic and environmental consequences of the land use/ cover changes and the potential effects in Menagesha Suba area.

1.4 Research Questions

The study attempts to seek answer to the following questions

- Do land cover dynamics in Menagesha Suba have significantly changed the socio-economic conditions of the local people and environmental condition of their area?
- What are the underlying and proximate causes which drive the land use/ cover changes in Menagesha Suba?
- What are the major socio-economic and environmental implications of the past, the current and the potential land cover dynamics in Menagesha Suba?

1.5. Rationale and Significance of the Study

Studying the land use/ cover changes in Menagesha Suba in relation to the livelihood strategies and the local environment of the area is important from several perspectives. Firstly, the diversity of the land cover types and uses, jointly with the growing human settlement and development trends around one of the protected forest area of the country i.e. Menagesha Suba State forest makes a near ideal to develop and evaluate the potential of satellite remote sensing for monitoring such land cover changes. Secondly, as a result of the land cover changes that have been persistence over the years were switching of the livelihood strategies and the traditional and cultural values of the local people of the study area. Thirdly, it is obvious that the changes have brought about changes to the local environment of the area which can be explicitly explained by the loss of biodiversity, agro-diversity and crop diversity over time.

Similarly, a study of livelihood strategies of local people in connection with land use/ cover changes is important for several points of view and it is one of the topical research issues among researchers in the field of environment and society. First, understanding the local community coping up mechanism to the changes taking place in their locality can help policy makers and decision makers to add local knowledge in their actions. Second, such study of land cover changes will help to identify the factors such as social, political, economic and technological drivers on local land use planning process. Third, it will provide planners, policy makers and decision takers with the information of both natural and social variables that would help them in the current and future planning of the land. Fourth, it would be essential for reserve managers to plan for the future based on the information obtained from the study of human-environment interactions in Menagesha Suba over the years.

1.6. Scope and Limitation of the Study

The study is conducted in and around one of the protected forest area i.e. Menagesha Suba which experienced land cover changes over the years. The scope of the study is limited to the analysis of the causes and the effects of these land cover changes between 1973 and 2007 on the livelihood strategies of local people in Menagesha Suba and the study includes the identification of the drivers of the land use/ land cover changes in the area. And the socio-economic survey is also limited to three Kebeles of which the land cover changes were taking place. The sample size is also limited to 10 percent of the population which is 151 households of these Kebeles.

This study of the impact of land use/land cover changes on the sustainable livelihood strategies of the local community has limitation in terms of image analysis since the 1973 image which has only three channels hinders in identifying all the major land use classes of the area. The limitation also extends to the lack of the application of Geographical Positioning System (GPS) where it hinders in digitizing the classification of the land uses/ covers of the area. Moreover, due to the lack of the ENVI software for the analysis of land use change matrix, the gains and the loss of the land uses/covers are not included in the results and discussions of the study.

Besides these and other methodological limitations, there was also lack of satellite images of the recent years such as 2008/9 which hinders the change detection from including recent phenomena. Moreover, the socio-economic survey on livelihood strategies requires the households' to report their past livelihood activities which makes them a difficulty to report on their history of livelihood which in turn makes a difficult situation on the quality of the data.

1.7. Ethical Consideration

Informed consent was obtained from local administration and interviewers before undertaking any field work. The letters of cooperation during the research woks are attached at the appendixes section. Before starting the discussion with various groups, the objectives of the research were outlined and discussed so that consensus was reached on the information to be obtained and analyzed for this research. The individual interviews and groups were kept confidential and not be disclosed in their village. The names of the informant were not given in the report. Pseudonyms were used if necessary.

1.8. Organization of the Paper

The first chapter deals with the introductory aspects of the study including the background information, the statement of the problem, the research objectives and questions, the ethical consideration during the research activity, and the scope and limitation of the study as well as the significance and rational of studying in Menagesha Suba area and the organization of the paper as well.

The second chapter comprises the review literature. It focus on the issues of land, land use, land cover and land use/cover changes, the scores of aspects related to land use and land cover changes, the proximate and underlying drivers of land use and land cover changes and the respective models appropriate in the analysis of the changes. Moreover, concepts related to livelihood strategies and sustainable way of living and the impacts of the land cover changes on the livelihood strategies of people in an area are included under this chapter.

The third chapter is all about the method and materials used in the study and the bio-physical and socio-economic descriptions of the study area. The chapter gives emphasis to the process of image analysis techniques, socio-economic analysis and other sources of data for the research.

Chapter four encompasses the result and discussions of the satellite image analysis for the year 1973, 1986 and 2007. The analysis covers the detail of the land use and the land cover changes of Menagesha Suba over the past 30 years. It also consists of the breakdown of the proximate and underlying causes of the land cover changes which operates for many years in the study area. Moreover, it covers the socio-economic and local environmental implications and impacts of the land cover changes in Menagesha Suba. The final chapter is all bout the conclusion and the recommendation of the study.

Chapter Two

2. Review of Related Literature

This chapter describes the deskwork's on revision of literature related to the study from the many previous research outputs. The literature review includes works on the concept of land; land use/land cover changes which are basic and fundamental to this study. Aspects and drivers of land cover changes which are again includes many issues in the study of land use/cover changes are also included under this chapter. Models and approaches which are appropriate and important in the study of land use/ land cover changes and the livelihood impacts of land cover changes on local people are included in the review literature part of this research.

2.1. Concept of Land, Land Use and Land Cover Changes

Land is at the centre of every economic activity of human beings including primary, secondary or tertiary economic sectors. It is the foremost important natural resource up on which all human cultures is based through the course of history (Codje, 2007). Codje (2007) elucidated that land as a very important asset that human existence is based on it. It is a means to sustain livelihoods and a key resource for most of human activities such as agriculture, industry, forestry, energy production, settlement, recreation and water storage and catchments. In economic terms, land is a fundamental factor of production that it has been firmly linked to economic growth through the course of human-environment interaction. Though the concept of land differs from culture to culture, the interdepartmental working group on land use planning at FAO (1994) proposed a functional definition of land as:

> *Land is a delineable area of the earth's terrestrial surface, encompassing all attributes of the biosphere immediately above or below this surface, including those of the near surface climate, the soil, and terrain forms, the surface hydrology (including shallow lakes, rivers, marshes), the plant and animal populations, the human settlement pattern and physical results of past and present activity (terracing, water storage or drainage structures, roads, buildings, etc)*

From the definition above one can imply that land is comprised of two important components. These are the bio-physical element which encompasses soil, topography, climate, geology, hydrology, and biodiversity; and the socio-economic factors such as technology, political division and management of land. All these together determine the land use pattern, the land cover change processes, and the livelihood strategies of people in an area.

It is this land that is used for the provision of ecosystem services and products and also utilized for the fulfillment of the livelihood of humans. Human beings are directly or indirectly interact with the natural environment through the use of land. These days, unprecedented population pressures and the soaring demands of the human populations on scarce resources such as land, water and biodiversity are affecting the stability and resilience of the ecosystem and the environment as a whole and the land resource in particular. Such interaction of the human-environment for years long has resulted in land use and land cover changes and in turn switching the existing living strategies of people in local areas . Though land use and land cover changes have been used interchangeably in many literature of land, there is an embodied significant difference in their connotation.

Land use has been defined as the way in which, and the purposes for which, humans employ the land and its resources (Codje, 2007). It is the human modification of natural environment or wilderness in to built-environment such as fields, pastures and settlements. Land use is also a description of how people utilize the land and the socio-economic activity. The two of most recognized high-level classes of land use mentioned in Fisher et al (2005) are urban and agricultural land uses.

According to de Sherbinin (2002), the term land use has been used to refer to human uses of the land or to immediate actions of human beings that modifies and converts the cover of the land. He farther classified the land uses as broad categories such as human settlements, protected areas, and agriculture; and as refined categories such as urban and

rural settlements, irrigated and rain fed fields, national parks and forest reserves and transportation and infrastructures.

Land cover is the physical material at the surface of the earth which overlays or currently covers the ground. It includes natural vegetation, bare ground, roads and structures, and water surfaces and permanent snows and ice fields etc (Comber et al, 2005, Codje, 2007). Therefore, Land covers refer to the natural vegetation covers that characterize a particular area. It is a reflection of the local climate and geomorphology of that area. As it is pointed out in de Sherbinin (2002), many of the earth's ecological characteristics and processes such as the productivity of the land, the diversity of plant and animal species, and the biochemical and hydrological cycles have a direct and strong interrelationships with the land use and land cover changes.

Land use is primarily constrained by environmental factors such as soil characteristics, climate, and topography and vegetation cover of the area. Land use and land cover changes may results in environmental, social and economic impacts of greater damage than benefits to the area (Moshen, 1999 as cited in Dawit, 2009). Researchers found out that in the past three centuries, human transformations of the earth's surface have been greatly intensified and resulted in tremendous land use and land cover changes (LULCC) (de Sherbinin,2002).

The land use and land covers are altered by human actions and it has gone through a continuous change for years not only dominantly caused by human induced forces but also accompanied by natural phenomena (de Sherbinin, 2002). Codje (2007) mentioned that rapidly growing global population, increase in technological capacity, and affluence are worthily contributing to the land cover dynamics across the globe. He added that profound changes in social organization, attitudes and values of people have also contributed for the transformation of the earth's land cover.

De Sherbinin (2002) affirmed that land use change is the proximate cause of land cover changes of the earth. The driving forces to this activity could be economic, technological, demographic, scenic and or other human induced factors. It is the actual fact that land use/land cover dynamics is the result of complex interactions between several biophysical

attributes and socioeconomic aspects. This dynamism and interaction may occur at various temporal and spatial scales (Reid et al, 2000 as cited in Dawit 2009).

As it is also identified in Moran (2001), Turner (2001), and Lambin et al (2001), the human being is at the centre of most of the land use and land cover conversions since the pre-historic times (Cited in de Sherbinin,2002). It is identified that land use and land cover change has been the major causes of local and global climatic change; land degradation and desertification, and loss of fauna and flora species of the earth, the reduction of the net productivity of the earth and alter the local as well as the global ecological services and modify the socio-economic settings of local people.

As described in Saxena and Liang (2003), land use/land cover change is a global change phenomenon with significant ecological and socio-economic consequences. Spatial-temporal patterns and implications of such changes are determined by a complex interaction of environmental, social, economic and policy factors. They identified two broad categories of land use/ land cover changes. The first is *Land use/ Land cover conversion* - it refers to the conversion from one category of land cover to another and it is very prominent radical changes of land use. Example includes deforestation, urbanization, and industrialization. The second one is *Land use/ Land cover modification*- it implies to the modification of condition with in a category and it is less prominent or finer changes as compared to the aforementioned process. Example includes changing in cropping patterns, management practices.

2.2. Land Use/ Land Cover Classification

The Anderson (1976 and, 2001) land use and natural vegetation classification has got a world wide acceptance in the study of land use/ land cover changes. The Anderson classification, which is used in the study of land use and land cover, has three levels. The first level gives high emphasis to the major land uses and land covers while the second and the third provide with the detail of each lad uses and covers. Following are summary of some of the major and level I classes of land use and land cover classification.

Urban or built-up land is comprised of areas of intensive use with much of the land covered by structure. According to Anderson (1976, 2001), the urban or built-up environment includes all forms of residential, commercial and services, industrial, transportation, communications and utilities.

Agricultural land is a broad term that can include land use for livestock production. Under this broad category, cultivated land are those regularly used to grow domesticated plants, ranging from long-fallow, land-rotational systems to permanent, multi cropping systems(Meyer and Turner, 1992). Anderson (1976 and 2001) classified agricultural land to include all forms of cropland and pasture, orchards, groves, vineyards, nurseries and ornamental horticultural areas.

According to Anderson (1976 and 2001), the range land comprises of herbaceous, shrub and brush and mixed rangelands. Meyer and Turner (1992) defined grass land/ pasture land as land having a ground story of vegetation cover in which grasses are the dominate life forms. Various factors such as climate, soil, fire have controlled the natural distribution and extent of grass lands. Only the last one has been considerably altered by the human actions. They further pointed out that the two most principal processes of change of grazing land are loss through conversion to cropland and grain through deforestation. They give high emphasis for desertification, which has been widely identified as a major human-induced global change connected with excessive pressure on grasslands.

The forest land consists of deciduous forest, evergreen forest and mixed forest lands according to Anderson (1976 and 2001). Two kinds of tree cover changes have been identified across the globe (Meyer and Turner, 1992). The first is clearance and conversion to another land cover (whether cultivation, grass land, or settlement) and change of condition (such as forest thinning without outright conversion). Clearance for cultivation is probably the most widespread proximate sources of forest change. Pasture development have been significant causes of forest clearance. Timber extraction and fuel wood extraction in excess of growth have been also contributed for the clearance or conversion of forest lands (Meyer and Turner, 1992). The second type of forest cover

change is through reforestation or afforestation, which many governments have instituted such programs, can result naturally from land abandonment or can be undertaken deliberately by state or private action to plant vegetation on abandoned land.

The water body comprises all forms of streams and canals, lakes, reservoirs, bays, estuaries and others. Water bodies constitute one form of land use and land cover and it is also one of the most rigid form of land use that does not easily convert to other form of land use type. Rarely there may be cases of conversion of lakes, marshy and mangrove areas to other land use type such as agriculture and others. Anderson classification also includes wetlands, barren lands, tundra and perennial snow or ice cover among others.

2.3 Aspects of Land Use/ Land Cover Dynamics

This section includes aspects of land use and land cover changes which are prominent and relevant to the study of land use as well as the analysis of its impact on the socio-economic conditions of local people. Among others population pressure which has a strong link with land use/cover changes studies and agricultural practice which is the foremost driver of land use/ land cover changes and the livelihood strategies of the majority of the people are included under this part. Other issues which have strong relationship with the study of land use such as human settlement, protected areas and local environment are also included in this section of the related literature review.

2.3.1. Land Use and Demographic Changes

Codjoe (2007) identified that rapid population growth and low economic standards of living all together have contributed a lot of consequences for agricultural land and forest resource conversions. Demographic pressure is one of the many factors which have been contributed to greater competition for land and greater aggression of land resources. This is due to the fact that as population increases, so too does the need for land, to expand settlements, infrastructure and other utilities. This increasing population pressure is not only limited to the aggression of the land but also lead to a greater competition for other resources such as forest. Therefore, there has been also increasing use of fuel wood in both urban and rural areas which is aggravating the land use conversion process and conversion of forest lands into other forms of land uses.

As mentioned in Meyer and Turner (1992), population is not only a driving force for environmental changes but also unique in its credibility and simplicity of quantification. Report by FAO (1998) indicated that there is a strong global level correlation between modern population growth and annual change in land cover (forest, cropland, and pasture use).Countries like Ethiopia where there is a bourgeoning population growth; land use/land cover conversion is a common phenomenon. Further research output on the area of land use/cover changes and demographic pressure reveled that land use conversion is equally strong correlations with surrogate variables for technology and affluence (Meyer and Turner, 1992). Therefore, besides the growing number population other factors such technology, wealth of the people and others are contributing for land use and land cover changes of an area.

2.3.2. Land Use and Agricultural Practice

Many past researches identified that agriculture has been the most significant contributor of historical change in land cover since the down of plant domestication (de Sherbinin, 2002). Hence agriculture is the most noteworthy livelihood strategy of peoples around the world, it does not only has impact on land use and land cover changes but also degraded the soil and the environment of the earth and leading to both local and global climate variability and climate change respectively. Countless researches have been conducted on the impacts of agricultural based land uses and land cover conversions all over the world. Conclusion is reached that agriculture is the foremost driver and force of land use and land cover among all cultures and all forms of the environment of the earth.

Boserup (1967) proposed that under population pressure and in absence of a frontier for expansion, people intensify agricultural production to meet subsistence needs either by expanding production via the intensive cultivation of existing fields.

Saxena and Liang (2003) identified multiple of factors for the expansion of cash crops in mountainous region including a socio-cultural change from subsistence to market economy, comparative ecological advantages for cash crops in hills, changing food habitats and supply of food grains at subsidized price by government.

It is also identified in Meyer and Turner (1992) that agricultural expansions in land cover have been driven by real and perceived needs for expanded agricultural production. They further concluded that regardless of the underpinning causes, the major proximate sources of conversion have been fire and clear-cut timbering (in forested areas), tillage technologies (in grass lands and heavy soils), drainage (in wet lands), and irrigation (in arid lands or where paddy is used).

However, it is only a few land use and land cover change studies have been conducted in different parts of Ethiopia, which reported that agricultural lands have expanded at the expense of devastation of natural vegetation (Solomon, 1994; Engdawork, 1997; Belay, 2002; and Atakilte, 2003). For instance, Solomon (1994) reported land cover changes of cultivated and forest lands in spatial and temporal terms between 1957 and 1982 in Metu area of South Western Ethiopia. Engadwork (1997) reported that patterns of land uses are interrelated with the types and properties of soils. He identified that cultivated land and shrub land increased by 58% and 70% respectively in Werkaryia area of the Kutaber Wereda.

2.3.3. Land Use and Human Settlement

Meyer and Turner (1992) defined human settlement both as a form of land cover and/or a form of land use. As land use, it includes areas devoted to human habituation, transportation and industry. As land cover, it incorporates highly altered surfaces such as buildings and pavement, but such cover represents only a portion of the total area that a land-use classification might accord to settlement.

Though towns and cities are occupying only a few percent of the land surface, they are expanding at a rapid rate particularly in developing countries. Such expansion of cities and towns is a significant cause of conversion of land to highly human-modified urban landscapes. The demand for food, water, raw materials and sites for waste disposal of urban areas dominate the land around them. As a result urban expansion occurred at the expense of farm land rather than forest reserves.

Past researches indicated that urban development process was the result of combined factors. Yuan et.al. (2005) pointed out urban growth; particularly the movement of residential and commercial land use to rural areas at the periphery of metropolitan areas has long been considered a sign of regional economic vitality. While according to Squires (2002), urban growth benefits are increasingly balanced against economic impacts, such as degradation of air and water quality and loss of farm land and forests, and socio-economic effects of economic disparities, social fragmentation and infrastructure costs.

As many researches have identified from all over the globe, well over 80% of the earth's land surface has been affected by human settlements and activities (de Sherbinin, 2002). The number of people living in urban areas is growing tremendously from time to time resulting in urban expansion. The trend is worth in developing countries like Ethiopia, where they are experiencing the fastest growth of urbanization (McDonald et al, 2008). With regard to impacts of urban built up areas on the environment and land cover changes, there are a number of research outputs that have found both the direct and indirect impacts. To mention few of them, for instance Heiling (1999) and Vincent et al (2002) were examined the impacts of urban sprawl on crop-land loss (as cited in de Sherbinin, 2002). In the case of Ethiopia it is mentioned in the works of Feyera (2005) and Sheshigu (2007) that urban land expansion has impact on the surrounding agriculture and livelihoods of people in Addis Ababa and the town of Alemgena.

2.3.4. Land Use and Protected Areas

Natural resources are protected in area so as to reserve the ecology of the area, the species and genetic diversity of the various fauna and flora of the earth. Protected areas are organized as parks, reserves and wild life game areas in remote areas or near human settlement areas. The world's system of protected areas has grown exponentially over the past thirty years particularly in developing counties where the greatest biodiversity is located (Lisa et. al. 2005). The effort to expand protected forest areas around the world is based on the concern that to address the local community's development endeavor. Protected areas are important source of livelihoods of people in and around them. As part of the process protected areas are also vulnerable to various social and ecological processes and greatly affected by land use and land cover changes taking place in and

around the areas. Population pressure is an important driver of deforestation but socio-economic and policy factors seems to be equally or even more crucial in determining the rates of deforestation of protected areas.

Maharjan (as cited in Saxena and Liang, 2003) argued that restrictions on traditional community participation and weak institutional settings have encouraged unsustainable ways of forest resources uses of the protected areas. Restricting uses of forest resources together with providing alternatives to forest based traditional requirements of people can only ensure conservation /enhancement of forest resources. With all the efforts to protect the forest resources, forest ecosystem services are threatened by increasing human demands. Exploitation of forests has been at the expense of bio-diversity and natural regulation of water and climate and has undermined subsistence support and cultural values for some people.

Though there are lots of researches outputs with regard to conservation of protected areas, it is only few of them are linked with land use and land cover changes and situation of protected areas in Ethiopia. Belay (2002), Tadesse (2007), and Alemu (2007) reported the impact of land use and land cover changes on vegetation, environment and biodiversity of the protected and state forest areas of the different parts of Ethiopia. It is also in Alemu (2007) and Simie (2007) that protected area was linked with livelihood strategies of local people.

2.3.5. Land Use and Local Environment

Land use/ Land Cover Changes (LULCC) are a central component of global environmental change and it has direct implications for the earth's climate, ecology, and human societies. It needs the great concern of national and international policy makers (Cambell et. al, 2005, 764). The implications of environmental changes are often discussed in terms of global and regional consequences, there is growing recognition that many of the critical causes arise from interactions between societal and bio-physical processes at local level. Such interaction between social and bio-physical processes at the local level resulted in alteration of the environment through the loss of bio-diversity, climate alteration and change in the course of time.

2.4. Drivers of Land Use/ Land Cover Changes

A burgeoning population and economic development together with global markets at a larger scale have resulted in unprecedented land use changes (Walker, 2001). In this regard, Unsustainable land use is one of the major driving forces of land cover change or land degradation. Land cover change ranks with climate change and loss of bio-diversity as a threat of habitat, economy and society. It is reported in the past research that the most dynamic changes have been in forest cover and composition, expansion and intensification of croplands, and growth of urban lands (UNEP, 2007).

Processes that drive LULCC are complex and require the use of multiple methods of analysis and critical interpretation of social data in order to understand the drivers and impacts of change through time and across spatial scales (Campell et al, 2005). Drivers of land use change include great increases in the human population and density, increased productivity, high incomes and consumption patterns, and technological, political and climate change. Policy-making will continue to influence land use and have implications for land users. Policies seem to be the ultimate factors determining spatial-temporal patterns of natural resource dynamics in relation to livelihoods of local people (Saxena and Liang, 2003). Identification of past and ongoing patterns and processes can assist planners in copping with the uncertainty associated with planning for future developments in the area.

According to a political ecology approach, the driving forces of LULCC are two types. This includes local driving forces some times called proximate causes and exogenous driving forces also referred as underlying causes of land use and land cover changes (Helemit, 2002).

In this regard, the proximate causes are all human activities or immediate actions at the local level, such as agricultural expansion, that originate from intended land use and directly impact land uses/ land covers of the area (Helmut, 2002). Other proximate causes of land cover dynamics identified in past researches include wood extraction, human settlement and infrastructure expansion. At the proximate level, land use/ land cover change is best explained by multiple of factors rather than by single variables.

Dominating the broad clusters of proximate causes is the combination of a number of economic, social, cultural and bio-physical factors at the local level.

Underlying driving forces, on the other hand, are fundamental societal process, such as human population dynamics or agricultural policies that underpin the proximate causes and either operate at the local level or have an indirect impact from the national or global level (Helmut, 2002, 143). Land cover dynamics is driven by identifiable regional patterns of casual factor synergies, of which the most prominent are economic factors, institutions, national policies, and remote influences (at the underlying level) driving agricultural expansion, wood extraction, and infrastructure extension (at the proximate level).

In many literatures of LULCC, such local and exogenous drivers are further identified in broad groups as societal and bio-physical drivers. The societal drivers include economic forces operating at the international, national and local levels; socio-cultural conditions at the regional and local levels; and institutional and policy forces working at all levels mentioned above. The economic forces, which works at the international level, includes the global market forces, the international trade policy and agreements and the structural adjustments by the international financial institutions such as World Bank and IMF. The same economic policy, land use and land tenure policy and the government urban development policy works together at the national level to shape the land use at the local level. While access to markets, diversifying of products, immigration, intensification and extensfication and economic differentiation are together resulted in land use change at the local level (Cambell, et. l. 2005).

The socio-cultural driving forces, which includes urbanization, immigration and leadership at the national level and population dynamics, settlement patterns, cultural changes and inter-ethnic violence at the local level, are another major driving forces of land use conversion and determinate of livelihood strategies of local people. Institutional factors both in international arena (such as international conventions, bilateral and multilateral governmental and community interest, NGOs, warfare, political instability and refuges) and national level (including centralization vs. decentralization,

uncoordinated policy framework, land tenure policy, and political and economic power) and at local level (such as land tenure, social differentiation in land rights, informal land claims and local NGOs) are acting together as drivers of land use conversion (Cambell, et. l. 2005).

The bio-physical ones include the climate (rainfall, temperature), availability of surface water and the change in the hydrological cycle, the fertility of soil and the natural vegetation conditions. Water related forces include swamp margins, water quality and quantity, access to water (such as for domestic purpose, agricultural use and livestock or wildlife) and change in hydrological cycle. Soils also determine the land use of an area through decline in fertility and soil erosion (either through increased run-off, siltation and wind erosion) (Cambell, et. l. 2005).

Equally important is the natural vegetation of an area in determining land use. In this regard, change in species mix and spatial pattern, and habitat depletion and fragmentation are influenced land use of an area. As a whole, patterns of land use and land cover change and land management are shaped by the interaction of economic, environmental, social, political and technological forces on local to global scales (Helmut, 2002, 143; Cambell, et. l. 2005). Such understanding of land use and land cover dynamics and its interactions with socio-economic and bio-physical drivers (factors) will serve the analysis of land use and land cover change across scale.

The United Nations Environmental Program (UNEP, 2007) has identified two forms of drivers of land use changes based on the tempo of their impacts. The first are slow drivers which results in gradual impacts over decades. These drivers include natural population growth, excessive or inappropriate use of land, commercialization and agro-industrialization. The second types of drivers are fast drivers that may have impacts in one year time. In this group drivers identified include, for instance, spontaneous migration, forced population displacement, capital investments, and internal conflicts.

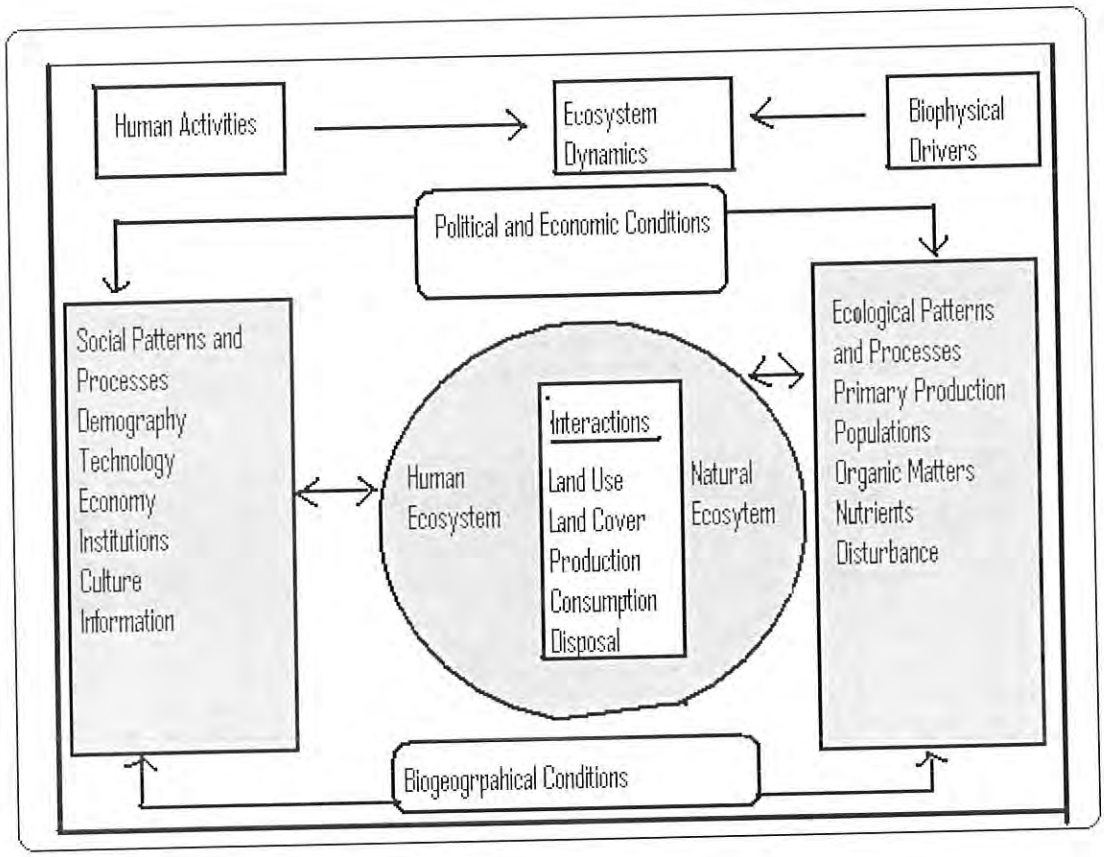


Figure 2.1. Drivers of Land Use/Cover Changes and their Interaction with the Ecosystem Adapted from Agrwal(2001).

2.5. Models and Approaches of Land Use/ Land Cover Changes

Many land use/cover changes models have been developed for the analysis of land use/ land cover change of an area. Though over 19 well-known land use and land cover analysis models have been identified and documented in the literature of land use, most of them have restricted themselves to the analysis of one or two land use factors. Of which two of them are selected for the purpose of application to this study of land use/ land cover analysis in Menagesha Suba. The two models will be used in identification of the various drivers of land use land cover changes. These land use/ land cover analysis models which are selected for the purpose of this study are Conversion of Land Use and its Effects (CLUE) and Land Use Change Analysis Systems (LUCAS). The detail of each model will be presented as follows.

2.5.1 Conversion of Land Use and its Effects (CLUE)

This model is developed by Veldkamp and Fresco (1996) for the first time. It is used to explain and predicts land cover change in the future of a local, regional and national area. The model explains biophysical derivers of land use changes of local areas. These bio-physical derivers include land suitability for crops, climate (temperature/ precipitation), effects of past land uses and impacts of pests, weeds and diseases. Besides, the model deals with human drivers of land use changes including population size and density, level of technology and affluence, political structures, economic conditions and attitudes and values of local people (Agrwal et. al., 2002).

The CLUE model is specifically developed for the analysis of land use in small regions (such as water shade or province) at a fine spatial resolution. The model structure is based on system theory to allow the integrated analysis of land-use change in relation to socio-economic and bio-physical driving factors. The relations between land use and its driving factors are thereafter evaluated using stepwise logistic regression (Veldkamp and Fresco 1996).

The Model contains two distinct modules which operate together and resulted in allocation of land use based on demand. The first is a ***non-spatial demand model*** which calculates the area of change for all land use types at the aggregate level. These demands are transferred in to land use changes at different locations with in the study area using a raster-based systems (Verburg et, al, 1999).

While the second is a ***spatially explicit allocation model*** where the area covered by the different land use types is a direct in put for the allocation module. The allocation is based up on a combination of empirical, spatial analysis and dynamic modeling.

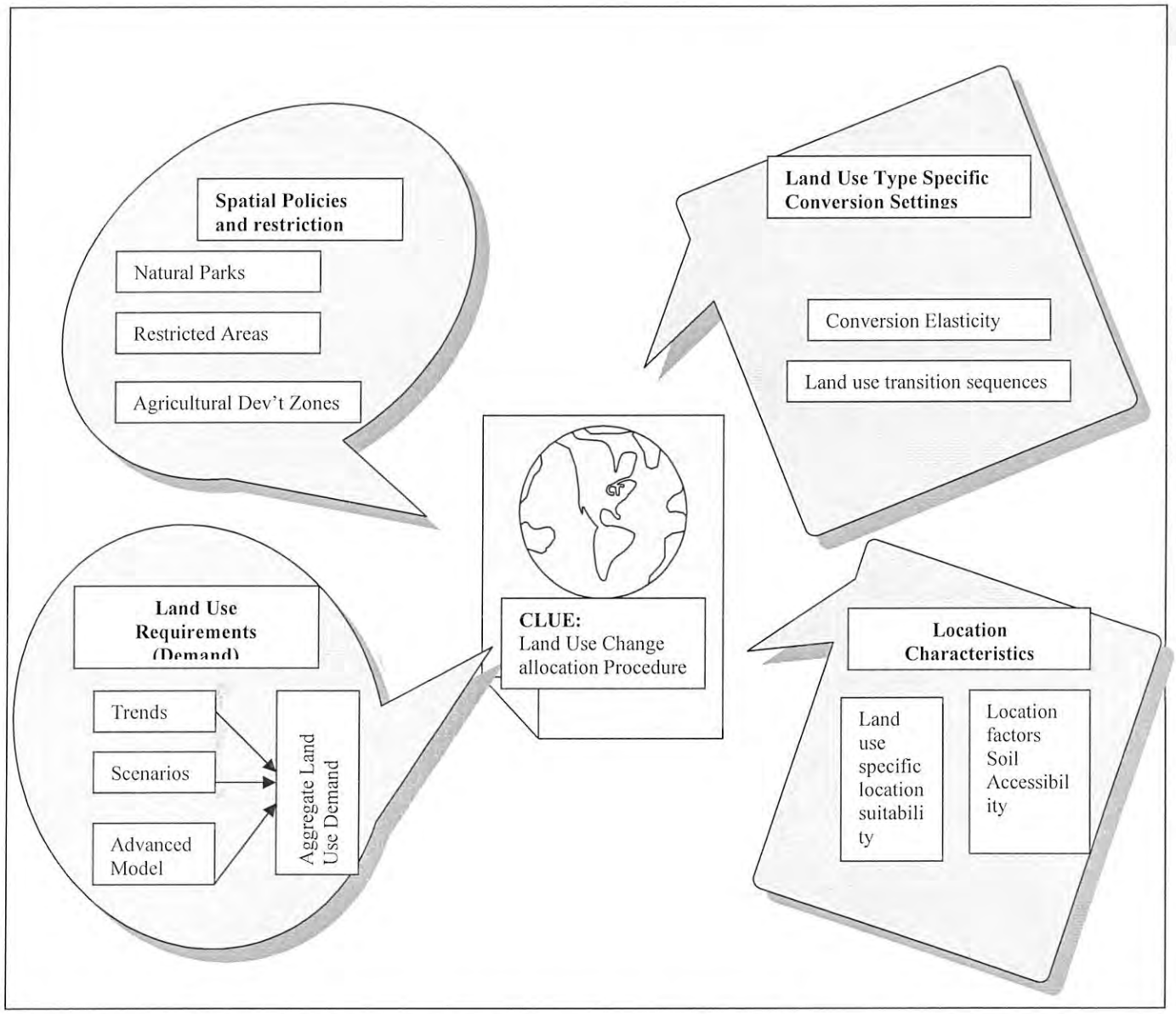


Figure 2.2. Overview of Information Flow in the CLUE Model

Adapted from Veldkamp and Fresco (1996).

It was developed to stimulate land use change using empirically quantified relations between land use and its driving factors in combination with dynamics modeling of competition between land use types (Verburg et, al, 1999).

Though the model covers a wide range of both biophysical and human drivers at differing temporal and spatial scales, it has limited consideration of institutional and economic variables (Agrwal and et. al., 2002).

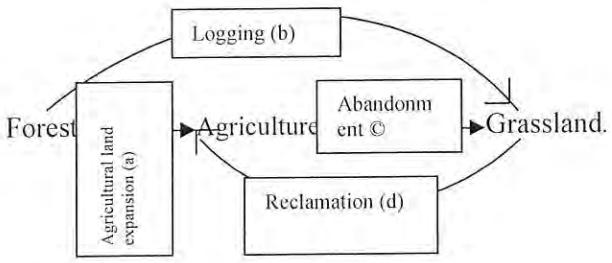
Explanation of the model:

- **Spatial Policies and Restrictions** indicate areas where land use changes are restricted through policies or tenure rights (status). Spatial policies and tenure and policies can influence the pattern of land use change.
- **Land use Requirements (demand)** are calculated at the aggregate level as part of a specific scenario.
- **Land use type Specific Conversion Settings** determine the temporal dynamics of the simulations. Two sets of parameters are needed to characterize the individuals land use types.

1. **Conversion elasticity** is related to the reversibility of land use change. Land use types with high capital investment will not be easily converted in other uses as long as there is sufficient demand. Example includes residential locations, plantation with permanent crops (fruit). Other land use types easily shift location when the location becomes more suitable for other land use types like arable land. Therefore, for each land use type a value needs to be specified that represents the relative elasticity to change, ranging from 0 (easily convertible) to 1 (irreversible change).

2. **A conversion matrix** specifies land use type specific conversion settings and their temporal characteristics. Land use conversion matrix defines as t what other land use types the present land use type can be converted or not.

Land Use Change Sequence



Land Use Conversion Matrix

Future Land Use → / Present Land Use ↓	Forest	Agriculture	Grassland
Forest	+	+(a)	+(b)
Agriculture	-	+	+(d)
Grassland	-	+©	+

Figure 2.3. Illustration of the Translation of Hypothetical Land Use Change Sequence in to a Land Use Conversion Adapted from Verburg and other, (1999).

Note that + indicates conversion possible

- implies conversion not possible

❖ **Location Characteristics:** Land use conversions are expected to take place at locations with the highest "preference" for the specific type of land use at that moment of time. Preference represents the outcome of the interaction between the different actors and decision making processes that have resulted in a spatial land use configuration.

2.5.2. Land Use Change Analysis System (LUCAS)

Berry and et al (1996) developed this model for the analysis of land use change. The model has three components such as socio-economic, landscape change and impact modules. It also explains Transition Probability Matrix (TPM) of change in land covers and stimulates landscapes and assesses the impact on species habitat. Besides, the model explains a number of variables which are socio-economic and bio-physical in nature. According to this model, landscape pattern is a product of the interaction between ecological and socio-economic processes.

The model examines the impact of human activities on environmental and natural resources sustainability. The premise of the model is that landscape properties such as fragmentation, connectivity, spatial dynamics and the degree of dominance of habitat types are influenced by market processes, human institutions, land owner knowledge and ecological processes((Agrwal, 2002).

Berry and et al. (1996) pointed out that ecological dynamics such as land use /land cover changes in human-influenced landscapes are strongly affected by socio-economic factors that influence land use decision. According to them, landscape pattern is a product of the interaction between ecological and socioeconomic processes. Therefore, understanding the function and structure of landscapes is paramount, primarily in terms of human impacts, which requires integration of biological and socio-economic knowledge. And secondly, in terms of natural resource management, which in turn need integration of

effectively evaluate the social and environmental consequences of alternative management scenarios.

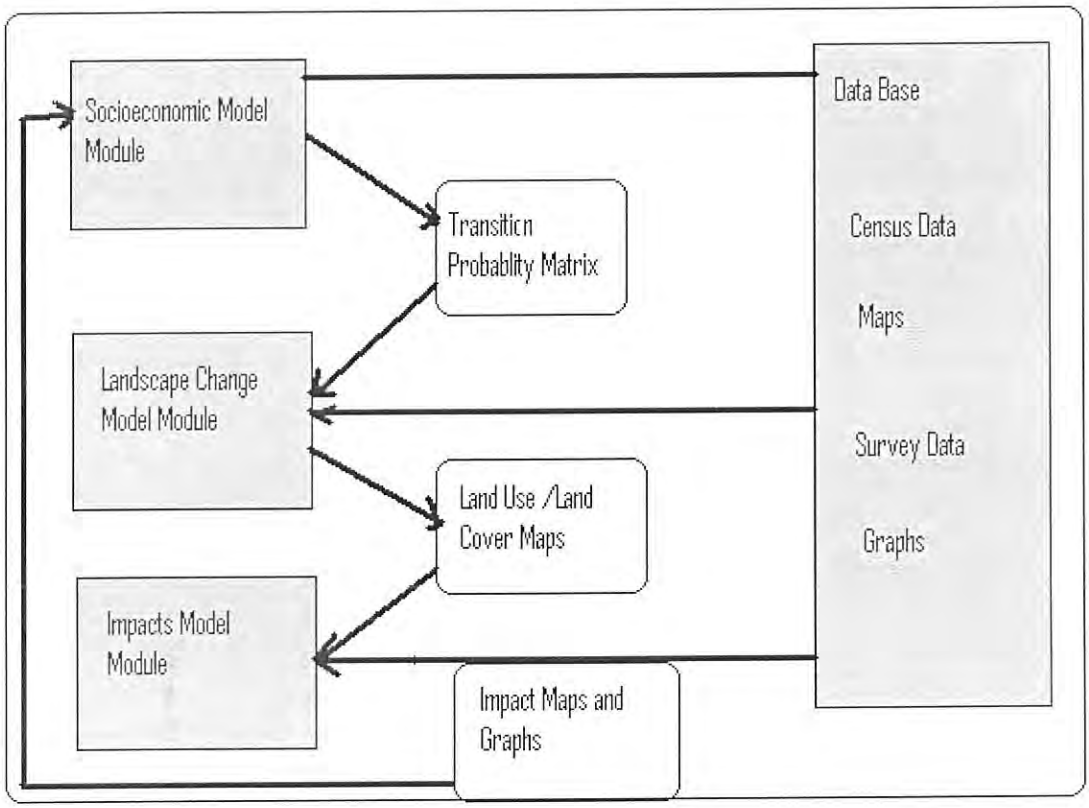


Figure 2.4. LUCAS Modules Framework Adapted from Berry and others, (1996).

The model examines the impact of human activities on environmental and natural resources sustainability. The premise of the model is that landscape properties such as fragmentation, connectivity, spatial dynamics, and the degree of dominance of habitat types are influenced by market processes, human institutions, land owner knowledge and ecological processes. Therefore, modeling environmental sustainability of human-dominated landscapes will benefit from the integration of human and ecological processes.

2.5.3. Landscape and Political Ecology Approaches

There are various approaches in the study of land use and land cover changes. These approaches are particularly important in the detection of drivers of land use and land cover changes of a certain area. The two most widely used approaches in the study of

land use and land cover changes are the *Landscape Ecology* and the *Political Ecology* approaches. For better understanding of land cover dynamics of the earth, it is a paramount importance to use the different models and approaches together in an integrated and simultaneously way.

According to landscape ecology approach, landscapes are shaped by both physical and ecological processes as well as socio-economic and cultural factors. A primary goal of the approach is to understand the reciprocal relationship between spatial patterns and ecological flows or processes. Therefore, understanding the fundamental mechanisms and spatial dynamics and variability of ecological flows of materials, energy and information across landscape mosaics is central to landscape approach (Wu and Hobbs, 2002).

The approach stated that land use and land cover predominantly determine the structure, functioning and dynamics of most landscape throughout the world. The approach further affirmed that land use and land cover change is driven primarily by socio-economic forces and is one of the most important and challenging research areas in landscape ecology (Wu and Hobbs, 2002).

Another important approach in the study of land use/ land cover is the political ecology approach which gives high values to the socio-political processes operating on the landscape. This approach is used as a conceptual approach to identify local and exogenous driving forces of change. It reflects ecological and societal conditions and the interactions between them over space and time (Cambell, 2001). According to this approach the processes that drive land use and land cover are complex and require the use of multiple method of analysis and critical interpretation of social data in order to understand the drives and impacts of change through time and across spatial scales. According to the political ecology approach, policies seem to be the ultimate factors determine spatio-temporal patterns of natural resource dynamics in relation to livelihoods switching over from small scale (Saxena et. al. 2003).

Policy-making were determining land use and land cover patterns and processes and will continue to influence land use and have implications for the land users. Identification of past and on going patterns and processes can assist planners in coping with the uncertainty associated with planning for future developments in the area (Cambell, 2001).

2.6. Impacts of Land Use/ Land Cover Changes

Land use changes have had mixed-blessing impact i.e. both positive and negative effects on human well-being and on the provision of the ecosystem (UNEP, 2007). These effects sometimes have a profound impact on the livelihood of local people and have an extended global environmental implication that it acts through time and space. Sometimes its effect might not be noticeable both at the local as well as global scale that it is difficult to recognize its impact.

For instance, crop land expansion and intensification which helps to secure more for livelihoods of local people and promote growth in agricultural output is at the expense of many environmental impacts. In this regard, loss of biodiversity, soil water retention and regulation; disturbance of biological cycles, increase of soil erosion, nutrient depletion, salinity and eutrophication are among the many environmental consequences. The following table summarizes the important types of land use and land cover changes and their respective environmental, human health, safety and socio-economic impacts (UNEP, 2007).

Table 2.1. *Summary of the Impact of Land cover Change*

Types of Land use/ Land Cover Change	Material Needs that Drives the Change	Impact on human health	Impact on safety	Environmental impacts	Socio-economic Impacts
Agricultural Land Expansion and Intensification	Increased food and fiber production-such as doubling world grain harvest in last 40 years	Spread of disease vectors related to vegetation and water (such as irrigation associated with schistomiasis)	Increased hazards from flood, dust and landslides during extreme weather	Loss of habitat and biodiversity, soil water retention and regulation, disturbance of biological cycle, increase of soil erosion, nutrient depletion, salinity and eutrophication	More secure livelihoods and growth in agricultural output Changes in social and power structures
Loss of forest, grass land, and wet lands	Diminished variety of resources Diminished water resources and water quality	Loss of forest ecosystem services including potential new medicinal plants	Increased hazard of flooding and landslides during extreme weather and tsunamis	Loss of habitat, biodiversity, stored carbon, soil water retention and regulation	Loss of forest products, grazing, fisheries and drought reserves Loss of livelihood, cultural values and support for traditional lifestyles of indigenous and local communities Loss of recreation opportunities and tourism
Urban land expansion	Increased access to food, water and shelter; increased choice, but satisfaction of material needs highly dependent on income	Respiratory and digestive-tract diseases due to air pollution, poor water supply and sanitation Higher incidence of stress and industry-related diseases Higher incidence of heat stroke	Increased exposure to crime Traffic and transport hazards Increased hazard of flooding caused by soil sealing and occupation of hazardous sites	Disruption of hydrological and biological cycles; loss of habitat and biodiversity; concentration of pollutants; solid and organic wastes and urban heat	Increased opportunity for social and economic interaction and access to services Increased competition for financial resources Diminished sense of community, increased sense of isolation

Adapted from UNEP, (2007).

2.7. The Livelihood Impacts of Land Use/ Cover Changes

Conceptually livelihoods signify the means, activities, entitlements, and assets by which people make a living. The concern for livelihood among the local community is growing in both research and policy decision. The action taken at the local level is affecting the well-being of the local community in particular and the global society as a whole. The land cover dynamics which are taking place at the local level have also impact on the welfare and security of households or individuals. So it is important to twin environment and humanity in research activities.

Carswell (1997) defined livelihood as "*comprising capabilities, assets, both material and social resources and activities required for means of living.*" He further explained the nature of sustainable types of livelihood as "*a livelihood is sustainable if it can cope with, and recover from stress and shocks, maintain or enhance its capabilities and assets and provide net benefits to other livelihoods locally and more widely, both now and in the future, with out undermining the natural resource base*". The concept of sustainable livelihood frame work and approach, which captures the complexities of the interrelationships of *livelihood assets* (human, social, natural, financial and physical capital), *strategies* to use these assets in order to come up with desired *livelihood outcomes* (more income, increased well-being, reduced vulnerability, sustainable use of resources) in the context of *external influences* such as policies, institutions, laws, culture and individual preferences and priorities, are elaborated in the works of the Department for International Development (DFID, 2001) and Carney (1998)

In recent years, the emphasis has been given to the study of livelihood of people in Ethiopia in different corners. In this regard it is worthy to mention the works of Tekeleweny (2009), Abiot (2009) and Abiot (2008) who have linked livelihood strategies with dynamics of land use and land covers.

Household livelihood strategies are shaped by several factors. Among others land use and land cover changes is important for both production and consumption decisions. Other factors affecting household decisions are: access and control of human, natural, productive, cultural and social resources (Valdivia and Quiroz, 2001). Livelihood

strategies are diverse and influenced by linkages in and out side agriculture and life cycle of family characteristics such as age, education, and the number of family members (Valdivia and Jette, 1997).

Diversification is also affected by stage in the life cycle. Households in their initial stages start to accumulate and their ability to expand or diversify their portfolio is limited. Diversification in agriculture and non-agricultural activities may take place as accumulation grows. As families become old and resources are donated, these become less diversified. The tangible resources-natural, human, cultural, social and productive; and the claims and access-intangibles are factors that impact the ability to negotiate, are the mechanism that households may diversify their portfolios (Valdivia and Quiroz, 2001).

Households may access resources through networks of families and friends. Households with differing varieties and densities of networks can build relations in and outside of agriculture. Depending on the event and the wealth in capitals, the family may be able to build only an agricultural portfolio or a combination of rural/urban and other forms during time of stress.

A livelihood encompasses not only the income generating activities pursued by a household and its individuals, but the social institutions, intra-household relations, and mechanisms of access to resources through the life cycle. The purpose of understanding livelihood strategies is to shed light on how and when individuals, households, and groups negotiate among themselves, with their communities, markets and society to improve their well being or reduce food insecurity by appropriating the benefits from their assets, activities and investments.

The sustainable livelihood framework developed by the Department for International Development (DFID, 2001) is used to the analysis of livelihood strategies of local people in Menagesha Suba. The model captures the complexity of the interrelationships of livelihood assts (human, social, natural, financial and capital). It also includes the strategies employed by the local people to use these assets in order to come up with

desired livelihood out comes. The outcomes include more income, increased well-being, reduced vulnerability and sustainable use of resources. The model has also include the external factors under which the assets and strategies to be utilized. These external shocks (influences) include policies, institutions, laws, culture and individual preferences and priorities.

The focus of the model is on the assets that poor men and women use the strategies that they employ to make living rather that focusing on their needs. The model comprises the following basic components:

- ***Vulnerability***: refers to the insecurity or well being of individuals or communities in the face of changing environments (ecological/ social/economic/political) in the form of sudden shocks, long term trends or seasonal cycles. According to UNDP (1997), the extent of vulnerability relates both to the level of external threats to a household's, individual's or community's welfare and to their resilience resisting and recovering from these external threats.
- ***Assts***: these resources include a broad range of financial, human, social, physical, natural, and political capital. Issues relating to access to assets and how to access is key to the sustainable livelihood model.
- ***PIPs:*** these refer to policies, institutions and processes. PIPs cover a broad range of social, political, economic and environmental factors that determine people's choices and so help to shape livelihoods, such as institutions (social norms and belief systems), organizations, policies or legislation.
- ***Livelihood Strategies:*** these are the planned activities that men and women undertaken to build their livelihoods. Livelihood strategies include coping strategies designed to respond to shocks in the short term, and adaptive strategies designed to improve circumstances in the long term.
- ***Livelihood outcomes:*** these are the results of women and men's livelihood strategies and feed back into the vulnerability contexts and asset bases, with successful strategies allowing them to build asset bases as a buffer against shocks and stresses, as opposed to poor livelihood outcomes which deplete asset bases, thereby increasing vulnerability.

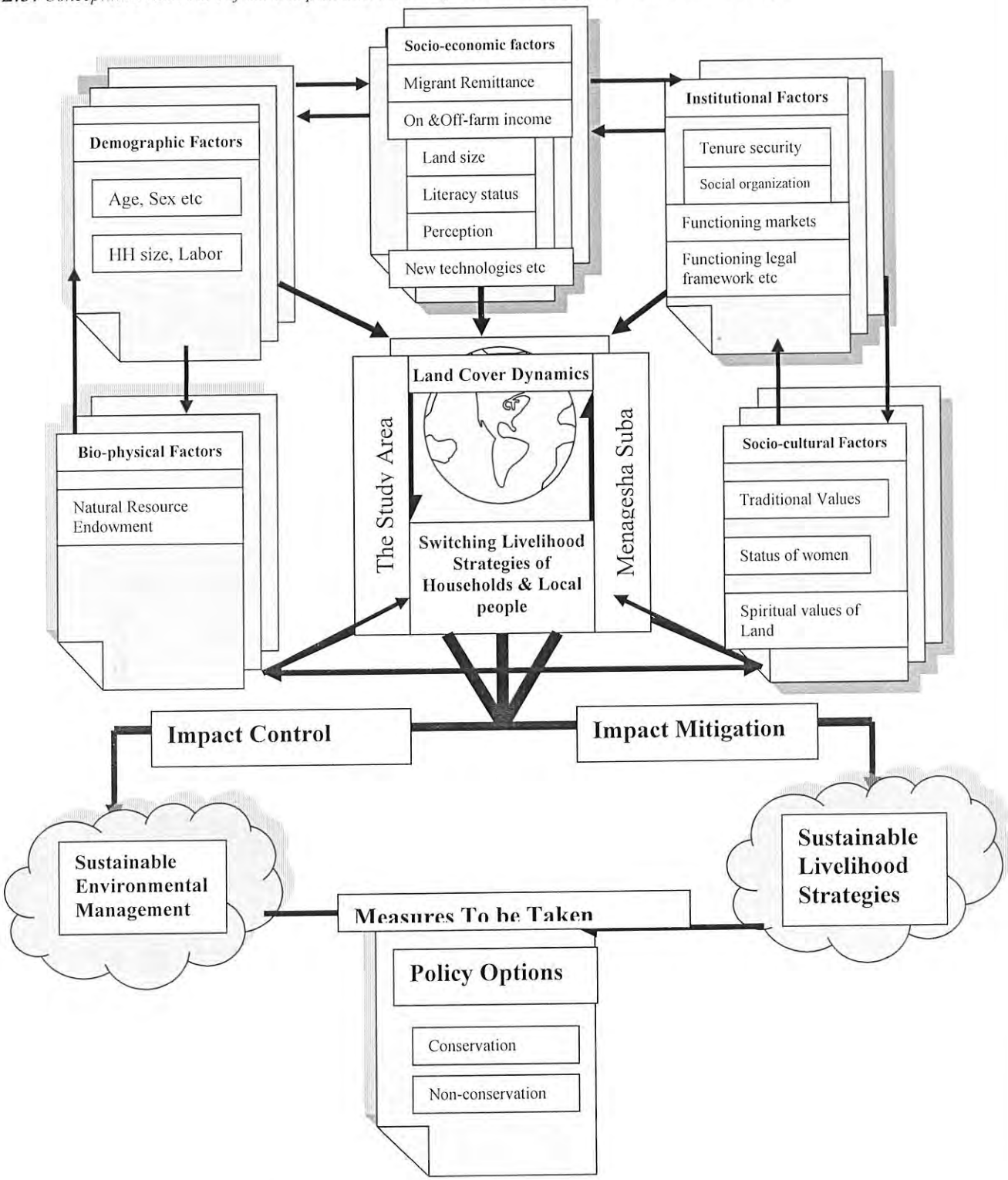
2.8. Nexus between Land Use, Local Environment and Livelihood Strategies: A Conceptual Framework

Land use and land cover changes are affected by agricultural demand (such as food, fiber, bio-energy, forest etc...) and trade; population growth and consumption patterns; urbanization and economic development; science and technology and so many other factors. The combination of land use and land cover changes may have profound effects on national, regional and global human supporting capacities, but surely it has effect on local people livelihood strategies and their living environment.

Land use/ land cover changes over a period of time accompany changes in other spheres such as natural resources and livelihoods of local people. Such changes in other spheres of life may not be desirable from the point of environmental sustainability or socio-economic equity of individuals at local level (Saxena and Liang, 2003). For instance agricultural land use expansion benefits farmers substantially in economic term but at the cost of increased vulnerability to climatic and market uncertainty.

Deforestation, loss of biodiversity, declining farm productivity, hydrological imbalances and soil erosion are interconnected problems related to land use/land cover changes, with significant implications for sustainable development (ibid). Livelihood problems in local areas may be because of land use/land cover changes happening over the years or due to severe constraints in realization of potential benefits from land resources. Poor economy in local areas may lead to environmental degradation and conversely environmental degradation may aggravate poverty. This vicious circle of environmental degradation and poverty is a threat to local and global environment and to the livelihood strategies of local people (Saxena and Liang, 2003). Local communities traditionally tuned to subsistence economy, with passage of time are getting more and more integrated with the market. This integration provides not only new livelihood or economic development opportunities but also at the same time new problems.

Fig.2.5. *Conceptual Framework of the Complex Interactions of various Drivers of Land Use/ Cover Changes*



Adapted and Modified From Demissie (2008).

Among the many challenges faced by such communities is to develop and implement technologies and institutions that foster enhancement of local livelihoods, improvement in economy, equity and environmental conservation as an integrated goal. The problem is more pronounced when environmental changes such as land use/land cover changes have twined with their social and economic challenges. In that regard, traditional societies would develop strategies to tackle the problems and sustain their livelihood activities. So that the impact would be minimized and to some condition would be avoided or it would resulted in switching their activity.

Therefore, both the drivers of land use changes and the livelihood assts interact at space and time to result in land cover changes, which is one of the leading environmental issues and switching the livelihood strategies of local people, which is again another most pressing socio-economic issue of our planet earth. The Diagram above depicts the complex interactions of the various factors and drivers of changes of land cover and switches the livelihood of households and local people in Menagesha Suba.

Chapter 3

3. Research Methodology

This chapter deals with methodological issues of the research which includes the description of the study area in terms of its absolute and relative location, bio-physical and socio-economic characteristics. The chapter also considers data sources such as multi-temporal images, key informant interview (KII), socio-economic surveys and secondary document sources. Moreover, the chapter takes into account of methodological analysis for the data which comprise satellites imagery interpretation using soft wares, key informant interview analysis and socio-economic data interpretation. It also considers sampling procedures and sampling techniques for the socio-economic survey undertaken in the study area.

3.1. Description of the Study Area

Menagesha Suba is located in Oromyia Region of Welemera Wereda (i.e. $8^0$54"N to 9^0 04" N latitude and 38^0 30" E to 38^0 39" E longitude) with an elevation ranging from 2880mabsl to 3310mabsl (Figure3.1). It is situated on the road from Addis Ababa to Ambo some 30kms and covers an approximate area of 370.7km^2. The area is one of the oldest and earliest natural reserves established in the country. It is also referred as African Oldest Park established in the medieval period (Abate, 2006).

In terms of relative location, the study area is located south west of Addis Ababa where the city is expanding to the territories of the area, north of the town of Sebeta where the study area is draining south west towards the town and north east of the town of Holetta where again the study area is draining south west towards the town.

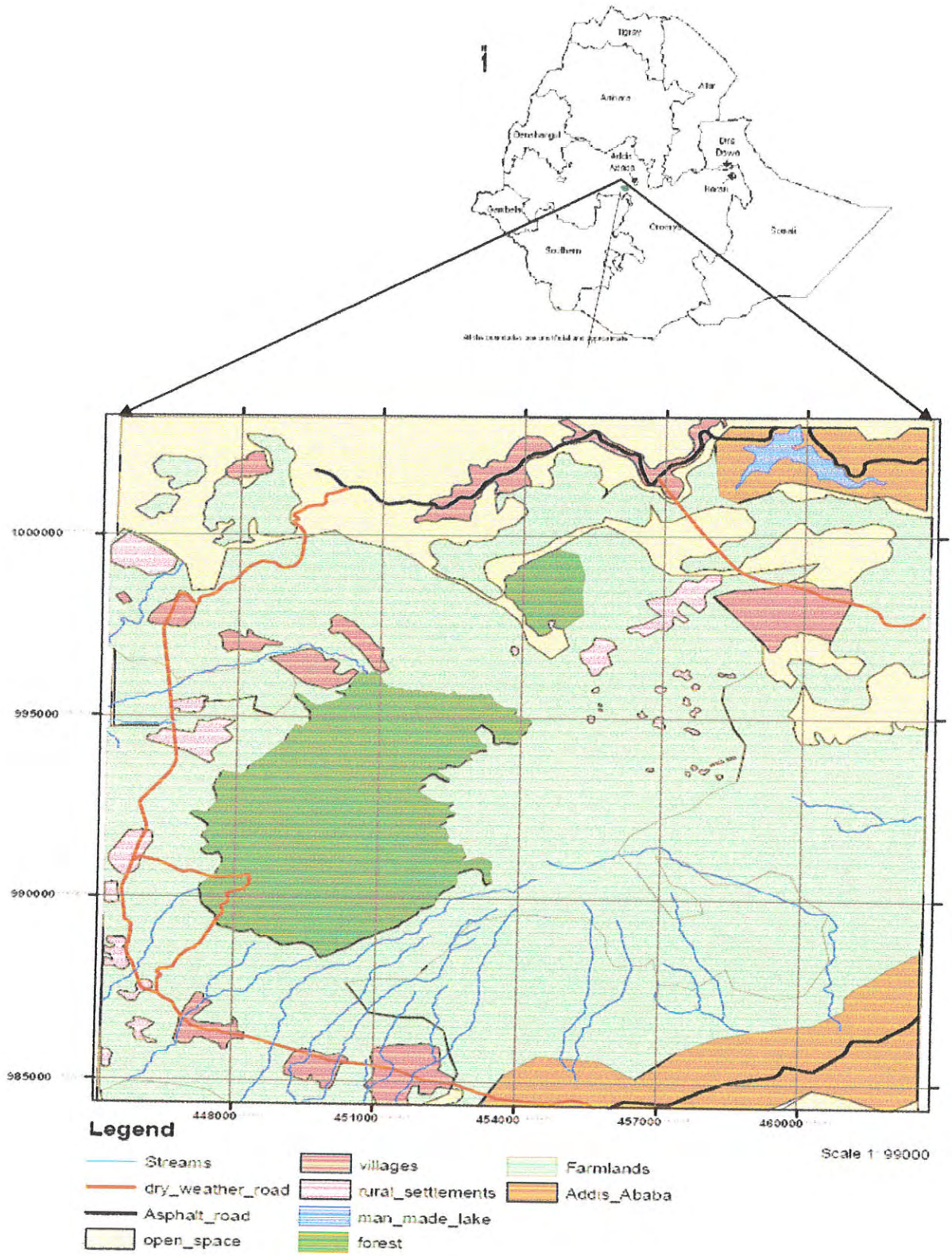


Figure 3.1. Location Map of the Study Area

3.1.1 Biophysical Characteristics

The area consists of an isolated mountain surrounded by low lying plains. It is the part of the long-stretching Wechacha mountain chain. The topography of the area is extremely dissected, with alternating ridges and valleys dominating the landscape. As part of the Wechacha mountain chain, Menagesha Suba is an extinct volcano situated in a very complex tectonic location where it adjoin the Great Ethiopian Rift Valley (Abate, 2006)

The soils at higher altitudes are shallow and light brown with rocky substrate. At lower altitudes, the soils are deep, reddish-brown and less gravelly (Senbeta and Teketay, 2001 and von Breitenbach and Kokol, 1962).

Menagesha Suba is made up of basalt rocks of volcanic origin and other parent materials. These hills and the mountains ranges often consists of rhyolites and tracchytes interspersed with pryclolastic rocks such as tuff and agglomerates exhibiting soils of different structures and properties (MSSF, Management Plan, 1998).

Various rivers and streams are draining the Menagesha Suba forest area. These rivers and streams together consist of three water catchments in the area. These include:

Table 3.1. Water Catchments of Menagesha Suba

S. no.	Water Catchments	Area Drained by the Rivers	Name of Rivers
1	The Sebeta Water Catchments	Drains areas towards Sebeta town to a larger river called Senbo.	Fincho, Otto, Chagina, Gogeti, Fuloso, Bole and Kersa
2	The Holleta Water Catchments	Drains areas towards Holeta town.	Welnso, Bobe, Boroftu and Kechem
3	Tinishu Akaki Water Catchments	draining from Wechucha mountain range and the area round the highest peak Mogle i.e. 3385masl towards Gefersa and Akakli	Kile, Shiniko, Goje kersa and Welenso

Source: Compartmental Map of MSSF, Unknown Date

The whole water catchments together drain to Awash River which is one of the largest rivers of Ethiopia.

The climate of the area is temperate mountain characterized by medium to cold weather. Such climate locally referred as "Weyna Dega" and "Dega" in Amharic which are equivalent to temperate and sub-tropical climate of the global climate classification respectively. The annual rainfall in the area is estimated to be around 1225mm and the mean monthly temperature ranges from 12 to 16°C. With variation of altitude in Menagesha Suba, there is variation in precipitation and temperature, for example Wuchucha and Mogle experiences frost (MSSF, Management Plan, 1998).

Originally the natural forest communities of Menagesha Suba consisted of *Hypercium* belts, *Hagenia-Juniperus* forest, *Juniperious* forest, *Juniperus-Podocarpus* and *Podocarpus* forest in descending order of elevation from 3500m down to 2000m. These forests have been under commercial exploitation starting from the first saw mill was established in the country since the early 20th century (Senbeta and Teketay, 2001).

Currently the forest covers an area of about 2500ha of which 800ha is man made forest and the remaining is natural forest. The forest cover is concentrated on the northwestern and southwestern half of the mountain, while the eastern slope has been converted into farm land (MSSF, Management Plan, 1998).

Forest plantation establishment was initiated in the mid 20th century with some indigenous and exotic tree specious, among which *Juniperious procera* Endal, *Eucalyptus globules* subsp., *globules* Labill, *pinus radiate* D. Don, Pinus Patula Schlechtendal and Chamisso, and Cupressus lusitanica Miller, were included. Plantations are undertaken in already deforested areas for cultivation or affected by unsustainable commercial exploitation (Senbeta and Teketay, 2001).

The Menagesha Suba forest is the habitat of numerous wild animals, including baboons, Colobus monkeys, bushbucks, bush pigs, ghenet, caracal, spotted hyena, wildcat and a variety of bird species (Abate, 2006).

3.1.2. Socioeconomic Characteristics

Menagesha Suba is found in an area where it consists of five local administrations (Kebeles) some are entirely engulfed by the forest (like Nano Suba and Wuchecha Kebeles), while others are bordering the forest (like Berfeta Lemifa, Berfeta Tokofa and Gararsu Seda Kebeles). The following table summarizes the number of households and approximate number of population in each of the Kebele administrations for the year 2009.

Table 3.2. Number of Household and Approximate number of Population in Menagesha Suba

Name of the Kebeles	Number of Households in each Kebeles			Approximate number of population
	Male	Female	**Total**	
Berfata Lemafa	654	114	**768**	4140
Bertata Tokofa	664	166	**830**	4168
Garasu Seda	412	60	**472**	2360
Nano Suba	-	-	**785**	3041
Wechacha	230	42	**272**	1423
Total	**1960**	**382**	**3,127**	**15,132**

Source, Berhanu Mengesha, (2009).

The study area is surrounded by local farm associations and the town of Menagesha. People are expected to live around the reserve exert great pressure on its integrity and management. Most of the peasants depend on crop farming, raising livestock and using forest and non-forest products for their livelihood. They also engage in supplementary off-farm income generating activities such as petty trading and wage earning temporary jobs. Most of the households are also using fuel wood as a primary source of energy for domestic needs. Large scale forest logging and consequent land use changes have significantly altered the ecosystem structure and function, leading to rapid loss of habitants and biodiversity (Abate, 2006) and shifting the livelihood strategies of the local people.

The study area is experiencing land use and land cover dynamics; on the one hand due to rapid increase in the human population, there has been greater conversion of the forest reserves into farm lands and other land use types. On the other hand, due to the rapid urban land expansion, there has been greater conversion of farm lands and forest areas in

to urban land. These days the land use of the area includes forest land, agricultural land, grazing land, land for human settlement and open areas. The land tenure system implemented in the area is communal land used in common and private land owned privately. The general tenure policy that is found at work in Ethiopia is obviously land is a public property owned by the public at large (Article 40, FDRE constitution, 1995).

3. 2. Research Design, Data Sources and Methods of Collection

The research design used in this study was mixed method, while the data sources for this research of land use/cover changes and its impacts on the socioeconomic conditions of the local people included multi-temporal satellite images, socio-economic survey, key informant interview and secondary document sources. Following each of them are briefly described.

3.2.1. Research Design

This particular study was designed as a mixed method where both quantitative and qualitative data were collected to achieve the research objectives and answer the research questions. The rational behind in selecting this research design includes generating more reliable and appropriate data for concluding the research output. Moreover, it is important to give explanation for quantitative results using qualitative description which strengthens the reliability of the research at the same time.

Therefore, here the quantitative data were collected from the interpretation of satellite imagery of the 1973, 1986 and 2007; and from the socio-economic survey on the nature of the households in the study area. At the same time the qualitative data were collected from key informant interview and analysis of document from the secondary sources. Both the quantitative and qualitative data from the different sources were integrated and triangulated during the interpretation stage under the result and discussion section of the study.

3.2.2. Multi-Temporal Images

Remote sensing and Geographic Information System as a research tools have shown remarkable achievement over the years to provide accurate and timely geospatial

information of our ecosystem particularly of our land resources. The integration of satellite remote sensing, GIS and historical data provides more comprehensive information in the study of land use/land cover changes. It allows for a better understanding of the direction, nature and rate of land use/ land cover changes over several years of any particular study area. It also represents an alternative method to perform studies in land use, livelihood studies, natural resource analysis and environmental studies of local areas (Miguel, 2008).

Data collection from the satellite imagery was used for land cover change detection of Menagesha Suba and it will be collected using various satellite imagery of the study area. The 1973 Multi-Spectral Scanning (MSS) Land Sat Image, the 1986 Thematic Mapper (TM) land sat image, and the 2007 satellite SPOT-5 imagery will be used to detect the historic land cover changes of the study area over the past 30 years.

Multi-Spectral Scanning (MSS): It is one of the available medium spatial resolution sensors (20 to 250m) and it was in use for 12 years since its introduction in 1972. For many years the Land Sat Multi-spectral Scanner (MSS) sensor provided image data with a spatial resolution of approximately 80m, acquired across four spectral bands (i.e. visible and near-infrared). The MSS spatial resolution was sufficient for general mapping efforts in urban/ suburban and natural environments. These data are invaluable to day for historical change detection studies. The Land Sat MSS spectral bands and band widths are selected for their general utility to map vegetation and geological features (Rogan and Chen, 2004). For the purpose of this study the MSS 1973 land sat with spatial resolution of 28.5m was used to detect the historic land cover of the area.

Thematic Mapper (TM): It is one of the high spatial resolution sensors (less than 20m) available these days for the analysis of change detection in land use and land cover studies. The launch of Land Sat Thematic Mapper TM in 1984 produced a new remote sensing data source that provided higher spectral, spatial and radiometric resolution data. Land Sat TM Spectral channels are chosen specifically to map vegetation type, soil moisture, and other key landscape features (ibid). In this regard, it is the Enhanced Thematic Mapper (ETM) with spatial resolution of 28.5m was used in the study.

SPOT-5 imagery: the launch of the Syste'me Pour l'Observation de la Terre (SPOT) satellite in 1986 was initiated by the lacked of large area, high spatial resolution remote sensing data from space in the pervious remote sensing eras. This sensor provided multi-spectral data with a slightly higher spatial resolution (20m) and a panchromatic channel (10m). The SPOT-5 which was started to launch in 2002 and its least version 2007 collects panchromatic, visible and near-infrared and mid-infrared data at 5, 10, and 20m spatial resolution respectively(ibid). This study was also used this particular imagery with spatial resolution of 5 meter for the purpose stated in the objective.

Table3. 3: Data Type and Data Source for Land Cover Change Detection of Menagesha Suba

Data Type	Nature of Data	Date/Year	Source	Scale/ Resolution
Land Sat Image	MSS	1973	ILRI	Medium Resolution
Land Sat Image	TM	1986	ILRI	Medium Resolution
Satellite Spot Imagery	Spot-5	2006	EMA	High Resolution

3.2.3. Socio-Economic Survey

In the second stage, data collection was on the socio-economic conditions to understand the livelihood strategies of the local people in the areas where the land cover changes were detected. In this regard, both quantitative and qualitative data were collected from the local villagers and residents using socio-economic survey to explore the impact of the land cover dynamics on their livelihood strategies and to evaluate its impact on the environment of the Menagesha Suba.

In view of this, simple random sampling was employed to ensure that representative house holds of the total population from the different land use types. Local data collectors were hired to assist in the survey. Questionnaires with both fixed-response and open-ended were used in the study.

3.2.4. Key Informant Interview

In depth interviews of local people and professionals in the area were used to identify the proximate and the underlying driving forces of land cover dynamics of Menagesha Suba. While semi-structured interviews were conducted with senior government officials;

village leaders and other concerned body to gather detailed information about the land use/ cover changes and its local impact on the socio-economic conditions of the communities in Menagesha Suba.

To gather contextual and supporting information an additional interviews were conducted with government urban development, environment and agriculture and rural development officials, natural reserve manager, academics and researchers who were not directly associated with the changes in Menagesh Suba. Topics discussed were generally involved land use/ land cover changes, agricultural land expansion, urban land use planning, natural reserve and environment, and local people livelihood strategies and their socio-economic wellbeing.

3.2.5. Official Document Analysis

Secondary information sources such as local land use development plan, official records and other pertinent laws and regulations were reviewed to develop a full understanding of the process and the livelihood strategies of the local people. In this regard, the Management Plan of the Menagesha Suba state forest was used as in generating information on plantation activity and other information in the area.

3.3. Data Analysis Techniques

The analysis of the land use and land cover changes was done using various softwares which help in the detection of change from satellite imagery. In this regard remote sensing (RS) and geographic information system (GIS) were utilized to analyze the land cover dynamics of Menagesha Suba. While the socio-economic survey for the livelihood strategies of the local people in Menagesha Suba was analyzed using descriptive statistics techniques.

3.3.1. Satellite Imagery Interpretation

Digital change detection is the process of determining and or describing changes in land cover and land use properties based on co-registered multi-temporal remote sensing data. Though there are many ways of approaching the use of satellite imagery for determining

land use /land cover changes of an area, Yuan (2005) identified the whole process for change detection and classification in to two stages.

- **Pre-Classification Techniques:** at this level all image processing was carried out with the use of program called ERDAS Imagine 9.1 and ARC GIS 9.2 software packages. The images were geo-referenced with respect to each other with appropriate pixel size. The geographically referenced images were still radio-metrically corrected so as to maintain the geometric correlation of the images. The process applies various algorithms, including image differencing and image rationing, to single or multiple spectral bands, vegetation indices or principal components directly to multiple dates of satellite imagery to generate 'change' vs. 'no change' maps. These techniques locate change but don't provide information on the nature of change.
- **Post classification Techniques:** This method uses to separate classifications of images acquired at different times to produce difference maps which 'from-to' change information can be generated. The accuracy of the change maps is dependent on the accuracy of the individual classifications and is subject to error propagation.

At this stage of image processing the 1973, 1986 and 2007 images were classified using an unsupervised maximum likelihood algorithm. Then, various land cover classes were identified for each respective image. This process generated open water, agricultural fields and open areas, built-up environment, forest covers and grazing lands and so on. Anderson et. al (1976), natural vegetation and land use classification techniques for interpretation of remotely sensor data at various scales and resolution was employed to generate the first class level land uses. There was a ground verification of the most recent image (2007) so as to make an accuracy assessment of the classification.

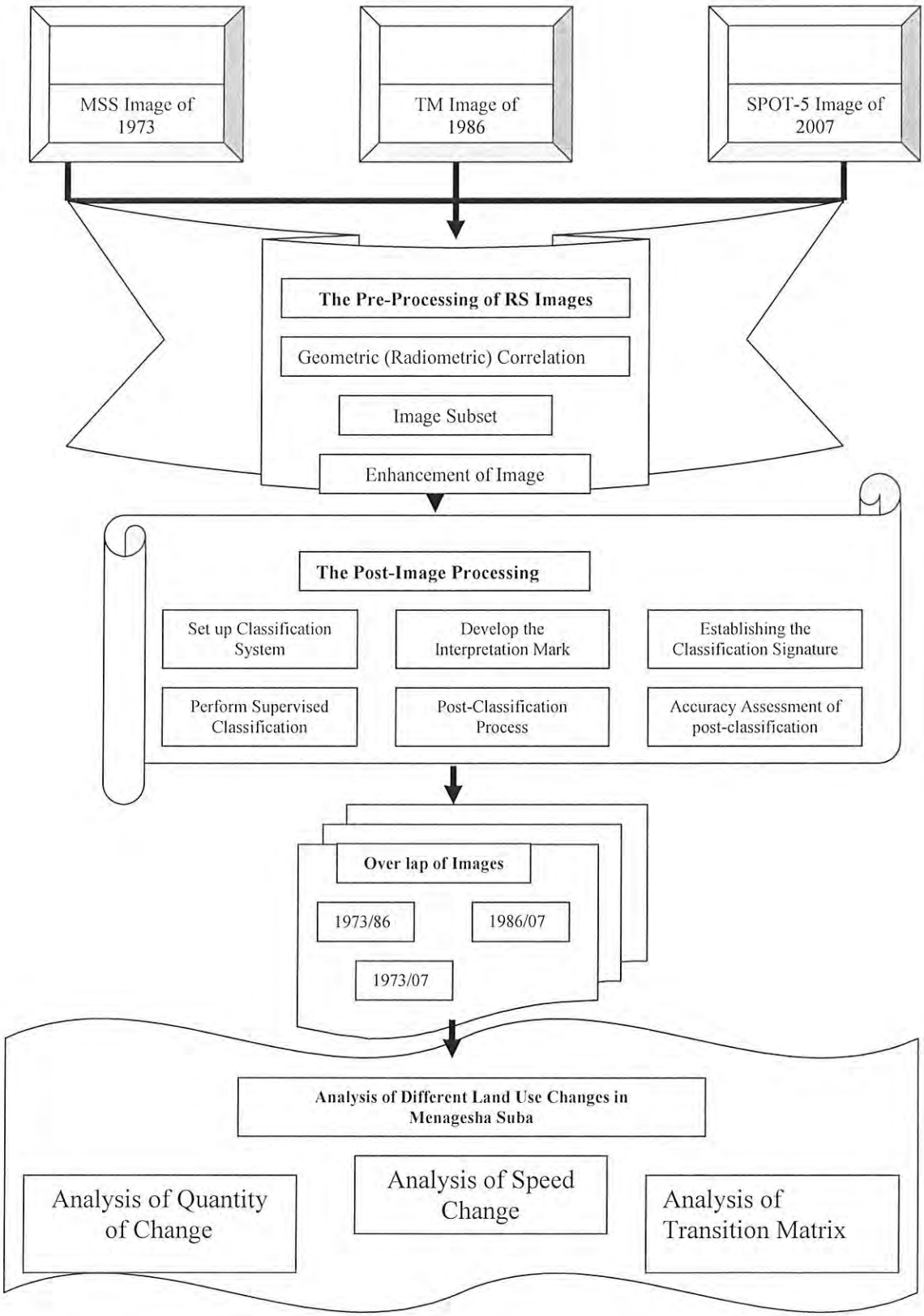


Figure 3.1. Summary of the Image Processing Steps

3.3.2. Measurement of Land Use Changes

Two levels of land use change were calculated in this study. In the first place, the quantitative land use/ land cover changes was analyzed. In the second place, the speed or the rate of change of land use and land cover was also analyzed. And the following variables were calculated from the analysis of the images.

Table 3.4: *Summary of Land Use/ Land Cover Change Measurements*

Content of Calculation	Formula	Descriptions of symbols
Area of each Land use type	A=	A= Area of irregular shapes identified on the images
Percentage Change of Land Cover each year	$PC = \frac{OC}{TC} \times 100\%$	PC, percentage of change of each year against each land use type; OC, observed Change; TS, total (sum) of change.
Annual Rate of Change	$ARC = \frac{PC}{100} \times$ no. of years	ARC, annual rate of change

Source: Own Construction

3.3.3. Drivers of Change Analysis

After identifying the various bio-physical and socio-economic factors of drivers of land use/land cover changes in Menagesha Suba through in depth interviews and questionnaires based interview of professionals, various variables were integrated into the land cover changes identified in different periods of time. This process generated the various proximate and underlying drivers of land cover dynamics in Menagesha Suba.

3.3.4. Socio-Economic Survey Analysis

In order to understand the livelihood dynamics of the area as a result of the past land use/ land cover changes, the following information were collected on different livelihood assets of the local people.

- Human capital: this includes all information on family structure, education, and occupation links to outside farm source of income.

- Social Capital: this comprises information on collective actions, access to traditional knowledge of natural resources such as land, forest and etc…
- Natural Capital: this consists of information on land, livestock, trees, crops grown, access to common resources.
- Financial Capital: it involves all information related to markets, off-farm jobs of the local community.
- Physical Capital: it entails information related to access to markets, technologies and so on.

The specific quantitative methods of analysis employed in this study were descriptive in nature. Descriptive statistics was used to asses and investigate variations in income, agriculture production and other livelihood attributes threatened due to the land use/ land cover changes in various land use categories and time series comparison of mean over years. This provided insight in to the impact assessment of the land cover changes of Menagesha Suba. Finally, the results of the land cover change detection and the socio-economic analysis were integrated and interpreted to show the correlation between land cover dynamics and socio-economic conditions of the people and environmental status of the study.

3.3.5. Sampling Size/ Sampling Procedure

The sample population used in this study was ten percent of the total households living in and around Menagesha Suba peasant associations and rural kebeles. In view of this, the sample was taken proportionally from each local administration (Kebeles). The table below shows the proportion of samples taken from each Kebeles.

Table 3.5. *Number of Sample Taken from each local Administration (Kebeles).*

Name of Kebeles	**Household Numbers**	**Sample Taken from each Kebeles**
Berfata Lemafa	768	**Not taken**
Bertata Tokofa	830	**Not Taken**
Garasu Seda	472	**47**
Nano Suba	775	**77**
Wechacha	272	**27**
Total	3,127	**151**

Chapter Four

4. Results and Discussions

This chapter gives detailed discussions of results from the satellite images analysis, key informant interviews, document analysis and socio-economic survey analysis. The patterns and processes of land cover changes which were taking place over 30 years in Menagesha Suba were interpreted using the data of Land Sat Multi-Spectral Scanner (MSS) of 1973, thematic mapper (TM) of 1986 and SPOT-5 imagery of 2007 through the application Remote Sensing (RS) and Geographic Information System (GIS) (Figure 4.1 below).

Moreover, this chapter deals with drivers that causes land use and land cover changes in Menagesha Suba. The drivers that aggravate the land cover dynamics in Menagesha Suba are complex and diverse and vary with time and therefore a time perspective longitudinal analysis was used to investigate them. They are also largely interdependent and integrated with each others. These drivers are identified as proximate and underlying causes of land cover dynamics in the area.

Finally, the chapter describes the results of households' socio-economic survey, which were collected from 151 households in Menagesha Suba. The households were randomly selected from three Kebeles which are systematically selected where the households are residing in relation to the protected Menagesha Suba state forest. The results of the survey include the socio-economic composition of the households, the land and agriculture characteristics; the alternative off-farm activities of the households and their interaction with the protected state forest. The discussions also include opinion of the households on land and forest cover changes; the reasons given by the households for the cover changes and the opinions forwarded on the impacts of such cover change on their livelihoods.

4.1. Pattern and Extent of Land Use/ Land Cover Changes in Menagesha Suba

The analysis of such land cover change detection and the process of the classification of land used for producing land use maps for 1973, 1986 and 2007 and to investigate changes that occurred between these periods, the following four land use classes were considered in image classification: natural forest area, farm land, human settlement and open land. And the plantation (man-made forest) was generated from the Menagesha Suba State Forest Management Plan. The choice of these land use classes was guided by: (i) the objective of the research; (ii) the expected certain degree of accuracy in image classification; (iii) the easiness of identifying classes on the satellite images. Then, the land classes identified during the process include forest area, farm land, human settlement and open land areas by using maximum likelihood algorithms of a supervised classification for the last image and the unsupervised classification for the two previous images. A brief description of each land use classes is given in Table 4:1.

The maps produced by such processes below show the change observed in different periods of the study (Fig.4.2.). A short inspection of the maps and results in the table show that the natural forest area or cover tremendously decreased while the agricultural or crop land increased continuously over the study period (1973 to 2007). While, the open land increased during the first period of the study (1973 to 1986) but decreased during the second period of the study (1986 to 2007). Another different trend of change is observed to the human settlement in Menagesha Suba. The human settlement was decreased during the first period but increased during the second period of the study. A detail losses and gains among the five land use classes over the study period are included in Table 4:2.

These overall dynamisms in land cover in Menagesha Suba is an important concern of this study in terms of identifying the driving forces or the cause of the change and in terms of analyzing the impact on livelihood strategies of local people in the area. And this has continued from the past years mainly as a result of traditional agricultural practice

and unrestrained deforestation of the forest area either for commercial and domestic proposes.

Table 4:1 Description of Land Use Types in Menagesha Suba.

S. no.	Land use Type	Descriptions of Land use Classes
1	Naturally Grown Forest	A land use type describing the densely afro-mountain forest of the Menagesha Suba area. These are dense and closed canopy forests with no or little disturbance are included under this category.
2	Farm land	Referring to the land use type where agriculture practice is underway on it. It is spatially continuous small household agricultural farms.
3	Human Settlement	It refers to the tukuls, established villages and human built-up areas which are either clustered or dispersed in and around the protected forest area.
4	Open land	A land that is not used either for agricultural farm or forest. It includes land for grazing, fallow land and land in sloppy areas.

The study of the satellite image interpretation covers approximately 32,349ha land where it includes the Menagesha Suba State Forest (MSSF) and the near by peasant associations (Pas). Though there is no clear demarcation of the state forest recently, according to the 1981 forest land demarcation and the 1991 forest inventory of the area, the state forest covers well over 9200ha (MSSF, Management Plan,1998). Therefore the study covers the land cover changes observed in and around the state forest. These include well over 15 PAs which are found around and engulfed the Menagesha Suba State Forest. Of which 5 to 8 PAs now rural Kebeles are highly interacted with the forest and are included under this study. These rural Kebeles include Gararsu Sida, Berfeta Lemafa, Berfeta Tekofa, Nano Suba and Wechucha all of them are from Welemera Wereda and Mogli and Koacha Kebeles from Alemgena Wereda. This study therefore covers the changes taking place not only to the state forest but also to those Kebeles or peasant associations of the rural localities. According to the image processing result, the Menagesha Suba land use system is divided in to four types, i.e. natural forest area, farm land, human settlement and open land (either land for grazing or fallow lands). The description of each land use class is given below in the table.

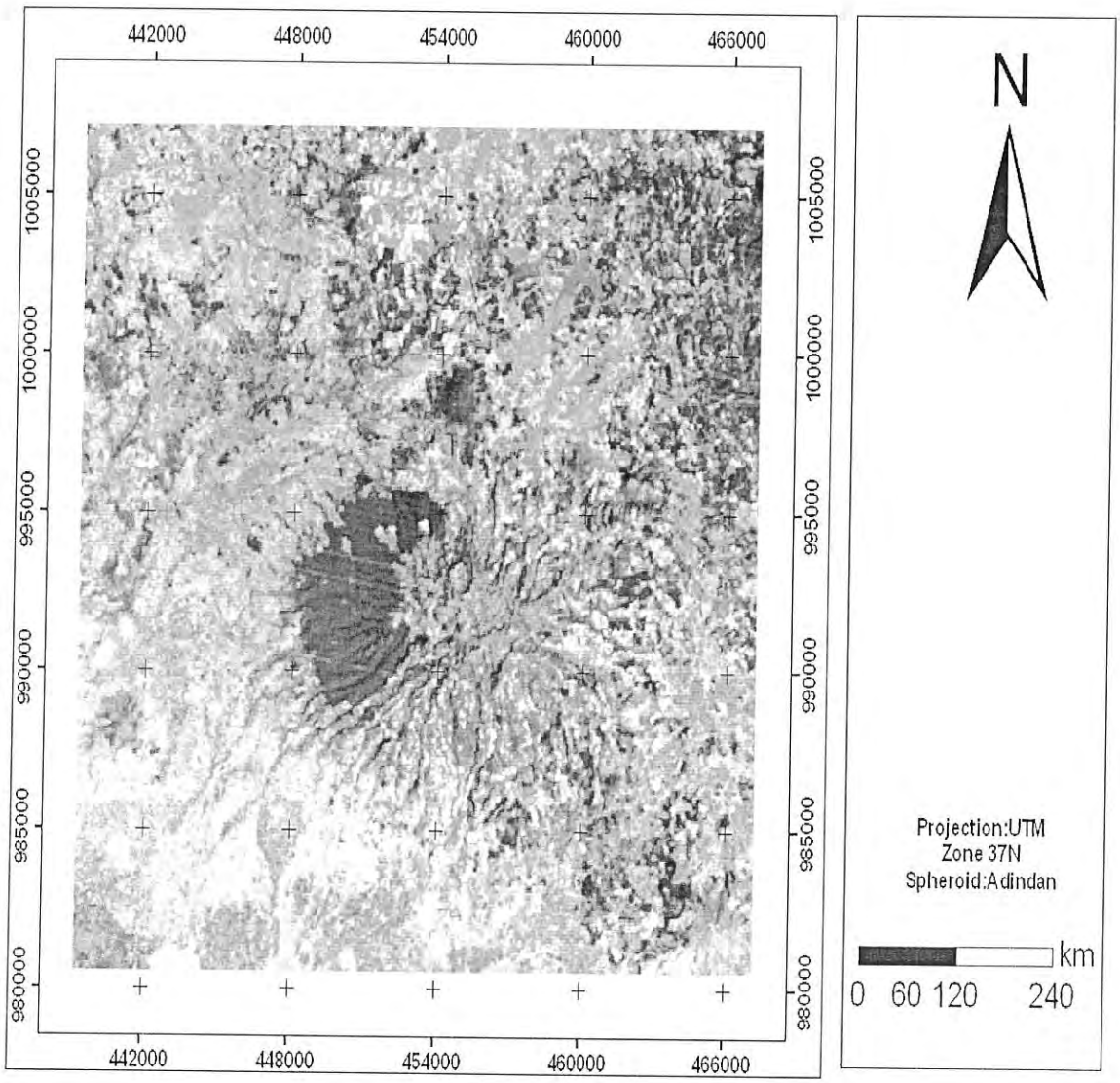


Figure 4.1. Raw Data of the Satellite Images for the year 1973

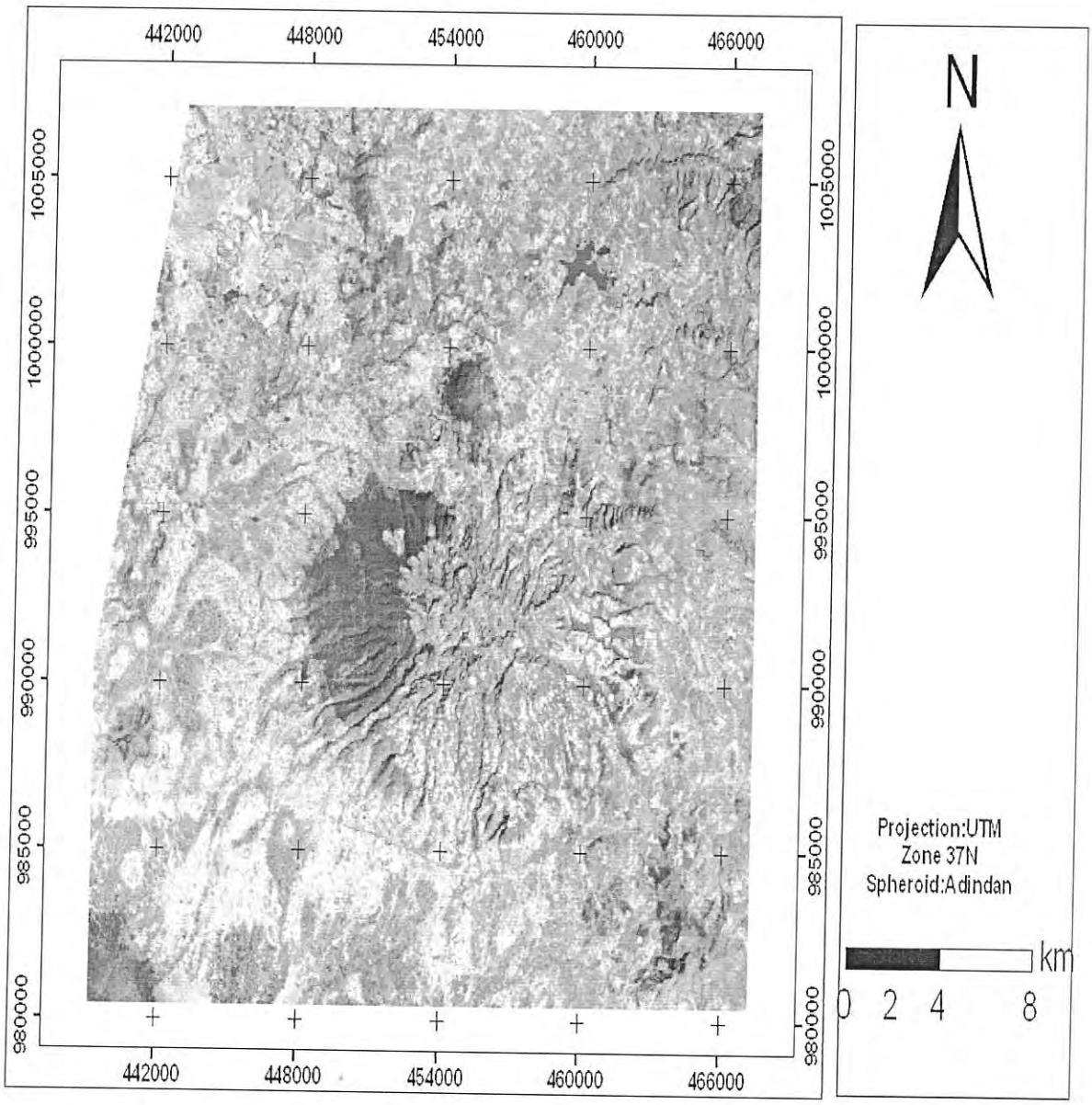


Figure 4.2. Raw Data of the Satellite Image for the year 1986

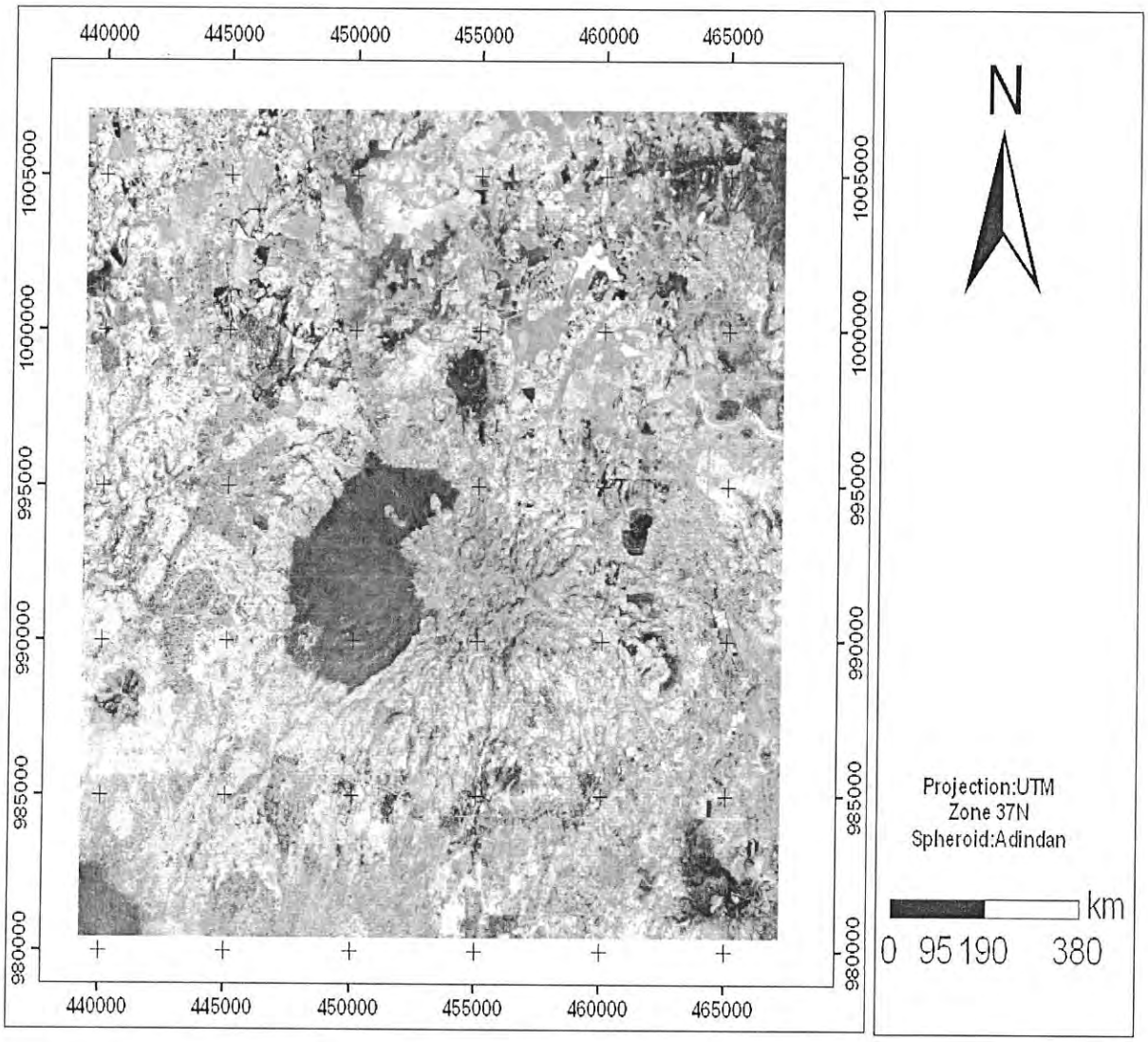


Figure.4.1. Raw Data of the Satellite Image for the year 20

Table 4:2 Summary of Land Sat Classification of Land Use Area Statistics for 1973, 1986 and 2007

s. no	Land Cover Classes Years and Area	1973		1986		2007	
		Area in Km^2	% Share	Area in Km^2	% Share	Area in Km^2	% Share
1	Natural Forest	153.85	47.56	71.30	20.04	35.42	10.95
2	Farm Land	39.49	12.21	110.83	34.26	215.70	66.68
3	Human Settlement	27.35	8.46	5.90	1.82	20.90	6.46
4	Open Land	102.80	31.77	135.46	41.88	51.47	15.91
	Total	**323.49**	**100.00**	**323.49**	**100.00**	**323.49**	**100.00**

Source: Image Processing and Field Survey

4.1.1. Changes in the Forest Cover

The data in Table 4:2 above indicated that the main land use structure of the area was naturally growing forest. The natural forest was not only the base for the ecology of the Menagesha Suba State Forest but also the foundation of the land cover of the surrounding peasant associations with the total area of 15,385 ha (47.56% of the total land use/land cover) in 1973. During this time the forest cover was comprised of the major land use in Menagesha Suba and it was widely spread over a larger area. However, the condition is different during the next periods of the study, where almost 50% of the forest covers degraded with in the first 13 years (i.e. from 1973 to 1986) and reached to the level of only 7130ha (20.04%) by the year 1986. The first period of the study of the satellite image had shown a great loss in the forest cover particularly of forest located in the lands of land lords and other private land owners of the previous regime (Personal Communication with Elder Persons).

So that the remaining forest cover confined only near the preserved state forest. This however doesn't mean the Menagesha Suba State Forest didn't suffer from this huge deforestation process in the area. Though the state forest was under strong protection for so long years, there was illegal cutting of trees and expansion of farm land towards the reserve.

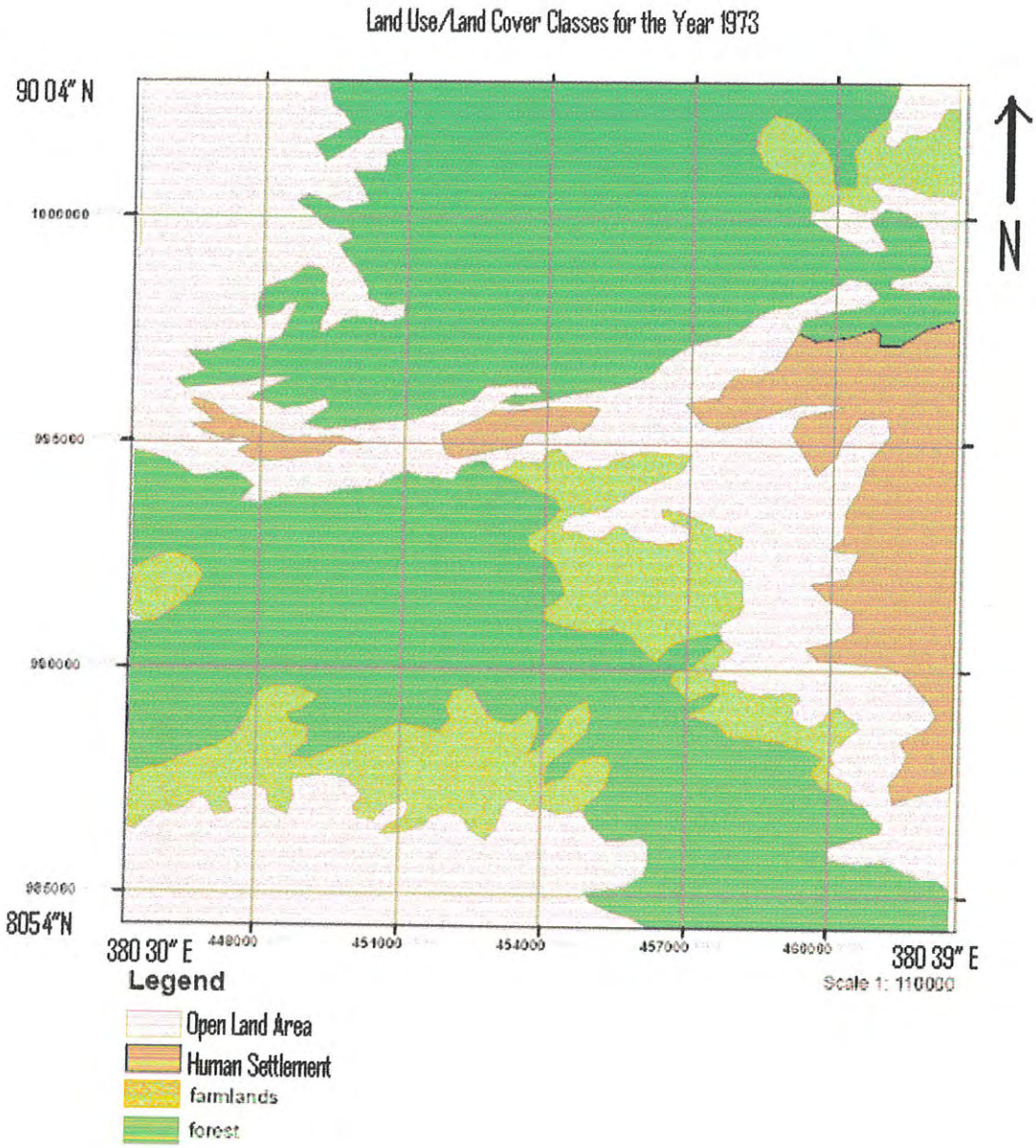


Figure 4.4. Land Use/Land Cover Class of 1973MSS Land Sat

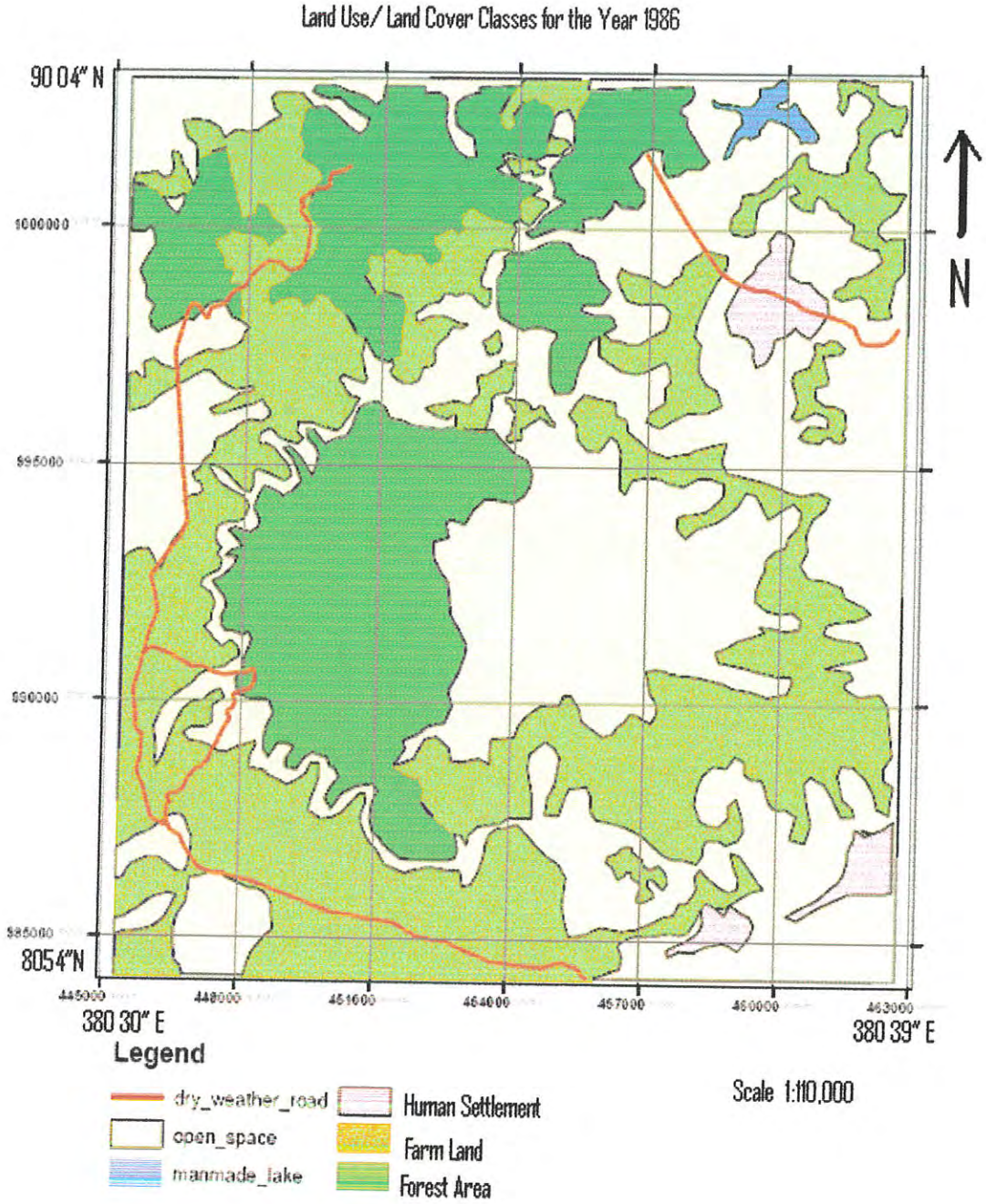


Figure 4.5. Land Use/Land Cover Class of 1986TM Land Sat

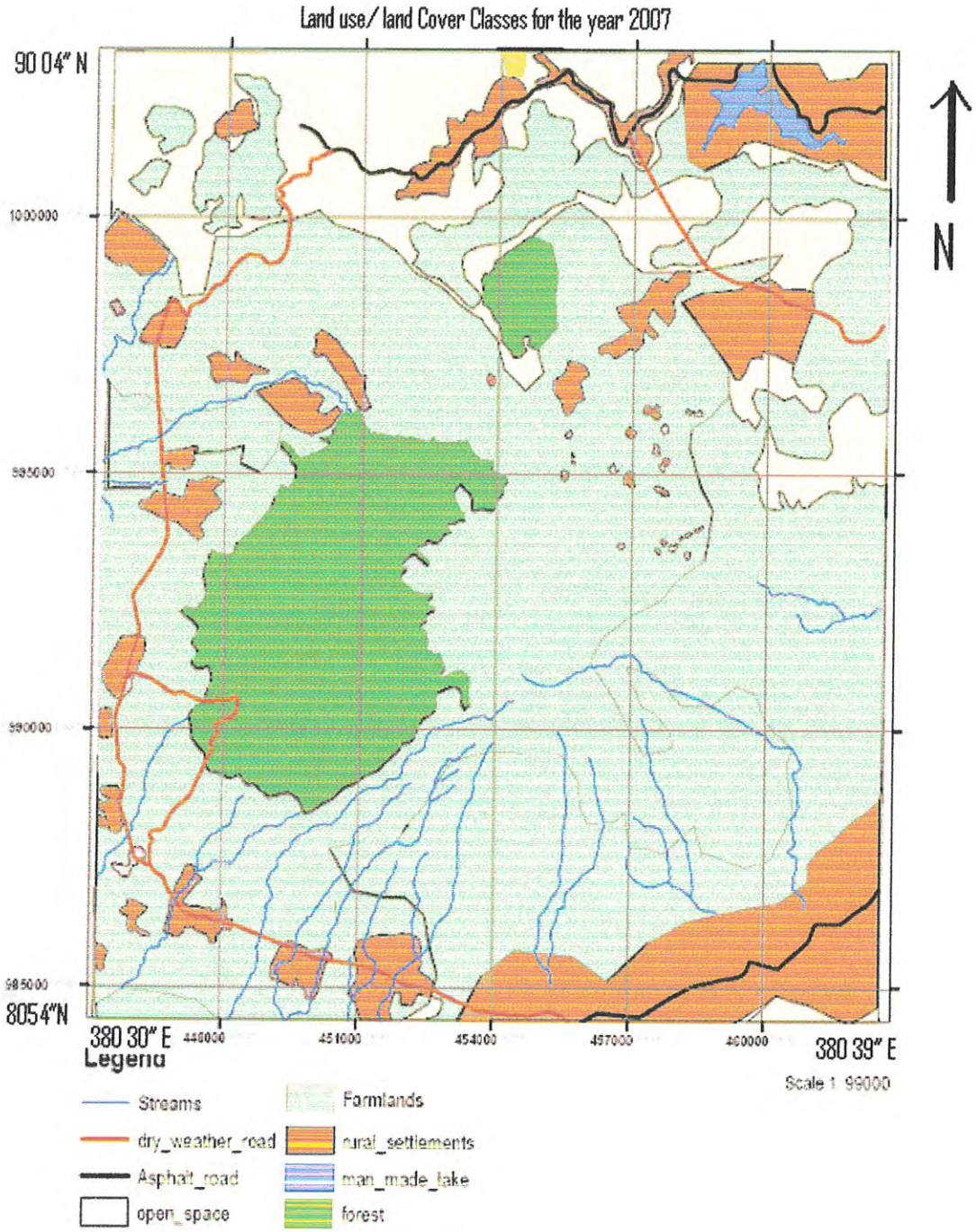


Figure 4.6. Land Use/Land Cover Class of 2007 Spot.

The condition for the forest cover in Menagesha Suba had continued similarly for the second period with well over 50% declination even to a much lower than 3542ha in 2007 of which 1300ha of the forest cover were a result of afforestation and plantation since the first plantation effort in 1949(MSSF, Management Plan, 1998).

There has been an effort to plant both exotic and indigenous tree species in Menagesha Suba State Forest (MSSF, Management Plan, 1998). The indigenous species includes Juniperious Procera, Podocarpus falcatus, Hageina abyssinica and Olea Africana where as the exotic species includes Cuperssus lusitanica, Pinus patula, Eucalyptus globules, Grevilla robusta, Pinus radiate, Acacia decurrens and Acacia Melanoxylen. Until 1973, it was only 390ha of land was covered by man-made forest where formerly devastated by commercial timber production or illegal cutting since the turn of the century i.e. 1900.

Table 4.3. Summary Statistics for Plantation/ Man-made forest of the Study Area

s. no	Land Cover Classes Years and Area	1973		1986		2007	
		Area in Km^2	% Share	Area in Km^2	% Share	Area in Km^2	% Share
1	Plantation/ Man-made forest	3.90	1.21	8.70	2.69	9.42	2.91

Source: Menagesha Suba State Forest Management Plan

In the first period of the study (i.e. 1973 to 1986), there has been a significant increasement in the plantation of trees almost 380ha of land had been covered by the 13 years. But compared with the destruction of the naturally growing trees, the plantation was insignificant. While the period showed commitment by the government to plantation and afforestation of both the Menagesha Suba State Forest and its surrounding.

In terms of plantation, the second period of the study (i.e. 1986 to 2007) is very insignificant; hence it is only 72 ha of land were covered with new trees. This was a period of stagnation in plantation may be due to various reasons but due to institutional instability of the then Ministry of Agriculture. During much of this period forestry was not given much attention as departments such as FAWCAD and Natural Resources Management and Conservations were not properly functioning to discharge their

responsibility. The whole effort of the plantation is a clear indication that the forest cover in the area is originally natural.

A drop in magnitude of forest cover was observed in all the three images. However, this decline is largely explained by increase in the magnitude of agricultural farm over the study years.

Table 4.4. Summary of Statistics for Forest Cover Change in Menagesha Suba

S. no	Description of Forest Cover Change	Observed Change	
1	Forest Cover in Km^2		
i	for the year 1973	153.85	(15,385ha)
ii	for the year 1986	71.3	(7130ha)
iii	for the year 2007	35.42	(3,542ha)
2	Deforestation rate (Km^2/year)		
i	b/n the year 1973-1986	-6.35	(635ha/year)
ii	b/n the year 1985-2007	-1.79	(179ha/year)
iii	b/n the year 1973 -2007	-3.48	(348ha/year)
3	Percent of Forest Cover Change (%)		
i	b/n the year 1973-1986	-25.52%	
ii	b/n the year 1986-2007	-11.15%	
iii	b/n the year 1973-2007	-36.61%	
4	Annual Rate of Forest Cover Change (%)		
i	b/n the year 1973-1986	-3.32%	
ii	b/n the year 1986-2007	-2.42%	
iii	b/n the year 1973-2007	-12.45%	
5	Forest Cover Permanency (%)		
i	by the year 1986	74.48%	
ii	by the year 2007	63.39%	

The size of the forest in Menagesha Suba declines over the study period from 1973 to 2007. This size declination is accompanied by a decline in magnitude of deforestation. The first period of the study i.e. 1973 to 1986 had shown a rate of deforestation of 635ha per year of forest resource. So that 6.35Km^2 of forest land had been converted to other forms of land such as agriculture, human settlement and open land areas. While the rate of deforestation (i.e. the rate at which the forest cover was converted into other land forms such as farm land and open area) was reduced to 179ha per year in the second

period of the study. Though the magnitude of deforestation dropped in the second period due to various reasons, the forest resource of the area was almost declined by four times in 2007 from the original forest (15,385ha) in 1973.

4.1.2. Changes in the Agricultural Land

When we see the 1973 image analysis result, farm land accounts only 3949ha (Less than 1.5%) of the whole study area. But during the first period of the study (i.e. 1973 to 1986), there had been a significant increase in agricultural land or crop land. The declining forest cover had been countered by the increased farm land. During this time there had been an increase in farm land almost three times of the original to reach 11,083ha by the year 1986.

The condition for the agricultural farm land expansion is similar even for the second period in such a way that agricultural land increased by almost 50% in 21,570ha in 2007. Again this farm land expansion is largely explained either by the destruction of the forest cover or encroachment of the open land. Particularly, the encroachment of the open land showed that it had decreased by half from the previous period in to 5,147ha in 2007. Therefore, the agricultural land expansion has been significantly contributed and identified as the major driving force for the conversion of other land use types such as open land, which includes the grazing land of the area. As a result, the quantity of open land was dropped to a lower level during the study periods.

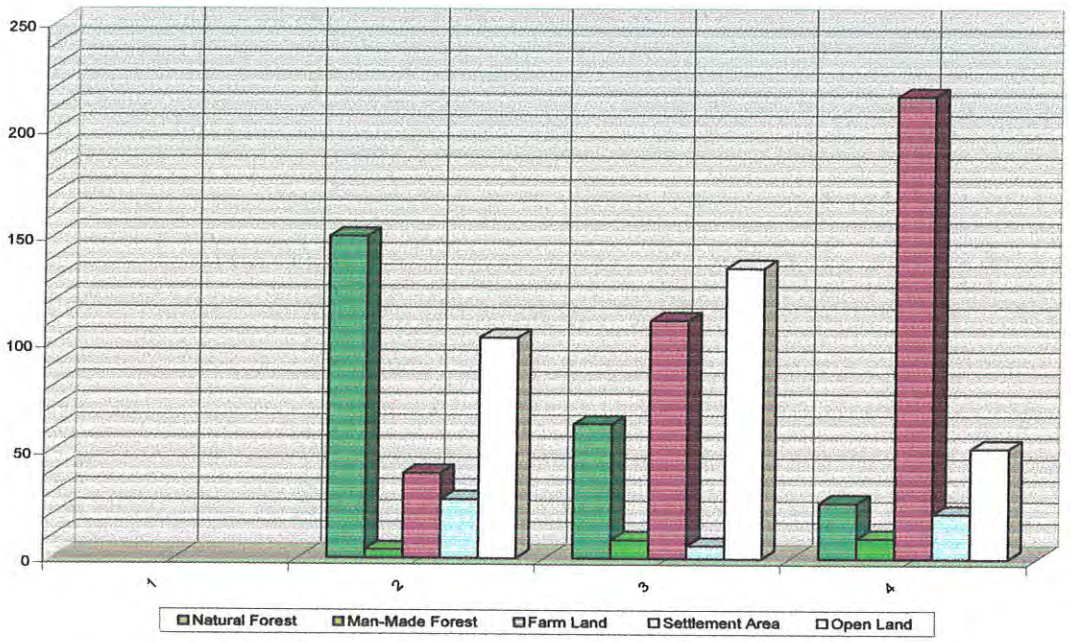


Figure 4:3 Land Use Types between 1973 and 2007 *Source: Own Construction*

An opposing condition observed with regards to the agricultural land expansion and its encroachment activity in the surrounding of Menagesha Suba. The following table describes the nature of change of the farm land.

Table 4:5 Summary of Statistics for Farm Land Cover Change in Menagesha Suba

S. no	Description of Farm land Change	Observed Change	
1	Farm Land Cover in Km^2		
i	for the year 1973	39.49	(3,949ha)
ii	for the year 1986	110.83	(11,083ha)
iii	for the year 2007	215.70	(21,570ha)
2	Expansion rate (Km^2/year)		
i	b/n the year 1973-1986	5.49	(549ha/year)
ii	b/n the year 1985-2007	4.99	(499ha/year)
iii	b/n the year 1973 -2007	5.18	(518ha/year)
3	Percent of Farm Land Cover Change (%)		
i	b/n the year 1973-1986	22.05%	
ii	b/n the year 1986-2007	32.42%	
iii	b/n the year 1973-2007	54.47%	
4	Annual Rate of Farm Land Cover Change (%)		
i	b/n the year 1973-1986	9.3% per year	
ii	b/n the year 1986-2007	6.8% per year	
iii	b/n the year 1973-2007	18.52% per year	

The first period of the study had witnessed a fast agricultural expansion at the rate of 549 ha per year, while the second period showed a significant decline in the rate of agricultural land expansion at the rate of 499ha per year. It is still very large as compared with the conversion rates of other land use types.

The agricultural dynamism in the area implies that how much agriculture was and still is an important economic base of the people. Almost all the population in the area depends on agriculture for leading their livelihoods. A similar result was also observed from the socio-economic survey of households in the area (96.69% of the households surveyed).

4.1.3. Changes in the Human Settlement

There is no recorded history as to when the human settlement commenced in the area. However, personal sources on human settlement of the area dates back to the reign of emperor Menelik II, where the forest guards (also called in Amahric 'eremetagea') came to the area to safe guard and protect the forest. Hence, human settlement is expanding greatly the satellite image analysis of the year 1973 had shown that it covered 2735ha. As we see the trend of the human settlement of the area from the satellite image analysis its coverage declined in the first period of the study to 590ha. Such decresement in the human settlement is later explained mainly by the villageization and settlement program of the then government.

The satellite image analysis for the second period showed that there has been huge expansion in the human settlement. Comparing the base year i.e. 1986, the human settlement expansion reached 2090ha by 2007. It is almost 4 times greater than the previous year. Human settlement expansion of this period can be explained by increased in number of human population. Unlike the other land uses and land covers in Menagesha Suba, the human settlement has also undergone various changes.

Table 4:6 ***Summary of Statistics for Human Settlement Change in Menagesha Suba***

S. no	Description of Human Settlement Change	Observed Change
1	Human settlement Cover in Km^2	
i	for the year 1973	27.35 (2735ha)
ii	for the year 1986	5.9 (590ha)
iii	for the year 2007	20.9 (2090ha)
2	Expansion rate (Km^2/year)	
i	b/n the year 1973-1986	-1.65 (165ha/year)
ii	b/n the year 1985-2007	0.71 (71ha/year)
iii	b/n the year 1973 -2007	-0.19 (-19ha/Year)
3	Percent of Human Settlement Cover Change (%)	
i	b/n the year 1973-1986	-6.63%
ii	b/n the year 1986-2007	4.64%
iii	b/n the year 1973-2007	-1.99%
4	Annual Rate of human Settlement Cover Change (%)	
i	b/n the year 1973-1986	-0.86%per year
ii	b/n the year 1986-2007	0.97%per year
iii	b/n the year 1973-2007	-0.68% per year

4.1.4. Changes in Grazing Land

The satellite image for the year 1973 clearly showed that there was a significant area of grazing land which accounts for about 10,280ha of land even it is much more than the agricultural land during that time. During the first period of the study, grazing land has been increased to 13546ha. This could be mainly due to massive deforestation in the area and abandonment of agricultural lands. The second period of the study on the contrary has witnessed that much of the grazing land was converted to agricultural lands. So that it is greatly reduced from 13,546ha of land in 1986 to 5,147ha of land in 2007 almost 2.5 times from the pervious base year.

A similar trend was happened to the open land/ grazing land in Menagesha Suba. The image result implied that the first period had shown a positive change in the size of grazing land with an annual rate of increasement of 251ha per year or 1.31%of change per year. The condition for the second period of the study is different in terms of the size of the grazing land in the area where it is significantly decreased. Nevertheless, its rate of change increased to the level of 3.99ha/year or 5.45% of change per year.

Table 4:7 Summary of Statistics for Grazing Land Change in Menagesha Suba

S. no	Description of Grazing land Change	Observed Change
1	Grazing Land Cover in Km^2	
i	for the year 1973	27.35 (2735ha)
ii	for the year 1986	5.9 (590ha)
iii	for the year 2007	20.9 (2090ha)
2	Expansion rate (Km^2/year)	
i	b/n the year 1973-1986	-1.65 (165ha/year)
ii	b/n the year 1985-2007	0.71 (71ha/year)
iii	b/n the year 1973 -2007	-0.19 (-19ha/Year)
3	Percent of Grazing Land Cover Change (%)	
i	b/n the year 1973-1986	-6.63%
ii	b/n the year 1986-2007	4.64%
iii	b/n the year 1973-2007	-1.99%
4	Annual Rate of Grazing Land Cover Change (%)	
i	b/n the year 1973-1986	-0.86%per year
ii	b/n the year 1986-2007	0.97%per year
iii	b/n the year 1973-2007	-0.68% per year

4.2. Drivers of Land Cover Changes in Menagesha Suba

These drivers of land cover dynamics ranges from proximate causes, which act within the local environment and the context of the local people to underlying causes which act at the national and international level. These drivers can be of socio-cultural, socio-economic and socio-political in nature so that understanding both the ecological and political landscape of the area in particular and the socio-economic and political changes in the national and international arena are worthy to identifying the real causes of the dynamics. Therefore, this section provides with evident of the major driving of the land cover changes acknowledged in different time perspectives in Menagesha Suba by professionals in the field.

Many literatures on forestry of Ethiopia mentioned that the history of Menagesha Suba State Forest dates back to the reign of Emperor Zera'Yekob (1426-1460E.C.). It was this time that the forest was reserved as welfare for the local people and a balancing effects of climate and soil erosion (von Breitenbach, 1962; Demel, 2002). Menagesha Suba was one of the watershed forest protection areas of the Emperor along with Wof-Washa and Jibet in North Shewa and West Shewa respectively (Demele, 2002).

Later, in late 19th century Emperor Menelik II recognized the relevance of the protection of Menagesha Suba forest as a source of wood products for the construction his palace and fuel wood. In fact, the emperor who is noted for his law of 'Ethiopian Forest Regulations' reserved the forest as one the 'Crown Forest Land' in Ethiopia. Therefore, the emperor assigned forest guards in Menagesha Suba so as to protect from illegal exploitation and improper utilization. These forest guards who were referred as 'eremetaga' in Amharic were given land in responsibility of protecting the forest free from the government taxation (personal communication).

Though, utilization of the forest was started as early as the late 19th century, by the turn of the century (i.e. 1900) the first saw mill was introduced to Menagesha Suba by an Austro-Germany entrepreneur called Otto. The saw mill machine was established with the purpose of properly utilizing the naturally growing indigenous forest. However, the Italian occupation of the country (1935-1941) resulted in heavy and large scale exploitation of the original naturally grown forest in Menagesha Suba (Demel, 2002).

It was in 1949 that the first seedlings were prepared for plantation in the forest area so as to re-afforest the divested area. This effort of the plantation process is considered as the first afforestation activity in the country (personal communication). From the early 1940s' to 1955 the forest had been administered by the Ministry of Work and Ministry of Finance together. By 1950 after half a century of heavy exploitation of the forest, Emperor Hailesellasie I officially commissioned the saw mill to terminate the exploitation of the forest. It was in 1954 that the responsibility was given to the Ministry of Agriculture (MSSF Management Plan, 1998). Now both historic saw mill machines are exhibited in Suba village.

Though demarcation and delineation of the forest area started earlier, the first official demarcation and delineation of the Menagesha Suba State Forest was made in 1981 by the Ministry of Agriculture, Department of Forestry. The result of the demarcation of the forest cover resulted in a total area of 9805ha; however, the satellite image analysis for the year 1986 showed that the forest cover was 6260ha. After the area was demarcated, the Menagesha Suba State Forest was identified as one of the first priority area by the then Forestry and Wildlife Conservation and Development Authority (FAWCDA).

In 1989 large scale plantation has been interrupted for years until the first management plan begun to be implemented in 1998. Currently, the state forest is administered by the Oromiya Forest and Wildlife Enterprise.

4.2.2. Proximate Causes of Land Cover Dynamics

As discussed in earlier section, Menagesha Suba has experienced land cover changes as early as the 1970s with expansion of agricultural land towards the forest area. A number of socio-economic and socio-political conditions have interplayed to bring this ecological and land cover changes in the area over the years. Analysis of the Key informant interview and the Socio-Economic Survey showed that proximate causes at the local level drive the patterns of land use of the area as well as the land cover changes in Menagesha Suba. In subsequent section proximate causes of land cover dynamics shall be presented in detail.

Agriculture has been the major economic activity of the people in Ethiopia and it is also the major source of employment. As identified in the satellite image analysis agricultural land has been expanded greatly and changed the ecological bases i.e. the forest in Menagesha Suba. So that the agricultural land expansion over the year became the major driving force of land cover dynamics in the area. This agricultural land expansion; however, associated with a number of socio-economic and socio-political conditions in the area as well as in the country.

First and foremost, the 1974 mass revolution had changed the economic system from feudal based economy to socialist based command economy which provided the larger public to have participated in the agricultural economy. This change of government and ideology altered the economy of the country to the extent of demanding for more agricultural products. The high demand for the agricultural products coined with the relative raise in price led agricultural land to be expanded greatly (Personal Communication). Previously, before 1974 with the Feudal ideology land was in the hands of few landlords so that agricultural practices and preservation of natural resources was mainly with the willingness of the individuals. So that large area of forest cover was seen on images before the 1974. However, after the mass revolt, land was nationalized and became the property of the public and distributed to peasants so that farmers get the access to expand their agricultural land. This access right to the land greatly expanded the agricultural land that is clearly shown in satellite images after the 1974. Second and still most important reason is the 1975 land reform which followed the mass revolution and brought radical nationalization of all lands in the country and redistributed to the peasants. As the land was distributed to the peasants the agricultural land was begun to be expanded to bring in ecological changes through devastating the naturally grown forests over the year.

Demographic forces either in the form of migration or natural increase has also contributed for the land cover changes in Menagesha Suba. Though data on population condition is not available, the national demographic conditions clearly indicated that population in the area is increasing over the years. Therefore, the agricultural expansion in the two periods of the study is a clear indication that population is growing obviously in the area. This growing population is not only contributing for farm land expansion but also exerting pressure on natural resources such as the forest. Growing population

demands forest resources in many ways among other in the form of construction materials, energy source and land for settlement.

As a result of increasing local population, human settlement is also greatly expanding towards the protected forest area. Urban areas such us Addis Ababa and others are also sprawling towards the forest through urban gigantism process. Moreover, these urban areas are highly demanding the forest in various forms including wood for commercial and domestic consumption purposes.

The social infrastructures such as education, health and others were expanding in the area earlier than the study periods under consideration. The physical infrastructure such as the road crossing the forest area was also constructed earlier. They are also improved in quality and services from time to time that they are attracting huge population to the area and at the same time they facilitating easy access of resources to the near by towns and markets. So that the expanding social and physical services together are contributing their share in driving the land cover changes observed in the area.

A worth mentioning proximate driver of land cover dynamics in Menagesha Suba is relocation of human settlement due to villageization and settlement program. The 1985 villageization and settlement program of the then government have drowned out people from the highland forest area to establish settlement in the low land plain areas. This program had resulted for the decrease in the human settlement of the image analysis for the year 1986. This resettlement of the government was mainly because of the non-suitability of the terrain for agriculture but without the consent of the people. After the people displaced from the area, it was covered by man-made plantation.

Nevertheless, after the 1991 national change of government, the people who were dislocated by the villagezation program relocated their settlement near and inside the forest destroying both the natural and man-made forests in Menagesha Suba. Particular areas affected by this process include Wechucha, Kochi and Mogli villages (personal communications with elders).

According to the Management Plan of the Menagesha Suba State Forest, about 73.42 ha of the plantation have been destroyed by encroachers in this period (MSSF, 1998). Here again the satellite image analysis for 2007 clearly showed that with total size of 2090ha

there has been resettlement in the area comparing to the base year 1986. It is almost 4 times greater than that of the pervious year. Therefore, the whole process of villagezation and settlement program and its counter action re-location and re-settlement process of the local people greatly contributed in land cover dynamics of the study area.

4.2.3. Underlying Drivers of Land Cover Dynamics

Drivers of land cover dynamics are so broad and diverse in nature that it needs the understanding of the ecological and political landscapes to clearly forward the causes for ecological changes. Among these, underlying drivers are the most important in playing the game of land cover changes in local areas. Underlying drivers are far from the local phenomena and they act at the national or international level to affect the local land use patterns and the local land cover changes. In this section the major underlying factors for the land cover dynamics in Menagesha Suba would be discussed briefly.

As mentioned by the key informants' interview the periods when the government transition had occurred again significantly contributed for the land cover change. This transition period played in cover change through illegal utilization of forest and land resources. The satellite image analysis for both periods also showed that there is a significant change in cover of forest after the change in national government too. This is particularly important for the time after the 1991 change in national government where most of the land in Menagesha Suba particular area such as Wecuhcha was abandoned its forest cover for agricultural purpose (Personal Communication).

The changes in national governments in both periods have also changed the socio-economic condition of the society that has significantly played in the expansion of the agricultural land and utilization of the forest resources at the same time. For instance, the first period i.e. the 1974 mass revolution changed the economy from feud-capitalist to socialist command economy where it had brought in significant increase in the price of agricultural products and demand of forest products in different parts. Similarly, the 1991 change of government brought again change in the economy from centrally planned command economy to a relatively free market economy which again brought increases in agricultural products that highly demanded agricultural land expansion. So that the increasing in agricultural land size of the image analysis of both period is a clear indication that the change in the national economic condition has contributed for the land cover dynamics.

The politico- economy of Ethiopia before 1973 clearly showed that land was owned in the hands of the few and it was granted to those who have special connection with the ruling monarch. In fact agriculture was practiced on large farm lands of the landlords; even more lands were available for the forest to grown on individually owned lands. Compared with the later periods, forest cover was dominantly found not only on government owned lands but also on individually owned lands. This made the forest cover during that time to be significantly higher.

While after the 1975 radical and massive land reform which took place all over the nation had changed the socio-political as well as socio-economic condition of the society and the land issues too. This radical land reform nationalizes all the land and the land resources such as the forest as a public property of all Ethiopian. Privately owned large agricultural as well as forest lands began to be distributed to the peasants who were formerly abounded land by the Feudal system. This redistribution of land had significantly increased agricultural lands that are the major reason why agricultural land was expanded particularly in the first period of the study (i.e. 1973 to 1986) and even in the later period.

At the same time, the private owned forest began to be distributed to the public that a significant level of forest cover change was observed in the first period as well as the second period of the study. Therefore, the March 1975 Land Reform of the government significantly had played for the land cover dynamics which took place in and around Menagesha Suba.

Market access for agricultural and forest products could also play major role in aggravating land cover dynamics. As it is mentioned in a key informant interview, Menagesha Suba unlike other forest areas in the country, it is one the nearest to the capital of the nation i.e. it is only 45 km far from Addis Ababa. So that high pressure is exerted by illegal forest resources consumers either for commercial timber production or domestic fuel wood consumption. As matter of fact, agricultural products from the area as well as forest products are highly demanded by the market in Addis Ababa. Moreover, there are also other emerging markets for agricultural products of the area i.e. the Sebeta and Holetta towns at the near distance from the forest. So that products from the area are

highly commercialize and demanded that farmers are increasingly in need of land for agriculture which aggravated the land cover change of the area.

As the national population is growing year by year, the demand for agricultural land and products obviously increased which played significant role in land cover dynamics of an area. The condition in the growth of the national population in Ethiopia has shown that it is growing at 2.6% per year which significantly demanded agricultural land and products tremendously. Therefore, the growth in the national population is also one of the most underlying causes that played in local condition of land use in Menagesha Suba. Even it is clearly shown on the satellite image analysis that the growing population after the years 1973 and 1986 has played a role in the cover change. This phenomenon of growing population as a cause of land cover dynamics was also supported by the majority of the sampled households in the socio-economic survey.

The trend in human settlement in and around Menagesha Suba showed that former rural Kebeles and farmers associations are changing into larger villages, towns and urban centers. These emerging villages, small towns and urban forms are highly attracting population and demanding agricultural products and energy sources which is mainly forest products in the form of fuel wood. In this regard, emerging village such Asgory (5km from the forest), emerging town Menagesha Koleb (10Km from the forest), speedily urbanized towns such as Sebeta and Holleta (25km from the forest) and highly urbanized city Addis Ababa are together demanding agricultural and forest products for consumption. The emerging villages and the urbanization process are not only seeking for products for consumption but also land resource for expansion. Therefore, both process are aggravating the land use and land cover dynamics in the study area.

4.3. Socio-Economic Impacts of Land Cover Changes in Menagesha Suba

This study of socio-economic impacts covers 10% of the total population living in five Kebeles in Menagesha Suba. The five Kebeles include Gararsu Sida, Nano Suba, Berefeta Lemefa, Berefeta Tokofa and Wecucha. Of which three are systematically selected for the purpose of this study. The selected Kebeles include Nano Suba (located inside the state forest); Garasu Sida (located far from the state forest) and Wechecha (located around and near the protected forest). The preceding sections provide the socio-

economic characteristics and the impact analysis of land cover changes of the sampled households.

4.3.1. Household History and Location

The household history is to mean that the year when the households were established. This study of land cover dynamics in Menagesha Suba considered two periods such as the period between 1973 and 1986 and the period between 1986 and 2007. Therefore, the households under this study are grouped to these periods to understand the land use history of the area.

Table 4.8. Periods of Households Established

S. No	Periods Households Established	Number of Households	Percentage Share
1	Between 1973 to 1986*	70	46.36
2	Between 1986 to 2007 **	81	53.64
	Total number of Households	**151**	**100**

Source: Own Survey

Note that:

* This period includes households established before 1973

** This period includes households established after 2007.

The result from the table indicated that 46.36 % of the households under the study were established in the period between 1973 and 1986; while 53.64% of the households were established after the 1986. The periods for the study are selected based on (i) the availability of the satellite images; (ii) the years are associated with the changes in the national condition such as the 1974 mass revolution and the 1987 change in national economy from command to mixed.

The sampled households are again grouped based on their relative location to the near by road and market. The road is the basic infrastructure facilitating the local economy while the market plays a role in activating all the economy including agriculture.

Table 4.9. Relative Location of Households to the Nearest Road and Market

S. No.	Distance Categories	HHs to the Nearest Road		HHs to the Nearest Market	
		No. of HHs	% share	No. of HHs	% Share
1	Below 5Km	102	67.55	100	66.23
2	5Km to 10Km	22	14.57	24	15.89
3	10Km to 15 Km	6	3.97	6	3.97
4	15Km to 20 Km	7	4.64	7	4.64
5	Above 20Km	14	9.27	14	9.27
	Total No. Households	**151**	**100**	**151**	**100**

Source: Own Survey

4.3.2. Family Size, Age and Sex and Marital Status of Households

The family size matters in households to stand firmly the impacts of environmental changes such as land use and land cover dynamics. It is also important in understanding of households' portfolio of their economic activity and their utilization of land and other natural resources.

Table 4.10. Family Size of Sample Households

S. No.	Family Size Categories	No. of Households	Percentage Share
1	1-2	8	5.29
2	3-5	61	40.39
3	6-10	76	50.34
4	>10	6	3.98
	Total Number of Households	**151**	**100**

Source: Own Survey

Fairly above half of the total population of the households (50.34%) have large family size with 6 and more number of people in a family while significant number of households (40.39% of the sampled households) have family size of 3 to 5. It is only few households of the population (5.29% of the sampled households) that have small family size. The result of the family size implies that there would be high dependence of the study population on land resources for agricultural purpose and other economic benefits. Following the sex, age and marriage characteristics of the household heads are depicted.

The age and sex are biologically ascribed characteristics that determine a number of socio-economic and socio-cultural phenomena in a society.

Table 4.11. Age and Sex Characteristics of Sampled Household Head

S. No.	Age and Sex Characteristics	No. of Households	Percentage Share
1	Age of Households Head		
	Below 25	8	5.29
	25-34	34	22.52
	35-44	42	27.82
	45-54	48	31.79
	55+	19	12.58
	Total Number of Households	**151**	**100**
2	Sex of Households Head		
	Male	145	96.03
	Female	6	3.97
	Total Number of Households	**151**	**100**

Source: Own Survey

The majority of the household heads age ranges between 25 and 54, which accounts for about 82.13% of the sampled households. It is only 5.29% and 12.58% are found in younger age below 25 and older age of above 55 respectively. This implies the economically active part of the population, which is highly dependent on the land resources for various purposes, comprises the population in the study area. High economically active population means, there would be high pressure on land and forest resources, which contributed for environmental changes such as land cover dynamics.

In terms of sex, the majority of the sampled households (96.03%) are male headed and only few (3.97%) of them are female headed households. The sex of the population also plays an important role in resource utilization particularly of land and forest. It is also important in understanding environmental responses among the sexes.

Marriage and marriage related issues are other important social phenomena that determine utilization of natural resources and response to the impact of land use and land cover changes. It is also an important social construction that the society give due regard in terms of land utilization. As households' forms family, they need more land resources which aggravated land use/land cover changes in local areas.

Table 4.12. Marital Status of Households Heads

S. No.	Marital Status of Households Heads	No. of Households	Percentage Share
1	Single	12	7.95
2	Married	136	90.07
3	Divorced	2	1.32
4	Widowed	1	0.66
	Total Number of Households	**151**	**100**

Source: Own Survey

In this regard, the majority (90.07%) of the sampled households is married and it is only 7.95% of the sampled households head is single and 1.32% and 0.66% are found to be divorced and widowed respectively.

4.3.3. Level of Education, Religious and Ethnic Composition of Households Heads

The level of education determines the level of knowledge/ understanding of using land and other resources. It is important in diversifying the portfolio of the households and withstand to changes in environmental phenomena as well.

Table 4.13. Education Characteristics of Households Heads

S. No.	Level of Education	No. of Households	% Share
1	Illiterate	81	53.64
2	Read and Write	56	37.09
3	Schooling	11	7.29
4	Graduate	3	1.99
	Total Number of Households	**151**	**100**

Source: Own Survey

Over half of the sampled households (53.64%) understudy is illiterate while 37.09% of them know how to read and write. It is only 1.99% of households who are graduates. The education characteristics of the population indicated that households' level of education determines their level of awareness of environmental phenomena, such as land use/land cover changes.

Religion is equally important social make up of a society. In any religion, society as well as individuals develops view and opinion towards using land and other natural resources. Similarly, ethnic composition also matters in developing a certain culture towards utilizing natural resources.

Table 4.14. Religious and Ethnic Characteristics of Households

S. No.	Religious and Ethnic Characteristics	No. of Households	Percentage Share
1	Religious Composition		
	Christian	150	99.34
	Muslim	1	0.66
	Total Number of Households	**151**	**100**
2	Ethnic Composition		
	Oromo	131	86.75
	Amhara	19	12.58
	Unidentified	1	0.66
	Total Number of Households	**151**	**100**

Source: Own Survey

Almost all the households (99.34%) are Christian with the dominant ethnic group Oromo nationality (86.75%) followed by the Amhara (12.58%).

4.3.4. Major Economic Activities and Land Ownership, Size and Type of Households

Economic activity of households is still an important part to know the interaction of the households with their local environment. With households engaged in primary economic activity such as agriculture, forestry, fishery and others, there is high and direct interaction with the natural environment. While society in secondary and tertiary economic activities is still highly but indirectly interact with the local environment. This interaction of households with the local environment determines the level of changes in the environment in the form of land uses and land covers.

Table 4.15. Major Economic Activity of Households

S. No.	Major Economic Activities of Households	Number of HHs	Percentage Share
1	Farmers	146	96.69
2	Civil Servants	2	1.33
3	Merchants	2	1.33
4	Other Types	1	0.66
	Total number of households	**151**	**100**

Source: Own Survey

Fairly all the sampled population of the households (96.69%) is engaged in farming sector. The rest are engaged in civil serves (1.33%) and trading (1.33%). As farming is a major economic activity of the majority of the households, land is an important natural resource where they depend on it for their livelihoods. Therefore, it is important to know the nature of land ownership, size and type of land to understand the economic activities of the households and their interaction with other natural resources such as the forest.

Table 4.16. Land Ownership, Size and Type of Households

S.No.	Land Ownership Characteristics	No. of Households	Percent Share
1	Do you own land?		
	Yes	134	88.74
	No	17	11.26
	Total Number of households	**151**	**100**
2	Types of Land Ownership		
	Own land	109	74.66
	Rented Land	6	4.11
	Sharecropping	2	1.37
	Inheritance	2	1.37
	Gift	1	0.69
	Combination of either Rent, Sharecropping, inheritance or gift	26	17.81
	Total Number of Households	**146**	**100**
3	Size of the Land		
	Less than a hectare	25	17.12
	1ha to 1.99ha	46	31.51
	2ha to 2.99ha	27	18.49
	3ha to 3.99ha	24	16.44
	4ha to 4.99ha	18	12.33
	Above 5ha	6	4.11
	Total Number of Households	**146**	**100**

Above three-fourth of the sampled households (88.74%) owned land in different forms such as rented, inherited, sharecropping and other. While 11.26% of the sampled population doesn't own land for agricultural purpose. Again nearly three-fourth of the

sampled population i.e. 74.66% have land of their own and the rest have land either in the form of rent(4.11%), sharecropping(1.37%), inheritance(1.37%) or gift(0.69%).

In terms of land size 17.12% and 31.51% of the sampled population have land size less than a hectare and two respectively. This implies how much the land for agriculture is fragmented and too small. While it is only a smaller portion of the sampled population i.e. 12.33% and 4.11% of them have land size greater than 4 hectare and 5 hectare respectively.

4.3.5. Land and Agriculture Characteristics

In this section of the paper, the nature of the land and its location in relation to Menagesha Suba state forest would be discussed and the type of agriculture would be dealt. Moreover, households past land use trend for agriculture and future expectation of their farm size would also be discussed in detail.

Farmers may own different types of land among others farm land, grazing land, fallow, forest and communal lands. These forms of lands provide households with different services such as farming, grazing and forest product extractions. These lands of the households again may be located inside, near or far from the protected state forest of Menagesha Suba. The location in relation to the protected forest area also matters the interaction of the households with the forest resources.

Table4.17. Types of Land and its Relative Location with the Protected State Forest Menagesha Suba

S.No.	Types Farm Land	Inside the Forest		Around the Forest		Far From the Forest	
		No. of HHs	% Share	No. of HHs	% Share	No. of HHs	% Share
1	Farm Land	-	-	55	37.67	89	60.96
2	Grazing Land	-	-	45	30.82	70	47.95
3	Fallow Land	1		14	9.59	22	15.07
4	Forest Land	-	-	2	1.37	9	6.16
5	Communal Land	-	-	1	0.69	19	13.01

Source: Own Survey

The majority of the sampled households have lands either around or far from the Menagesha Suba State Forest. For instance, only 37.67% of the households have farm land around the forest, while the rest 60.96% of the households have farm land far from

the protected forest area. Similar conditions are observed for the grazing, fallow, forest and communal lands of the sampled households.

The major type of agriculture practiced in the area includes crop production, animal husbandry and agro-forestry. The mixed farming i.e. crop production and animal rearing together takes the largest share with 72.60% of the households engaged in it; while 21.92% of the sampled households are engaged in agro-forestry i.e. combining agriculture and forestry in their farming land.

Table 4.18. Types of Agriculture by Households

S. No.	Forms of Agriculture	No. of Households	Percent Share
1	Mixed Farming	106	72.60
	Crop Production		
	Animal Husbandry		
2	Agro-forestry	32	21.92
	Farming		
	Forestry		
3	Other Types	5	3.43
4	Non-response	3	2.05
	Total Number of Households	**146**	**100**

Source: Own Survey

In terms of the period that agricultural land owned by the households and the expansion of agricultural practice in the area, households were requested to the period when they owned their agricultural lands and the results of their response are depicted in the table below.

Table 4.19. Length of Agricultural Land Ownership by Households

S.No	Periods when the agricultural land was owned by the Households	No. of the Households	Percent Share
1	Between 1973 to 1986	62	42.47
2	Between 1986 to 2007	80	57.79
3	Non Response	4	2.74
	Total Number of Households	**146**	**100**

Source: own Survey

Less than half of the sampled households i.e. 42.47% of them owned either form of land before the year 1986. While the over half of the sampled households' i.e.57.79% of them owned their land after 1986. Though agricultural land expansion was started in the earlier period of the study (i.e. b/n 1973 and 1986), as reported by well over half of the sampled households, the later period (i.e. b/n 1986 and 2007) again witnessed relatively high expansion of agricultural land in the area. These responses of the sampled households' conceded with the results of the satellite imagery analysis for the period under study.

In order to understand whether the size of the agricultural land has increased, decreased or remain constant at the household level, the analysis of the households response is presented below.

Table 4.20. Trends in Land Size of Households

S. No.	Trends in Land Size of Households over the year	No. of Households	Percentage Share
1	Decreased Land Size	62	42.47
2	Increased Land Size	34	23.29
3	Land size Remain Constant	44	30.14
4	Non response	6	4.10
	Total Number of Households	146	100

This study covers the period when the households established their home and begun agriculture as their major economic activity. Accordingly, 42.47% of the sampled households responded that their agricultural land size have been decreased over the years. This might be due to the fact that they shared their land to their sons and daughters over the years.

While 30.14% of the households surveyed responded that their agricultural land size remains constant with out showing any form of changes. On the contrary, 23.29% of the sampled households responded that the size of the agricultural land they owned has shown increasement over the year. For this group of the households, further questions were presented to respond by how much their land size increased and where does it comes from. The result of their response is given below.

Table 4.21. Household Response on their Increased Land Size

S. No.	Survey Questions Presented	No. of Households	Percent Share
1	To what extent your land is increased?		
	By 0.25ha	23	67.65
	By 0.5ha	1	2.94
	By 0.75ha	6	17.65
	By greater than 1 ha	2	5.88
	Non Response	2	5.88
	Total Number of Households	**34**	**100**
2	Where does it come from?		
	Purchased from other farmers	25	73.53
	Distributed by the government	3	8.82
	Expanding to the Forest area	1	2.94
	Rent and sharecropping	3	8.82
	Gift and Inheritance	2	5.88
	Total Number of Households	**34**	**100**

Significantly above half of the interviewees of the sampled households which accounts for 67.65% responded that their agricultural land increased by 0.25ha. While it was only few (2households) of them that accounts for 5.88% increased their agricultural land to well over a hectare. The majority again responded that they have increased their land through buying from other farmers, sharecropping and rent agricultural lands.

In order to understand the future expectation of households of their agricultural land, and the future land use and land cover process in the area, further research questions were presented to the sampled households. The result of their response is shown below.

Table 4.22. Households Response on their Future Access of Agricultural Land

s.no.	Survey Questions Presented	No. of Households	Percent Share
1	Is your land enough to lead your livelihood?		
	Yes, it is enough.	15	10.27
	No, it is not enough	131	89.73
	Total Number of Households	**146**	**100**
2	(If no), Do you want to increase your land size?		
	Yes, I do want.	119	81.51
	No, I don't want	13	8.90
	Non response	14	9.59
	Total number of households	**146**	**100**

Source: own Survey

Among the sampled households, 89.73% of them considered that the land they have is not enough to lead their livelihoods. While 10.27% of the households' responded that it is enough. Similarly, 81.51% of the sampled households want to increase their farm land through various means such as purchased from others, rent, sharecropping, gift from others or their relatives, and through distribution by the government are among others.

4.3.6. Alternative Mechanisms of Livelihoods

In rural economy, agriculture is not the only means to lead ones livelihoods. Rural dwellers diversify the mechanisms of earning income to lead their family and member of their households. In doing so, households seek for alternative mechanisms of livelihood means to support their family members. The following section deals with the various mechanisms used by the sampled households in Menagesha Suba area to sustain their livelihoods. The section also depicts how the peoples are interacting with the protected forest area to fulfill their livelihood demands.

Table 4.23. Major Alternatives Mechanisms by the Households to Lead their Livelihoods

S. No.	Off-Farm Activities	From the Protected Forest area		Outside the Protected Forest area	
		No. of HHs	% Share	No. of HHs	% Share
1	Grazing	19	12.58	27	17.88
2	Beehives and Food	27	17.88	18	11.92
3	Wildlife Products	15	9.93	2	1.33
4	Timber Products	29	19.21	7	4.64
5	Charcoal Production	58	38.41	36	23.84
6	Fuel wood Collection	94	62.25	41	27.15
7	House Furniture Production	44	29.13	6	3.97
8	Other Means	5	3.41	4	2.64

The sampled households taken in Menagesha Suba have engaged in various activities as an off-farm activity. Grazing, beehives, wildlife products, and timber products are among others forms of alternative activities. With 62.25% households interacted with the protected Menagesha Suba state forest for fire (fuel) wood collection. Similarly, charcoal production with 38.41% of the sampled households shares the second largest off-farm activity. Households are also engaged in beehives (17.88% of the sampled households), timber production (19.21% of the households) and house furniture making (29.13%) from

the protected forest area. So that fuel wood collection followed by charcoal production is the dominate livelihood strategy of the local people from the Menagesha Suba State Forest.

By the same token, fire wood collection (27.15% of the households), charcoal production (23.84% of the sampled households) and beehives (17.88% of the sampled households) are the major off-farm activities of households even outside the protected forest area. While wildlife products and other means with 9.93% and 3.31% respectively contributed least in livelihoods activities of the local people both from the protected forest area and outside the protected forest area. Such diversification of livelihoods activities by the local people would enable them to tackle environmental challenges such as land use/ land cover changes. Similarly, it would enable villagers to find adaptive mechanisms to such challenges.

In order to understand, when did households begin such off-farm activities as a means of livelihood is an important thing to know the strategies developed by the local people over the study periods.

Table 4, 24. Length of Off-Farm Activities Started by the Households

S. No.	Periods when off-farm activity started by the HHs	No. of Households	Percent Share
1	Between 1973 to 1986	39	25.83
2	Between 1986 to 2007	103	68.21
3	Non Response	9	5.96
	Total Number of Households	**151**	**100**

As clearly indicated in the table above, the later period i.e.1986 to 2007 has shown in households' activities of diversifying their livelihoods portfolio. This can be due to the fact that the later period has shown a significant level of land cover changes that households need to tackle such environmental phenomena through diversifying their portfolio. The sampled households identified that the major obstacles to on-set alternative mechanisms of livelihoods are lack of capital, lack of enough knowledge and lack of well developed infrastructure area.

Table 4.25. Response of Households to Problem Related to Capital

Lack of Capital to Start or to expand or maintain business		No. of Households	Percent Share
Options	Yes	141	93.38
	No	3	1.99
	Non Response	7	4.64
	Total Number of Households	**151**	**100**
Ranks	Most Hindering	110	72.85
	Hindering	34	22.52
	Less Hindering	2	1.33
	Non Response	5	3.30
	Total Number of Households	**151**	**100**

With 93.38% of the sampled households lack capital to start or to expand other forms of economic activity is a major problem to their households. 72.85% of them considered capital as the most hindering factors while only 1.33% of them considered it as less hindering to start other off-farm activities.

Table 4.26. Response of Households to Problems Hindering Off-Farm Activities

Lack of enough Knowledge of Off-Farm Activities		No. of Households	Percent Share
Options	Yes	80	52.98
	No	71	47.02
	Non Response	-	-
	Total Number of Households	**151**	**100**
Ranks	Most Hindering	26	17.22
	Hindering	44	29.14
	Less Hindering	10	6.62
	Non Response	77	47.02
	Total Number of Households	**151**	**100**

52.98% of the sampled households considered lack of enough knowledge as a problem to off-farm activities. While the remaining 47.02% of them considered lack of enough knowledge is not a problem. With 17.22% and 29.14% of the households responded that lack of enough knowledge as most hindering and hindering factor to start off-farm activities respectively. While it is only 6.62% of them considered lack of knowledge as less hindering.

Table 4.27. Response of Households to Problems Hindering Off-Farm Activities

Lack of Well developed infrastructure of Road		No. of Households	Percent Share
Options	Yes	101	66.89
	No	46	30.46
	Non Response	4	2.65
	Total Number of Households	**151**	**100**
Ranks	Most Hindering	60	39.74
	Hindering	33	21.85
	Less Hindering	1	0.66
	Non Response	57	37.75
	Total Number of Households	**151**	**100**

Similarly, 66.89% of the sample households considered lack of well developed infrastructure of road as an obstacle to off-farm activities. With 39.74% of them considered lack of infrastructure as the most hindering while 21.85% as hindering to off-farm activities.

4.3.7. Household Survey on Land and Forest Cover Changes in Menagesha Suba

This section deals with the importance of forest for households understudy and forest related issues including access of households to the forest resources. Besides, it considers the households reasons for the change in forest and land covers in Menagesha Suba with the emphasis of factors driving the land cover process.

Forest resources have a multitude of importance to human society among others extraction of construction wood, furniture, carving and fuel wood are the major ones. Non-timber products such as honey, medical plants, forest foods, spices and others are also important values of forest. Moreover, watershed services, environmental values and Socio-cultural values of forest are worth here to mention. In this part of the study, households are presented with questions that in what forms are using the forest resource to support their livelihood activities.

Table 4.28. Values of Forest in the Form of Timber Products for Households

S. No.	Timber Products of forest	Most Important		Important		Less Important	
		No. of HHs	% share	No. of HHs	% Share	No. of HHs	% Share
1	Wood for Construction	75	49.67	46	30.46	3	1.99
2	House Furniture	59	39.07	50	33.11	7	4.64
3	Carvings	30	19.87	24	15.89	5	3.31
4	Agricultural Implements	76	50.33	39	25.83	4	2.65
5	Fuel Wood	49	32.45	15	9.93	2	1.33

Fairly half of the households responded that they use the forest resources for construction materials (49.97%), and agricultural implements (50.33%). While the rest use the forest resources for house furniture (39.07%) and fuel wood (32.45%). They also considered these services of the forest as most important to their household. 33.11% of the households for house furniture, 30.36% for construction and 25.83% for agricultural implements considered forest as important for their livelihoods.

Table 4.29. Non-Timber Values of Forest for Households

S. No.	Non-Timber and other values of forest	Most Important		Important		Less Important	
		No. of HHs	% share	No. of HHs	% Share	No. of HHs	% Share
I	Non-Timber Values						
1	Production of Honey	36	23.84	22	14.57	15	9.9
2	Medicinal Plants	45	29.80	26	17.22	16	10.60
3	Production of Food	10	6.62	2	1.33	2	1.33
4	Production of Chat/ Coffee	4	2.65	1	0.66	-	-
II	Other Values of forest						
1	Grazing Grass	59	39.07	10	6.62	2	1.33
2	Fodder Services	30	19.87	7	4.64	2	1.33
3	Water Services	18	11.92	30	19.87	11	7.29

Source: Own Survey

29.80% of the households use the forest for medicinal plants, 23.84% use as production of honey and 39.07% use for grazing grass considered as most important for their livelihoods. Others are using the forest production of food, cash crop such as chat, fodder and it also provides water services to their family.

Table 4.30. Environmental and Socio-Cultural Values of Forest for Households

S. No.	Environmental and Socio-Cultural Values of forest	Most Important		Important		Less Important	
		No. of HHs	% share	No. of HHs	% Share	No. of HHs	% Share
I	Environmental services						
1	Regulating water Supply	72	47.68	38	25.17	1	0.66
2	Stabilizing Climate	132	87.42	8	5.30	-	-
4	Agricultural Implements	138	91.39	8	5.30	-	-
5	Shade	138	91.39	4	2.65	-	-
II	Socio-Cultural Values						
1	Beauty of the area	136	90.07	5	3.31	-	-
2	Future use for Children	120	79.47	10	6.62	1	0.66
3	Sacred Values of forest	94	62.25	17	11.26	1	0.66

Own Survey

91.39% and 87.42% of the households responded that maintaining soil fertility, shade and stabilizing climate as most important value of environmental services of forest resources respectively. While, 90.07% and 79.47% of the households considered that beauty of the area and future use for children respectively as socio-cultural values of forest. Forest has also sacred values to households accounting 62.25%.

Access to natural resources such as forest is one of the basic livelihood portfolios in rural areas. Such access to resources is important in diversifying the livelihood activities of local people. It has also relevance for households to share and to use resources with others and to protect and save guard as the same time. The following table presents access right to the forest for sampled households in Menagesha Suba.

Table 4.31. Households Access to Forest Resources

S.no.	Resource Access Related Questions	No. of Households	Percent Share
1	Do you have access to the forest resources?		
	Yes	80	52.98
	No	60	39.74
	Non Response	11	7.29
	Total Number of Households	**151**	**100**
2	How do you get the right to use the forest resources?		
	Through the forest resource distribution	40	26.49
	Sharing with Relatives	10	6.62
	Purchased from Others	27	17.88
	Inherited from parents	2	1.33
	Other means	14	9.27
	Non response	58	38.41
	Total Number of Households	**151**	**100**

Source: Own survey

52.98% of the households responded that they have access to use resources from the forest while the rest responded that they don't have that access at all. Majority of them (40% of the households) responded that they have got the access through forest resources distribution. Others have access to the forest through sharing with relatives, purchased from others, inherited from parents and other means.

In order to understand households understanding of their environmental change such as forest and land cover changes, they are asked to respond their experience of land use and land cover pattern changes of their local area since they have established their households. Such survey is important to know communities perception of environmental phenomena.

Table 4.32. Households Opinion to Land Cover Change in Menagesha Suba

S. no.	How do you view the level of Land Cover Change in Menagesha Suba since you have established your households?	Number of Households	Percent Share
1	Very severe	113	74.83
2	Severe	12	7.95
3	Minor	19	12.58
4	No problem at all	-	-
5	Not certain	6	3.97
6	Non response	1	0.66
	Total number of Households	**151**	**100**

Own Survey

Nearly three-fourth of the sampled households (74.83%) responded that the land cover changes observed in Menagesha Suba over the years is one of the most severe in the area. Further research questions were presented to households to explore the forest cover change as well as their opinion on the extent of the land cover change.

Table 4.33. Households Opinion on Forest Cover Change in Menagesha Suba

S. no.	**Survey Questions presented to households**	**No of households**	**Percent share**
1	Have you observed a decrease in size of the forest cover		
	Yes	145	96.03
	No	6	3.97
	Total households responded	**151**	**100**
2	What do you think about the extent of the decreasing cover of the forest?		
	A great deal	107	70.86
	Considerable	25	16.56
	Few	9	5.96
	Not certain	1	0.66
	Non response	9	5.96
	Total number of households	**151**	**100**

With 96.03 % of the whole sampled households' replied that forest cover has been decreased in size over the years. 70.86% of the households again responded that there is a great deal of land cover changes observed in their area.

4.3.8. Households Reasons for Land Cover Change

The research further extended to investigate the reasons and the causes for this massive land cover changes in general and the forest cover changes in particular. Households again tried to rank the major drivers of the land cover changes in their area. The following section presents the causes of land and forest cover changes based on the households perspectives.

Expansion of agricultural land for the purpose of crop production is identified as one of the major causes of land cover dynamics in Menagesha Suba by households under study.

Table 4.34. Households Response for the Cause of land Cover Dynamics

s. no.	Reason for Land Cover Dynamics	No. Households	Percent Share
1	Agricultural Land Expansion		
Options	Yes	136	90.07
	No	9	5.96
	Non response	6	3.97
	Total Number of Households	**151**	**100**
Ranks	Tremendously	98	64.90
	Fairly	36	23.84
	Little	1	0.66
	Non Response	16	10.59
	Total Number of households	**151**	**100**

With 90.07% of the sampled households' response agricultural land expansion was one of the major causes of land cover dynamics in their area. This response of the households coincides with the results of the satellite image analysis and the reasons forwarded by the key informant interviews. 64.90 % of the households considered that agricultural land expansion is tremendously contributing for the land use/ land cover changes. While only 23.84% of them think that agricultural land expansion fairly contributed for the changes.

In relation to the causes of land cover dynamics in Menagesha Suba, households again mentioned that improper land utilization together with aggressive invasion of land in the area are also another contributing factors for the cover changes.

Table 4.35. Households Response for the Cause of land Cover Dynamics

s. no.	Reason for Land Cover Dynamics	No. Households	Percent Share
1	Improper Utilization of Land		
Options	Yes	111	73.51
	No	14	9.27
	Non response	26	17.22
	Total Number of Households	**151**	**100**
Ranks	Tremendously	63	41.72
	Fairly	32	21.20
	Little	14	9.27
	Non Response	42	27.82
	Total Number of households	**151**	**100**
2	Aggressive Invasion of land		
Options	Yes	84	55.63
	No	24	15.89
	Non Response	43	28.48
	Total number of Households	**151**	**100**
Ranks	Tremendously	70	46.36
	Fairly	13	8.61
	Little	4	2.65
	Non Response	64	42.8
	Total Number of Households	**151**	**100**

Nearly three-fourth of the households (73.51 %) responded that improper land utilization by local people in the area have resulted in land cover changes of Menagesha Suba of which 41.72% of them considered the land utilization in Menagesha Suba is tremendously improper while 21. 20% of them are considered as land is fairly utilized. In terms of aggressive invasion of land in the area, 46.36% of them considered it as tremendously contributing for the land cover changes in Menagesha Suba. It is only 8.61% of the households who considered aggressive invasion of land contributed fairly for the changes.

The expanding human settlement and the growing population together are considered by the households as the most contributing factor for the land cover changes. Particularly households believed that the growing population is the most important factor for the whole ecological process in the area and the land cover changes in particular.

Table 4.36. Households Response for the Cause of land Cover Dynamics

s. no.	Reason for Land Cover Dynamics	No. Households	Percent Share
1	Increased Human Settlement		
Options	Yes	74	49.00
	No	33	21.85
	Non response	44	29.15
	Total Number of Households	**151**	**100**
Ranks	Tremendously	59	39.07
	Fairly	10	6.62
	Little	3	1.99
	Non Response	79	52.31
	Total Number of households	**151**	**100**
2	Increased in human population pressure		
Options	Yes	148	98.01
	No	-	-
	Non Response	3	1.99
	Total number of Households	**151**	**100**
Ranks	Tremendously	114	75.50
	Fairly	36	23.84
	Little	1	0.66
	Non Response	-	-
	Total Number of Households	**151**	**100**

Nearly half (49%) of the households considered that human settlement expansion as one of the causes of land cover change in the area. 39.07% response human settlement expansion was tremendously contributing for the change.

Compared with the other factors, human population increment contributes a lot for the land cover dynamics. Accordingly, with almost all respondents (98.01%) of the sampled

households' reported that human population growth is highly contributing for the cover change in Menagesha Suba. Still, three-fourth (75.50%) of the sampled households considered that human population pressure is tremendously contributing for the land cover change in Menagesh Suba.

Agricultural technologies which enhanced productivity of the sector contributes to land cover dynamics in the area. Households responded that agricultural technologies and improper government policies contributed least as drivers of land cover changes in Menagesha Suba.

Table 4.37. Households Response for the Cause of land Cover Dynamics

S. NO.	REASON FOR LAND COVER DYNAMICS	NO. HOUSEHOLDS	PERCENT SHARE
1	Agricultural technologies		
Options	Yes	42	27.81
	No	34	22.52
	Non response	75	49.67
	Total Number of Households	**151**	**100**
Ranks	Tremendously	24	15.89
	Fairly	18	11.92
	Little	1	0.66
	Non Response	108	71.52
	Total Number of households	**151**	**100**
2	Improper government polices		
Options	Yes	23	15.23
	No	49	32.45
	Non Response	79	52.32
	Total number of Households	**151**	**100**
Ranks	Tremendously	10	6.62
	Fairly	8	5.30
	Little	11	7.29
	Non Response	122	80.79
	Total Number of Households	**151**	**100**

It is only 27.81 % of the households who responded that agricultural technologies have contributed to land cover dynamics. With 15.89% of the household responded that agricultural technologies contributed tremendously for land cover changes.

About 15% of the households responded that improper government policies of land have resulted in land cover dynamics. Of which, it is only 6.62% of the sampled households considered improper land policy tremendously contributed for the land cover dynamics in Menagesha Suba.

Table 4.38. Households Response for the Cause of land Cover Dynamics

s. no.	Reason for Land Cover Dynamics	No. Households	Percent Share
1	Aggressive Deforestation of the forest		
Options	Yes	140	92.72
	No	2	1.33
	Non response	9	5.96
	Total Number of Households	**151**	**100**
Ranks	Tremendously	109	72.19
	Fairly	25	16.57
	Little	1	0.66
	Non Response	16	10.59
	Total Number of households	**151**	**100**

Majority of the households (140 of the sample) responded that aggressive deforestation of the forest area as a major driver of land cover dynamics in Menagesha Suba. With 109 of the households' response the condition was tremendous. The households further gave their opinion on individual and public actions on deforestation.

Table 4.39. Households Response for the Cause of land Cover Dynamics

s. no.	Reason for Land Cover Dynamics	No. Households	Percent Share
2	Individual and Public action on deforestation		
Options	Yes	92	60.93
	No	2	1.33
	Non response	52	34.44
	Total Number of Households	**151**	**100**
Ranks	Tremendously	36	23.84
	Fairly	28	18.54
	Little	22	14.57
	Non Response	65	43.05
	Total Number of households	**151**	**100**

With 60.93 % of the households, individual and public actions together have contributed for deforestation in Menagesha Suba. This action was tremendous with response rate of 23.84% of the households. So that individual and public actions on the forest resources was still another major driver of land cover dynamics in Menagesha Suba. This reasons of the households are also accepted by professionals who participated in key informant interview.

Households were presented with survey questions to forward their opinion on which period they have experienced high land cover change in Menagesha Suba. The following table summarizes their response.

Table 4.40. Household Response of their Experience of High Land Cover Dynamics.

S. No.	Periods when high land cover dynamics experienced by HHs	No. of Households	Percent Share
1	Between 1973 to 1986	38	25.17
2	Between 1986 to 2007	108	71.52
3	Non Response	5	3.31
	Total Number of Households	**151**	**100**

The majority of the household (108 of them) responded that they have experienced relatively high level of land cover dynamics in Menagesha Suba on the year between 1986 and 2007. While 25.17% of the sampled households responded that they have begun to experience land and forest cover changes even in the first period of the study i.e. the year between 1973 and 1986.

4.3.9. Land Cover Changes Impacts on Households

Households are again presented with survey questions to provide their experiences of the impact of land use and land cover changes in Menagesha Suba on their livelihood strategies as well as on the community as a whole. In fact, the sampled households have identified a number of impacts of land cover dynamics on themselves and on their surrounding environment. This section brings the impacts as mentioned by the households.

Agricultural land expansion has a cursed blessing impact on livelihood strategies of local people and their environs. On the one hand as agricultural land is expanded it contributes

in an increasing productivity of crop and livestock which is a blessing for households in local area. Hence it improves the income of the households as the same time the living standard of their family.

On the other hand as agricultural land is expanded it also creates damage to the biodiversity of the local environment, spread of diseases among human beings and increased hazard of flooding in local areas. This way expansion of agricultural land is a curse to households hence it threatened their livelihoods. Households under this study identified that one of the impact of agricultural land expansion to themselves and to their community is in terms of increased agricultural productivity and improved livestock productivity as well.

Table 4.41. Household Response on Impact of Land Cover Dynamics

s. no.	**Impact observed by Households**	**No. Households**	**Percent Share**
1	Increased in agricultural productivity		
Options	Yes	90	59.60
	No	26	17.22
	Non response	35	23.18
	Total Number of Households	**151**	**100**
Ranks	A great deal	53	58.89
	Considerable	35	38.89
	Few	1	1.11
	Non Response	1	1.11
	Total Number of households	**151**	**100**
2	Improved in livestock productivity		
Options	Yes	68	45.03
	No	35	23.18
	Non Response	48	31.79
	Total number of Households	**90**	**100**
Ranks	A great deal	27	39.71
	Considerable	25	36.76
	Few	16	23.53
	Non Response	-	-
	Total Number of Households	**68**	**100**

59.60% and 45.03% of the households responded that agricultural land expansion in the area have increased their agricultural productivity and have improved their livestock productivity over the study years respectively. Of whom 58.89% and 39.71% of the sampled households considered that both agricultural and livestock productivity have increased and improved a great deal respectively. Therefore, the agricultural land expansions in the area have significantly contributed in improvement of the framers productivity and in turn on their livelihoods. On the contrary, the expansion of the agricultural land has also impacted households through spread of diseases, increased hazard of flood and loss of biodiversity. Households identified these as a negative impact of farm land expansion in their area.

Table 4.42. Household Response on the Impacts of Land Cover Dynamics

s. no.	Impact observed by Households	No. Households	Percent Share
1	Spread of diseases		
Options	Yes	47	31.12
	No	48	31.79
	Non response	56	37.09
	Total Number of Households	**151**	**100**
Ranks	A great deal	16	34.04
	Considerable	16	34.04
	Few	15	31.92
	Non Response	-	-
	Total Number of households	**47**	**100**
2	Increased hazard of floods		
Options	Yes	140	92.72
	No	6	3.97
	Non Response	5	3.31
	Total number of Households	**151**	**100**
Ranks	A great deal	134	95.71
	Considerable	5	3.57
	Few	-	-
	Non Response	1	0.72
	Total Number of Households	**140**	**100**

3	Loss of Biodiversity		
Options	Yes	64	42.38
	No	16	10.60
	Non response	71	47.02
	Total Number of Households	**151**	**100**
Ranks	A great deal	41	64.06
	Considerable	13	20.31
	Few	10	15.63
	Non response	-	-
	Total Number of households	**64**	**100**

Own Survey

Households under study identified that spread of diseases, loss of biodiversity and hazard of flood as the impacts of agricultural land expansion. Of which, with 92.72% of the sampled households increased hazard of floods is a leading impact associated with farm land expansion. Of whom, 95.71% of the sampled household's response the increased hazard of flood is a great deal over the study period.

In terms of loss of biodiversity, it is only 42.38% of the sampled households responded that agricultural land expansion has impact on it. While of whom, 64.06% of the sampled households considered the loss are a great deal among the biodiversity in their area.

Another impact on the households is aroused from the changes in cover of the forest and the grazing land. These impacts can be explained in terms of reduction in off-farm incomes, change in growing season, lack of grazing land, diminished in forest resources and changes in traditional life styles of the local people. Households were provides with these options to forward their opinion that which alternatives have impacted their livelihoods as well as their community.

Table 4.43. Household Response on the Impacts of Land Cover Dynamics

s. no.	Impact observed by Households	No. Households	Percent Share
1	Reduction in off-farm incomes		
Options	Yes	95	62.25
	No	9	5.96
	Non response	48	31.79
	Total Number of Households	**151**	**100**
Ranks	A great deal	56	59.57
	Considerable	29	30.85
	Few	8	8.52
	Non Response	1	1.06
	Total Number of households	**95**	**100**
2	Lack of grazing lands		
Options	Yes	111	73.51
	No	26	17.22
	Non Response	14	9.27
	Total number of Households	**151**	**100**
Ranks	A great deal	91	81.98
	Considerable	17	18.68
	Few	1	1.10
	Non Response	2	2.20
	Total Number of Households	**111**	**100**
3	Diminished resources of the forest		
Options	Yes	107	70.86
	No	30	19.87
	Non response	14	9.27
	Total Number of Households	**151**	**100**
Ranks	A great deal	84	78.51
	Considerable	18	16.82
	Few	2	1.87
	Non response	3	2.80
	Total Number of households	**107**	**100**

4	Loss of Traditional Life Style		
Options	Yes	36	23.84
	No	10	6.62
	Non response	105	69.54
	Total number of households	**151**	**100**
Ranks	A great deal	30	83.34
	Considerable	3	8.33
	Few	3	8.33
	Non response	-	-
	Total number of Households	**36**	**100**

The change in forest and grazing land cover reduced the off-farm income earned by households in the study area over the years. 62.25% of the sampled households reported that their income from the forest and grazing land has been decreased over the study period. This is mainly due to the fact that forest and grass areas were changed in to other forms of land uses particularly of agriculture. This is also clearly shown in the result of the image analysis. Equally important is the decreased in size of grazing land in Menagesha Suba due to the cover change. Again 73.51% of the sampled households reported that grazing land declined in size over the years in their area.

In terms of forest resources, 70.86% of the sampled households reported that there is a diminishing trend in the forest resources. The diminished in grazing land and forest resources have its own impact on the livelihoods of the households concerned. 23.84%of the sampled households again reported that there is a loss in traditional life style of the local people due to the land cover dynamics which took place over the years.

Expansion in human settlement particularly urban growth has an impact to the households any many forms. Among others increased access to food, water and other social services, increased opportunities to social and economic services, increased competition for financial resources and increased condition of respiratory and digestives diseases together with increased sense of individuality are worthy to be mentioned here.

Table 4.44. Household Response on the Impacts of Land Cover Dynamics

s. no.	Impact observed by Households	No. of Households	Percent Share
1	Increased access to food, water and other social services		
Options	Yes	43	28.48
	No	6	3.97
	Non response	102	67.55
	Total Number of Households	**151**	**100**
Ranks	A great deal	40	81.63
	Considerable	7	14.29
	Few	-	-
	Non Response	2	4.08
	Total Number of households	**49**	**100**
2	Increased Opportunity of Social, and economic Services		
Options	Yes	68	45.04
	No	22	14.56
	Non Response	61	40.30
	Total number of Households	**151**	**100**
Ranks	A great deal	56	82.35
	Considerable	12	17.65
	Few	-	-
	Non Response		
	Total Number of Households	**68**	**100**
3	Increased Competition for Financial Resources		
Options	Yes	108	71.52
	No	5	3.31
	Non response	38	25.17
	Total Number of Households	**151**	**100**
Ranks	A great deal	76	70.37
	Considerable	21	19.44
	Few	6	5.56
	Non response	5	4.63
	Total Number of households	**108**	**100**

4	Growing Sense of individuality		
Options	Yes	121	80.13
	No	12	7.95
	Non response	18	19.92
	Total number of households	**151**	**100**
Ranks	A great deal	56	46.28
	Considerable	18	14.88
	Few	3	2.48
	Non response	44	36.36
	Total number of Households	**121**	**100**

Expansions in human settlement have a number of impacts to the local people either positively or negatively. 28.48% of the households reported that they have experienced the increased access for food, water services and other social infrastructure as a result of the human settlement expansion in their area. Of whom 81.63% of them reported the increased access to food, water and other social services is a great deal.

In terms of opportunities for social and economic services, 45.04% of the sampled households reported that the opportunities for social and economic services have been increased during the study period. Of whom 82.35% considered that the opportunity to these services increased a great deal.

With high response rate of 71.52% of the sampled households reported that they have experienced increased competition for financial resources. Similarly 70.37% of them considered that the competition for the financial resources was a great deal while it is only 19.44% of the households reported the competition is considerable.

As it is formerly stated in forest and grazing land cover change, local people are changing their traditional life style in the study area. Similarly, due to expansion in human settlement again, there is a growing condition of sense of individuality according to the report from the survey. In this regard, 80.13% of the households responded that they have experienced a growing condition of sense of individuality as a result of expansion of settlement in their area. Of whom 46.28% of them considered the condition are a great deal while it is only 14.88% considered the condition is considerable.

Chapter Five

5. Conclusion and Recommendations

This chapter provides the conclusion part which includes points to be concluded at the end of this research process. The chapter also gives space for recommendations to be done in the future to draw more concrete information on the impact of land cover changes on human livelihoods.

5.1 Conclusion

The land cover change detection analysis coupled with key informant and socio-economic survey in the area clearly indicated that there is land cover dynamics in Menagesha over the past 30 to 40 years. In the conclusion, the forest cover tremendously decreased from the original 15,385 ha in 1973 to 3542ha in 2007 which is 1/4.3times the original forest cover in the area. This decline in forest cover has implied a lot of things in terms of the degradation of the local environment, the lose of local biodiversity, the switch in local people livelihood strategies in many forms. This, in turn, has also changed the ecological base of the area from forest base in the base year to agriculture base ecology in the later years of the study.

Similarly, the grazing and open land in the study area declines over the year and changed into other forms of land use particularly of agriculture. This shift of the grazing and open land into agriculture again has played a major role in the land cover dynamics of the area and it switches the livelihood condition of the local people.

On the contrary, agricultural land in the area is greatly increased from 3949ha in the year 1973 to 21570ha in 2007 which is five times the original. As explained and reported by the local people, this increment in agricultural land in the area has both negative and positive impact in their livelihood. On the one hand, the agricultural land expansion resulted in increasing productivity of crop and improved livestock productivity during the study period. This helped the local people in increasing their income at the same time their living standard to a certain extent. On the other hand, the expansion of farm land may bring unexpected conditions such as diseases, hazard of flood and loss of biodiversity which negatively impacted inhabitants' livelihood.

The human settlement expansion is again similar to that of the farm land has increased to a significant level which contributed to the land cover dynamics in Menagesha Suba. This expansion of the human settlement in the area affected the local people in many ways among others through increased access for basic needs and basic social services, increased opportunity of the many social and economic services and infrastructures and at the same time through increased competition for resources, growing sense of individuality are worth to be mentioned.

The land cover dynamics in Menagesha Suba has been caused by a number of factors at the local area and at the national and international levels. The proximate causes which aggravate the cover dynamics are basically local in their nature hence they are clearly observed on the ground in the study area. As supported by the image analysis, the key informant interview and the socio-economic survey analysis, the agricultural land expansion is the main cause of the land cover dynamics in Menagesha Suba. The agricultural land expansion is not only the main forces of land use/land cover conversion in Menagesha Suba but also the major driving forces of all forms of land cover changes all over the country and even all over the world. Previous research out put also clearly concluded that the major force of all forms of land cover dynamics across the globe is agriculture. Hence agriculture is the base of the economy of most poor nations like Ethiopia, expansion of agricultural land at the expense of other natural resources such as grazing land and forest is the day to day phenomena of local farmers.

Moreover, the relative increament of the price of agricultural products and commercialization of agricultural products during the study period have demanded farmers to expand their agricultural land over the years. This is due to the fact that in this period there was a general shift in the economic structure of the country which in way or another affected the agricultural land expansion. In the first place, the shift was from feudal-capitalist to socialist command economy coupled with nationalization of land and redistribution of land to the peasant. Then, the shift was from command economy to a relatively free market economy again with a number of changes in the land holding right of the peasant.

There are also a number of other proximate causes which have played for the dynamics in Menagesha Suba among others: the expansion in local human settlement and human population, the emerging of new villages, towns and the urbanization process are all together aggravated the changes in Land use/land cover in the area.

At the same time, the national conditions in the country over the study periods have also played their role of driving the land cover conversion in Menagesha Suba. These underlying forces include the change in the national governments at least twice, the change in the national land policy of the government, the alarming growth in national population and the increased in commercialization of agricultural products both at the national and international levels.

5.2. Recommendations

This research argued that further research has a paramount importance in the area of the loss in biodiversity; the increased in agricultural productivity, the improved livestock productivity and other areas of the impact of land cover dynamics to exactly know the extent of the impact. It is also recommended that the state forest which is still under high pressure of conversion needs high attention from all stakeholders at least to sustain as a scratch of forest left to the generation to come. This is important for many reasons among others it is one of the closest forests to the capital of the nation Addis Ababa so that it has many roles to play as environmental regulation, as a source of biodiversity and even as an area of recreation.

The researcher of this study also recommends that there is a need to develop a land use planning and an environmental planning in order to utilize the agricultural land and the forest resources in a proper manner and in order to reduce the land cover changes at the same time. As it is observed in some part of Menagesha Suba such as the Wechucha, the land used by the farmers is not as suitable for agriculture as other parts. Such areas need more attention in order to rehabilitate and properly utilize the land for the desired purpose.

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LIST OF APPENDIXES

APPENDIX-A

Questionnaires for Determining of Proximate and Underlying Causes of Land Use/ Land Cover Changes

The objective of these interview questions is to collect information on the underlying and proximate causes of land use and land cover changes in Menagesha Suba. The intent of this interview is mainly academic and it will not be used for other purpose. Therefore, you are kindly requested to report what you know and experienced in the area during the past 30 to 40 years genuinely. Thanks in advance for your cooperation.

Identification:

Your Experience	Your Position	Your organization	Level of Education

I. Proximate Causes and Drivers of Land Use and Land Cover Changes

1. Have you been experiencing crop land expansion in Menagesha Suba over the last 30 years? A. Yes B. No
2. (*If yes*), when was the major agricultural land expansion took place in the area?
   A. before the 1973 B. between the 1973 and 1986
   C. between 1986 and 2007 D. after 2007
3. What were the reasons for the expansion of agricultural land in the area during that time? (*Rank them in their order of importance and mention specific examples for each*)

Options	**Rank**	**Specific examples**
National policy change (land tenure policy)		
Local authority preference meaning towards agriculture than other forestry.		
Demand of agricultural product both in local, national and international markets (National market demand, Price in the international market)		
Access of the farmers to local markets (opening of new road, transport or other.		
The need for diversification of agricultural products i.e. from cereal crop production to cash crop production		
State here, if you have any reason		

4. What happened to the agricultural land expansion over the last 30 years in Menagesha Suba Area? A. Increased tremendously B. Increased at Constant rate
   C. Decreased at all D. No change at all

5. Have you noticed the land cover change in Menagesha Suba in relation to agricultural practice of the area? A. yes B. No

6. (*If yes*), when was the major land use and land cover change in Menagesha Suba started?

   A. Before 1973 B. between 1973 and 1986

   C. between 1986 and 2007 D. after 2007

7. *(If yes)* To what extent the agricultural land expansion have contributed to the land use/ land cover changes in Menagesha Suba?

   A. didn't have any contribution B. Bring moderate change

   C. Severely contributed to the change D. Very severely contributed to the change

8. What were the major reasons for such land use / land cover change of the area other than agriculture?

   _____

9. Have you been experiencing the change in the human settlement in Menagesha Suba?

   A. Yes **B. no**

   - (*If yes*), when was the extensive human settlement started in the area?

   A. Before 1973 B. between 1973 and 1986

   C. between 1986 and 2007 D. after 2007

   - What happened to the settlement in the area during the past 30 years?

   A. Increased B. Decreased C. Remain Constant

10. What were the reasons for the commencement of the settlement in the area? (*rank them in order of importance and give specific examples for each)*

Options	**Ranks**	**Specific examples**
Government policy (like resettlement, villagezation, town formation or any other)		
Individuals' preference (What was their reasons?)		
Establishment of industry or other social infrastructure (road, health centre, school, post or telecommunication services etc.) in the area		
State here, if you have any more reasons?		

11. To what extent the human settlement have changed the land use/ land cover in Menagesha Suba? A. Didn't bring any change at all B. Bring Moderate Change

    C. Severely affected the area D. Very severely affected the area

12. Have you been again experiencing the change in the forest cover of the area?

    A. *Yes* *B. No*

13. *(If yes)*, what happened to the size of the forest cover of the area during the past 30 to 40 years?

A. Increased B. decreased C. remains unchanged.

14. (*If decreased*), when was the major change (decreasemet) observed in the forest cover of the Menagesha Suba?

A. before the 1973 B. between 1973 and 1986

C. between 1986 and 2007 D. after 2007

15. *(If decreased)*, what was the reason for decrement in the size of the forest cover during that period? (*Rank them in order of importance and give example for each of them).*

Options	**Examples**	**Rank**
Interference of the local people for use of forest products (what types of forest products do they use?)		
Expansion of Human settlements to wards and inside the forest		
Expansion of agricultural land to wards the forest		
Increasing number of commercial forest exploitation		
Change in national government forest policy		
High demand of forest products both in national and international market		
Specify here, if any other reasons		

16. When were the road and other transport systems on track in Menagesha Suba?

A. before the 1973 B. between 1973 and 1986

C. between 1986 and 2007 D. after 2007

17. When were markets (private and public) started in the area?

A. before the 1973 B. between 1973 and 1986

C. between 1986 and 2007 D. after 2007

18. When were the following Public services (water *lines, electric grids and post and telephone services*) started in the area?

A. before the 1973 B. between 1973 and 1986

C. between 1986 and 2007 D. after 2007

19. Do you think the aforementioned factors (such *as agricultural land expansion, expansion of human settlement and others*) have contributed for the change in land use and land cover in Menagesha Suba? A. Yes B. No

20. If no, then what were the reasons and the drivers of land use and land cover change in Menagesha Suba? (*Mention at least two other than agriculture and human settlement expansion)*

---

21. What happened to the following biophysical and socio-economic conditions of Menagesha Suba over the last 30 years (*Between 1973 to 2007*)?

Bio-Physical and/ or Socio-economic Attributes	**Increased/ Improved**	**Decreased/ Declined**	**Remain Constant**
Land Characteristics such as:			
Quality of Soil (fertility)			
Soil erosion			
Run off and siltation			
Topography of the area (in terms vegetation cover)			
Forest fragmentation			
Management of land (using manure and chemical fertilizer)			
Natural Vegetation conditions such as:			
Change in species mix			
Change in spatial pattern			
Habitat depletion/ fragmentation			
Distribution of fauna			
Natural Triggers Such as:			
Natural fires			
Droughts			
Floods			
Pests			
Climatic conditions such as:			
Variability of Rainfall			
Change in local temperature			
Shift in growing season			
Change in hydrological cycle			
Water related Conditions such as:			
Water quality			
Water quantity			
Access to water (for domestic, agricultural, livestock/wildlife use)			
Swamp margins (riparian zones)			
Social triggers such as:			
War (violence in inter-ethnical conflict based on resource such as land, grazing land, water, if any)			

Social disorder (crime, theft etc.)			
Abrupt displacement			
Abrupt policy shift (decision of local authority)			
Culture Related Issues such as:			
Ethnic heterogeneity			
Settlement patterns			
Leadership issues (age, gender)			
Trust in and recourse in traditional initiations			
Change in gender roles			
Divisions of labor			

II. Underlying Causes and Drivers of Land Use and Land Cover Changes

1. What happened to the following demographic conditions in Menagesha Suba during the past 30 to 40 years?

Demographic Variables	**Increased**	**Decreased**	**Remain Constant**
Size of the Population			
Fertility status of the population			
Mortality condition of the population			
In-migration of the population			
Out-migration of the population			
Population density of the area			
Population distribution of the area			

2. When was the size of the population began to increase in Menagesha Suba?

   A. Before the 1973 C. between 1973 and 1986

   B. Between 1986 and 2007 D. after 2007

3. *(If the size increased,)* what was the reason for the increment of the size? (*multiple of choice is possible)*

   A. High Fertility C. High in-migration to the area.

   B. If any reason state here_____

4. If in-migration was also in the reason, what causes the in-migration? (*Rank them in order of importance).*

Options	**Ranks**	**Remarks (if any)**
The availability of agricultural land		
The availability of grazing land		
The availability of potable water for domestic and		

agricultural purpose		
The conducive climatic condition of the area		
The availability of forest resources (timber and non-timber products)		
The availability of any forms of social services in the area		
If any other reasons state here		

5. Have you been experiencing out-migration in Menagesha Suba?

   A. Yes B. No

6. If yes, what is the reason for high-out migration from Menagesha Suba? (*rank them in order of importance)*

Options	**Ranks**	**Remarks**
Lack of agricultural land in the area		
Lack of grazing land		
Hostile climatic condition of the area over time		
The dynamic land use/ land cover of the area		
Strict forest protection policy of the government		
Lack of alternative economic means to the area		
Establishment of new-urban centers around the area		

7. Which age group of the population is highly involved in out-migration?

   A. age between 10 to 14 B. ages between 15 to 24

   C. age between 25 to 34 D. ages between 35 to 44

   E. age above 45

8. Which sex group is highly involved in out-migration?

Sex group	**Rank**	**Reason for migration**
Male		
Female		

9. Do you think demographic factors (*such as population size, high fertility and high in-migration and other)* are the causes of land use and land cover change in Menagesha Suba? A. yes B. No

10. *(If no),* then what do you think were the causes and drivers of land use/ land cover changes in Menagesha Suba? *(mention at least two causes)*

_____

11. What happened to the following economic conditions in Menagesha Suba over the last 30 years?

Economic Variables	**Increased/ Improved**	**Decreased/ Declined**	**Remain Constant**
Local market status			
Commercialization (i.e. high urban demand for agricultural products)			
Economic structures of the area such as			
Primary economic activity such as agriculture, forestry and others			
Secondary economic activity such as manufacturing industry			
Tertiary economic activity such as service delivery in the area			
Economic options other than agriculture and forest products in the area			
Employment opportunity in the area			
Level of urbanization of the area			
Special variables such as			
Exchange rates			
Price of agricultural commodity			
Price of manufacturing products/goods			
Price of transport			

12. Do you think economic factors mentioned above (*such as local market status, economic structures and pricing)* have contributed for land use/ land cover changes in Menagesha Suba over the past 30 years? A. yes B. no
13. *(If yes)* then, to what extent do the economic factors contributed for the land use/ land cover dynamics in Menagesha Suba?
    A. no contribution at all B. moderately contributed to the change
    C. highly contributed to the change D. severely contributed to the change
14. *(If yes)* again, when do you think most of the economic factors mentioned above began to be observed in the area?
    A. Before the 1973 C. between 1973 and 1986
    B. Between 1986 and 2007 D. after 2007

15. What conditions were seen in the following technological factors in the past 30 to 40 years?

Technological Variables	**Increased/ Improved**	**Decreased/ Declined**	**Remain Constant**
Agricultural Factors of Production			
Agro-technical changes in the area (ex/intensification of agricultural products)			
Distribution of fertilizers			
Distribution of quality seeds			
Access to dairy and fattening technologies			
Access to irrigation technologies			
Rain fed agriculture			
Application of technologies in forest extraction			
Natural resource management techniques			
Soil erosion protection technologies			

16. When was these technological factors introduced to Menagesha Suba?

A. Before the 1973 C. between 1973 and 1986

B. Between 1986 and 2007 D. after 2007

17. Do you think technological factors such as the above were contributed to the land cover dynamics in Menagesha Suba? A. yes B. no

18. *(If yes)* then, to what extent do the technological factors contributed for the land use/ land cover dynamics in Menagesha Suba?

A. no contribution at all B. moderately contributed to the change

C. highly contributed to the change D. severely contributed to the change

19. Have you been experiencing any of the following national policy change in Ethiopia? If yes, when do you think they were introduced to the people? (*multiple of choice for each policy option is possible)*

Policy options	**Experienced**		**When was introduced?**			
	yes	**No**	**Before 1973**	**b/n 1973 to 1986**	**b/n 1986 to 2007**	**After 2007**
National land tenure policy						
National land use policy						
National economic development policy						
National forestry policy						
National natural resource management policy						
National soil conservation policy						
National environmental policy						
National settlement and resettlement policy						
National land tenure reform policy						
National urbanization policy						

20. Do you think any of these policy options contributed for land use and land cover change in Menagesha Suba? A. yes B. no

21. *(If yes)*, which one contributed more to the land cover dynamics in Menagesha Suba? (*Rank them 1 to 4 in order of importance*)

    1._____

    2._____

    3._____

    4._____

22. Which land tenure systems have contributed more to the land use/ land cover changes in Menagesha Suba?(rank them in order of importance and the years they have been in practices)

Land Tenure System	**Ranks**	**When was in use?**			
		Before 1973	**b/n 1973 to 1986**	**b/n 1986 to 2007**	**After 2007**
Customary land tenure system					
Land ethos based on ethnicity					
Land to the tailor					
Land based on alienation					
Land based on acquisition					

23. What do you think to the following socio-cultural behavior of the public and individual in Menagesha Suba?

Socio-cultural variables	**Increased/ Improved**	**Decreased/ Declined**	**Remain Constant**
Public attitude, value and belief to land use, forest and other natural resources			
Individuals and household behavior to land use, forest and other natural resources			

24. Do you think such public attitudes and individual behavior have contributed for land use/ land cover dynamics in Menagesha Suba?

    A. yes B. no

Thanks

APPENDIX–B

Interview Based Questionnaires for Households to Determine their Livelihood Strategies

The principal objective of this questionnaire is to investigate the livelihood impacts of land use / land cover changes in Menagesha Suba and its surrounding community, and to explore the responses of the community to such environmental change. The study is intended for academic purpose only. Hence, the responses from respondents are confidential and cannot be identified with the persons who provided them. Thank you in advance for your cooperation.

I. IDENTIFICATION

S.No	**Enumerator Related Information**				
1	Name of the Enumerator				
2	Date of the Enumeration				
	Location Related Information				
3	Name of the Kebele				
4	Household Number				
5	Name of the Village				
6	Distance to the nearest road				
7	Distance to the nearest Market				
	Household Related Identification				
8	Name of the Household				
9	Respondents				
	Years for Identification of the Household (*mention the exact years with in the categories*)	**Before 1973**	**b/n 1973 - 1986**	**b/n 1986 - 2007**	**After 2007**
10	When was the household established?				
11	Where was the Household established? (*if in the same place leave the next two question)*				
12	When did you leave that place?				
13	When did you come to the present place?				
14	Why did you leave that place?				

II. HOUSEHOLD HEAD and MEMBERS CHARACTERISTICS

Serial No	(1) Name of the head/ members of the Households	(2) Relation with the head H-Head W-wife S-sons D-daughters R- relatives	(3) Age of the HHs	(4) Sex M-Male F- Female	(5) Marital Status M-Married S-Single D- Divorced	(6) Level of Education I-Illiterate R-read and write S-Schooling G-Graduate	(7) Religion C-Christian M-Muslim O-other types	(8) Ethnicity A-Amhara O-Oromo same way	(9) Main occupation F-Farming C-civil servants M-Merchants L-Laborer S-Student O-other types	(10)Other economic activities	(11) Absent/ present HH for more than/ less than 6 months A= absent P=Present	(12) Do you Have land for agriculture Y- yes I have N- no I haven't	(13)Size of the land 1- for 1 Timad 2. for 2 Timad 3. for 3 Timad 4. for 4 and more Timad	(14) Land ownership type O-own land R-Rent land S-sharecropping I- inheritance G- Gift
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
Summary for the Page	Total no of HH= NB=Check for the Total of each Column.	H= S= D= R= W= T=	0-14= 15-24= 25-34= 35-44= 45+= T=	M= F= T=	M= S= D= T=	I= R= S= G= T=	C= M= O= T=	A= O= T= G= .... T=	F= C= M= L= S= O= T=		A= P= T=	Y= N= T=	1= 2= 3= 4= T=	O= R= S= I= G= T=

III. MIGRATION & REMITTANCE RELATED QUESTIONS

1. *If there are absent for more than 6 months in column 12,* are they part of a household in the place where they stay?

   A. yes B. no **ans. 1._____**

2. Why are they absent?

   A. due to seasonal labour migration B. due to education

   C. staying with family elsewhere D. Start own household

   E. Due to Household income declined F. Due to personal interest

   G. state if any reasons_____ **ans.2._____**

3. *If there are present for less than 6 months in column 12,* are they part of the present household?

   A. yes B. no **ans.3._____**

4. Why do they leave their home in other place?

   A. due to seasonal labour migration B. due to education

   C. staying with family elsewhere D. Start own household

   E. split up of household

   F. state if any reasons_____ **ans.4._____**

5. Could you describe the household situation (food/labour/cash) in years that s/he (you) left the area?

_____

6. Is the decision to temporarily leave the area also influenced by other factors? *(If yes, mention the other factors)*

_____

7. Is the migrant expected to send home food or money or can he use all his earnings for personal expenses?

_____

8. How much does s/he (or you) usually earn in one trip *(if several trips a year, then sum up and specify)?* _____

9. Has the importance of migration and remittances for the household increased, decreased or stayed the same over time? Explain

_____

IV. LAND AND AGRICULTURE RELATED QUESTIONS

1. *(If the household own land in Column 15)* Please mention the type of land that you have and its location in relation to the protected Menagesha Suba Forest in the following table.

S. no	Type of Land	Location of the Land I- inside, A-around, F-far from	Size of the Land in Timad (*note a Timad of land is 0.25ha.)*	How long have you held the land (in/near) the protected area? *(State the exact year in each categories)*			
				Before 1973	b/n 1973 - 1986	b/n 1986 - 2007	After 2007
1	Farm Land						
2	Grazing Land						
3	Fallow Land						
4	Forest Land						
5	Communal Land						
6	Other types of land Specify here						

2. Which of the following agricultural activities does the Household engaged in? *(A multiple of response is possible).*

   1. Crop production 2. Animal husbandry

   3. Mixed farming 4. Afro-forestry

   5. Others **ans. 2_____**

3. What happened to your land size during the past 30 years in your household?

   A. Decreasing B.Increasing C.Unchanging **ans.3_____**

4. *(If increased),* to what extent it is increased?

   A. by two Timad B. by three Timad C. by four Timad

   D. by five and more Timad **ans.4_____**

5. What benefits/ services have you been obtaining from the agricultural land/ grazing land and forest area?

   _____

   _____

6. Please give us the following information about land holding and farming practice of the household. (*State the exact year in each year categories and check for the increment or decrement in the land size*).

Information Required	References Years (*use I- Increase , D-decrease*)				
	Before 1973	b/n 1973 -1986	b/n 1986 -2007	After 2007	Remark
Total Size of land holding in Timad					
Proportion of Land Under Rain fed farming					
Proportion of Land Under Irrigation					

• Using water of the river					
• Using underground water					
• Using rainwater harvesting					
Dominant crop type grown *(mention its name)*					
• Staple Crop					
• Cash crop					
Number of Household engaged in the farm					
• Adult males					
• Adult females					
Proportion of Land allotted for quality seed					
Proportion of land used for fertilizer					

7. *(if the table shows increasing in land size ask)* Where does it come from?

   A. bought from others farmer B. Distributed by the government

   C. expanding to the forest area

   D. specify if any reason_____ **ans.7.**_____

8. Is the land you have now enough for leading your livelihood?

   A. Yes B. No **ans.8.**_____

9. *(If no),* do you want to increase your land size?

   A. yes B. no **ans.9.**_____

10. If you need more land, explain how do you get the land?

_____

11. Please mention in the table below the alternative mechanisms that you have used to lead your livelihood?

S. no	**Alternative Activities and Services**	**From the Protected Forest Area**	**Outside the Protected forest area**	**When did you start these alternative activities? *(write the exact year in each of the categories)***			
				Before 1973	**b/n 1973 - 1986**	**b/n 1986-2007**	**After 2007**
1	Farm and grazing						
2	Beehives and food						
3	Wild life products						
4	Timber						
5	Charcoal						
6	Fuel wood						
7.	Other wood products						
8	Other specify						

12. What do you think most hindering to engage in off-farm/ alternative means of livelihood in your household?

Problem faced by the household in off-farm activities	**Options**		**Rank of the Problem**		
	yes	**No**	**1**	**2**	**3**
Do you face lack of capital to start or to expand or to maintain a business other than agriculture?					
Do you think lack of enough knowledge of off-farm activities hinders you?					
Do you face problem well developed infrastructure of road?					
Other problems, specify here					

1. Most Hindering *2. Hindering* *3. Less Hindering*

13. From the surrounding areas, what do you prefer most for your future use? *(Rank 1 to 3)*

S. no.	**Types of area**	**Ranks**		
		1	**2**	**3**
1	Farm land			
2	Protected areas			
3	Grazing Land			
4	Open access land			
5	Farm land and grazing area			

V. FOREST, & LAND COVER RELATED ISSUES

1. What do you think is most important living (in/near) the protected forest area? *(Rank them in order of importance).*

S. no.	**Most important reasons for living (in/near) the protected forest area**	**Ranks**		
		1	**2**	**3**
1	Better living condition			
2	Lack of other land for settlement			
3	Access to other livelihood alternatives			
4	Cultural benefits of the forest			
5	Presence of wild life in the forest			
6	Place of birth			
7	State if any other reasons			

2. Do you have access to the forest resources?

1. Yes 2. No **ans.2.**_____

3. *If yes*, how do you get access to them?

1. Through the forest resource distribution 2. Shared with relatives

3. Purchased from others 4. Inherited from parents **ans.3.**_____

4. Which forest product is more important to your households? *(Rank them 1 to 3 based on their importance in the following table)*

s. no	Types of forest Products and Services	Ranks		
		1	2	3
I	Timber Products			
1	Wood for Construction			
2	House furniture			
3	Carvings			
4	Agricultural implements			
5	Fuel wood			
II	Non-Timber Forest Products			
1	Production of honey			
2	Use of medical plants			
3	Production of foods from forest			
4	Production of Coffee or others			
III	Other forest Products and Services			
1	Grazing grass			
2	Fodder services			
3	Water service			
IV	Environmental Services			
1	Regulating water supply of the area			
2	Stabilizing climate of the area			
3	Maintaining the fertility of the soil			
4	shade			
V	Socio-cultural Values			
1	Beauty of the area			
2	Future use for Children			
3	Scared values of the forest			

(1-Most Important; 2: Important 3: Less Important)

5. Have you been taught and consulted about natural resource management and management of the protected forest areas? Please mention the training and consultation attended in the table below (*if yes mention the year and who gave the training or consultation*)

S. no	Training prepared and delivered or consultation offered by	Training or consultation attended		When did you take the trainings? (*write the exact year in each of the categories*)			
		Yes T-Training C- Consultation	No	Before 1973	b/n 1973 -1986	b/n 1986 -2007	After 2007
1	The government agricultural department						
2	The local village leaders						
3	The local NGOs						
4	The Menagesha Suba protected forest mangers						
5	State here, if different						

6. Do you participate in community resource management?

   1. Yes 2. No **ans.6.**_____

7. If yes, which resource management you have participated?

   1. Land conservation 2. Water conservation 3. Forest conservation

   4. Soil conservation 5. other_____ **ans.7.**_____

8. Do you apply the same to your farm land? 1. Yes 2. No **ans.8.**_____

9. If no, what are your reasons?

_____

10. What is your perception of the protected forest area?

    1. Negative 2. Positive **ans.10.**_____

11. If you perceived the protected forest area negatively, what is your reason?

    1. It has no benefit for me 2. It is an obstacle for livelihood

    3. It is a source of conflict 4. It is a source of problem animals

    5. Specify if any other reasons_____ **ans.11.**_____

12. Have you ever faced any problem from the management of the protected forest area?

    1. Yes 2. No **ans.12.**_____

13. If yes what kind of mistreatment you have faced?

    1. jailed 2. Insulted 3. Beaten

    4. displaced 5. Livestock killed 6. Property damaged **ans.13.**_____

14. Do you recognize the land use/ and land cover changes in Menagesha Suba over the past 30 years? 1. Yes 2. No **ans. 14._____**

15. How do you view the level of land cover change in Menagesha Suba since you have stated household?

    1. Very severe 2. Severe 3. Minor

    4. No problem 5. Not certain **ans.15._____**

16. Have you observed a decrease in size of the forest cover?

    1. Yes 2. No **ans.16._____**

17. If yes, what do you think about the extent of the decreasing cover of forest?

    1. a great deal 2. Considerable 3. Few 4. None

    5. Not certain **ans.17._____**

18. *(If yes),* what do you think is the reason for such land cover change in the area? Please give the information for the land cover change in the table below

Reason for the Land Cover Changes	**Does it Contributed to the change?**					**When do you think it began to contribute for the cover change?**			
	Yes	**No**	**Rank**			**Before 1973**	**b/n 1973 -1986**	**b/n 1986 -2007**	**After 2007**
			1	**2**	**3**				
The expansion of agricultural land									
Improper utilization of land									
Aggressive invasion of land									
Increased human settlement									
Increased number of human population									
Introduction of agricultural technologies									
Improper government policies									
Deforestation of the forest land									
Other individual and public actions									

1. a great deal 2. Considerable 3. Few

19. What do you think the impact of such land cover dynamics that was happening over 30 years to your household and the community as large? *(Please give information on the table below and rank them from 1 to 3).*

Impact observed as a result of land cover change in your household/ and community level	Does it really impact you? If yes then rank the impact.					When do you think the impacts have begun?			
	Yes	No	Rank			Before 1973	b/n 1973 -1986	b/n 1986 -2007	After 2007
			1	2	3				
Impact related to Agricultural Land Expansion and Intensification									
Increased of agricultural productivity									
Increased in livestock productivity									
Spread of diseases related to vegetation									
Increased hazards of flood									
Loss of biodiversity									
Impact Related to Loss of forest, grass land, and wet lands									
Reduction in non-farm income									
Changing of growing season									
Lack of grazing land									
Deforestation of the forest land									
Diminished resources of the forest (medicinal plant, wild life)									
Loss of traditional lifestyles									
Impact Related to Urban land expansion									
Increased access to food, water and shelter									
Respiratory and digestive tract disease									
Increased opportunities for social and economic services									
Increased competition for financial resources									
Increased sense of individuality									

1. a great deal **2. Considerable** **3. Few**

VI. INCOME & PRODUCTIVITY ISSUES

1. What are the sources of your income to your household? (*a multiple of choice is possible)*

   1. Agriculture 2. Trade 3. Remittance 4. The Forest

   5. Mention if different_____ **ans.1.**_____

2. *(If agriculture),* Please provide the following information on yours household crop production performance for the indicated periods.

Crop type	Means of Production 1. rain fed 2. irrigation				Area covered by the crop in Timad				Amount Harvested *(in Quintal)*			
	Before 1973	b/n 1973-1986	b/n 1986-2007	After 2007	Before 1973	b/n 1973-1986	b/n 1986-2007	After 2007	Before 1973	b/n 1973-1986	b/n 1986-2007	After 2007
Sorghum												
Maize												
Teff												
Wheat												
Barely												
Chat												
Vegetable												
Potato												
cabbage												
Onion												
others												

3. What do you think most hindering productivity of crop in your farm land? Please rank items in the table in order of importance.

Problem faced by the household in productivity of crop (1. High 2. Medium 3. low)	Options		Rank of the Problem		
	yes	No	1	2	3
Do you have enough capital to buy pesticides, fertilizers, quality seed, and land or to rent more land?					
Do you think pest is a problem to your productivity?					
Do you face a decreasing rainfall and drought as a problem of productivity?					
Do you face lack of labour to plough and weed you crop?					
Do you face lack of storage or preservative for your crop products?					
Do you face lack of plough oxen					
Do you think lack of well facilitated transport is a problem?					
Do you think moles and field rats a problem to your crop?					
Do you have access to market your products?					
Do you think low price as a problem for your crop?					
Do you have access to the extension services?					
Do you have access to credit?					
Any problems other than the above mention here.					

4. How do you evaluate your household income over the past 30 years?

A. Increasing B. decreasing C. Remain constant **ans.4.**_____

5. *If decreasing*, what are the reasons?

A. lack of land for agriculture B. lack of access to market

C. Lack of water for irrigation D. high cost of living

E. high cost of farm inputs F. others_____ **ans.5.**_____

6. Do you have farm animals? A. Yes B. No **ans.6.**_____

7. For what purpose do you use your cattle?

A. for source of income B. for pack animal purpose

C. for source of power D. for plough purpose **ans.7.**_____

E. State here, if there is a different purpose_____

8. When do you think your cattle are very important?

a. Every time throughout the year c. during the time of drought

b. During adverse time d. when the income of the HH decreased

Ans.8.____

9. Where do you take your cattle for grazing?

1. To the forest area 2. To the farm land

3. to the wet land areas 4.to open access land **ans.9.**____

10. Please tell us about your farm animals' status over the past 30 years? *(use the table next page)*

Type of Farm animals	**Number of cattle in different period of time**				
	Before 1975	**b/n 1973-1986**	**b/n 1986-2007**	**After 2007**	**Use of the animals *(use the numbers as stated below)***
Cattle					
Chicken					
Goats					
sheep					
Donkey					
Horse					
Others					

1. Meat (consumption)
2. Milk/eggs (consumption)
3. Meat (selling)
4. Milk/eggs (selling)
5. Manure
6. animal traction
7. social obligations
8. others (specify)

11. What do you think most hindering productivity of livestock in your household? Please rank items in the table in order of importance.

Problem faced by the household in livestock productivity (1. High 2. Medium 3. Low)	**Options**		**Rank of the Problem**		
	yes	**No**	**1**	**2**	**3**
Do you think disease is a problem to your livestock productivity?					
Do you think medicine for cattle is expensive					
Is fodder a problem to livestock productivity?					
Is there a veterinary service available to your livestock?					
Any more problem mention here					

12. Are you sometimes forced to sell animals in order to buy grains to feed your family?

_____

13. Please give us information on your households incident of conflict with others in the use of resources over the period indicated. *(Use the table next page)*

Year	**Frequency**	**Response Type**					**Reasons**
		Water	**Land**	**Grazing land**	**Forest**	**Livestock**	
Before 1973	Once						
	Twice						
	More						
b/n 1973-1986	Once						
	Twice						
	More						
b/n 1986-2007	Once						
	Twice						
	More						
After 2007	Once						
	Twice						
	More						

14. Have you been engaged in any off farm income generation activities in the past 30 years? Choice any of the following economic activities?

S. no.	Type of main economic Activity in the Household	Years in which the households engaged in the activity			
		Before 1973	b/n 1973- 1986	b/n 1986-2007	After 2007
1.	Farming				
2	Agricultural Labour				
3	Trader in Village				
4	Household utensils making				
5	Tella and Kattikala Production and selling				
6	Firewood and cattle residual selling				
7	Honey production				
8	State if any				

15. What were the reasons for the engagement of the household in such kind of activities?

_____

16. Have your non-farm income increased; decreased or stayed the same over time (describe the trend)?

_____

17. Has the number of income sources for your household increased, decreased or stayed the same over time (describe the trend)?

_____

18. Identify any of the major marketing problems to your household and rank them in order of priority each from 1 to 3 in a table below.

S. no.	Marketing problems faced by your household or community	Do you face the problem?		Rank the Problem 1. Very severe 2. Severe 3. not severe		
		Yes	No	1	2	3
1	Poor road transport					
2	Lack of information on market prices					
3	High cost of transportation					
4	Price fluctuations					
5	Low price of agricultural products					
6	Lack of transport					
7	Low demand					
8	No problem at all					
9	State if any other problem					

Thank you Very Much!!

DECLARATION

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in any other university, and that all sources of material used for the thesis have been duly acknowledged.

Name: Mesfin Agonafir

_____

Signature

June 2010

Confirmation

This thesis can be submitted for examination with my approval as a university advisor.

_____

Aklilu Amsalu(Dr)

June 2010