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IMPACTOF URBAN SPRAWLON FARM LANDS: THE CASE OFSEBETA TOWN, CENTRAL ETHIOPIA

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This is to certify that the thesis prepared by Dejene Adugna, entitled: Impact of Urban Sprawl on Farmlands: the case of Sebeta Town, Central Ethiopia and submitted in partial fulfillment of the requirements for the degree of Degree of Master of Arts (Geography and Environmental Studies, specialization: Land Resources and environmental Management) complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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I declare that thesis is my original work and has been presented for the ful fillment of a degree in any other University and all that sources of material used in this thesis have been fully acknowledged.

Dejene Adugna _____ _____

Signature Date

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ACRONYMS

BoFED	Oromia Bureau of Finance and Economic Development
CSA	Central Stoical Authority
DEM	Digital Elevation Model
DFDI	Department for International Development
EMA	Ethiopian Mapping Agency
ETM	Enhanced Thematic Mapper
GIS	Geographic Information System
GLCF	Global Land Cover Facility
GPS	Geographical Positioning System
LULCC	Land Use Land Cover Change
BOFED	Oromia Bureau of Finance and Economic Development
OUPI	Oromia Urban Planning Institute
SPOT	System Pour l'Observation de la Terre French=System for observing the Earth
SPSS	Statistical Package for Social Scientists
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
WGS	World Geodetic System

Abstract

Urbanization ensued urban sprawl that is an avoidable phenomenon which ultimately converts the agricultural land into built environment Urban Sprawl negatively impacts the farmers' livelihood as well as agricultural production and consumption of the surrounding area. Thus, the objective of this study is to investigate the level and impact of urban sprawl on the farmlands of Sebeta town.GIS and remote sensing were used to analyze the phenomena of agricultural land transformation into urban land use. The change detection method has been applied to investigateLULCC.In order to achieve these, satellite data of Land sat TM for 1986, ETM for 2000 and 2016 have been obtained and processed using ERDAS Imagine. The Maximum Likelihood Algorithm of Supervised Classification has been used to generate land use and land cover maps. For the accuracy of classified Land Use/Land Cover maps, a confusion matrix was used to derive overall accuracy and results were above the minimum and acceptable threshold level. The satellite image results show that urban land increased by 224.1ha (1.5%) and 3851.0ha (25.2%) *respectively in the first, the second and the entire study periods. Rural settlement increased in the first period and remained stagnant in the second period. Grassland was the most converted cover type during the entire study period .In the30years, croplands expanded by over* 57.9*%of the original forest cover of what existed at the base year. The impact of this LULC change is more significant on the socioeconomic condition and status of the study area. The findings showed loss of farmland and displacement of the households who had been involved in farming. In general, high rate of urban expansion (3627 ha/1618.4%) over the last thirty years led to the loss of large agricultural land. The major corrective measures could be improvements on the spatial planning which could balance the land demand of urban areas and shrinking of agricultural land in and in the fringes of Sebeta town.*

Key words: urban sprawl, displacement, farming community, periphery peri-urban, rural –urban, urban interface, urban -fringe

CHAPTERN ONE: INTRODUCTION

1.1. Background of the study

For the most part of its history the human population lived a rural lifestyle. However, in the first decade of the 20th century this trend started to change and the world is becoming urbanized as thousands of people migrate to cities. Urbanization is now a rising trend all over the world, especially in an alarming rate in developing countries. This makes cities grow both in number and in a real extent. In quite a lot of instances, the percentage increase in population is accompanied by more than proportional percentage increase of an urbanized area. Today's world is rapidly urbanizing, particularly radical urban expansion predicted in developing countries (Marshall *et al*., 2009).

Although urbanization in developing countries is low, the pace of urbanization is at the fastest rate. Approximately 25 %of Africa's population lived in towns and cities in 1975. In 2000, 38 %of the continent's population lived in urban areas and the proportion was expected to increase to 47% by 2015 and to double by 2050 (Thou, 2010). Such rapid urban expansion has a great impacts on the peri-urban area in terms of changing in land use, differential access to urban benefits (such as health infrastructure and employment) and increased pressure on common natural resources (Marshall *et al*., 2009).

In line with this, rapid population increase, urbanization and changing socio-economic pattern are deriving forces that influenced spatial change in peri-urban areas of developing countries. This peri-urban areas are those areas adjacent to built up areas of high population concentration, zones where traditional farming activities come into conflict with alternative economic, residential and recreational interest. Ethiopia is characterized by low level of urbanization even by African standard, where only 16% of populations live in urban area(PCC,2008). Despite this, it has recorded a relatively high growth rate of urban population (4% annually), double to that of rural areas. However, such high growth rate is not often accompanied by development in socio-economic services and infrastructure, and economic and employment capacity of the urban centers to support

the growing population(Mander et al., 2010)Hence, it is important to investigate the impact of rapid urban growth dynamics, developments of urban sprawl and quantifying the spatial extent of urbanization as it is helpful for decision makers.

1.2. Statement of the problem

Because of the rapid expansion of urbanization, a lot of land has been converted from rural to urban. From the land use and land cover change point of view, expansion of urban areas is of greater importance because of its strong effect on other land cover classes, such as agricultural lands, non-built areas, forests and others. Ethiopia, having the second largest population in Africa has a total of over 80 million populations. It has a 2.3% of annual growth rate and having 4.6% average annual urban growth rate (Haregeweyn*et al.*, 2005). The problem of rapid and uncontrolled urban growth and its consequence on regional landscape in developing countries have been a serious concern for various scholars. Perhaps more worrisome is when there is surreptitious city encroachment on fertile agricultural land and other socio-economic implication on peri-urban areas of most cities (Adeboyejo*et al*., 2007).

In Ethiopia, commercial farms, protection of parks, villagization, resettlement, road construction and urban expansion have been causing population displacement (Feleke, 1999). Particularly, as most private investments have so far concentrated around the main urban centers, notably Addis Ababa and its surrounding, the problem of displacement is becoming the primarily concern. An outward expansion of these centers contributed to encroachment of fertile agricultural land in which most farming community depend their livelihood. Indeed, one small town surrounding Addis Ababa is *Sebeta* town in Oromia Special Zone which is currently expanding tremendously in terms of population and physical size. The main reason for the development of these towns is derived from favorable reform in the country in terms economic policy that has created conducive environment for private investments and the proximity of these towns to the center and national market (Addis Ababa). The expansion of these towns created numerous opportunities as well as challenges for surrounding farming communities. These opportunities include advantages of employment, access to urban services, and urban-rural linkages or trickledown effect of development (OUPI, 2015).

In fact, several studies have been conducted on peri-urbanism for instance ; study by Fayera, (2005) on 'impacts of Addis Ababa expansion on farming community on peripheral area, indicated that the city's expansion programmes implemented in different periods of time were not participatory and negatively influenced the livelihood of farmers on peri-urban area. Similarly, study by Ermias, (2009) on 'prospects and challenges of real estate development on livelihood of rural communities: the case of LegaTefoLegaDadi.' further found that in process of the establishment of the real estate in the area gave little attention to the peri-urban interface, due to the fact that such areas are neither being under the control of urban authorities nor under the control of rural authorities. Yet only a handful of people are made rich, while the majority is excluded from the opportunities that peri-urbanisms brings forth. This is an indication that the two growth rates differ and urban area grows in a more rapid pace. Because of the different activities and processes that take place in the urban ecosystem every day, the subject of urbanization and urban sprawl has drawn attention from ecologists, urban planners, civil engineers, sociologists, administrators, policy makers, and finally to common urban or rural resident. In addition, research conducted by Dejene (2011) did not consider the impacts of urban sprawl on agricultural land rather on the socio economic impacts of urban sprawl on the farming communities. This study investigates the level and impacts of urban sprawl on the agricultural land resource. Therefore, understanding urban sprawl and its level of encroachment on agricultural land resource would be a guide for decision-makers and citizens who want to create a healthy, affordable and sustainable urban future.

1.3. Objectives of the Study

1.3.1. General Objective

The general objective of the study is to investigate the level and impacts of urban sprawl on the farmlands of Sebeta Town.

1.3.2. Specific Objectives

Specifically, the study aspires to:

i. examine the socioeconomic effects of urban expansion on farmers residing in urban fringe areas of Sebeta town.

ii. identify factors that contributed torpid expansion of Sebeta town to the urban-rural interface agricultural areas.

iii. examine land use/land cover change /of the study area for selected years by assessing the magnitude of the intermittent leap frog encroachment of Sebeta town on farmlands

iv. investigate the level of urban expansion to rural areas of surroundings Sebeta Town.

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1.4. Research Questions

In order to address the stated problem and objectives, the study attempted to answer the following basic questions:-

1. What are the socioeconomic effects of urban expansion on farmers who are expropriated of their farm lands because of urban expansion?
2. What are the factors that contributed to rapid expansion of Sebeta town to the urban-rural interface agricultural areas?
3. What evidences are available in satellite imagery document regarding leapfrog encroachment of farm lands surrounding Sebeta town?
4. What is the level of urban expansion to rural areas of surrounding Sebeta Town?

1.5. Significance of the Study

Analyzing and modeling of urban sprawl provides greater importance to the research community, urban planners, stake holders as well as decision making groups in terms of understanding the impacts of Urban sprawl on land resource of Sebeta Town. It might have significant impact on the surrounding ecosystem: loss of agricultural land, destruction of forest cover, water depletion and implication on the benefits generated from the land

The results of this study could provide better information about the changes to agricultural land resource due to urban sprawl that have been quantified through integrated application of GIS, Remote Sensing and land change modeler. Hence the outcome of the study would be input for planners and policy makers who lack accurate, timely and cost effective urban land use data and it was also most essential to make decision concerning land resource management. In addition, it also provides the opportunity to understand the trends of changes in built up areas as a result of driving variables. Moreover, the findings of this study are an initial input for future research direction for interested groups in the area.

1.6. Scope of Study

This study was delimited geographically, thematically and methodologically. Geographically, the study was conducted on peri-urban areas of Sebeta town as the town has been expanding horizontally over time to include lands that were previously under the rural agricultural lands in the study area. With the town's expansion, land use pattern is also diverted from agricultural land use to industrial and urban residential purposes. Thematically, the study concentrates on an impact of urban sprawl on farm lands surrounding Sebeta towns and respective land use changes to agricultural lands. In addition to this, the study also covers people who previously lost their farm land due to the urban sprawling the periphery of the town. Methodologically, the spatial extent of the study is limited to the households surrounding Sebeta town in the year 2016.The satellite image data used for the study covers 1986,2000 and 2016.This study used a mixed approach and the methods used in the collection of data were house hold survey and key informant interview.

1.7. Limitation of Study

Challenges in obtaining previously recorded secondary data from the town's municipality; particularly data on land allocation for residential and total number of displaced households who obtained compensation by years has been a major challenge during data collection time. During interview, obtaining staffs in municipal with sufficient know-how and experience on the area was a difficult task. Even, those who were interviewed were reluctant to give relevant information due to the serious land administration problems in the area during data collection time. Moreover, there were challenges to easily obtain displaced households particularly those who reside in the urban fringe. These households are either completely lose their land and become landless and shift their livelihood to urban mode of life.

1.8. Organization of the Thesis

The thesis is organized in to five chapters. Chapter One presents background of the study, statement of the problem, objectives of the study, research questions, significance of the study, scope of the study, and definitions of terms. Chapter Two come up with the literature review which is both theoretical and empirical aspects of urban sprawl and its impacts. Chapter Three embraced methodology of the study and chapter Four presents the results of the study with discussion and interpretation. Finally, Chapter Five presents conclusions and recommendations.

CHAPTER TWO: REVIEW OF RELATED LITERATURE

2.1. Concept of Urban Sprawl

'Sprawl' in simple term is just spreading out of a city and its suburbs over more and more rural land at the periphery of an urban area while in reality it is a complex phenomenon that mean different things in different areas and conditions. In Early time the term was used to suggest that it consumes excessive space in an uncontrolled, disorderly manner leading to poor distribution and loss of open spaces, high demand for transportation, and social segregation. This definition has not changed much through time. Modern usage of the term 'sprawl' was coined by Earle Draper, one of the first city planners in the United States in 1937 (Black, 1996). Since then, the issue became popular and concerns continue to grow with different measures introduced to combat it in one way or another.

As the word 'sprawl' is a multidimensional phenomenon, it has caused much confusion. Possible mathematical regressions attempting to explain sprawl from land use perspective such as the degree of compactness did not generate statistically significant results and hence it is difficult to define the term mathematically (Wassmer, 2005). The Vermont Forum on Sprawl defines sprawl as; dispersed development outside of compact urban and village centers along highways and in rural countryside. In the report, Revisiting Sprawl: Lessons from the Past, (Burch ell, 1998) defined the term "expanding physical development, at decreasing densities, in metropolitan regions, where the spatial growth exceeds population growth"

Generally, sprawl is widely known as ugly development with tendency to discontinuity and haphazard layout. Sprawl is the consequence or effect of some independent variable, such as fragmented local government, 'poor' planning, or exclusionary zoning. Sprawl occurs as a consequence of the fragmentation of control over land-use in metropolitan areas. Sprawl is a pattern of land use in an urbanized area that exhibits low levels of some combination of eight distinct dimensions: density, continuity, concentration, compactness, centrality, nuclearity, diversity and proximity (Galster*et al*., 2001).According to Siedentrop (2005) urban sprawl is the de-concentration processes of urban functions combined with the spatial expansion of urban uses into rural areas. Hence, urban sprawl is a multifaceted concept, which includes the

spreading outwards of a city and its suburbs to its outskirts to low-density and auto-dependent development on rural land, high segregation of uses, and various design features that encourage car dependency. Urban center means any locality having a municipal administration or a population size of 2000 or more inhabitants of which at least 50% of its labor force is engaged in non-agricultural activities(ULLHP, No.721 /2011, page: 622).

2.2. Causes of Urban Sprawl

Population growth rise in household income, subsidization of infrastructure investments like roads, ineffective land-use, social problems in central cities and poor land policies are taken to be the main causes of sprawl. One of the main factors that help in explaining the increasing sub-urbanization of population in rich countries is the demand for larger suburban lots. With rise in household incomes, people who move into the suburbs are motivated to a significant degree by the desire for more living space. Between 1950 and 1980, one-half of the increased sub-urbanization in America can be explained by people getting richer (Glaeser and Kahn, 2003).In addition to population growth, expansion of economic base also (such as higher per capita income, increase in number of working persons) creates demand for new housing or more housing space for individuals (Bhatta el al, 2010). This also encourages many developers for rapid construction of new houses. Rapid development of housing and other urban infrastructure often produces a variety of discontinuous uncorrelated developments. Rapid development is also blamed owing to its lack of time for proper planning and coordination among developers, governments and proponents.

Furthermore, establishment of new industries in countryside increases impervious surfaces rapidly. Industry requires providing housing facilities to its workers in a large area that generally becomes larger than the industry itself. The transition process from agricultural to industrial employment demands more urban housing. Single-storey, low-density industrial parks surrounded by large parking lots are one of the main reasons of sprawl. There is no reason why light industrial and commercial land-uses cannot grow up instead of out, by adding more storey instead of more hectares. Perhaps, industrial sprawl has happened because land at the urban edge is cheaper. Transportation routes open access of city to

countryside and responsible for linear branch development. The construction of expressways and high-ways cause both congestion in the city and rapid outgrowth (Harvey and Clark, 1965). Roads are commonly considered in modeling and forecasting urban sprawl as they are a major catalyst of sprawl (Cheng and Masser 2003; Yang and Lo, 2003).Development of urban economy and thereby job opportunities are directly dependent on the transportation facilities. Therefore, transportation facilities can never be suppressed; rather it initiates to impede linear branch development. So as to improve government policies and regulations should be practiced.

2.3. Consequences of Urban Sprawl on Bordering Rural Areas

Consequences of urban growth may have both positive and negative impacts; however, negative impacts are generally more highlighted because this growth is often uncontrolled or uncoordinated and therefore the negative impacts override the positive sides. Positive implications of urban growth include higher economic production, opportunities for the underemployed and unemployed, better life because of better opportunities and better services, and better lifestyles. Urban growth can extend better basic services (such as transportation, sewer, and water facilities) as well as other specialist services (such as better educational facilities, health care facilities) to more peoples. However, in many instances, urban growth is uncontrolled and uncoordinated resulting in sprawl. As a result, the upside impacts vanish inviting the downsides (Cheng and Masser, 2003).

In the developed countries, during the nineteenth and early twentieth century's, urbanization resulted from and contributed to industrialization. New job opportunities in the cities motivated the mass movement of surplus population away from the villages. At the same time, migrants provided cheap, plentiful labour for the emerging factories. Currently, due to movements such as globalization, the circumstances are similar in developing countries. The concentration of investments in cities attracts large number of migrants looking for employment, thereby creating a large surplus labour force, which keeps wages low. This situation is attractive to foreign investment companies from developed countries that can produce goods for far less than if the goods were produced where wages are higher. Thus,

one might wonder if urban poverty serves a distinct function for the benefit of global capital (Glaeser and Kahn, 2003).

Developed and developing countries of the world differ not only in the number of people living in cities, but also in the way in which urbanization is occurring. In many megacities of developing world, urban sprawl is a common problem and a substantial amount of city dwellers live in slums within the city or in urban periphery in poverty and degraded environment. These high-density settlements are often highly polluted owing to the lack of urban services, including running water, sewer, trash pickup, electricity or paved roads. Nevertheless, cities provide poor people with more opportunities and greater access to resources to transform their situation than rural areas (Glaeser and Kahn, 2003).

2.4. The Socioeconomic Impacts of Urban Sprawl

Rapid urbanization process is demanding a transformation of land use in surrounding rural area to cater the needs of urban areas (DFID, 2000). Land is the primary asset that can be affected by intense pressures of land conversion process in peri-urban areas. Changes in land use from rural to urban activities affects the physical form of environment as well as economic and social features of peri-urban interface (DFID, 1999).

The agricultural land is an important source of land for industry and service sectors. In most cases, particularly in developing countries, some negative consequences that come with land conversion and displacement is not critically considered. Yet, it can have adverse effects on displaced households in terms of livelihood disruption, and social and cultural consequences (Phuong, 2007).

Administrative body of developing countries cities expropriates peasant agricultural land by appropriation of minimum compensation. The compensation given for land and removed asset is not valued based up on the market value. That means in most developing countries, the compensation given is valued based on the legal price called ‘state price’ in that the price is fixed by the government body which results in very low compensation (Phuong, 2007). On the other hand, the money received as compensation spends quickly on unplanned expenditure and unproductive goods such as consumer able

goods rather on capital goods (Fayera, 2005). Moreover, lack of education and skill training prohibit them to obtain non- agricultural jobs especially the middle age and older people. In sum, loss of land is equivalent to loss of livelihood (Phuong, 2007). Basically, poor people living in peri-urban interface develop multi-stranded, risk reducing livelihood portfolio that enables them to cope with the changes within interface. However, factors such as lack of education, skills and means to access credit facilities to start new income generating activities limit the poor in peri-urban interface. Therefore, the poor usually engage in low paid casual employment, petty trading and other low return activities (DFID, 2008).

2.5. Rational to Control Urban Sprawl

The recommendations offered for curbing the negative environmental impacts of urban sprawl in the articles are consistent with expectations, drawing heavily upon the Smart Growth canon of encouraging more compact development investing in transit balancing jobs with housing and ensuring that the true costs of development are passed on to the direct consumers. This similarity in responses to sprawl from two of the fastest growing developing nations is evidence of convergence across geographic contexts that transcends the familiar developed-developing country dichotomy. Although embracing the tenets of Smart Growth are most frequently suggested as the way forward, there are also articles that question the overall efficacy of such a strategy. Robinson et al (2003) find that growth management policies like urban growth boundaries have been successful in raising interior densities, but have failed to curb the proliferation of sprawling low-density housing in rural and wild land areas. Similarly, zoning and development regulations alone have not been enough to protect agricultural land from urban sprawl in Spain's Bilbao region and market-based mechanisms, like transfer of development rights, have been suggested as a possible solution (Glaeser and Kahn, 2003).

CHAPTER THREE: DESCRIPTION OF THE STUDY AREA AND THE RESEARCH METHODS

3.1. Description of Study Area

Sebeta is the town of Sebeta Hawas Woreda located in Special Central Zone Surrounding Finfinne of Oromia Regional State. It is situated at a distance of 24km west of Addis Ababa along Jimma road. Sebeta town is located within approximate geographical coordinates of $8^0$52'30"N-$9^0$00'00"Nlatitude and $38^0$35'00"E $38^0$40'00"E longitude. With regard to relative location, it shares common boundaries with Addis Ababa in the North, Northeast and East, Burayu town in the North, and rural villages of Sebeta Hawas Woredato the south and west. With total area that was covered with the current topographic map of the town is estimated to 9.8 km2 (OUPI, 2015)**.** The town is situated on a fertile area known for natural resources. The area is surrounded by different chain of hills and mountains such as Wachacha, Hoche and seasonal marshy plains including Furi-Gara-Bello, *G*ejja, and Ballachisand Jammo (OUPI, 2015).

The town has eight *Kebeles* which include Sebeta (01), Alemgena (02), Walete (03), Furi (04),Dima (05),Daleti (06),Sebeta (07), and Kerabu (08). The population and housing census of CSA (2010) estimated the total population of Sebeta town to be 61,461. However, currently CSA projected the population of the town for the year 2014 was equal to 107, 298 (OBoFED, 2015).

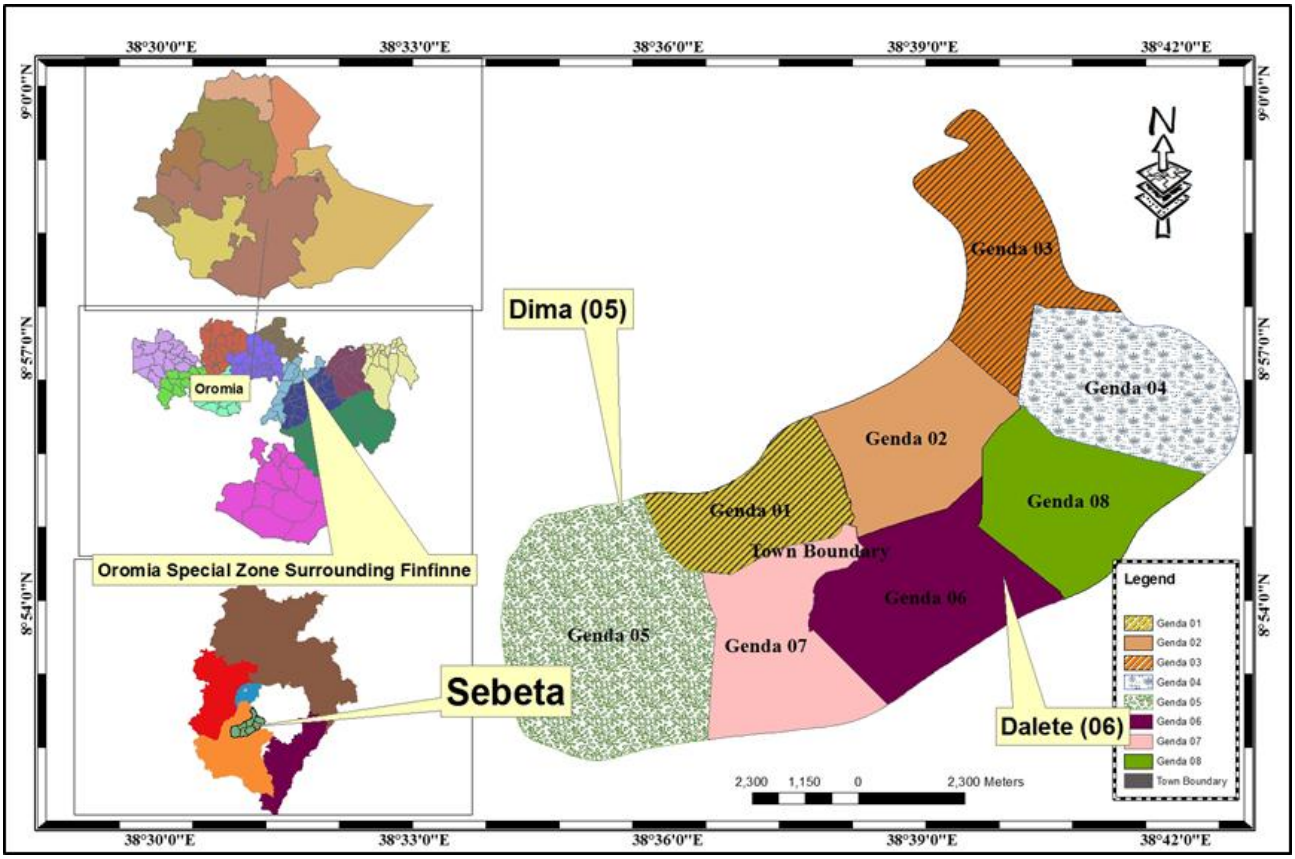


Figure3.1: Location map of the study area (Source: Eth Gis, 2004; CSA, 2007)

3.1.1 Historical Background of Sebeta Town

The present Sebeta town encompasses three major neighborhood entities: Sebeta 01, Alemgena, and Walete that were previously developed as separate centers, without a municipality of their own. However, they are highly interconnected through socio-economic activities and administrative structure (OUPI, 2015). Therefore, understanding of the towns' history requires looking at each of them separately. Sebeta 01as an embryo of Sebeta town emerged as a town in 1935. Its foundation is traced back to Menelik II period. According to some sources Menelik II was attracted by its fertility, cool and attractive climate when he took rest while returning back from the Walet*e* campaign in 1894. Hence, he made a temporary encampment at the place called 'Qarsa Ana' and finally obtained a plot of land from local leader. On the other hand, the establishment of close to the present Liquor factory around Sebeta area by Turkish people paved the way and the base for emergence of

Sebeta town .The construction of a palace around 1942 was also another event which marked the development of the area into town (OUPI, 2015).

For the construction of this palace Haile Sillassie dislocated local people called 'WaraFatu'. Meanwhile the palace become transformed to Nunnery (SebetaGetsemanyBetedengelTebabat) in 1960 by Etege MenenAsfew, the wife of Emperor H/Sillassie for this service. Sebeta got municipal status in 1953/4. It was after that period that the town began to serve as a seat of Alemgena district. Prior to that period the seat of Alemgena district was Alemgena town (OUPI,2015).

Alamgena also emerged as a separate settlement just before the Italian occupation. During Italian occupation (1936-41), Alemgena took more urban character as a result of occupying Italian force in the area and hosted as a truck repair shop. This became a base for the Imperial Road Authority Training Center which was established in 1956. Hence, this village town has been chosen as a district seat even after the time of liberation until Sebeta took this position at the end of 1950. The Walete was a rural peasant settlement area with small-scale commercial transactions all through the 1950s, 1960s and 1970s as the area is very close to Addis Ababa and nearby the main road from Jimma to the capital (OUPI, 2015). It was under the administration of ManageshaAwraja, Alemgana district. The development of settlement gradually made the area a centre of the villages called Karabu, Qorke and Raphi. During the revolutionary period it began to take a sub-urban character and intensive settlements took place. Since 1990s, Walete has characterized as a full-fledged urban area that is part of Sebeta town (SMTR, 2016).

During the last few years, the town was expanded towards an already vacant land and peasant agricultural land holdings. The vacant pocket areas were found within the municipal boundary, mainly in the west and southwest parts of the town. These areas include different open grazing and eucalyptus tree areas along the road to Jimma especially between Walete and Alemgena, Alemgena and Sebeta, and Sebeta and Dima areas. On the other hand, expansion areas that were already under the holding of farming community includes: areas along ButaJira road called Daleti, open spaces found in the West (east of Furi mountain), south west (along Sebeta and Dima river catchment areas),

and North West of Dima rural village direction (OUPI, 2015). For instance, in 1994 population and housing census, the total area that covered by topographic map of the town was 2.1 sq km (OBoFD, 2010). Due to horizontal expansion of the town, this figure becomes more than tripled and the total area that is covered by current topographic map of the town increased to 7.41 sq km (CSA, 2010).

The main feature for the physical expansion of the town is contributed by its high potential in attracting investment in the area. The investment attraction potentials of the town include its proximity to national market and potential land that attracts potential investors; easy access to infrastructure such as roads, electricity, etc; minerals identified from the existence of many quarry sites in and around the town; its land escapes to create attractive recreation area; and prospect of future expansion of the town, etc

3.2. Research Approach

A mixed research approach was applied in the course of doing this study to generate rich data from multiple sources of both quantitative and qualitative type. The concept of mixing different methods probably originated in 1959, when Campbell and Fiske used multiple methods to study validity of psychological traits. They encouraged other to employ their "multi method matrix" to examine multiple approaches to data collection in a study. This prompted others to mix methods, and soon approaches associated with field methods such as observations and interviews (qualitative data) were combined with traditional surveys quantitative data (Sieber, 1973). Recognizing that all methods have limitations, researchers felt that biases inherent in any single method could neutralize or cancel the biases of other methods. Triangulating data Sources were used as a means for seeking convergence across qualitative and quantitative methods were born (Jack, 1979). From the original concept of triangulation emerged additional reasons for mixing different types of data.

3.3. Method of Data collection

Data were collected from both primary and secondary sources, which complement each other. It has both qualitative and quantitative type, which mainly focuses on impacts of the urban \sprawls on farmlands and the peripheral community who has been engaging on

farming activities and holding that farm lands. Key informant interview guidelines served as a tool to conduct key informants' interviews. Observation checklist was also used as a tool for guiding data that were generated through observation. Questionnaire was used to collect survey data. GPS readings were used for supervised classification of the satellite image.

3.3.1. Primary Data Sources

Important sources of primary data for this study were key informant interview, field survey, and observation.

A/Key informant interview: would help to generate rich data from government officials and elders of the community. Because experts and office head who are directly working on the issue believed to have rich data than the others. In addition, it helps to get required information from community elders could describe changes resulted over time than other existing young people. Hence, purposive sampling was used to select participants for key informant interviews. Finally, nine people participated in the key informants' interviews. More specifically, one from municipality of the town, one from Office of Land Management of Sebeta, four from community elders, two from *kebele* administration and one from *woreda* Office of Land Management and Environmental Protection.

B/Household Survey: survey questionnaire also helps to generate data on effects of sprawl on farmers' production, income and quality of life in relation to its activities which is mixed farming system or both rearing cattle and cultivating land. Questionnaire was used to gather these data. The researcher has planned to carry out all data collection by himself to get real experience of data collection and to learn more from challenges that might be encountered in the process of data gathering.

C/Observation: the researcher has observed existing sprawls. Thus, observation was focused on density, and characteristics of sprawl using structured checklist. In addition the socio-economic activity of the community was observed.

3.3.2. Secondary Data Sources

Necessary documents were reviewed to get required secondary data. books, journals, official reports, websites, legal documents, CSA reports, satellite images and previous study documents were important sources of secondary data. Land sat imageries of TM and ETM+ was employed and acquired in the same season and the same level of resolution for the periods 1986, 2000and 2016. Hence, satellite map of the stated years were compared to see the difference comes over time. Thus, it was conducive for comparison of changes and patterns occurred in the time under discussion. The images were downloaded from the Global Land Cover Facility of the University of Maryland (GLCF, 2013) and the United States Geological Survey (USGS) and spatially referenced in the Universal Transverse Mercator (UTM) projection with datum World Geodetic System (WGS) 1984 UTM zone 37N.

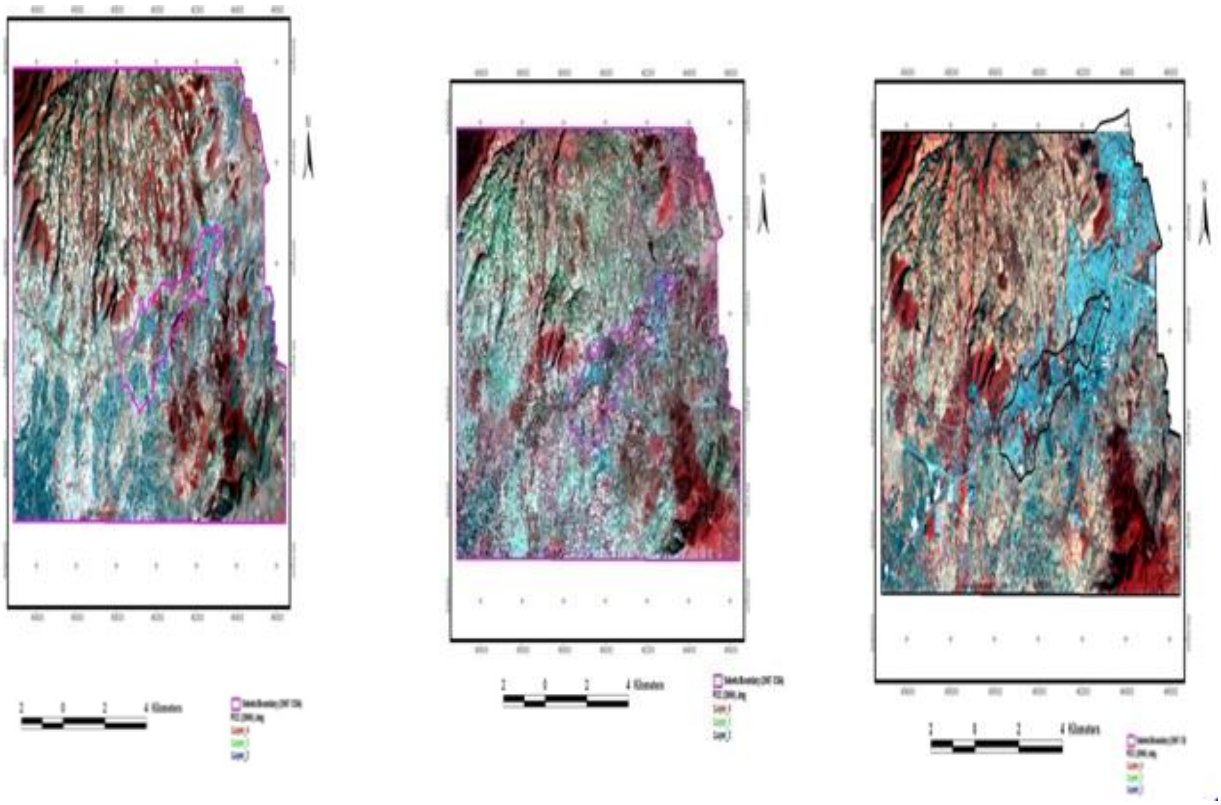


Figure 3.2: False Color Composite Display of Land Sat TM 1986(left); ETM+ 2000(middle) & ETM+ 2016(right) for Sebeta and the Surrounding Area.

Table 3.1: Data Source Characteristics

No.	**Data Type**	**Sensor**	**Date of Acquisition**	**Path/Raw**	**Resolution**	**Source**
1	Land sat Image	TM	01/1/1986	182&183/52	30m by 30m	GLCF
2	Land sat Image	ETM+	01/1/2000	170/52	30m by 30m	GLCF
3	Land sat Image	ETM+	01/1/2016	170/52	30m by 30m	GLCF

3.4. Sampling Techniques

In the process of realizing this study, both probability and non-probability sampling were used to select study participants. Two *kebeles* were selected purposely from eight *kebeles* of the town which are Delatti and Dima. Since Sebeta town shares boundary with Addis Ababa, the two kebeles i.e Furi and Walete area already bounded and limited by Addis Ababa city and has not shown much expansion. On the other hand the three kebeles Alemgena, Karabu and Sebeta are bounded and limited by mountains that hinder the expansion of the settlements. Therefore, these two *kebeles* Delatti and Dima are found relatively on flat areas that make them suitable for urban expansion and hence were purposely selected for this study.

Purposive sampling was used to select key informants from government officials and elders of the community. Because experts and office head who are directly working on the issue believed to have rich data than the others. In addition, community elders could describe changes resulted over time than other existing young people. Hence, purposive sampling was used to select participants for key informant interviews. Finally, nine people participated in the key informants' interviews. More specifically, one from municipality of the town, one from Office of Land Management of Sebeta, four from community elders, two from *kebele* administration and one from *woreda* Office of Land Management and Environmental Protection.

3.4.1. Sampling Frame.

The sampling frame for this research was taken from households who are living in Dalatti and Dima *kebeles.*

3.4.2. Sampling Unit.

The sampling unit was households of the stated *kebeles* and any member of a target population should live at least one year in the area; the reason is to get precise information from the respondent.

3.4.3. Sample Size

Representative samples were taken from the households of selected *kebeles* based on scientific formula at required degree of confidence.

According to Sebeta Town Office of Finance and Economic Development, the number of households who live in Dalatti and Dima (05) *kebeles* are around one thousand two hundred.

Therefore, representative sample of these households was calculated based on formulae for sample size determination and for finite population. According to Kothari (2004, p. 179) it is given by the formula

$$n = \frac{z^2.p.q.N}{e^2.(N-1) + z^2.p.q}$$

Where, n = the desired sample size

z = the value of the standard variant at a given confidence level (to be read from the table giving the areas under normal curve)

p = the proportion of target population estimated (50%)

q = 1-p

e = acceptable error (the precision)

N = population size

Therefore, representative sample of population was determined at 95% degree of confidence.

Hence at 95% degree of confidence,

Z=1.96 p=0.5 q=1-p e=5% (0.05); by substituting;

$n = \frac{(1.96)^2 (0.5) (0.5) (1200)}{(0.05)^2 (1200-1) + (1.96)^2 (0.5) (0.5)} = 291$ which is approximately equal to 291.

According to table of sample size determination developed by Kerjcie and Morgan (1970), at 95percent degree of confidence, the representative sample size for one thousand two hundred populations is equal to 291. This is similar with the above-calculated result. Therefore, 291households were participated in the survey.

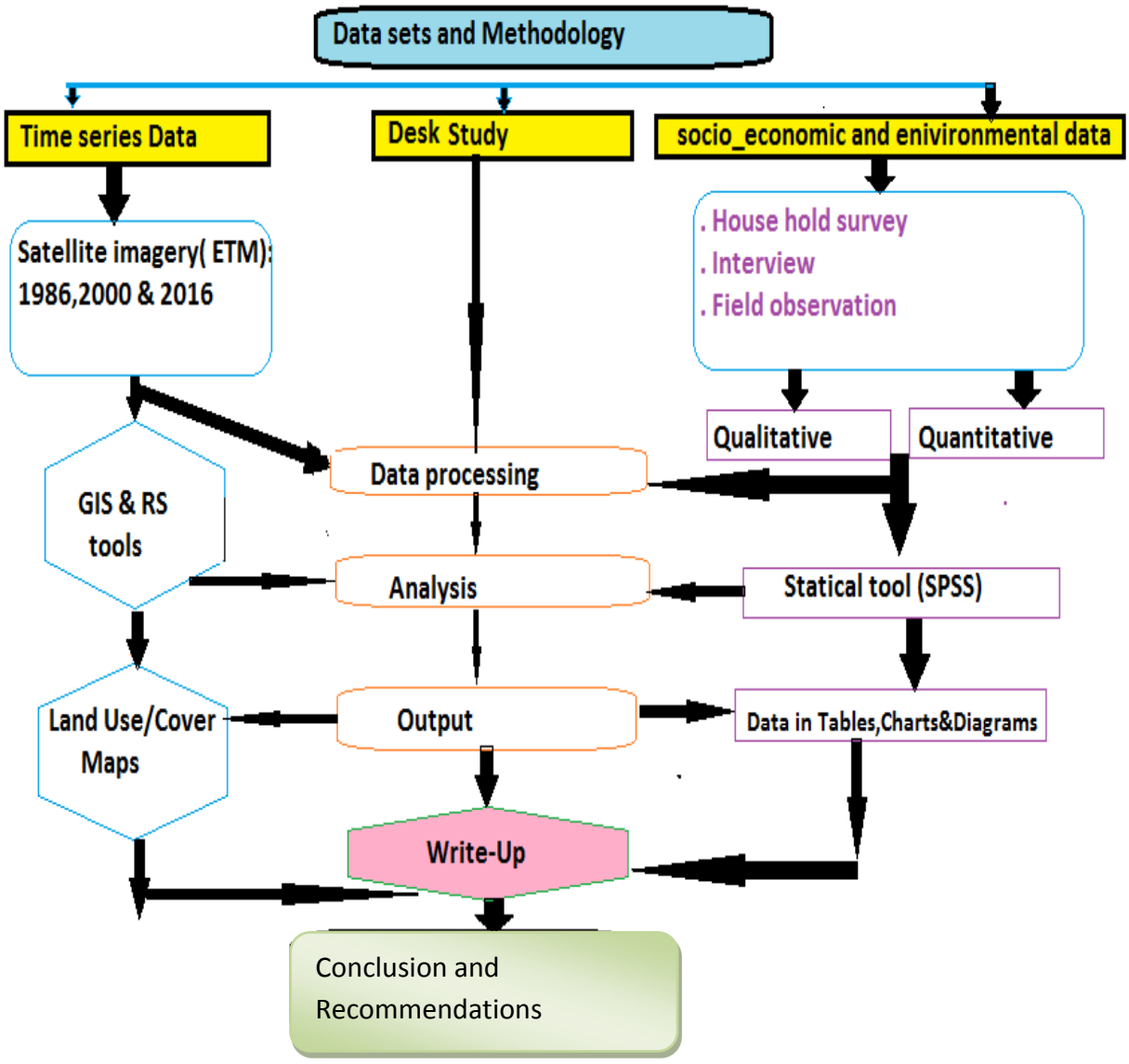


Figure 3.3: Geneneral methodological flow of the study

3.5. Data Analysis

3.5.1. Spatial data analysis

The satellite imageries acquired were already geo-referenced and radio metrically corrected. The image processing was then started by image classification within the administrative boundary of Sebeta town. Depending on the scope of the study and visual interpretation of the satellite imageries, only six classes were chosen. These were forest land, shrubs land, grassland, cropland, rural settlement and urban area. There are two methods of image classification. These are, supervised and unsupervised image classifications (Singh, 1989; ERDAS, 1999Tadesse et al 2001). Supervised classification involves selecting pixels that represents land cover classes that are recognized by the analyst. This requires, however, prior knowledge of the area by the analyst. Unsupervised image classification is more computer automated. It enables the analyst to

Specify some parameters that the computer uses to reveal statistical patterns that are inherent in the data. These patterns are simply clusters of pixels with similar spectral characteristics. This method is usually used when less is known about the data before classification (ERDAS, 1999; Tadesse et al., 2001). Due to similar spectral characteristics of grass, crop and shrubs lands, which were determined to be independent classes before classification, the application of unsupervised classification may not give good results. As a result, in this analysis, supervised image classification was used. After determining the land cover features the next step employed was land cover change detection. Land cover change detection is the process of assessing the spatial and temporal dynamics of a given land cover feature. This was done through overlying the classified satellite imageries and analyzing by image differencing algorithm. _and Arc GIS 9.3 software's were used for analysis. The former employed to image classification and change detection while the later was used to finalize the mapping exercises and layout preparations from the classified images. Furthermore, the outputs of image classification were verified by conducting ground truth.

Quantitative data were analyzed using Statistical Package for Social Sciences (SPSS)version 20 . Variables such as, sex, age, households size, education status, their attitude on the effects of urban sprawl on their farmland and livelihood were analyzed using descriptive statistic mainly percentage and means. The data has been summarized descriptively using graphs, tables. Photographs and charts are helpful to present relevant data. For qualitatively gathered data

through observation, key informant interview and reviewed document were described. In addition satellite image results also displayed changes come over time.

3.6. Reliability and Validity of Methods and Materials

The reliability and validity of the outcome of this thesis report was ensured as much as possible by taking the following precautions. The insights were obtained from the combined use of quantitative and qualitative methods simultaneously increase the strength of the conclusion. Consulting knowledgeable persons (experts, development agents, researchers) on issues that require expertise and crosschecking information was obtained through interviewing with information gathered from public records and published materials on the issue.

3.7. Ethical Considerations

All research studies present a number of ethical and moral dilemmas which must be identified and addressed prior to carrying out any research study in order to protect all participants from potential harm. Also the privacy and confidentiality of study's subjects was maintained, all findings is portrayed in a confidential manner so that no personal or identifiable information is recorded or printed in the study. Thus, the name of participants was not recorded during the data collection process. Therefore, before data collection, a formal letter was given to the researcher from Addis Ababa University and the researcher showed to the concerned organization and explained the general objective of the study. Then, the researcher gathered the required data for the study after getting permission from the concerned organizations.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

4.1Socioeconomic characteristics and Land use/cover Dynamics

This chapter is devoted to analysis of both qualitative and quantitative data related the impacts urban sprawl on farmlands and the livelihoods of the community living in urban-rural interface of Sebeta town. Out of 291 distributed questionnaires, data was collected from 284 respondents, which is equal to 97.59 percent of the total. The respondents are almost homogeneous, farmer background and share geographic boundary with each other. Hence, it is enough to analyze the findings.

4.1.1. Demographic Characteristics

The demographic variables of the respondents such as sex, age, education status, household size and religion were collected and the results presented as follows.

4.1.2. Sex Structure of the respondents

In developing countries such as Ethiopia, sex composition of the population has strong impact on households' labor division and decision making that in turn influences the entire livelihood of the community. Due to this reason sex composition was intentionally considered when sampling the respondents.

Table 4.1: Sex structure of the respondents

Sex	Number of respondents	Percent
Male	230	81.0
Female	54	19.0
Total	**284**	**100.0**

Computed based on the data obtained from field survey, April2016

Male respondents dominated the sample respondents which constituted 81 percent of the total and only 19 percent of the respondents were female. This is because traditionally, landholding and land use decision-making are mainly the responsibility bestowed on male partners. Hence,

the disproportionate ratio between male and female respondents does not affect the objective of the study.

4.1.3. Marital Status of the Respondents

As it shown on Table 4.2 the majority of the respondents (84.5%) of the respondents are married followed by single with 12.3 percent while the rest are divorced and widowed. Hence, the respondents could give their answer from their experience of administering family and caring responsibility.

Table 4.2: Marital Status of the Respondents.

Marital status	**Number of respondents**	**Percent**
Single	35	12.3
Married	240	84.5
Divorced	3	1.1
Widowed	6	2.1
Total	**284**	**100.0**

Computed based on the data obtained from field survey, April 2016

4.1.4 Education Status of the Respondents

Most of the respondents are illiterate with 28.17 percent of the total followed by who are able to read and write with 23.59 percent. Those who gets access to education junior (1-8) grades, secondary school and tertiary (12+) shares 17.25 percent, 12.32 percent and 18.66 percent, respectively. While conducting this study, survey interview were used to fill the questionnaire for those who could not able to fill the questionnaire themselves.

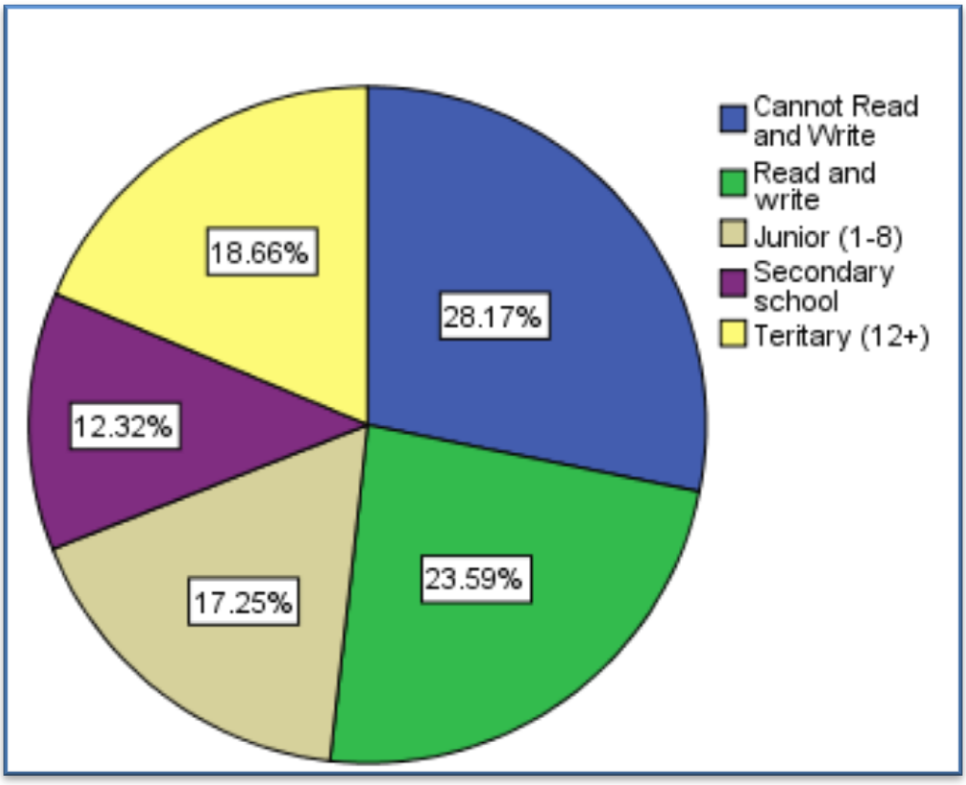


Figure4.1: Education Status of the Respondents (Source: Field survey, April 2016)

Most of the respondents are illiterate with 28.17 percent of the total followed by who are able to read and write with 23.59 percent. Those who gets access to education junior (1-8) grades, secondary school and tertiary (12+) shares 17.25 percent, 12.32 percent and 18.66 percent, respectively. While conducting this study, survey interview were used to fill the questionnaire for those who could not able to fill the questionnaire themselves.

4.2. Land Ownership of the Respondents

Is it indicated in table 4.3 out of the total respondents, 88.4 has land while the rest 11.6 percent are not however, different in size.

Table 4.3: whether the respondents have land or not

Response	Number of respondents	Percent
Yes	251	88.4
No	33	11.6
Total	**284**	**100.0**

Computed based on the data obtained from field survey, April 2016

4.2.1. Hectares of Land the Respondents Have

As it indicated in table 4.4 the average land holdings of the respondents is 3.38 hectors. However, there are respondents who have no land that is why minimum value is zero.

Table 4. 4: Average landholding of the respondents in hectare

	Number of respondents	Minimum	Maximum	Mean	Std. Deviation
Landholding size (ha)	270	.00	20.00	3.3814	2.65912

Computed based on the data obtained from field survey, April 2016

4.2.2.: Respondents' land Allotment purposes

The respondents are also using their land for different purposes. Out of their total land, crop land 83.5 percent, grazing land. 2.1 percent, fruits and vegetables 1.8 percent and either two or more of the stated purpose 4.9 percent. Hence, the land of the farmers is serving for means of livelihood for the farmers. This implies losing the land they hold directly affect their means of living unless replaced by another means of earning.

Table 4.5: For what purpose the respondents are using their land currently

Land use type	Number of respondents	Percent
crop land	237	83.5
Grazing land	6	2.1
Fruits and vegetables	5	1.8
crop land and Grazing land	12	4.2
crop land, Grazing land and Fruits and vegetables	8	2.8
crop land and Fruits and vegetables	6	2.1
Total	274	96.5
System	10	3.5
Total	**284**	**100.0**

Computed based on the data obtained from field survey, April 2016

Most of respondents are claiming that their land is serving for crop and grazing. Though growing fruits and vegetables also has significant place, crop land lonely dominates all with 83.5 percent of the total.

4.3. Socioeconomic Effects of Urbanization in Sebeta town

4.3.1. Reaction of the Respondents towards the effects of Urban Expansion

The respondents are also asked whether it is affecting their life or not and finally as it displayed in Table 4.9, 90.1 percent said yes the expansion of the town is affecting their life. Only, 3.9 percent are responded expansion of the town is not affecting their life.

Table 4.6: perception of respondents about the Impacts of expansion on their livelihood

Response	Number of respondents	Percent
Yes	256	90.1
No	11	3.9
Total	267	94.0
Missing System	17	6.0
Total	**284**	**100.0**

Computed based on the data obtained from field survey, April 2016

4.3.2. Types of Effects of Urban Expansion

As it indicated in Table 4.7 the respondents reacted that most of the respondents 71.5 percent loss of land the impact of urban expansion followed by loss of livelihood or 10.2 percent however it is not mutually exclusive of former, for farmers who are dependent of their land for means of earning their livelihood in one case or the other. Shortly, loss of land, social fragmentation or exclusion and loss of livelihood are the impacts on which the respondents agreed.

Table 4.7: Types of Impacts

Response	Number of respondents	Percent
loss of land	203	71.5
social fragmentation or exclusion	9	3.2
loss of livelihood	29	10.2
Other	1	.4
loss of land and loss of livelihood,	16	5.6
loss of land social fragmentation or exclusion	8	2.8
loss of land, social fragmentation or exclusion and loss of livelihood,	9	3.2
Total	275	96.8
Missing System	9	3.2
Total	**284**	**100.0**

Computed based on the data obtained from field survey, April 2016

4.3.3. Respondents Land Utilization before their Eviction

Table 4.8 portrays that the land taken from farmers have been serving them for agriculture 79.2 percent for residential and agriculture 5.6 and the rest have been serving them for grazing and one or more of the previously stated purposes. Hence, the effect of urban expansion on surrounding farmland directly affects the livelihood of the farmers through changing their farming activity, which is not possible without land. At least the way the farmers sustain their life or shifting their economic activity required cope up with the challenge.

Table 4.8: Type of Land Vacated

Response	Number of respondents	Percent
Agricultural land	225	79.2
Residential land	5	1.8
both residential and agricultural land	16	5.6
grazing land	3	1.1
Agricultural, Residential and grazing land	8	2.8
Agricultural and grazing land	6	2.1
Residential and agricultural land and grazing land	9	3.2
Total	272	95.8
Missing System	12	4.2
Total	**284**	**100.0**

Computed based on the data obtained from field survey, April 2016

4.3.4. Whether or not agricultural land was taken from the respondents

As it indicated in table 4.9, either Land was taken from 88 percent of the respondents fully or in part out of their total land only from 6.3 percent of the respondents claimed that their land was not taken.

Table 4.9: Type of Land Use of the Vacated Land

Response	Number of respondents	Percent
Yes	250	88.0
No	18	6.3
Total	268	94.4
Missing system	16	5.6
Total	**284**	**100.0**

Computed based on the data obtained from field survey, April 2016

4.3.5 .When land was taken from the Respondents

As it displayed in Table 4.10 most of the respondents claimed that their land was taken in the past 15 years (2000-2016) while few or 4.9 in the previous 15 years (1986-2016). This implies that in near past years expansion of urban or town to the surrounding rural might be a major factor for their land to taken for different purposes.

Table 4.10: when land was taken

Year	Number of respondents	Percent
Over the last 15 years (2000-2016)	263	92.6
Over previous 15 years (1986-2000)	14	4.9
Total	277	97.5
Missing System	7	2.5
Total	**284**	**100.0**

Computed based on the data obtained from field survey, April 2016

4.3.6 Respondents' View of the Current Use of the Vacated Land

Table 4.11 displays the respondents 69.7 percents claims the land taken from them is serving for industries, 6.3 percent for residential, 10.2 percent for commercial agriculture such as flower

farm, the rest is serving for commercial, infrastructure development such as railway line or one or more of the stated purposes

Table 4.11: Respondents' view of the purpose land was taken from them

Purpose of land	**Number of respondents**	**Percent**
Industrial	198	69.7
Residential	18	6.3
commercial agriculture	29	10.2
office construction	2	.7
any other	2	.7
Industrial, Residential and commercial agriculture	1	.4
Industrial and commercial agriculture	16	5.6
infrastructure development such as railway line	2	.7
Residential, office construction and infrastructure development such as railway line	3	1.1
Industrial and office construction	2	.7
Industrial and Residential	2	.7
Total	275	96.8
Missing System	9	3.2
Total	**284**	**100.0**

Computed based on the data obtained from field survey, April 2016

4.3.7. The Current Occupation of the Respondents

The respondents asked whether they have been raising livestock and almost all 97.5 are rearing only the 2.5 are not. This implies the livelihood of the respondents is dependent of mixed farming agricultural practice is in action on the area.

Table 4. 12: Whether or not the respondents raising livestock

Response	Number of respondents	Percent
Yes	271	95.4
No	7	2.5
Total	278	97.9
Total	**284**	**100.0**

Computed based on the data obtained from field survey, April 2016

4.3.8. Whether Currently the Respondent are Engaged on Cultivating Land

As it displayed in table 4.13 the respondents are still on engaging on cultivating land, which is 75.7 percent of the total and 16.2 percent, are not. Hence, this implies still the life of the farmers is not transformed to another economic activity.4.4.9 Compensation Given for the Land Taken

Table 4.13: The Current Occupational Engagements of the Respondents'

Response	Number of R respondents	Percent
Yes	215	75.7
No	46	16.2
Total	261	91.9
Missing System	23	8.1
Total	**284**	**100.0**

Computed based on the data obtained from field survey, April 2016

4.3.9. Compensation Given for the Land Taken

Most of the respondents get compensation for the land taken from them with 86.6 percent of the total. While 8.5 percent claims, they did not get any kind of compensation. This might be due to the regional government policy that encourages local communities to give their land for infrastructure development such as road without compensation.

Table 4.14: Compensation for land taken

Response	Number of Respondents	Percent
Yes	246	86.6
No	24	8.5
Total	270	95.1
Missing System	14	4.9
Total	**284**	**100.0**

Computed based on the data obtained from field survey, April 2016

4.3.10. Kinds of Compensation Paid

Compensation paid for land taken was in monetary term according to the respondents or 90 percent of the respondents claimed while the rest claimed either money and housing pilot or housing pilot only. This implies unless required care and training given for those displaced farmers it might be difficult to liquid money asset for lifelong livelihood or shift from the work they adopted which is farming to other income generating activity. Hence, sustaining the life of that farmers should get great attention.

Table 4.15: Kinds of compensation paid

Kind of compensation	Number of Respondents	Percent
Money	256	90.1
housing pilot	5	1.8
Money and housing plot	2	.7
Total	263	92.6
Missing system	21	7.4
Total	**284**	**100.0**

Computed based on the data obtained from field survey, April 2016

4.3.11. Whether or not required training was delivered to the Evicted households

As it indicated in Table 4.16, only 10.6 percent of the respondents get training after land was taken from them. Hence, the concerned body (urban local government) is not working properly on farmers displaced because of urban expansion, which is at expense of farmland. As table presents 85.6 percent of the respondents claimed that no any training was given for them when government took their land for different purposes and only 10.6 percent of the respondents get training. This implies that town administration is not working

Table 4.16: Whether or not required training was delivered to the Evicted households

Response	**Number of Respondents**	**Percent**
Yes	30	10.6
No	243	85.6
Total	273	96.1
Missing System	11	3.9
Total	**284**	**100.0**

Computed based on the data obtained from field survey, April 2016

4.3.12. Types of training on which the households participated

Table 4.16 portrays that only 10.6 present of the respondents get required training while evicted from their land (development induced displacement). Hence, these segment of respondents asked type of training they get and finally 2.5 percent on Social adjustment skill, 1.1 percent on Financial management/saving, 0.7 percent on own Business development management and the rest participated on two or more of the stated training as indicated in table 4.20.

Although the training coverage is very small compared to the respondents' size type of training delivered is more or less important for farmers to cope up with change of livelihood or means of their earning.

Table 4.17: Types of training on which the households participated

Type of training	Number of Respondents	Percent
Own Business development management	2	.7
Financial management/saving	3	1.1
Social adjustment skill training	7	2.5
All	6	2.1
Financial management/saving and Social adjustment skill training	7	2.5
Social adjustment skill training and technical training	2	.7
Own Business development management and technical training	2	.7
Financial management/saving, Social adjustment skill training and technical training	2	.7
Total	31	10.9
Missing System	253	89.1
Total	**284**	**100.0**

Computed based on the data obtained from field survey, April 2016

4.4. Factors that Contributed to the Rapid Expansion of Sebeta Town

According to key informants, the main causes of the rapid physical expansions of Sebeta Town to the urban-rural inter face agricultural areas Sebeta town is very near to Finfinne(Addis Ababa) attracted a number of investments and establishment of different factories. In addition, there are significant increase in the number f people being employed by this factories and other business

expanding in the town. These all people resulted in the increased demand for residential plots creating pressure on expansion of rural farm lands as well, the increased number of different organization like schools, banks, insurance, health institutions also contributed to the same expansion of the town are categorized as the lack of appropriate urban planning intervention, limited range of function of the city, lack of appropriate policy strategy and lack of stable and capable administrative organization.

4.5 Land use /Land Cover Dynamics

As indicated in the classification scheme Forest land, Shrub land, grassland, Crop land, Settlements and urban Built-up area are the major LULC classes for the study periods. The classified images were acquired, when crop harvesting had already started,

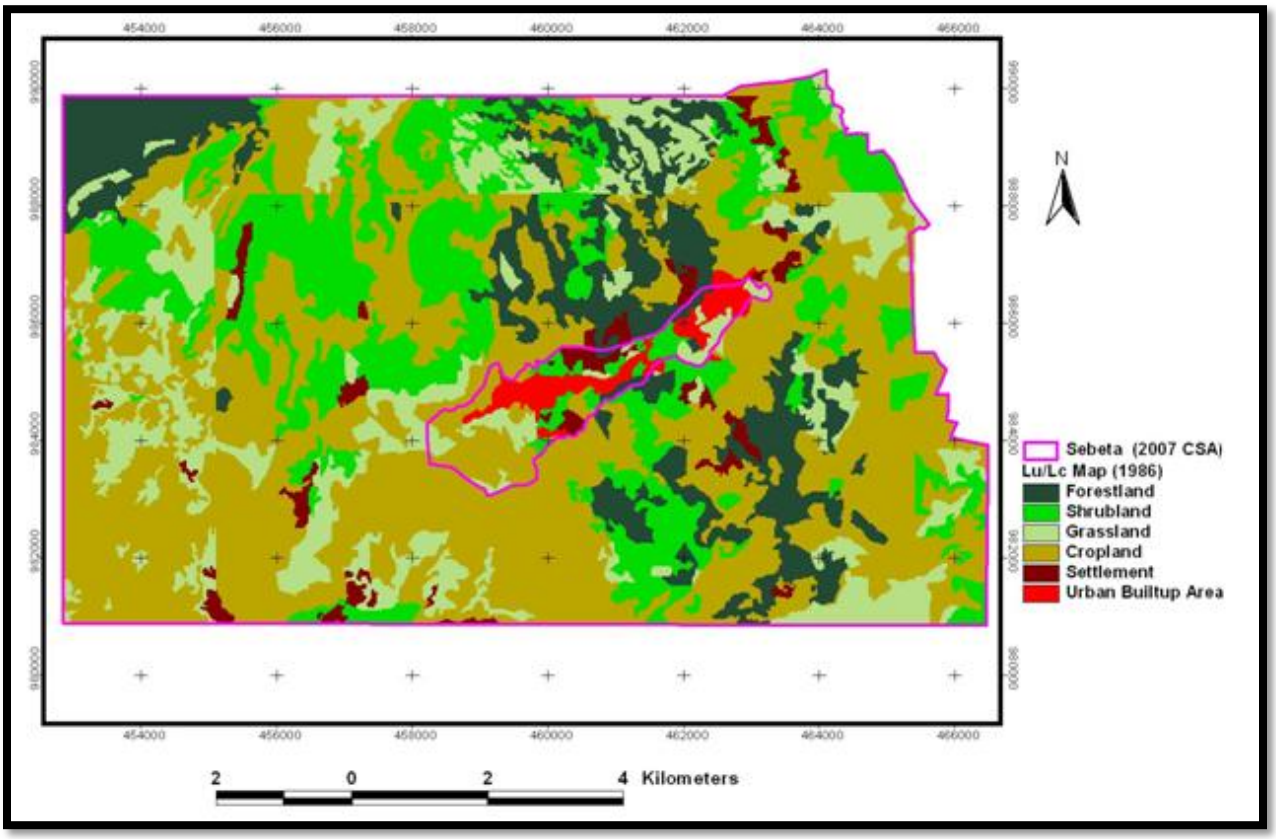


Figure 4.2: Land use/land Cover Map of Sebeta Town and the Surrounding Area (1986)

4.5.1. Percentages of Land use/Land cover in Sebeta Area in 1986

Table 4; 18: Percentages of Land use/Land cover in Sebeta Area in 1986

Lu/Lc type	Hectare	%
Forest/ Woodland	2042.6	13.4
Shrub land	3065.1	20.1
Grassland	2373.2	15.5
Cropland	7181.6	47.0
Rural Settlement	383.7	2.5
Urban area	224.1	1.5
Total	**15,270**	**100.0**

The classification result of the 1986 image revealed that Cropland constituted the largest proportion of land in the study area with a value of 47.0 %, followed by Shrub land which accounts for 20.1 % (Figure 4.1). Grassland, forest/ Woodland, rural Settlement, and urban area constituted 15.5%, 13.4%, 2.5% and1.5 % respectively.

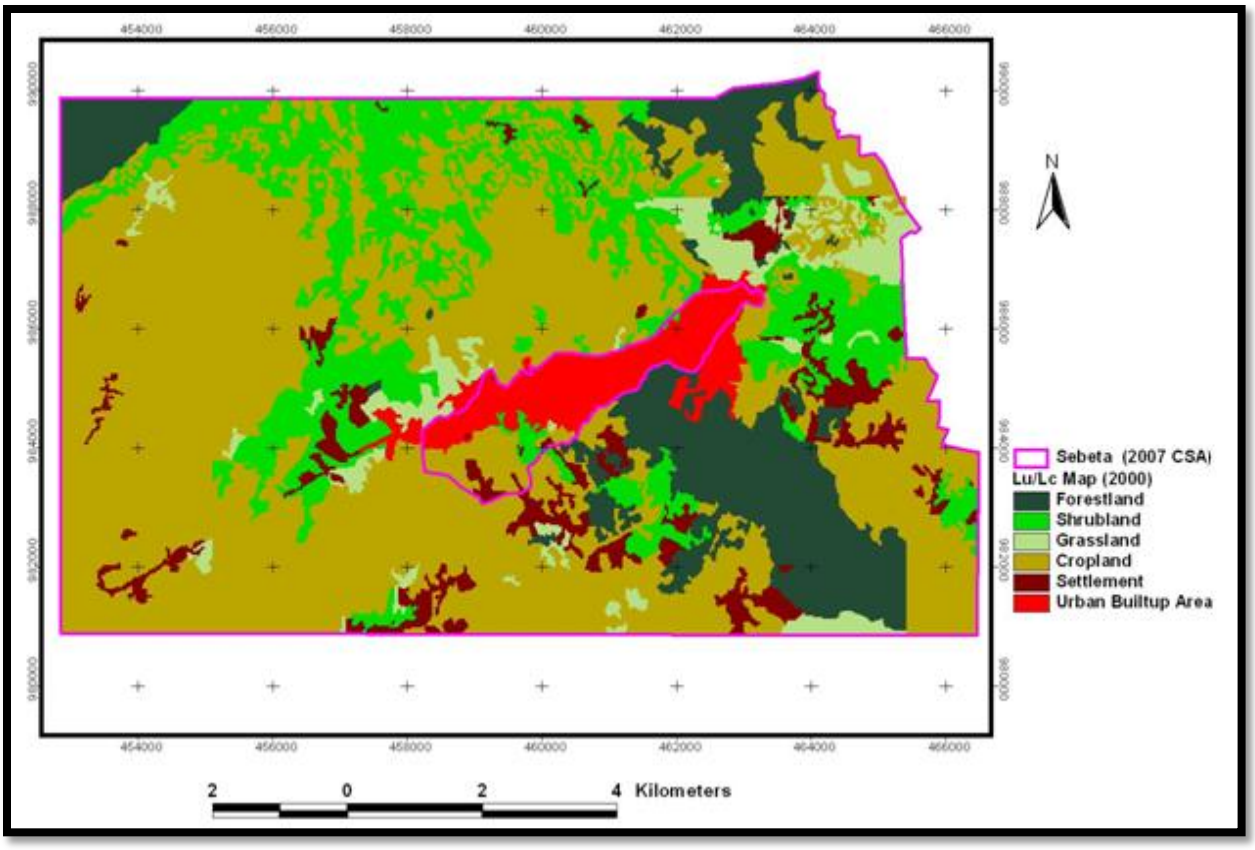


Figure 4.3: Land use/land Cover Map of Sebeta Town and the Surrounding Area (2000)

4.5.2. Percentages of Land use/Land cover in Sebeta Area in 2000

Table 4.19: Percentages of Land use/Land cover in Sebeta Area in 2000

Lu/Lc type	**Hectare**	**%**
Forest/ Woodland	1888.3	12.4
Shrub land	2642.8	17.3
Grassland	718.0	4.7
Cropland	8522.6	55.8
Rural Settlement	790.2	5.2
Urban area	708.5	4.6
Total	**15,270**	**100.0**

The classification result of the 2000 image revealed that Cropland constituted the largest proportion of land in the study area with a value of 55.8 %, followed by Shrub land which accounts for 17.3 % (Figure 5). Forest/ woodland, rural Settlement, grassland, and urban area constituted 12.1%, 5.2%,4.7% and 4.6 % respectively.

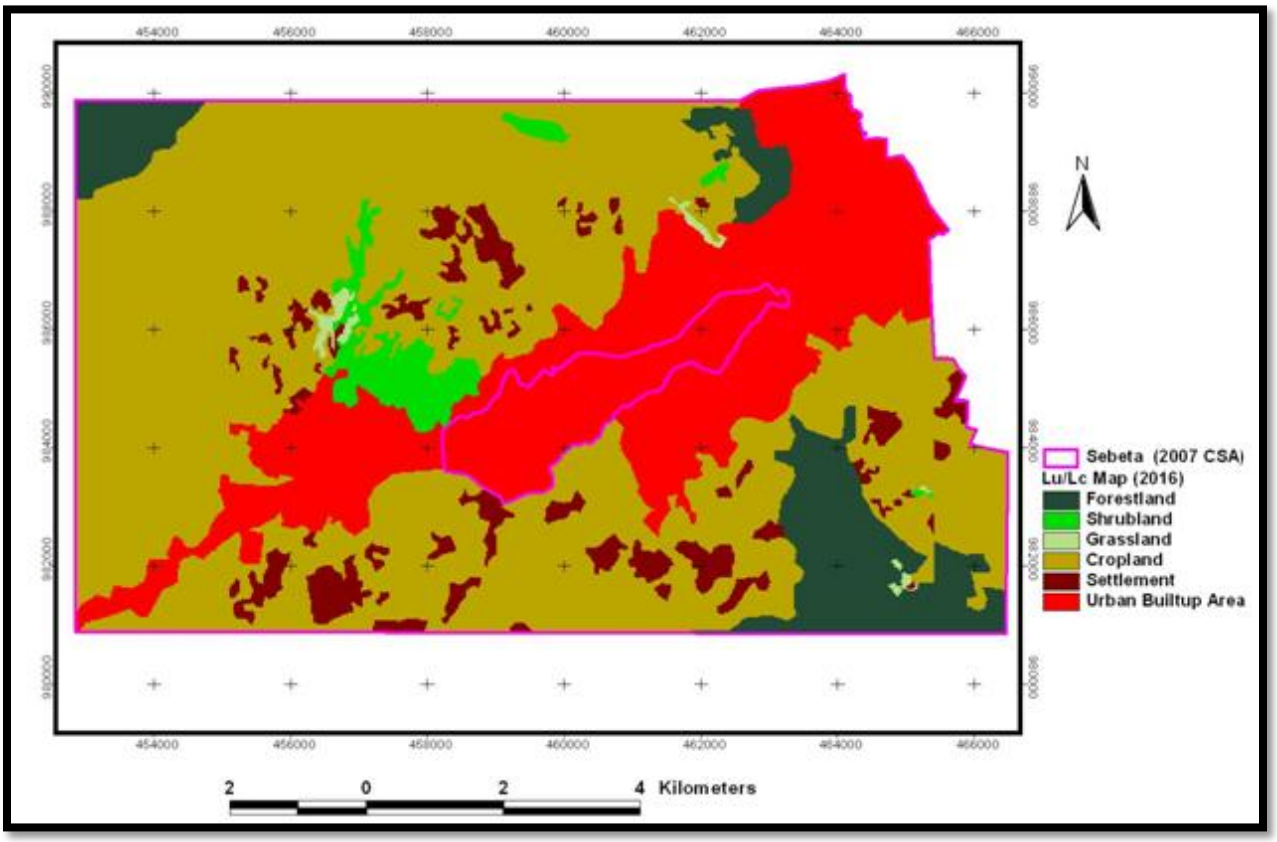


Figure 4.4: Land use/land Cover Map of Sebeta Town and the Surrounding Area (2016)

4.5.3 Percentages of Land use/Land cover in Sebeta Area in 2016

Table 4.20: Percentages of Land use/Land cover in Sebeta Area in 2016

Lu/Lc type	**Hectare**	**%**
Forest/ Woodland	1292.9	8.5
Shrub land	401.9	2.6
Grassland	69.3	0.5
Cropland	8847.8	57.9
Rural Settlement	801.1	5.2
Urban area	3851.0	25.2
Total	**15,270**	**100.0**

The classification result of the 2016 image revealed that Cropland constituted the largest proportion of land in the study area with a value of 57.9%, followed by Urban Area which accounts for 25.2 % (Figure 5). Forest/ Woodland, Rural Settlement, Shrub land &Grassland constituted 8.5%, 5.2%, 2.6% and 0.5% respectively.

4.5. 4Percentages of Land Use/Land Cover in Sebeta Area during 1986 – 2016

Table4.21: Percentages of Land use/Land cover in Sebeta Area during 1986 – 2016

Lu/Lc type	**1986**		**2000**		**2016**	
	Hectare	**%**	**Hectare**	**%**	**Hectare**	**%**
Forest/ Woodland	2042.6	13.4	1888.3	12.4	1292.9	8.5
Shrub land	3065.1	20.1	2642.8	17.3	401.9	2.6
Grassland	2373.2	15.5	718.0	4.7	69.3	0.5
Cropland	7181.6	47.0	8522.6	55.8	8847.8	57.9
Rural Settlement	383.7	2.5	790.2	5.2	801.1	5.2
Urban area	224.1	1.5	708.5	4.6	3851.0	25.2
Total	**15,270**	**100.0**	**15,270**	**100.0**	**15,270**	**100.0**

As indicated the above Table24, which is obtained from the 1986, 2000 and 2016 Land sat satellite images, six land use/land cover classes have been taken for the purpose of the research. These are: Forest/ Woodland (2042.6 Ha) ; Shrub land (3065.1 Ha);Grassland(2373.2 Ha); Cropland(7181.6 Ha); Rural settlement(383.7Ha) urban settlement(224.1 Ha) obtained from Land sat 1986; whereas Forest/ Woodland (1888.3 Ha) ; Shrub land (2642.8 Ha);Grassland(718.0 Ha); Cropland(8522.6 Ha); Rural settlement(790.2 Ha) and urban settlement(708.5 Ha)

obtained from Land sat 2000; and Forest/ Woodland (1292.9 Ha) ; Shrub land (401.9 Ha);Grassland(69.3 Ha); Cropland(8847.8 Ha); Rural settlement(801.1Ha) and urban settlement (3851.0 Ha) obtained from Landsat2016 which is calculated/ quantified by using ERDAS IMAGINE software

4.5.5. Percentages of Land use/Land cover Change in Sebeta Area during 1986 – 2016

Table 4.22: Percentages of Land use/Land cover change in Sebeta Area during 1986 – 2016

Lu/Lc type	**Change 1986-2000**		**Change 2000-2016**		**Change 1986-2016**	
	Hectare	**%**	**Hectare**	**%**	**Hectare**	**%**
Forest/ Woodland	-154.4	-7.6	-595.4	-31.5	-749.8	-36.7
Shrub land	-422.4	-13.8	-2241	-84.8	-2663	-86.9
Grassland	-1655.2	-69.7	-648.7	-90.3	-2304	-97.1
Cropland	1341.0	18.7	325.17	3.8	1666.2	23.2
Rural Settlement	406.5	106.0	10.89	1.4	417.42	108.8
Urban Area	484.4	216.1	3142.5	443.6	3626.9	1618.4
Total	**0.0**	**0.0**	**-0.39**	**0.0**	**-0.39**	**0.0**

Forestland areas have shown a net loss of in the first analysis period from 2,042.6 Ha to 1,888.3 Ha (-154.4 Ha) in 2000and in the second analysis period 1888.3 Ha to 1,292.9 Ha (-595.4 Ha) shown loss of forest, showing a total loss of (-749.8 Ha) within 30 years. Similarly, shrub land declined to 3065.1 Ha (-422.4Ha) in 2000 and 2642.8 Ha(-84.8 Ha) in the second analysis period

2010, showing a total loss of 401.9 Ha (-86.9 Ha) within 30years. As well, Grassland declined from 2373.2 Ha to 718.0 Ha (-648.7Ha) in the first analysis period, 2000 and 718.0 Ha to 69.3 Ha (-648.7Ha) in the second analysis period 2010, showing a total loss of -2304Ha within 30 years. On the other hand, Cropland have shown little increment (1341.0 Ha), from 7181.6 Ha in 1986 to 8522.6 Ha the first analysis period and it increased by 325.17 Ha in the second analysis period , showing a total gain of 1666.2Ha within 30 years. Similarly, Rural Settlement have shown increment (406.5Ha), from 383.7Ha in 1986 to 790.2Ha in 2000, in the first analysis period and it increased by 10.89Ha in the second analysis period , showing a total gain of 417.42 Ha within 30 years. As well, Urban areas have shown fast increment (484.4 Ha), from 224.1Ha in 1986 to 708.5 Ha in 2000, in the first analysis period and it increased by 3,142.5 Ha in the second analysis period , showing a total gain of 3,626.9Ha within 30 years.

4.6 Attitude of the respondents towards the Urban Encroachment of their Land

Table 4.23: Perception of the Respondents on Expansion of Town

Response	Number Respondents	Percent
Yes	262	92.3
No	21	7.4
Total	283	99.6
Missing System	1	.4
Total	**284**	**100.0**

Source: Computed based on the data obtained from field survey.

As it indicated in table 4.26, almost all or 92.3 percent of the respondents perceived that Sebeta town is expanding to their farmlands while 7.4 percent are not considering it. Comparison of satellite map is realized whether their perception is fact from past trends or not.

4.7. Urban Expansion of Sebeta Town during 1986-2016

As we see from figure 1.8 the GIS Result show that Forest land ,shrub land ,and Grass land decreased -9.1%-32%,and -28% respectively whereas Crop land ,Rural settlement and Urban land area increased 28.1%,5.1%,44.2% respectively.

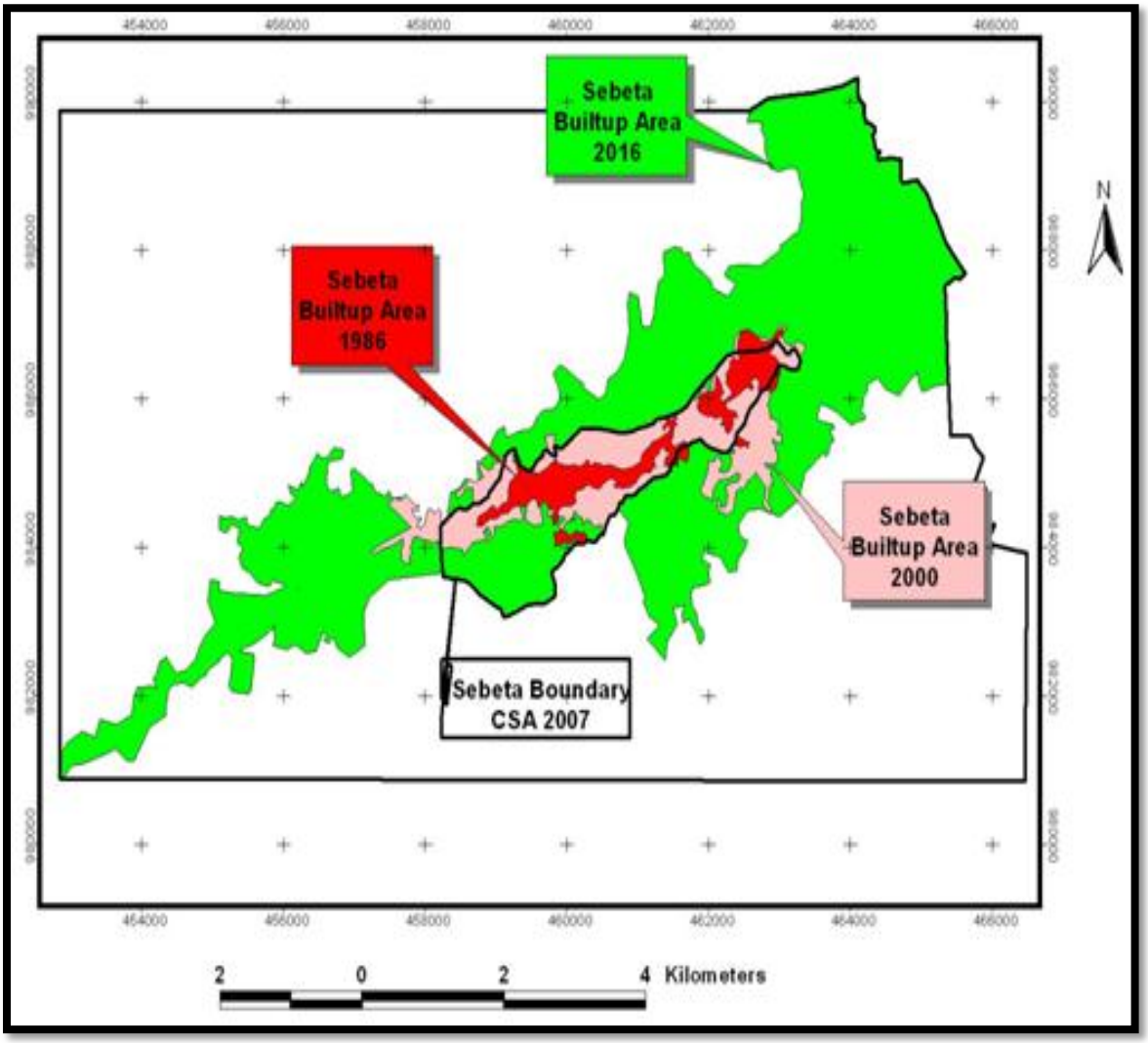
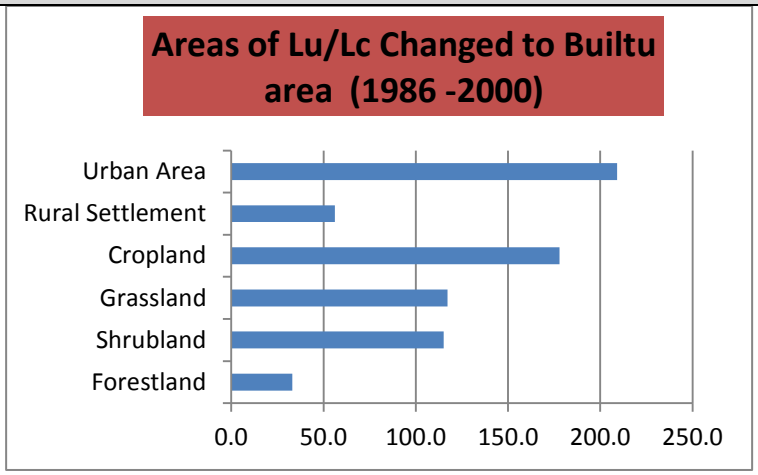


Figure 4.5: Expansion of Built-up Areas in Sebeta Town and the Surrounding Area (1986-201

Table 4.24: Land use categories Changed to Builtup area (1986-->2000)

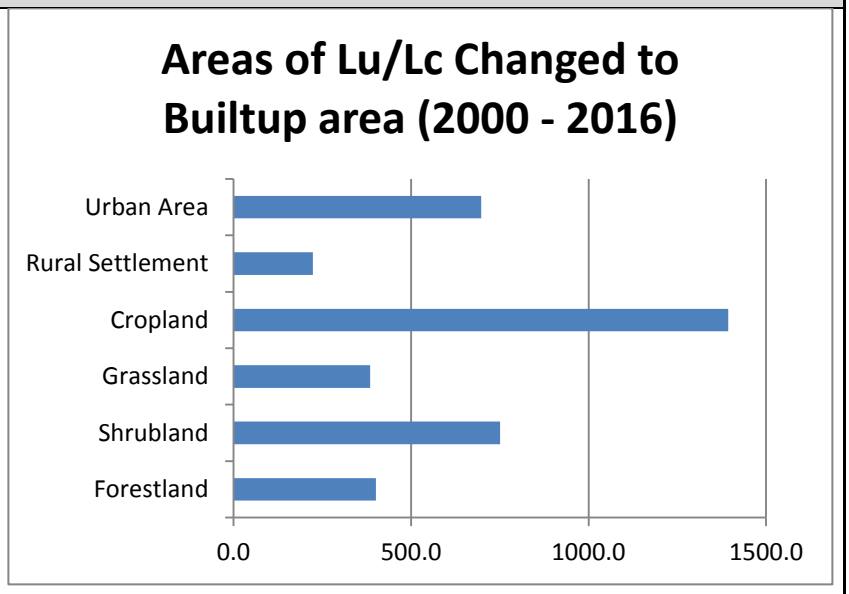
Lu/Lc Type	Hectare	%
Forestland	33.0	4.7
Shrub land	115.2	16.3
Grassland	117.3	16.6
Cropland	177.8	25.1
Rural Settlement	56.1	7.9
Urban Area	209.1	29.5
Total	**708.5**	**100.0**



As it indicated in table 4.27, the change of the two satellite imageries that are Land sat 1986 and 2000, Forestland(33Ha);Shrub land (115.2Ha);Grassland(117.3Ha);Cropland(117.8 Ha); Rural Settlement(56.1Ha) and urban area (209.1 Ha) changed to built up area. This shows that urban expansion in Sebeta town changed at a faster rate but Forest land, rural settlement also have changed at a slower rate in to built up area.

Table 4.25:)The Extent of the various Land use categories Changed to Built-up area (2000-->2016)

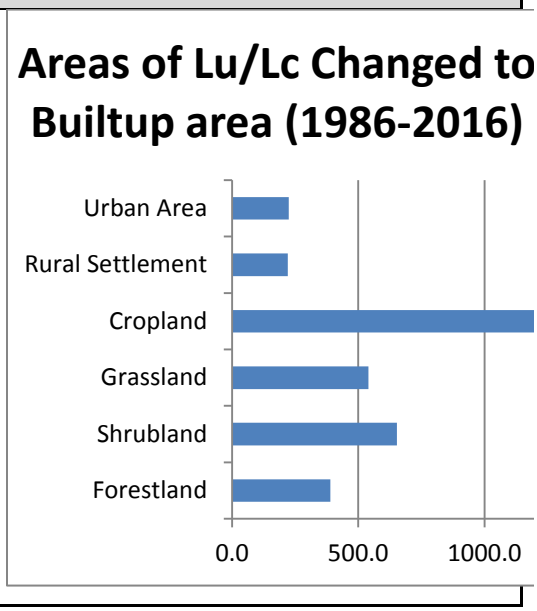
Lu/Lc Type	Hectare	%
Forestland	401.1	56.6
Shrub land	750.8	106.0
Grassland	385.0	54.3
Cropland	1393.1	196.6
Rural Settlement	223.1	31.5
Urban Area	697.9	98.5
Total	**3851.0**	**100**



As it indicated in table 4.28, the change in the two satellite imageries of Land sat 2000 and 2016, Forestland(401.1Ha); Shrub land (750.8Ha); Grassland(385.0 Ha); Cropland (1393.1 Ha); Rural Settlement (223.1Ha) and urban area (697.9 Ha) changed to built up area. This shows that Cropland, shrub land and urban areas in Sebeta town changed at a faster rate and at the same time Rural settlement and Forest land, also have changed built up areas but ,at a slower rate.

Table 4.26:Proportion of Land use categories Changed to Built-up area (1986-->2016)

Lu/Lc Type	Hectare	%
Forestland	388.6	54.9
Shrub land	653.0	92.2
Grassland	539.7	76.2
Cropland	1824.8	257.6
Rural Settlement	220.4	31.1
Urban Area	224.1	31.6
Total	**3850.6**	**100**



As it indicated on table 4.29, the change in the three satellite imageries that are Land sat 1986, 2000 and 2016, Forestland (388.6 Ha); Shrub land (653.0 Ha); Grassland (539.7 Ha); Cropland (1824 Ha); Rural Settlement (220.4 Ha) and urban area (224.1 Ha) changed to built up area This shows that Cropland, shrub land and urban areas in Sebeta town changed at a faster rate and at the same time urban area and Forest land, also have change slower rate.

4.7.1 Land use/Land cover change during 1986-2000

Table 4.27: Land use/Land cover change during 1986-2000

	Persistence		Gains		Losses		Net Change	
Lu/Lc Type	**Hectare**	**%**	**Gains (Hectare)**	**%**	**Losses (Hectare)**	**%**	**Hectare**	**%**
Forestland	798.6	39.1	1089.7	13.28	-1244.1	-15.2	-154.4	-1.9
Shrub land	955.5	31.2	1687.2	20.56	-2109.6	-25.7	-422.4	-5.1
Grassland	255.1	10.7	463.0	5.64	-2118.2	-25.8	-1655.2	-20.2
Cropland	4803.4	66.9	3719.3	45.31	-2378.3	-29.0	1341.0	16.3
Rural Settlement	40.7	10.6	749.5	9.131	-343.0	-4.2	406.5	5.0
Urban Area	209.1	93.3	499.4	6.084	-15.0	-0.2	484.4	5.9
Total	**7062.3**	**46.25**	**8208.1**	**100**	**-8208.1**	**-100**	**0.0**	**0.0**

Table 4.30 summarizes the results and shows (under *Image Difference*) that three out of six land cover/ use classes *decreased* in size over time, forest land(-1.95%),shrub land(-5.1%),and grassland(-20.2%).However, the farmland (crop land) class (16.3%) ; rural settlement (5%) and urban settlement (5.9%) increased significantly due to the fact that Sebeta town is very near to finfinne(Addis Ababa) attracted a number of investments and establishment of different factories. In addition, there are significant increase in the number f people being employed by this factories and other business expanding in the town. These all people resulted in the increased demand for residential plots creating pressure on expansion of rural farm lands as well, the increased number of different organization like schools, banks, insurance, health institutions also contributed to the same expansion of the town. In addition, there seems to be a clear reduction in vegetated areas also due to the expansion of cultivated land.

4.7.2 Land use/Land cover change during 2000-2016

Table 4.28: Land use/Land cover change during 2000-2016

	Persistence		Gains		Losses		Net Change	
Lu/Lc Type	**Hectare**	**%**	**Gains (Hectare)**	**%**	**Losses (Hectare)**	**%**	**Hectare**	**%**
Forestland	946.8	50.1	346.1	4.216	-941.5	-11.5	-595.4	-7.3
Shrub land	246.1	9.3	155.9	1.899	-2396.6	-29.2	-2240.7	-27.3
Grassland	5.8	0.8	63.5	0.774	-712.7	-8.7	-649.2	-7.9
Cropland	6305.0	74.0	2542.9	30.98	-2212.7	-27.0	330.1	4.0
Rural Settlement	93.7	11.9	707.4	8.618	-694.7	-8.5	12.7	0.2
Urban Area	697.9	98.5	3153.2	38.42	-10.6	-0.1	3142.5	38.3
Total	**8,295**	**54.34**	**6,969**	**84.9**	**-6,968.9**	**-85**	**0.0**	**0.0**

Main objective of this research is to investigate the level and impacts of land cover/use changes in the Sebeta town in relation to the urban sprawl on farm lands. Therefore, a second change detection analysis was conducted, this time limiting the area to the study site shown in Table 3b,summarizes the results and shows (under Image Difference) that again three out of six land cover/ use classes decreased in size over time for instance Forest land(-7.3%);shrub land(--27.3%)and Grassland(-7.9%). However, the farmland (crop land) class (4%) and rural settlement (0.2%) which is reality shows slight increase and especially the urban area (38.3%) increased significantly due to the fact due to the fact that Sebeta town is very near to finfinne(Addis Ababa) attracted a number of investments and establishment of different factories. In addition, there are significant increase in the number f people being employed by this factories and other business expanding in the town.

4.7.3. Land use/Land cover change during 1986-2016

Table 4.29: Land use/Land cover change during 1986-2016

	Persistence		**Gains**		**Losses**		**Net Change**	
Lu/Lc Type	**Hectare**	**%**	**Gains (Hectare)**	**%**	**Losses (Hectare)**	**%**	**Hectare**	**%**
Forestland	560.9	27.5	732.0	8.918	-1481.8	-18.1	-749.8	-9.1
Shrub land	249.8	8.1	152.2	1.854	-2815.1	-34.3	-2662.9	-32.4
Grassland	0.7	0.0	68.6	0.836	-2372.5	-28.9	-2303.9	-28.1
Cropland	4471.5	62.3	4376.3	53.32	-2706.8	-33.0	1669.6	20.3
Rural Settlement	14.4	3.8	786.7	9.584	-366.1	-4.5	420.6	5.1
Urban Area	224.1	100.0	3626.5	44.18	0.0	0.0	3626.5	44.2
Total	**5,521.3**	**36.17**	**9,742.2**	**118.7**	**-9742.2**	**-119**	**0.0**	**0.0**

The main reason for generating classification maps from images of two different time periods was to determine how past and present human activities (farmland, urban areas etc…) have been modifying the landscape and its ecosystems. These thematic maps were further used as inputs in a change detection analysis to determine how individual land cover/use classes may have changed over time and at what rate or magnitude. Therefore, a third change detection analysis was conducted, this time limiting the area to the study site shown in Table 3c,summarizes the results and shows (under *Image Difference*) that again three out of six land cover/ use classes *decreased* in size over time for instance Forest land(-9.1%);shrub land(-32.4%)and Grassland(-28.1%). However, the farmland (crop land) class (20.3%) and rural settlement only (5.1 %) which is generally, relatively shows slight increase among increased features and especially the urban area (44.2%) increased significantly due to the fact that Sebeta town is very near to finfinne(Addis Ababa) attracted a number of investments and establishment of different factories. In addition, there are significant increase in the number f people being employed by this factories and other business expanding in the town. These all people resulted in the increased

demand for residential plots creating pressure on expansion of rural farm lands as well, the increased number of different organization like schools, banks, insurance, health institutions also contributed to the same expansion of the town

4.8. Land Use/Land Cover Change: Trend, and Magnitude

An important aspect of change detection is to determine what is actually changing to what i.e. which land use class is changing to which other classes. This information reveal both the changes (additions and reductions) and classes that are relatively stable overtime. This information will also serve as a vital tool in management decisions. This process involves a pixel to pixel comparison of the study year images through overlays

The assigned LULC classes during supervised classification on ERDAS Imagine were reclassified by representing with the values as 1 =Forest Land2 =. Shrub Land 3 =Grass Land 4 =4Crop Land5 = Rural Settlement 6=. Urban Area on Arc GIS Map. Cross tabulation is a means to determine quantities of conversions from a particular land cover to another land cover category at a later date (Alphan, 2008). The change matrices based on post classification comparison were obtained and are shown in Tables 4.9, 4.10and 4.11

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4.9. Land use/Land cover change matrix in Sebeta Area during 1986 – 2000

Table 4.30: Land use/Land cover change matrix in Sebeta Area during 1986 – 2000

		Land use/Land cover types 1986													
	Lu/Lc type	**Forestland**		**Shrub land**		**Grass land**		**Cropland**		**Rural Settlement**		**Urban Area**		**Total**	
		Ha	**%**	**Ha**	**%**	**Ha**	**%**	**Ha**	**%**	**Ha**	**%**	**Ha**	**%**	**Ha**	**%**
Land use/Land cover types 2000	Forestland	798.6	39.1	268.3	8.8	172.6	7.3	584.0	8.1	60.7	15.8	4.1	1.8	1888.3	12.4
	Shrub land	459.4	22.5	955.5	31.2	342.1	14.4	845.6	11.8	36.8	9.6	3.4	1.5	2642.8	17.3
	Grass land	45.3	2.2	99.9	3.3	255.1	10.7	310.4	4.3	6.8	1.8	0.5	0.2	718.0	4.7
	Cropland	644.6	31.6	1506.6	49.2	1381.1	58.2	4803.4	66.9	182.6	47.6	4.4	2.0	8522.6	55.8
	Rural Settlement	61.8	3.0	119.6	3.9	105.1	4.4	460.4	6.4	40.7	10.6	2.5	1.1	790.2	5.2
	Urban Area	33.0	1.6	115.2	3.8	117.3	4.9	177.8	2.5	56.1	14.6	209.1	93.3	708.5	4.6
	Total	**2043**	**100**	**3065**	**100**	**2373**	**100**	**7182**	**100**	**384**	**100**	**224**	**100**	**15270**	**100**

4.9.1. Forest Land

In the 15 years, between 1986 and 2000, almost 644.6 Ha (31.6%) of forest/wood land was obtained from cropland. In 1986, this category had the smallest areal proportion next to Grass land. During the first period (1986-2000), the conversion of shrub land in to forest accounted for 268.3Ha (8.8%). In the same period, Grassland, Rural Settlement, Urban Areas; accounted for 172.6Ha (7.3%), 60.7Ha (15.8%) and 4.1Ha (1.8%) respectively

4.9.2. Shrub Land

Within the 15years, stuck between 2000 and 2016, almost 1506.6 Ha (49.2%) of shrub land was obtained from crop land mainly. During the overall period (1986-2000), the conversion of crop land in to shrub land accounted for 845.6Ha (11.8%). In the same period, forest, Grassland Rural Settlement, Urban Area; accounted for 459.4Ha (22.5%); 342.1Ha (14.4%); 36.8Ha (9.6%); 3.4Ha (1.5%) respectively.

4.9.3. Grass Land

During the 15years, sandwiched between 1986 and 2000, almost 310.4Ha (4.3%) of Grassland was obtained from cropland mainly. In 1986, this category had the relatively large areal proportion next to shrub land. Throughout the overall period (1986-2016), the conversion of forest in to Grassland accounted for 45.3Ha (2.2%). In the same period Shrub land, urban Area, rural settlement accounted for 99.9Ha (3.3%); 0.5Ha (0.2%); 6.8Ha (1.8%) respectively

4.9.4.Crop Land

In the 15 years, between 1986 and 2000, almost 1506.6Ha (49.2%) of crop land was obtained from shrub lands. In 1986, this category had the relatively large areal proportion next to shrub land. During the overall period (1986-2000), the conversion of forest in to cropland accounted for 644.6Ha (31.6%). In the same period Grassland, rural Settlement, urban area accounted for 0.5Ha (0.2%); 1381.1Ha (58.2%); 4.4Ha (0.2%) respectively

4.9.5. Rural Settlement

In the 15 years, between 1986 and 2000, almost 460.4Ha (6.4%) of rural settlement was obtained from Cropland. In 1986, this category had the small areal proportion next to forest/wood land. During the first period (1986-2000), the conversion of forest in to rural settlement accounted for

61.8Ha (3%). In the same period urban area Grassland and Shrub land accounted for 2.5Ha (1.1%); 105.1Ha (4.4%); 119.6Ha (3.9%) respectively.

4.9.6. Urban Area

In the 15 years, between 1986 and 2000, almost 177.8Ha (2.2%) of urban area was obtained from cropland. In 1986, this category had the small areal proportion next to rural settlements. During the first phase (1986-2000), the conversion of forest in to urban area accounted for 33.0Ha (1.6%). In the same period, Grassland and Shrub land accounted for 117.3Ha (4.9%); 115.2Ha (3.8%) respectively.

4.10. Land use/Land cover change matrix in Sebeta Area during 2000- 2016

Table 4.31: Land use/Land cover change matrix in Sebeta Area during 2000- 2016

Land use/Land cover types 2000

Land use/Land cover types 2016	**Lu/Lc type**	**Forestland**		**Shrub land**		**Grass land**		**Cropland**		**Rural Settlement**		**Urban Area**		**Total**	
		Ha.	**%**	**Ha.**	**%**	**Ha.**	**%**	**Ha.**	**%**	**Ha.**	**%**	**Ha.**	**%**	**Ha.**	**%**
	Forestland	946.8	50.1	12.2	0.5	68.6	9.5	227.6	2.7	37.6	4.8	0.0	0.0	1292.9	8.5
	Shrub land	6.3	0.3	246.1	9.3	72.45	10.1	49.8	0.6	16.83	2.1	10.53	1.5	401.94	2.6
	Grass land	12.7	0.7	10.4	0.4	5.76	0.8	30.0	0.4	10.44	1.3	0	0.0	69.3	0.5
	Cropland	464.0	24.6	1493.5	56.5	178.56	24.9	6305.0	74.0	406.71	51.6	0.09	0.0	8847.81	58.0
	Rural Settlement	57.3	3.0	129.7	4.9	8.1	1.1	512.3	6.0	93.69	11.9	0	0.0	801.09	5.2
	Urban Area	401.1	21.2	750.8	28.4	385.02	53.6	1393.1	16.4	223.11	28.3	697.86	98.5	3851.01	25.2
	Total	**1888**	**100**	**264**	**100**	**719**	**100**	**8518**	**100**	**788**	**100**	**709**	**100**	**15264**	**100**

4.10.1.Forest Land

In the 15 years, between 2000 and 2016, almost 227.6Ha (2.7%) of forest/wood land was obtained from cropland. During the first period (2000-2016), the conversion of shrub land in to forest accounted for 12.2Ha (0.5%). In the same period, Grassland, Rural Settlement, Urban Areas; accounted for 68.6Ha (9.5%), 37.6Ha (4.8%) and 0Ha (0.0%) respectively

4.10.2. Shrub Land

Within the 15years, stuck between 1986 and 2000, almost 68.6Ha (9.5%) of shrub land was obtained from Grassland mainly. During the overall period (2000-2016), the conversion of forest in to shrub land accounted for 6.3Ha (0.3%). In the same period, crop land, Rural Settlement, Urban Area; accounted for 10.4Ha (0.4%); 16.83Ha (2.1%); 10.53Ha (1.5%) respectively.

4.10.3. Grass Land

During the 15years, sandwiched between 2000 and 2016, almost 30.0Ha (0.4%) of Grassland was obtained from cropland. Throughout the overall period (2000-2016), the conversion of forest in to Grassland accounted for 12.7Ha (0.7%). In the same period Shrub land, urban Area, rural Settlement accounted for 72.45Ha (10.1%);0 Ha (0.0%); 10.44Ha (1.3%) respectively

4.10.4. Crop Land

In the 15 years, between 2000 and 2016, almost 1493.5Ha (56.5%) of crop land was obtained from urban areas. During the overall period (2000-2016), the conversion of forest in to cropland accounted for 464.0Ha (24.6%). In the same period urban area, Grassland, rural Settlement, accounted for 0.09Ha (0.0%); 178.56Ha (24.9%); 406.71Ha (51.6%); respectively.

4.10.5. Rural Settlement

In the 15 years, between 2000 and 2016, almost 512.3Ha (6 %) of rural settlement was obtained from Cropland. During the first period (2000-2016), the conversion of forest in to rural settlement accounted for 57.3Ha (3%). In the same period urban area, Grass land and Shrub land accounted for 0 Ha (0.0%);8.1Ha (1.1%);and 129.7Ha (4.9%)respectively.

4.10.6. Urban Area

In the 15 years, between 2000 and 2016, almost 1393.1Ha (16.4%) of urban area was obtained from cropland. During the overall period (2000-2016), the conversion of forest in to urban

accounted for 401.1Ha (21.2%). In the same period, shrub land, Rural Settlement, Grassland; accounted for 750.8Ha (28.4%); 223.11Ha (28.3%); 385.02Ha (53.6%) respectively.

4.11.Land use/Land cover change matrix in Sebeta Area during 1986 – 2016

Table 4.32: Land use/Land cover change matrix in Sebeta Area during 1986 – 2016

Land use/Land cover types 1986

Land use/Land cover types 2016	Lu/Lc type	Forestland		Shrub land		Grassland		Cropland		Rural Settlement		Urban Area		Total	
		Ha.	%	Ha.	%	Ha.	%	Ha.	%	Ha.	%	Ha.	%	Ha.	%
	Forestland	560.9	27.5	135.4	4.4	245.4	10.3	343.1	4.8	8.1	2.1	0.0	0.0	1292.9	8.5
	Shrub land	20.4	1.0	249.8	8.1	64.17	2.7	60.5	0.8	7.11	1.9	0	0.0	401.94	2.6
	Grassland	13.2	0.6	20.4	0.7	0.72	0.0	34.9	0.5	0	0.0	0	0.0	69.3	0.5
	Cropland	1014.2	49.7	1786.6	58.3	1445	60.9	4471.5	62.3	130.5	34.3	0	0.0	8847.81	58.0
	Rural Settlement	45.3	2.2	219.8	7.2	78.12	3.3	443.5	6.2	14.4	3.8	0	0.0	801.09	5.2
	Urban Area	388.6	19.0	653.0	21.3	539.73	22.7	1824.8	25.4	220.41	57.9	224.1	100.0	3850.56	25.2
	Total	**2043**	**100**	**3065**	**100**	**2373**	**100**	**7178**	**100.**	**381**	**100**	**224**	**100**	**15264**	**100**

4.11.1. Forest Land

In the 30 years, this category was expanded by over 13.4% (2043 ha) of the original forest cover which existed at the base year. Between 1986 and 2016, almost 1.9% of forest/wood land was obtained from rural settlement..In 1986, this category had the smallest areal proportion next to Grassland. During the overall period (1986-2016), the conversion of Grassland in to forest accounted for 13.2Ha (10.3%). In the same period, Crop land, Rural Settlement, Urban Areas; accounted for 8.1Ha(4.8%),343.1Ha (2.1%)and 0.00Ha(0.00%) respectively.

4.11.2.Shrub Land

In the 30 years, this category was expanded by over 8.1% (249.8ha) of the original shrub land cover which existed at the base year. Between 1986 and 2016, almost20.4Ha (1%) of shrub land was obtained from forest lands. In 1986, this category had the largest areal proportion next to cropland. During the overall period (1986-2016) period, Grassland, Cropland, Rural Settlement, Urban Area; accounted for 64.17Ha (2.7%), 60.5Ha (0.8%); 7.11Ha (1.9%); 0Ha (0.0%) respectively.

4.113. Grass Land

In the 30 years, this category was expanded by over 15.5% (245.4Ha) of the original grassland cover which existed crop lands. In 1986, this category had the relatively large areal proportion next to shrub land. During the overall period (1986-2016), the conversion of forest in to Grassland accounted for13.2Ha (0.6%). In the same period Shrub land, urban Area, rural Settlement accounted for 2o.4 Ha (0.7%);0 Ha (0.0%); 0Ha (0.0%) respectively.

4.11.4. Crop Land

In the 30 years, this category was expanded by over 47.0% (7181.6Ha) of the original crop cover which existed at the base year. Between 1986 and 2016, almost1786.6Ha (58.3%) of crop land was obtained from shrub lands. In 1986, this category had the relatively large areal proportion next to shrub land. During the overall period (1986-2016), the conversion of forest land in to Grass land accounted for1014.2Ha (49.7%). In the same period grassland, rural 0.0%) respectively.

4.11.5Rural Settlement

In the 30 years, this category was expanded by over 2.5% (383.7Ha) of the original rural settlement which existed at the base year. Between 1986 and 2016, almost 443.5Ha (6.2%) of rural settlement was obtained from Cropland. In 1986, this category had the small areal proportion next to forest/wood land. During the overall period (1986-2016), the conversion of forest in to rural settlement accounted for 45.3Ha (2.2%). In the same period urban area, Grass land and Shrub land accounted for 0Ha (0.0%); 78.12Ha (3.3%); 219.8Ha (7.2%) respectively.

4.11.6. Urban Area

In the 30 years, this category was expanded by over 1.5% (224.1Ha) of the original rural settlement which existed at the base year. Between 1986 and 2016, almost 1824.8Ha (25.4%) of urban area was obtained from crop land..In 1986, this category had the small areal proportion next to rural settlement. During the overall period (1986-2016), the conversion of forest, rural settlement, Grassland and Shrub land in to forest accounted388.6 Ha (19%); 220.41Ha (57.9%); 539.73 Ha (22.7%) and 653.0 Ha (21.3%) respectively.

4.12. Accuracy Assessment of the Classification

Table 4.33:Land use/Land cover (office interpreted) * Land use/Land cover (Field Observed) Cross tabulation

		lulc_field												Total	
		Forestland		Shrub land		Grassland		Cropland		Rural Settlement		Urban Builtup Area			
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
lulc_cat	Forestland	7	13.7	0	0.0	1	2.0	1	2.0	0	0.0	0	0.0	9	17.6
	Shrub land	0	0.0	5	9.8	1	2.0	0	0.0	0	0.0	0	0.0	6	11.8
	Grassland	0	0.0	1	2.0	3	5.9	0	0.0	0	0.0	0	0.0	4	7.8
	Cropland	0	0.0	1	2.0	2	3.9	10	19.6	0	0.0	0	0.0	13	25.5
	Rural Settlement	0	0.0	2	3.9	0	0.0	0	0.0	4	7.8	0	0.0	6	11.8
	Urban Builtup Area	0	0.0	0	0.0	0	0.0	5	9.8	0	0.0	8	15.7	13	25.5
Total		**7**	**13.7**	**9**	**17.6**	**7**	**13.7**	**16**	**31.4**	**4**	**7.8**	**8**	**15.7**	**51**	**100.0**

Overall accuracy = 82.22

4.13. Discussion

The rapid population growth ensued urban sprawl of the world has resulted in uncontrolled haphazard growth in the fringes of urban areas .Ethiopia is urban fringes`` being have become victim of this phenomenon, notably, the horizontal expansion of urban areas often encroaching on arable lands on the outskirts. A wealth of information was retrieved on land-use/land-cover changes with the help of interpretation of satellite images of 1986 and 2016 Pertaining to the study area. Interpretation of images of these periods indicated the existence of considerable dynamics in the land-use/land-cover systems. In images of 1986 and 2016, six land-use classes were identified but most of the land-uses either increased or decreased in size at different change rates in 2016, as compared to the base year 1986.The satellite image analysis results show that urban land increased in the first study period but at a relatively slower rate. In the second study period Urban land for Sebeta town also continues to increase but at a faster rate than the time for the study period and the entire study periods i.e. 224.1Ha (1.5%) and 3851.0Ha (25.2%).rural settlement increased in the first period and remained stagnant in the second period .Grassland is the most converted cover type during the entire study period. Over the period of 30years, crop lands expanded by over 57.9%of the original forest cover what was existed at the base year. The impact of this LULC change is more significant on the socioeconomic condition and status of the study area. Apart from ecological influences, the urban sprawl episode has further been creating amorphous suburbs obstructing an authorized growth of the cities themselves. The study area, Sebeta Town, is no exception in this regard. Therefore, such illegitimate land development needs an effort like this research to address the problem before it threatens the livelihood of the inhabitants in the hinterlands. The fact that the study area has so far been rarely studied for the same purpose makes this study significant and timely effort to highlight the dynamism of sprawl and predict proneness of the area to urban sprawl. It is found to be important to gauge urban sprawl and its impact on peri-urban ecology and seek sound solution to minimize the stress or even avoid it. Urban sprawl is initially detected by gauging urban growth in many ways. The study done by Masek has well thought-out urban growth/sprawl by using remote sensing and GIS to measure rates of urbanization (Masek *et al*., 2000).

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The study was conducted to identify the impact of urban sprawl on the farm lands surrounding of Sebeta town. This study shows that there is considerable land use and land cover change around Sebeta town. Among these land use the impact exerted on agricultural land is much more than that of the other land uses. This resulted from intensified land use transformation due to urban land use encroachment of rural lands especially that of new residential development in to the fringes of the town.

Regarding the socio economic impacts exerted, it could be seen from two basic dimensions. The first one is the impact of urban expansion on the agricultural land because land is the most important economic base for the rural residents. As Farm lands are getting smaller and smaller urban expansion consumes agricultural land use. Small farm lands cannot produce enough for farmers to feed themselves and their families and provide for the market. The other social problems identified were the displacement of the people to urban areas which in turn negatively affected the livelihoods of the farming community. Accordingly, decreasing in agricultural land holding and food production ranks at the top of the problem facing rural societies.

Based on the major findings of the study, which was obtained from the analysis of changes of 1986,2000 and 2016 land sat imageries; the rate of urban expansion over the agricultural land use in1986 was not that much. The satellite image processing results showed that urban land increased in the first and the second and the entire study periods i.e. 224.1Ha (1.5%) and 3851.0Ha (25.2%) This shows that still the rate of urban expansion steadily and rapidly is increasing from time to time. This resulted in the reduction of agricultural land. Generally, one can say that the increased urban sprawl leads to higher loss of agricultural land in Sebeta districts. There also evidence that tradional organization, which support the Farming communities in case of crisis, are being disintegrated due to dislocation of these communities affecting their natural, physical, and human, financial and social assets.

5.2 Recommendations

Based on the findings of the study, the following recommendations. Proper agricultural land management cannot be achieved only through government efforts. It needs the effort of delivering institutions because the haphazard urbanization brings many problems to land resource. In the analysis part we have observed the impact of urban expansion on the agricultural land use in Sebeta town. The impact is singnificant, deeprooted and continuous. Thus, to tackle the problem exerted on both rural and urban residents, the following points are recommended.

- One of the causes of horizontal expansion of the town is rapid population growth resulted from natural increase and rural-urban and urban to urban migrations; therefore improvements in National, regional, family planning, Sebeta town administration by introducing integrated Urban land Management tackle in to account concerns on the surrounding Farm lands.
- Improvements in the land use planning of town including spatial planning for economic and efficient use of scarce land recourse.
- The city is expanding horizontally and its impact is clear. Hence, the Sebeta town administration should consider vertical development of the town. Like building condominium to solve increased demands for residential house
- Improve the land management knowledge and skills of the Sebeta town administration and planners to balance the increasing land demand and the loss of agricultural land.
- The town has to exhaustively and economically utilize existing land stock available in its land use planning before statutorily acquiring additional land from nearby rural areas.
- Future compulsory land acquisition plans by Sebeta town administration should consider the livelihood impact of dispossession on the affected community, and the environmental and economic contribution of agriculture.

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Appendix I

Addis Ababa University

College of Social Science

Department of Geography and Environmental study

Questionnaire for Sample Household Survey on the Impact of Urban Sprawl on Farmlands Surrounding Sebeta Town.

Introduction

Good morning/ after noon, Dear

My name is Dejene Adugna and I am a post graduate student of Geography and Environmental Studies at A.A.U. Currently, I carry out an academic research aimed at the impact of urban sprawl on farmlands surrounding Sebeta town. The target population for this study is household heads in the study area. The result of the study will give insight about the impacts of urban sprawl on farmlands surrounding Sebeta town. The participation in the discussion and interviewing process is on voluntary basis. The study is for academic purpose as a partial fulfillment for the requirement of MA Degree and the information you provide is strictly confidential and will be used anonymously in my thesis document.

Thanks for cooperation.

To be filled by household heads

Fill the answer in the blank space or mark in the box.

Part I personal information

1. Kebele _____
2. Sex: 1. Male ☐ 2. Female ☐
3. Age_____
4. Family size of the house holds _____

Marital status: 1. single ☐ 2. Married ☐ 3. Divorced ☐
4. Widowed ☐ 5. Separated ☐

5. Religion: 1. Orthodox ☐ 2. Muslim ☐ 3. If any other specify_____
6. Nationality/Ethnicity: _____
7. Occupation: 1. Farmer ☐ 2. If any other please mention _____
8. Your educational status

1. Illiterate☐ 4. Secondary ☐

2.Read and write ☐ 5. Tertiary(12+) ☐

3.Junior (1-8) ☐

Part II Socio- Economic Profile

9. Do you have a plot of land? 1.yes ☐ 2.No ☐
10. If your answer for question No.10 is yes, how many Hectare of land do you have? _____
11. For what purposes have you been using your land?

1. Crop- Land ☐ 2. Grazing land ☐ 3. Fruits and vegetation ☐

4. If any other please mention _____

Part III Factors that contributed for the expansion of Sebeta Town

12. Do you perceive the expansion of Sebeta town to the surrounding rural farmlands?

1. Yes ☐ 2. No ☐

13. If your answer for the question No 13 is yes, what do you think are the factors that contribute to such expansion of the town?

_____
_____
_____
_____

Part IV. Effects of the expansion on the surrounding farmsteads

14. Do you think that the expansion of the town has an impact on your livelihood?

    1. Yes ☐ 2. No ☐

15. If your answer for question No.15 is yes, what are the impacts?

    1. loss of land☐
    2. social fragmentation or exclusion ☐
    3. Loss of livelihood ☐
    4. If any other please specify_____

16. What do you feel the effect of development induced on your farmstead related to your potential income? Please explain

    _____

    _____

    _____

17. Is there any portion of your land that has been taken in the last 30 years for different purposes? 1. Yes ☐ 2. No ☐

18. If your answer for question No.18 is yes, what types of land was it?

    1. Agricultural land ☐ 2.residential land ☐

    3. Both residential and agricultural land ☐ 4. Grazing land ☐

    5. If any other specify_____

19. If a plot of land has been taken from you because of urban expansion/induced development, when was it taken?

    ☐ Over the last 15 years (2000 – 2016)

    ☐ Over the previous 15 years (1986 – 2000)

20. For what purposes did the plot of land was taken?

    1. Industrial ☐ 2. Residential ☐ 3.commercial agriculture ☐

    4. Office construction ☐ 5. If there is any other please mention _____

21. Were you raising live stocks? 1.Yes ☐ 2.No ☐

22. If your answer for question No.22 is yes, how many of them do you have? _____ Were there? _____

23. Were you cultivating the plot of land that was taken over? 1.Yes ☐ 2.No ☐

24. If your answer for question No.24 is yes, are you engaged in cultivation of any kind now?
    1. Yes ☐ 2.No ☐

26. How do you compare the previous and the present yield?

    _____

    _____

    _____

27. Did you get compensation from the authority in place of the taken land?
    1. Yes ☐ 2. No ☐

28. If your answer for question No.27 is yes, what kind of compensation did you get?
    1. Compensation (money) ☐
    2. Housing plots ☐
    3. Access to services ☐
    4. Opportunity to job ☐
    5. If any other please mention_____

29. Did you get any training after dislocation on how to cope up with a new arrangement?
    1. Yes ☐ 2. No ☐

30. If your answer for question No. 30 is yes, in which of the following training did you participate?

	Yes	No
1. Own business development of Management	☐	☐
2. Financial management/ saving	☐	☐
3. Social adjustment skill training	☐	☐
4. Technical training	☐	☐

Appendix II

Addis Ababa University

College of Social Science

Department of Geography and Environmental Study

Sample Household Survey on the Impact of Urban Sprawl on Farmlands Surrounding Sebeta Town

Interview Guide Questions for Key Informants

1. Name of the Respondent _____ occupation,_____ position if any, _____

2. Got (Gooxii) _____

3. Age _____

4. Educational level _____

5. How long did you reside or serve here_____

6. What do you witness about the process of expansion of Sebeta town to the surrounding rural areas?

7. What do you think are the factors that contributed for rapid expansion of Sebeta town during the last 30 years?

8. What is your view about the positive impacts of urban expansion on social, economic and environment?

9. What is your view about the negative impacts of urban expansion on social, economic and environment?

10. What do you think the government should do to improve the life of the local people affected by expansion? In capacity building, social organization, and strengthen the available institutions.

- Things need to be introduced or avoided.
- Immediate need
- Need for future intervention

11. What are the solutions you propose for the challenge faced as a result of expansion of the town?

Yuunivarsiitii Finfinnee

Kolleejjii saaynsii hawaasummaa

Dipaartimentii Jii'oografii fi Qo'annoo Naannoo

Gaaffannoo eddaattoota itti gaafatamtota maatitiin kan guutamu ta'e mata dureen dhiibbaa babal'inni magaala sabbata lafa qonnaan naannoo irratti qabu jedhu.

Seensa

Akkami jirtan, maqaan koo Dajanee Addunyaan jedhama.yeroo amma tanna Yuunvarsiitii Finfinneetti barataa digrii 2^{ffaa} ji'oograafii fi qo'annoo naannootti.mata duree qorannoo kootis dhiibba babal'inni magaala sabbata lafa qonnaa naannawa ishee irratti qabu jedhu yoo ta'u qorannoon amma gaggeessaa jiru kunis kan itti xiyyeeffatu itti gaafatamtota maatii naannoo qorannoon itti gaggeeffamu irratti argmaniidha.bu'aa qorannoo kanas dhibba babal'inni magaala sabbata lafa qonnaa naannoo irratti qabu ta'e marii fi gaaffaannoo qorannoo kanaaf godhamu irratti hirmaananni fedhii irratti kan hunda'eedha.qorannoon kuns brnoota digrii 2^{ffaa} xumuruuf kan adeemsifamu yoo ta'u deebii fi odeeffannoo isin kennitan qorannoodhuma kana kan oluudha.kanaaf deebii ykn odeeffannoo keessaan dhugaa irratti hunda'ee akka naaf kennitan jecha gargaarsa naa taasiftaniif kabajan durseen isin galateefadha.

Itti gaafatamtota maatitiin kan guutamu

Kutaa I

Bakkee duwwaa guutaa ykn mallattoo saanduuqaa keessatti filannoo keessan kan ta'e mallattoo "x"Ka'a

Kutaa I Odeeffannoo dhuunfaa

1. Ganda _____
2. Saala 1) dhiira ☐ 2) Dhalaa☐
3. Umurii_____
4. Baay'ina miseensa maatii keessanii_____

5. Haala Gaa'ilaa 1) kan hin fudhiin/heerumiin ☐ 2) kan fuudhe /heerumte ☐

3) kan hiike/hiikte☐ 4) kan jala du'e/duute☐ 5) gargar kan jiraatan☐

6. Amantii 1) Orthodoksii☐ 2) Musiliima☐ 3) kan biraa yoo ta'e ibsaa_____

7. Sabummaa/saba_____

8. Hojii_____

9. Sadarkaa Barnootaa 1)kan dubbissuu fi barreessuu hin dandeenyee☐ 2)barreessuu fi dubbissuu kan danda'uu☐ 3)kan barnoota sad 1ffaa barate☐ 4)kan barnoota sad 2ffaa barate ☐5)kan barnoota sadrkaa olaanaa barate☐

Kutaa II Pirofaayilii Hawaas Dinagdee

10. Lafa qonnaa qabdu? 1)Eeyyee 2)Lakkii

11. Yoo deebiin keessan gaaffii 10ffaatiif Eeyyeen yoo ta'e lafa hektaara hamami qabdu?_____

12. Lafa keessan kana maal maaliif itti fayyadamtu?

1.Lafa qonnaa ☐ 2) lafa tikfataa (margaa) ☐ 3) kuduraafi muduraa☐

4) kan biraa yoo ta'e yaa ibsamu_____

kutaa III Wantoota babal'ina magaalaa sabbataaf gumaachan

13. Magaalli sabbataa gara lafa qonnaan bulaa naannawaa magaalaa sabbataatti babal'achaa jira jettanii yaadduu?

1)Eyyeen☐ 2) Lakkii ☐

14. Deebiin kessan gaffii 13ffaatiif laattan yoo eeyyen ta'e sababoonni babal'ina magaalaa kanaaf kan ta'an maali jettanii yaaddu?

_____

_____

Kutaa IV Dhiibbaa babal'ina magaalaa lafa qonnaa qe'ee qonnaan bulaa irratti qabu

15. Babal'inni magaalaa kun haala jiruuf jireenyaa keessan irratti dhiibbaa qabaa?

    1)Eyyeen☐ 2) Lakkii ☐

16. Yoo deebiin keessan gaaffii 15ffaatiif eeyyen yoo ta'e dhiibba qaqqabee ture maalinni?

    1)Lafa qonnaa dhabuu☐ 2)jireenyaa hawasummaa dura ture irra fagaachuu(fkn Afooshaa) ☐ 3) waantoota ittiin jiraatan dhabuu☐ 4) Kan biroo yoo jiraate ibsaa_____

17. Dhiibban sababii misoomaan walqabatee qe'eefi lafa qonnarraa ka'uun galii kee irratti qabu maali fakkaataa? Sirriitti nuuf ibsaamee_____
    _____
    _____

18. Lafa qabdu keessaa waggottan darban 30 keessatti dhimma adda addaatiif isin jalaa fudhatame jiraa? 1) Eeyyeen ☐ 2)Lakki ☐

19. Yoo deebiin keessaan gaaffii 18ffaatiif eeyyeen yoo ta'e lafti isni irraa fudhatame lafa akkami ture?1) Lafa Qonnaa ☐ 2) lafa mana jireenyaa ☐ 3) lafa qonnaaf mana jireenyaa 4) lafa margaa /tikfataa 5) kan biraa yoo jiraate yaa ibsamu_____

20. Yoo lafti qonnaa kessan keessaa sababii babal'ina misoomaatiin ykn baba'ilna magaalatiin fudhatameera ta'e yeroo kama isin jalaa fudhatame?
    a) Waggoottan 15 darban keessaa (1992-2008) b) waggoottan kudha shanan duraan turan keessaa (1978-1992)

21. Lafti keessan isin jalaa fudhatame tajaajila maaliitiif oole?

    1)Industirii 2) mana jireenyaa 3) qonna ammayyaa (fkn abaaboof kkf) 4) ijaarsa biirootiif 5) kan biraa yoo jiraate yaa ibsamu-
    _____

22. Horii qabduu turtanii? 1) Eeyyeen☐ 2) Lakkii ☐

23. Yoo deebiin keessan gaaffii 22ffaaf laattan eeyyeen yoo ta'e kan horsii qabdan ammaam turani? _____ amma hoo meeqatu jiru?_____

24. Lafa isin jalaa fudhatame sana qonnaaf ittifayyadamaa turtanii?
1) Eeyyeen☐ 2)Lakkii☐

25. Yoo deebiin keessaan gaaffii 24 ffaatif laatan Eeyyee yoo ta'e Yeeroo ammaa kana lafa qotuu irratti hirmaachaa jirtuuyyi?_____1)Eeyyeen 2)Lakkii

26. Callaan keessan duriifi ammaa yoo walmadaalchiftan maalifakkaata?_____
_____

27. Lafa keessan isin jalaa fudhatameef qaama ilaaluu irraa beenyaan isiniif kaffalamee jiraa? 1) Eeyyeen☐ 2)Lakkii☐

28. Yoo deebiin keessan 27ffaa eeyyeen yoo ta'e beenyaa akkamii argattan?

1)Maallaqaan☐ 2) lafa mana jireenyaa☐ 3) kenna tajaajilaa☐

4) carraa hojii☐ 5) kan biraa yoo jiraate haa ibsamu_____

29. Yeroo lafa keessan irraa kaatan akkaataa itti deebitanii ijaraamuu dandeessanii fi rakkoo jiru irraa of eegdaniif leenjiin isniif kenname jiraa?
1)Eeyyeen☐ 2)Lakki☐

30. Deebiin keessan gaaffii 30ffaaf laatan eeyyeen yoo ta'e leenjii armaan gadii tarreeffame keessa kami irratti hirmaachaa turtan?

	Eeyyee	Lakkii
1)Akkataa daladala ofii itti gaggeessaniif bulchiin irratti	☐	☐
2)Qabiinsa maallaqaaf qusannaa irratti	☐	☐
3)Haala hawaasummaa deebi'anii ijaaraman irratti	☐	☐
4)Leenjii teekinikaa	☐	☐

Yuuniversiitii Finfinnee

Kolleejji saaynsii hawaasummaa

Dippaartimentii Ji'oograafii fi Qo'annoo Naannoo

Gaaffannoo eddaattoota itti gaafatamtota maatii fi qaama garagaraan mata duree dhiibbaa babal'inni magaala sabbata lafa qonnaa naannoo irratti qabu jedhuuf yaada kennamu.

Gaaffii qomaa

1. Maqaa gaafatamaa_____ hojii _____ gahee hojii_____
2. Gooxii fi ganda keessa jiraattan_____
3. Umurii_____
4. Sdarkaa barnootaa_____
5. Hagam naannoo kana jiraatte ykn tajaajilte_____
6. Mee waa'ee babal'inni magaalaa sabbataa lafa qonnaa naannawaa magilchaarratti ta'u maal dhugaa baata?_____
7. Waggoottan 30 darban keessatti saffisaan babal'achuun magaalaa sabbataaf sababa kan ta'an maali jette yaada?
8. Akk laalchi keetti babal'achuun magaalaa lafa qonnarratti qabu fayidaa inni hawaasummaa, dinagdee naannoo irratti qabu maali jettaa?
9. Miidhaan inni qabu hoo maali jetta?
10. Namoonni sababa babal'ina magaalichaatiin hubamaniif mootummaan jireenya isaanii fooyyessuuf maali hojjachuu qaba jettanii yaaddu?
11. - Waantoota hawaasa ka'e kanaaf dabalamuu qaban ykn haqamuu qaban jettanii yaaddan ibsaa

- Hatattamaan waantonni barbaachisan

-Gara fuula durattihoo maaltu guutamuu qaba jettanii yaadd an

Appendix III

		lulc_field												Total	
		Forestland		Shrub land		Grassland		Cropland		Rural Settlement		Urban Built up Area			
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
lulc_cat	Forestland	7	13.7	0	0.0	1	2.0	1	2.0	0	0.0	0	0.0	9	17.6
	Shrub land	0	0.0	5	9.8	1	2.0	0	0.0	0	0.0	0	0.0	6	11.8
	Grassland	0	0.0	1	2.0	3	5.9	0	0.0	0	0.0	0	0.0	4	7.8
	Cropland	0	0.0	1	2.0	2	3.9	10	19.6	0	0.0	0	0.0	13	25.5
	Rural Settlement	0	0.0	2	3.9	0	0.0	0	0.0	4	7.8	0	0.0	6	11.8
	Urban Built up Area	0	0.0	0	0.0	0	0.0	5	9.8	0	0.0	8	15.7	13	25.5
Total		**7**	**13.7**	**9**	**17.6**	**7**	**13.7**	**16**	**31.4**	**4**	**7.8**	**8**	**15.7**	**51**	**100.0**

Overallaccuracy = 82.22

Appendix iv

Urban sprawl in study Area (Photo by Dejene Adugna April, 2016)

Key informant interview with village elders in study Area Dima and Daleti Kebele (Photo by Dejene AdugnaApril, 2016)