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**URBAN EXPANSION AND ITS IMPACT ON THE LIVELIHOOD OF PERIPHERAL  
FARMING COMMUNITIES: THE CASE OF KUTABER TOWN, AMHARA REGION,  
ETHIOPIA**

**BY**

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in Partial Fulfillment of the Requirements for the Degree of Master of Arts in Geography  
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This is to certify that the thesis prepared by Ahlam Yimam, entitled: *Urban Expansion and its Impact on Peripheral Farming Communities: the Case of Kutaber town, Amhara Region, Ethiopia* and submitted in partial fulfillment of the requirements for the Degree of Master of Arts in Geography and Environmental Studies complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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## DECLARATION

I declare that this MA thesis is my original work, has never been presented for a degree in this or any other university and that all sources of materials used for the thesis have been fully acknowledged.

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## ACRONYMS

AMSL:	Above Mean Sea Level
AOI:	Area of Interest
°C:	Degree Celsius
CSA:	Central Statistical Agency
EMA:	Ethiopian Mapping Agency
ERDAS:	Earth Resource Development Application System
ETM:	Enhanced Thematic Mapper
ETB:	Ethiopian Birr
FAO:	Food and Agricultural Organization
FCC:	False Color Composite
GCP:	Ground Control Point
GIS:	Geographic Information System
GLCF:	Global Land Cover Facility
GPS:	Global Positioning System
Ha:	Hectare
Km <sup>2</sup> :	Square Kilometer
KWARDO:	Kutaber Woreda Agricultural and Rural Development Office
LULC:	Land Use Land Cover
LULCC:	Land use Land Cover Change
MLC:	Maximum Likelihood Classifier
RGB:	Red Green Blue
SPSS:	Statistical Package for Social Science
TM:	Thematic Mapper
UN:	United Nations
UNCED:	United Nations Conference on Environment and Development
USGS:	United States Geological Survey
UTM:	Universal Transverses Mercator

## ***Abstract***

*Currently, urban expansion is becoming a big problems in sub-Saharan African countries as they are expanded without well planed urbanization. Therefore, the objective of this study is to assess Urban Expansion and its Impact on Peripheral Farming Communities: the Case of Kutaber town, Amhara Region, Ethiopia. GIS and remote sensing were used to analyze the phenomena of agricultural land transformation into urban land use. Having employing the descriptive research methods, the researcher collected data based on survey on 145 households, those who were displaced and hence whose livelihood had been adversely affected. Research questionnaire, key informants' interviews, the researcher's participatory observation, GPS data, Satellite Image and documentary resources were tools to collect data. Data sources were of both quantitative and qualitative data collection. The change detection method has been applied to investigate LULCC. In order to achieve these, satellite data of Landsat TM for 1986, ETM for 2000 and 2016 have been obtained and processed using ERDAS IMAGINE 2013. The Maximum Likelihood Algorithm of Supervised Classification has been used to generate land use/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 maximum threshold level. . The satellite image results show that built up areas increased by 32.887km<sup>2</sup>(38.025%), 18.36km<sup>2</sup>(21.228%) and 51.247km<sup>2</sup> (59.254%) respectively in the first, the second and the entire study periods. While farm land, grass land, forest land, water body, shrub land and bare land decreased in both first, second and in the entire study periods, respondents who have income 41-50quintal decreased from 0.7% to 0%, 31-40quintals from 5.5% to 0.7%, 21-30quintal from 20% to 6.9% and 11-20quintal from 44.1% to 35.2%, and decreased livestock, before urban expansion these households had the an average oxen of 2.22, cows 2.83, sheep 13.72, and goats 10.47. But after then, currently, these households had the average oxen 0.92, cows 0.95, sheep 3.01 and goats 2.42 and increased displacement of the households who had been involved in farming.*

***Key Terms:*** *Urban expansion, peripheral farming communities, displacement, compensation, Land use/land cover change.*

## **CHAPTER ONE: INTRODUCTION**

### **1.1. Background of the Study**

Urban expansion as a dynamic process of land use change is a complicated social/economic phenomenon. It may be linked with details related to topography, transportation, land use, social structure and economic type, but it is generally related to demography and economy in a city (Lin Li *et al.*, 2003).

Urban expansion is synonymous with urban sprawl, to connote the extension of urban settlement to the surrounding area whose function are non agricultural. Urban expansion is a common phenomenon in both developed and developing countries. However, in developing countries urban expansions are known with its negative effect. The major effects contributing for rapid urban expansion in Ethiopia are higher natural population growth, rural to urban migration and spatial urban development (Fekadu, 2015). This expansion has its own negative impact on farmers livelihood which has different components.

Urbanization, the process of urban expansion may involve both horizontal and vertical expansion of the physical structure of urban areas. It can result in loss of agricultural land, natural beauties, range lands, parks and sceneries (Melesse, 2004). According to the World Urbanization Prospects reported by the United Nations (UN, 2012), from 1965 to 2010, the global population increased from 3.3 billion to 6.9 billion, and the total amount of population will exceed 9.3 billion by 2050. Along with the population growth, more and more people chose to live in urban areas. The percentage of the world's population residing in urban areas increased from 35.5% in 1965 to 51.6% in 2010 and this number will reach at 67% in 2015 (UN, 2012).

Although the level of urbanization in developing countries is low, its rate of urbanization is one of the fastest in the world. 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 is expected to increase to 47% by 2015 and to be double by 2050 (Thuo, 2010). Conversion of farmland and vegetation land cover into urban built-up areas reduces the amount of lands available for food and crop production. Urban expansion has created high pressure on the agricultural land. Subsequently, it brings negative impacts on socio-economic conditions to the communities. These

socio-economic problems are: reduce land quality and agricultural productivity, Soil erosion, deforestation, reduce the amount of open space, desertification (Raddad *et al.*, 2010).

According to Redman and Jones (2004), basically urban growth is a combination of three basic Processes. First, rural-urban migration: It is a key source of urban growth since the origin of cities. Rural-Urban migration is driven from perceived economic opportunities, insecurity in rural areas, climate or economic problems etc. Second, natural increase: This is a combination of increased fertility and decreased mortality rate. Third, re-classification of land from rural to urban categories.

As described by (Siciliano, 2012), the process of determining and implementing compensation are illogical, ad-hoc and lacking clearness and created widespread social and political tensions more importantly exposing the rural migrants for getting risk of increasing social vulnerability to unemployment and food insecurity. Since compensation paid to the displaced people and evicted from farm land ownership is usually inadequate, it is advisable and advantageous to accompany money compensation with alternative development program plans to rehabilitate economically and socially the evicted farmers (Siciliano, 2012).

A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource bases" (Krantz, 2001). Livelihoods can be made up of a range of on-farm and off-farm activities that together provide a variety of procurement strategies for improving household life (Drinkwater and McEwan, 1992).

Kutaber is one of the rapidly expanding town in the Amhara Regional State. The economic bases of the people in the district are the rain fed farming practices and free range livestock rearing. Mixed agriculture remains to be the main livelihood activity. Urban expansion has been its own impact on the livelihood of the surrounding farm households. Thus, the purpose of this study is assess Urban Expansion and its Impact on Peripheral Farming Communities by taking Kutaber town as a case study, Amhara Regional state, Ethiopia.

## **1.2. Statement of the Problem**

In developing countries, where urbanization rates are high, urban sprawl is a significant contributor of the land use change. Sprawl generally infers to some type of uncoordinated development with impacts such as loss of agricultural land, open space and ecologically sensitive habitats in and around urban areas (Sudhira *et al.*, 2007). Now urban expansion is increasing at an alarming rate in developing countries. This is due to fastest growth rate of world's population and change in human settlement preferences. This urbanization process was manifested through the urban physical/horizontal expansion to their peripheral agricultural farmlands. Such urban expansion affects more of the farmers in per-urban territory, especially in developing countries and more of the agrarian economy countries like, Ethiopia (G/Hiwot, 2006).

Generally, urban expansion is one of the basic problems that affect the living standard and food security of many agrarian economy peoples in developing countries. This invasion process leads to the loss of agricultural farm lands, grazing land, bare land and reduction of crops/food productivity (Fekadu, 2015).

Kutaber town is, one of the towns of South Wollo zone of Amhara region, affected by urban expansion due to the existence of high population growth and being flat in land scape make it suitable for urban expansion. Since, the expansion of the town is becoming fast, irregular and uncontrolled, it creates displacement to the farming community. There are different problems associated with this expansion. like: loss of agricultural farm lands, reduction of grazing lands and bare lands. Kutaber woreda is one of the woreda found in this region which is affected with these problems. Some research have been done in this woreda with land use and land cover change. For example, Kassaw (2010), by analyzing the long term dynamics of Landuse/landcover change and developing the susceptibility of land degradation map, concluded that agricultural land increases from 1973 to 2010, with mainly at the expense of grass land, forest land and Shrub land respectively.

However this study didn't touch urban expansion and how it affects household livelihoods in the woreda as well as in the town. Therefore, the researcher of this thesis assessed urban expansion and its impact on the livelihood of peripheral farming communities by giving special attention to three kebeles of the town by applying the GIS and remote sensing as well descriptive statistics.

### **1.3. Objectives of the Study**

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

The general objective of this study is to assess socio economic impact of urban expansion on the livelihood of peripheral farming community of *Kutaber* town.

#### **1.3.2. Specific Objectives**

The specific objectives of this study are:-

- To analyze the extent of horizontal expansion of *Kutaber* town using remote sensing and GIS techniques between 1986 and 2016.
- To identify the land use /land cover change of the study area.
- To identify the major impacts of urban expansion on the displaced farmers livelihood in the last 10 years in terms of financial, social, physical and natural capitals in the study area.
- To Explore factors that contributed to rapid expansion of study area.

### **1.4. Research Questions**

The aim of the proposed research is to answer the following basic research questions.

- What are the major impacts of urban expansion on farmers livelihood in the last 10 years in terms of financial, social, physical and natural capitals in the study area?
- What changes occurred in land use /land cover in the period of 1986 – 2016 in the Periphery of *Kutaber* town?
- What are the most important factors that contributed to rapid expansion of study area?

### **1.5. Significance of the Study**

Urbanization and Urban expansion in the developing countries like Ethiopia is an issue given due attention by scholars, state administration, NGOs, governments, partners and other stakeholders for various reasons. One of the reasons is the need to minimize negative impacts of urban expansion in economic, social and environmental impacts, to bring mutual development and symbiotic integration of the rural and urban life that foster social and economic development (Abdissa, 2005).

One of the major impacts of urban expansion is a shrinking amount of cultivated and grazing land through the development of infrastructures and various development projects. Therefore, urban

land use change studies are important tools for urban or regional planners and decision makers to consider the impact of urban expansion. The finding of this study is significant in providing realistic information and initial input for urban planning experts, decision makers, urban managers, researchers, policy makers, governmental and non-governmental organizations and academicians.

### **1.6. Scope of the Study**

This study was limited geographically, thematically and methodologically. Geographically, this study emphasis only on three peri-urban rural *kebeles* that are found surrounding Kutaber town as these are the only *kebeles* which are affected in the process of urban expansion. These *kebeles* are *Alasha*, *Beshilo* and *Doshigni*. Thematically, the scope of this study was limited to assessment of the impact of urban expansion on the farmer's livelihood specially on financial, social, physical and natural capitals by giving attention to income, livestock holdings, infrastructures and farm land that were affected because of urban expansion in the study area. To make it convention to hold that the study in time and coverage, it focused on the farmers that are displaced in the last 10 years. Methodologically, the spatial extent of the study was limited to the available satellite image of three points in time. This study used both qualitative and quantitative approaches and the methods used in the collection of data were key informant interview, questionnaires and field observations.

### **1.7. Limitation of Study**

Shortage of time and limited network connection to down load images are some of the challenges that were facing the researcher in the course of the study.

### **1.8. Organization of the Thesis**

This research was organized into five chapters. The first chapter contains background of the study, statement of the problem, objectives, research questions, significance, scope and limitation of the thesis. The second chapter is devoted to review of related literature. The third chapter deals with the description of the study area and methodology of the study and the fourth chapter deals with the results and discussion parts of the thesis. Finally, the last chapter presents the conclusion and recommendations of the study.

## CHAPTER TWO: REVIEW OF RELATED LITERATURE

### 2.1. Operational Definition of Related Words and Concepts

**Urban** (as opposite to rural) refers to areas characterized by denser population settlement per-unit of land, higher heterogeneity of inhabitants (in terms of ethnic background, religious adherence, livelihood strategies and sources, educational levels etc...), greater organizational complexities as well as higher formal social control (Bekele, 2010).

**Urbanization** is the process of urban expansion, may involve both horizontal and vertical expansion of the physical structure of urban areas. And it can result in loss of agricultural land, natural beauties, range lands, parks and sceneries (Melesse, 2004)

**Urban expansion** is synonymous with urban sprawl, is the extension of the attentiveness of people of urban settlement to the surrounding area whose function are non agricultural. Urban expansion is a common phenomenon in both developed and developing countries. However, in developing countries urban expansions are known with negative effect. The major effects contributing for rapid urban expansion in Ethiopia are higher natural population growth, rural to urban migration and spatial urban development (Fekadu, 2015).

**Urban periphery** is an open country side including peri-urban areas largely occupied by Agricultural communities in rural settlement pattern to which urban settlement expands and **Peripheral farming communities** is agricultural community in rural settlement pattern to which urban set elements expands (Bekele, 2010).

**Agricultural communities** are inhabitants of rural settlements that are mainly engaged in agriculture both crop and livestock production as well as forestry, fisheries and the development of land and water resource (Ciparisse, 2003).

**Livelihood** the most habitually employed definition of livelihood which the researcher agrees is 'A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and

in the future, while not undermining the natural resource base (Chambers and Conway, 1992). Livelihood assets can be understood by the notion of five main capitals:-human capital, social capital, physical capital, natural capital, and financial capital (Ellis, 2000).

**Natural capital:** consists of land, water and biological resources such as trees, pasture and biodiversity.

**Financial capital:** consists of stocks of money or other savings in liquid form. In this study context, it includes not only financial assets but also it does easily disposable assets such as livestock, which in other senses may be considered as natural capital. It includes income levels, variability over time, and distribution within society of financial savings, access to credit, and debt levels.

**Physical capital:** is that created by economic production. It includes infrastructure such as roads, irrigation works, electricity, reticulated equipment and housing.

**Human capital:** is constituted by the quantity and quality of labor available. At household level, therefore, it is determined by household size, but also by education, nutrition, skills, capacity and health of household members.

**Social capital:** any assets such as rights or claims that are derived from membership of a group. This includes the ability to call on friends or kin for help in times of need, support from trade or professional associations (e.g. farmers' associations) and political claims on chiefs or politicians to provide assistance. In one way or in another the social capital is a function of power a given individual or group assumes and a kind and a level of the relationship that exists in a given societal structure.

**Compensation:** according to Proclamation # 455/2005, compensation is a means of payment for the property that is expropriated by the respective executing body of government both either in cash or kind. The process of compensating for the evicted house hold should include all forms of asset ownership or use right among the affected population and provided a detailed strategy for partial or complete loss of assets.

## **2.2. Urbanization and Urban Sprawl**

Urbanization refers to a process in which an increasing proportion of an entire population lives in cities and the suburbs of cities. It is the movement of population from rural to urban areas and the resulting in increasing proportion of a population that resides in urban rather than rural places. Urbanization is a form of metropolitan growth that is a response to often bewildering sets of economic, social, and political forces and to the physical geography of an area. Population increase as well as immigration from rural area towards larger cities, particularly in developing countries results in considerable increase in urban areas. Sprawl is a pattern and pace of land development in which the rate of land consumed for urban purposes exceeds the rate of population growth which results in an inefficient and consumptive use of land and its associated resources Meles and Vanum (2012).

## **2.3. Urbanization in Africa**

Urbanization is increasing in both developed and developing countries. However, rapid urbanization, particularly the growth of large cities, and the associated problems of unemployment, poverty, inadequate health, poor sanitation, urban slums and environmental degradation pose a formidable challenge in many developing countries. Although urbanization is the driving force for modernization, economic growth and development, there is increasing concern about the effects of expanding cities, principally on human health, livelihoods and the environment (UNCED,1992). Natural population increase (high births than death) and migration are significant factors in the growth of cities in the developing countries. The natural increase is fuelled by improved medical care, better sanitation and improved food supplies, which reduce death rates and cause populations to grow. In many developing countries, it is rural poverty that drives people from the rural areas into the city in search of employment, food, shelter and education.

In Africa, most people move into the urban areas because they are pushed out by factors such as poverty, environmental degradation, religious strife, political persecution, food insecurity and lack of basic infrastructure and services in the rural areas or because they are pulled into the urban areas by the advantages and opportunities of the city including education, electricity, water etc. Even though in many African countries the urban areas offer few jobs for the youth, they are often attracted there by the amenities of urban life (Tarver, 1996).

#### **2.4. Urbanization in Ethiopia**

The urban population in Ethiopia is increasing rapidly. Estimated at only 17.3 percent in 2012, Ethiopia's urban population share is one of the lowest in the world, well below the Sub-Saharan Africa average of 37 percent. But this is set to change dramatically. According to official figures from the Ethiopian Central Statistics Agency, the urban population is projected to nearly triple from 15.2 million in 2012 to 42.3 million in 2037, growing at 3.8 percent a year. Analysis for this report indicates that the rate of urbanization will be even faster, at about 5.4 percent a year. That would mean a tripling of the urban population even earlier by 2034, with 30 percent of the country's people in urban areas by 2028 (World Bank, *Ethiopia Economic Update II* (2013)).

#### **2.5. Urbanization in Kutaber**

Kutaber town is one of the rapidly expanding town. The reason is that, the area is suitable for settlement and other infrastructure purposes. Because of this reason, the expansion is increasing at an alarming rate.

#### **2.6. Causes of Urban Expansion**

Urbanization in worldwide has resulted in cities that are rapidly growing and expanding to be able to host their increasing population and this expansion is termed as urban sprawl. The expansion of urban to the neighbouring rural environment is caused by two major factors, namely spatial urban growth and increase in urban population due to high birth rate and in-migration (both rural to urban and urban to urban) migration. The first source of urban expansion-urban development is induced by the economic advancement, urban clearance and/ or industrialization (Kedir, 2010).

Hence, places or sites that are adjacent to urban areas might be needed for social, economic, industrial and communication, road construction and for other infrastructure and investment that may in turn need resettlement and displacement of the neighboring rural farming community (Cernea, 2000).

#### **2.7. Consequences of Urban Expansion**

The rapid urban expansion in developing countries is usually associated with unplanned development in the periphery that requires high cost of infrastructure. It is also evident that even in planned activity the development of infrastructure usually does not correspond to the large tract of

land that develops in a low-density pattern. Thus urban expansion consequently results in social, environmental and economic problems to the society (Bhatta, 2010).

### **2.7.1. Positive Impacts of Urban Expansion**

Urban centers have positive impact on the development of their surrounding peri-urban areas through different ways. According to Satterthwaite and Tacoli (2004), the surrounding area of urban centers are mostly engaged in agricultural production either for local consumers or as links to national and export markets, urban centers act as access to market which is the pre-requisite to increasing rural agricultural incomes. Proximity also contributes to minimize the risks of perishable products to produce timely to market areas and to get affordable transportation.

According to (G/Egziabher,1998) and other, the practical activities approved that people who live in the surrounding urban centers can have possible access to both private and public services such as health, education, banking, postal & telephone and services of different professionals (lawyers) and private services like wholesale and retail, sales of manufactured goods.

As to the view of Kamete and Tvedten (2006) in order to assure that people who live around urban centers, because of their proximity, have a better access to employment and modern way of living than those who far rural dwellers. Besides, urban centers create employment opportunities through the development of small and micro enterprises and cooperatives.

Fekadu (2015), in his study on urban expansion and its effect on peripheral farming community in Hosanna town pointed out that, physical capital i.e. number of house rooms- buildings- increased in percentage.

### **2.7.2. Negative Impacts of Urban Expansion**

Urbanization has also some negative effects to its surrounding peri-urban areas in different aspects especially, in relation to displacement of farmers from their farmland and to degradation of valuable agricultural land. This is because as the nation's population increase, cities must grow spatially to their peri-urban areas to accommodate more people and to serve different services for them. In Ethiopia, the urbanization was increased from 5% in 1950 to 16% in 2000, on average 4.3% per year. Furthermore, it is estimated that by 2025 the World's, African's and Ethiopian's population rate will reach 58%, 52%, and 32% respectively (Webster, 2005 as cited in Mahari,

2011).The reason for an optimistic prediction towards the urbanization growth is that, it will have the following negative effects of urban expanding on their peri-urban areas.

As pointed out by (Dayong, 2004) uneven urban expansion will occupy considerable valuable farmland around urban centers, which causes to sensitive contradiction and conflicts with the farmers who are displaced from their farm land. Urbanization negatively affects the peri-urban areas in different ways. As urban centers, expand by occupying fertile farm land and displacing farmers cause to reduce the amount of production and number of family farmers and move to the nearby urban centers.

As a result, the farmers with their large family size will be exposed to unemployment and poverty (food insecure) for the reason that they are not well educated and skilled rather depending on their agricultural production. It is understood that, people without basic qualification or literally skilled are unable to compete and get job in the labor market G/Egziabher and Solomon (1997).

According to Mc Granahan et al. (2004), rapid urbanization leads to over exploitation of renewable and non-renewable resources of their peri-urban areas (especially, land). Because people who live in urban areas have vary and different consumption pattern than these who live in the peri-urban areas. The demands made by urban centers greatly exceed the carrying capacity of their own territory.

According to G/Egziabher and Solomon (1997), urbanization causes for enormous conflicts associated with land acquisition. The most sources of conflict are found at the borders of the urban and rural, common and private, smallholder and investors land.

The research conducted by Feyera (2005), that mainly focuses urban expansion effect on the livelihood of the dislocated farming community indicated that the rapid urbanization process in Addis Ababa towards the peripheral rural farmlands have displaced 4,390 agricultural communities estimated of 1232.96 hectares of farmland changed to urban use in 5 *kebeles* in three years time (1997-1999).

According to Adugna (2016), urban expansion led to loss of farmland and displacement of the households who had been involved in farming activity.

As pointed out by Fekadu (2015), natural assets mainly land and permanent forest declined. Also, the study by him found out that there was inadequate food, poor nutrition, poor health, poor education and very limited marketable skills and knowledge.

## **2.8. Rural- Urban Linkage**

Rural-urban interactions are important elements of the livelihood strategies of both rural and urban households, either in the form of flows of people (migration), natural resources, products, goods and services, information and money, or in the form of income diversification such as urban agriculture and non-farm rural employment. However, mostly rural and urban development has been considered in isolation in most developing countries. Their inherent linkage with each other's development is less considered or reduced to only market linkages. Although market linkages play significant role, Rural-Urban Linkage (RUL) is beyond this linear kind of assumption and it encompasses many complex interactions and processes. Rather it is important to recognize the close relation between urban and rural systems. This is due to fact that efforts and initiatives in one area, when properly conceived and planned, can have a positive spillover effects in the other (Tacoli, 2002).

Urban-rural linkages have the potential to transform sustainable human development for the benefit of all. Integral to this is knowledge generation and management as well as capacity development, which can provide an enhanced understanding of how functions and flows operate. It is critical to understand existing parameters that exacerbate the dichotomy between urban and rural areas and those that promote linkages. Globally, there is insufficient knowledge on the dynamics of small and intermediate cities where half of the world's urban people live, making them a missing link in understanding the dynamic of urban-rural interactions (Brian *et al.*, 2014).

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

## 3.1. Description of the Study Area

### 3.1.1. Location

Kutaber town is found in Amhara Regional State in South Wollo Zone of North-central part of Ethiopia. The town was established in 1837 (KWARDO, 2007). It is 495km far from the regional capital city Bahir Dar in the East, 419km far from Addis Ababa in the North, and 18km far from Dessie town in the North. It is enclosed by Dessie zuria on the South, Tenta on the West, Ambassel on the North, and Tehulederie on the East. The geographic location extends from 39°18' E –39°38' E Longitude and 11°8' N –11°29' N, Latitude and an elevation of about 2501m above sea level. Its total area 86.486 km<sup>2</sup> (Kassaw, 2010).

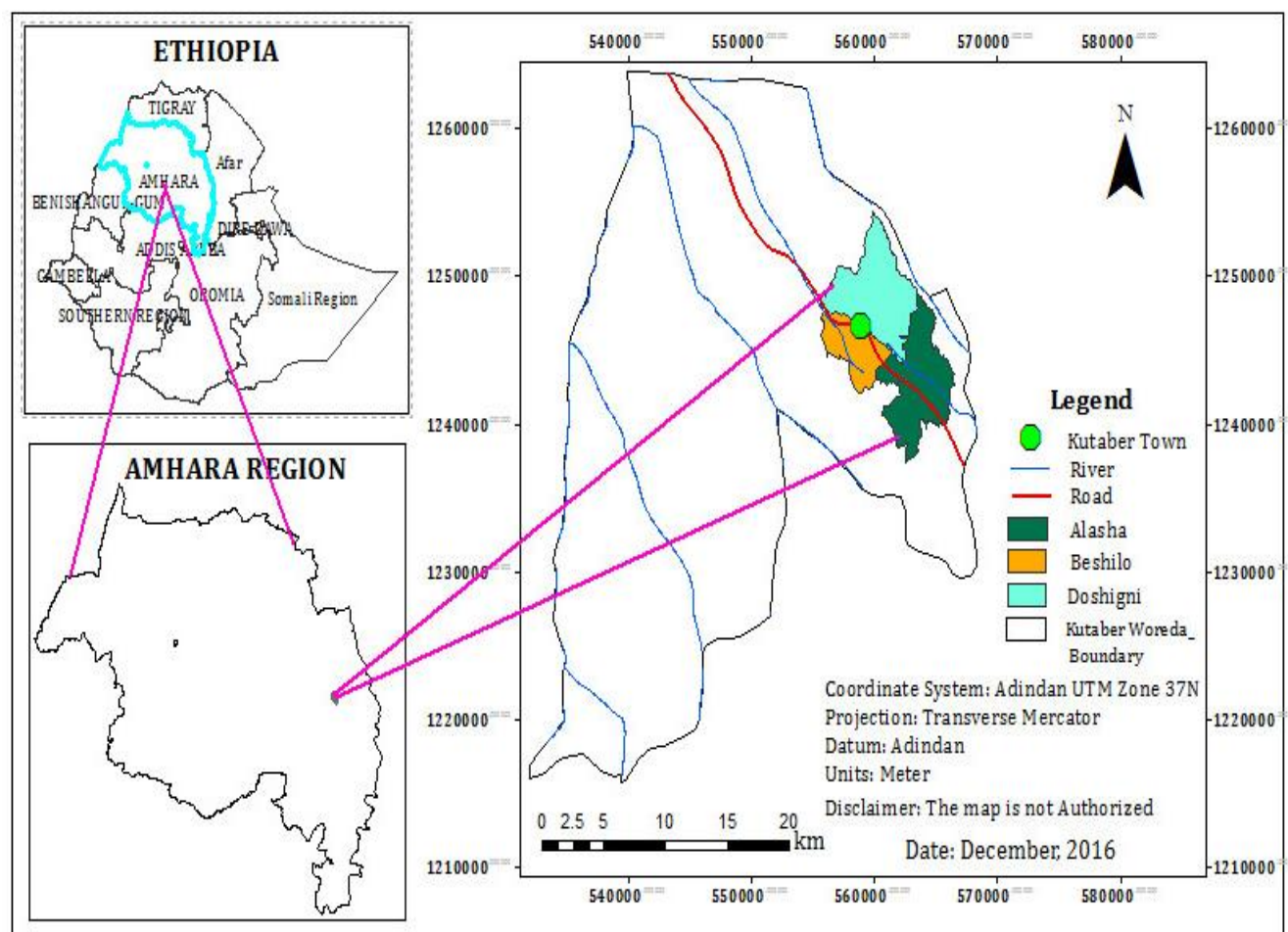


Figure 3.1. Location map of the study area.

Source: CSA, (2007)

### **3.1.2. Population**

The total population of the town is to reach 8,220 and rural population is 96,247. Average family size is 5-6. The town is totally inhabited by Amhara people and the people are predominantly followers of the Christians and Muslim faith (CSA. 2010).

### **3.1.3. Climate**

The agro climatic zone of the woreda varies from Kolla, Woina Dega and Dega. The average annual rainfall of the woreda is 1110.57 mm per year. The woreda high rainfall season is during Kiremt that starts in June and ends in September and short rain season is in Belg in January and ends in February. Temperature is the major determinant factor for Climate in Ethiopian. The mean minimum temperature for the woreda is 6.56°C during October and November to mean maximum temperature of 23.13°C during May (kutaber woreda Agricultural and Rural Development Office (KWARDO, 2007).

### **3.1.4. Soil**

The soils for the study area are predominantly Lithic Leptosols and Eutric Vertisols. The general slope ranges on from 0 to 79.85 % in which these soils occur. The area is usually found in landscapes of mountain and major scraps, uplands and bottomlands, and minor valleys (FAO, 1997).

### **3.1.5. Socio-economic Conditions**

The economic bases of the community in the woreda are the rain fed farming practices and livestock rearing. Mixed agriculture remains to be the main livelihood activity. The major cultivated crops include Teff, Barley, Wheat, Bean, Field peas, Maize, Chickpeas, and sorghum. In general, activities other than agriculture seem to be very limited. Agriculture is an important household resource that plays significant role to household food security, income generation. Cattle, sheep, goat, cow and ox are the most common domestic animals raised in the rural area and in the urban area, main activities are trade, cattle raring, daily labour, employees in the government and non government organization (KWARDO, 2007).

## **3.2. Materials and Methodology**

### **3.2.1 Research Design**

The method of research for this study was survey research design. The reason for this researcher choose this design was that it enabled to describe the intended study to the impacts of urban expansion on the peripheral farming community. In order to address the stated objectives the researcher was use both qualitative and quantitative types. This is because the proposed study needs the collection of statistical (numerical) data for the quantitative approach. Qualitative method applied to describe the existing conditions of expansion of the town and by using qualitative data, options that are hold and processes that are going on regarding to the urban expansion to periphery of Kutaber town.

### **3.2.2. Data Acquisition**

Reliable data is necessary to realize the designed objectives and hence the study is based on both primary and secondary data.

#### **3.2.2.1. Primary Data Sources**

Important sources of primary data for this study were key informant interview, questionnaires, field observations and Ground Control Points (GCP). Those generated during geophysical survey and the number of Ground Control Points measure by GPS (Global Position System) from field.

##### **i. Key informant interview**

The researcher prepared an interview guides for displaced farmers, experts of the municipality, *kebele* administration 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, 12 people participated in the key informants interviews. More specifically, three from Municipality of the town, two from Office of Land Management of *Kutaber*, five from Community elders, two from *kebele* Administration.

##### **ii. Questionnaire**

The researcher used similarly questionnaire for all respondents of the selected sample. The questionnaire was primarily prepared in English languages and then translated to Amharic

language. Finally it was translated to English language and then been analyzed. The items of questionnaire was both closed ended and open ended questions.

**iii. Field observation**

Ground truth data’s on the field were collected by direct observation on the selected area for this study. The researcher observed and collected the necessary visual information with the help of hand held GPS and camera from the existence of urban expansion. Observation used by the researcher in order to get more information to accurate the information gets from the other tools. Observation checklist was used by researcher to conduct field survey systematically.

**3.2.2.2. Secondary Data Sources**

The secondary sources of data were also collected from books, journals, official reports, websites, legal documents, satellite images, previous study documents, meteorological data, population data, aerial photograph and topographic map 1:50,000 of *Kutaber* from Ethiopian Mapping Agency(EMA) data's were widely used.

**3.2.2.2.1. Satellite Imageries**

In order to assess the urban expansion in the study area, Landsat imagery of (1986, 2000 and 2016) cloud free image for *Kutaber*, path 168 and row 52 were acquired from website. These data's were used to produce the historical land use/ land cover maps of the study area and urban expansion changes. The images were downloaded from the United States Geological Survey (USGS) Earth explorer website and spatially referenced in the Universal Transverse Mercator (UTM) projection with datum World Geodetic System (WGS) 1984 UTM zone 37N. The images were extracted to Tiff formats for processing and the detail of image properties are summarized in (table 3.1) below.

Table 3.1. The characteristics of landsat satellite data used in this study

No	Sensor	Date of Acquisition	Spatial resolution	Source	Path/Raw
1	Landsat TM	26/02/1986	30 m	USGS website	168/52
2	Landsat ETM+	05/02/2000	30 m	USGS website	168/52
3	Landsat ETM+	23/01/2016	30 m	USGS website	168/52

Satellite bands were composed in different ways in order to identify surface features in the study area. True color composite usually known by RGB 321 combination where band 3 reflects red

color, band 2 reflects green and band 1 reflects blue color. Another composite called "false color composite" which uses an RGB combination of 432. In this band combination band 4 represents the NIR infrared, band 3 belongs to red and band 2 to green. This combination gives better visualization in identifying vegetation which looks red in 432 combinations. Figure 3 below illustrated maps of the study area generated using the false color (432) combination of the year 1986 and 2000, false color (543) combination of the year 2016 and vegetation is seen as red and darkred.

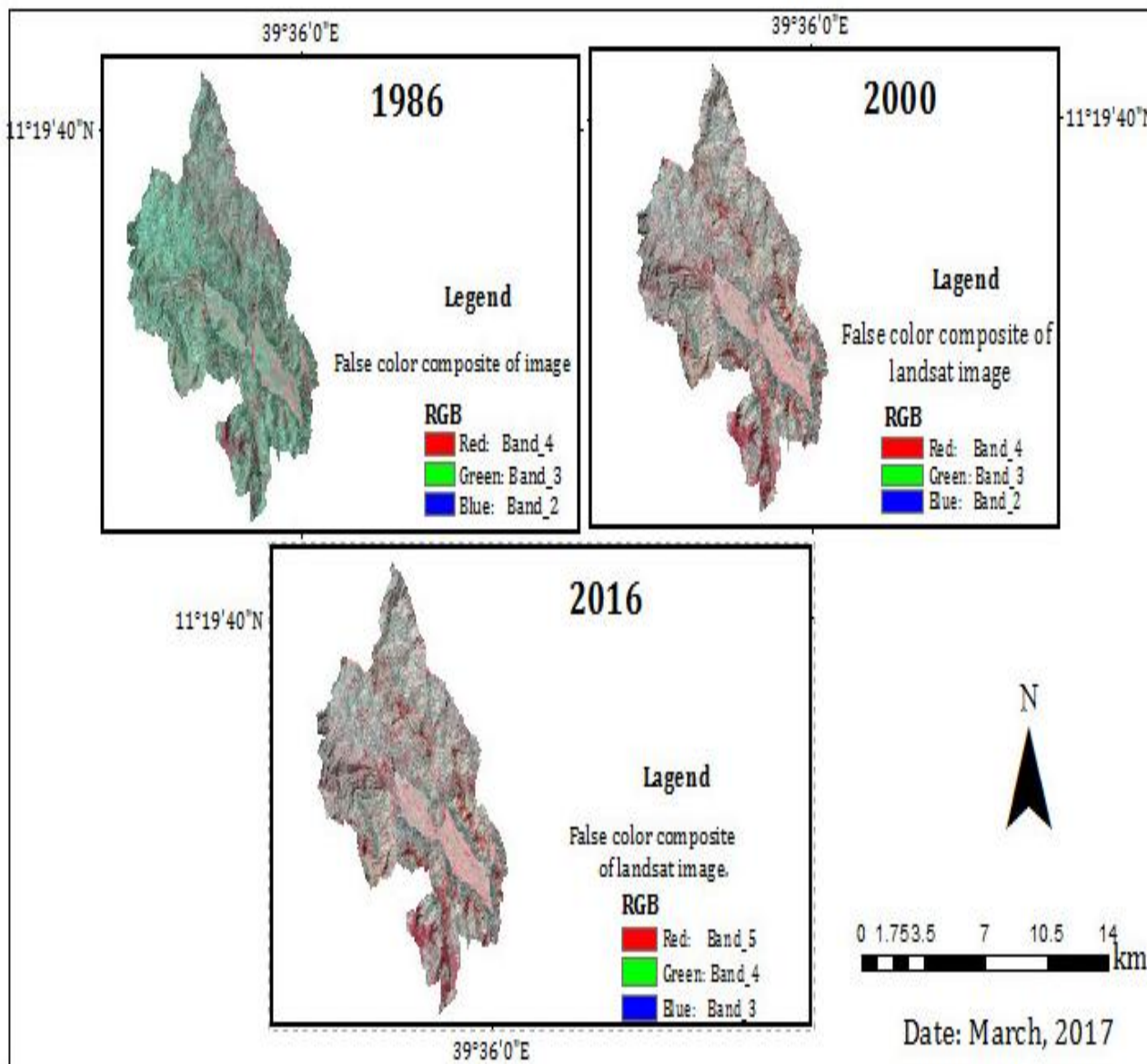


Figure 3.2. False color composite of landsat image of 1986, 2000 and 2016.

### 3.3. Materials and Software's

Table 3.2. Materials and Software's were used.

Materials and Software's	Function
ERDAS Imagine 2013	To image pre-processing, layer stacking single bands, supervised classification of land classes and accuracy assessment of the classification.
ArcGIS 10.3	To create study area shape file, identify path and row of the study area, data analysis, management, geo-referencing, the study area delineation and clipping and make layout for final mapping.
Micro-soft excel	To perform different statistical calculations.
Micro-soft word	To write the research paper.
SPSS	To process, manage and analyze the data's collected.
GPS	To collect ground control points (GCPs) used to conduct ground accuracy assessment.
Digital camera	To capture urban expansion images in the study area.

### 3.4. Sampling Techniques

#### 3.4.1. Sampling Frame

The sampling frame to identify respondents was the list of 4,410 households who were displaced farmers from their land. In each peripheral kebeles, a list of the displaced households would be generated from roasters of the kebele administration.

Table 3.3. Sampling frame used to identify sample households

Kebele	Total number of households	Population displaced in household
Alasha	8,532	1,950
Beshilo	2,519	600
Doshingi	8,449	1,860
<b>Total</b>	<b>19,500</b>	<b>4,410</b>

Source: Kutaber Town Administration, 2017.

#### 3.4.2. Sample Size Determination

In the process of realization this study, a purposive sampling technique was employed to assure the representativeness of samples on-target group-households that are faced with problem in the peripheral part of *Kutaber* town. In this regard, the researcher purposively selected three *kebeles*

from twenty one *kebeles* as they are *kebeles* which are affected with urban expansion, by considering distance from the district town, have road accessibility and these *kebeles* are found relatively on flat areas that make them suitable for settlement and other infrastructure purposes. These *kebeles* are; *Alasha*, *Beshilo* and *Doshigni*.

Representative samples from the households of selected *kebeles* were based on scientific formula at required degree of confidence. Therefore, representative sample of these households have been calculated based on formula for sample size determination and for finite population. According to (Dirribsa and Tassew, 2015). The formula is given as:

$$n = \frac{z^2 \cdot p \cdot q \cdot N}{e^2 \cdot (N-1) + z^2 \cdot P \cdot q} = \frac{1.96^2 \cdot 0.5 \cdot 0.5 \cdot 4410}{0.08^2 \cdot (4410 - 1) + 1.96^2 \cdot 0.5 \cdot 0.5} = \frac{3.8416 \cdot 0.25 \cdot 4410}{0.0064 \cdot (4409) + 3.8416 \cdot 0.25} = \frac{4235.364}{29.178} = 145.$$

Where n= required sample size=145, N=Population=4,410, Z= Confidence interval at 95% which is 1.96, e=8%, P= 0.5, q= 0.5, Z=95% confidence interval under normal curve 1.95. The samples of respondent are taken from each *kebeles* on the basis of the formula given above). e= acceptable error term(0.08), P and q are estimates of the proportion of population to be sampled and N=total population.

The following is the detail about the sample respondents from each *kebele* which is computed as total population of each *kebele* or portion/total population\*total calculated sample using the above formula: *Alasha*: displaced, 1950/4410\*145=64, *Beshilo*: displaced, 600/4410\*145=20, and *Doshigni*: displaced, 1860/4410\*145=61. Total= 64+20+61=145. This is summarized with the following (table 3.3).

Table 3.4. Sample size determination proportionality

Kebeles	Displaced Household Size	Sample Size based on Proportionality Sampling
Alasha	1,950	64
Beshilo	600	20
Doshigni	1,860	61
<b>Total</b>	<b>4,410</b>	<b>145</b>

Source: Own competition, March, 2017

### **3.5. Data Processing and Analysis Method**

#### **3.5.1. Data Processing**

The study area was selected from Ethio- GIS using arc map and export as a shape file. In order to identify path and raw of the project area and define project and re-projection was performed. The image processing task was carried out using (Earth Resource Data Analysis System) ERDAS Imagine 2013 software. Prior to data analysis, initial processing on the raw data is usually carried out to correct for any distortion due to the characteristics of the imaging system and imaging conditions. Land cover map was prepare after the images have been download, project and stack (pre-process) to be displayed in ERDAS IMAGINE software interface (Jensen, 2004).

#### **3.5.2. Data Analysis**

The primary data obtained from interview to government office experts and elder person community members selected in the pre-urban evicted farmers was analyzed qualitatively. With regard to the data gathered from household survey, field supervisor checks every completed questionnaire, the pre-coded questionnaires were processed, managed and analyzed by using the Statistical Package for Social Sciences (SPSS) software and Micro-soft excel program. Variables such as, sex, age, households size, education status, their attitude on the effects of urban expansion on their farmland and livelihood were analyzed using descriptive statistic mainly percentage and mean as well as graphs. The acquired land use statistics data were presented and analyzed by using tables, figures, charts and reports.

Depending on the scope of the study and visual interpretation of various environmental features of the study area was done based on the visual elements or characteristics of satellite image, i.e. tone, texture, shape, Pattern, shadow, association and aspect of the features with the support of field verification of each land use/land cover features.

To get a land cover/land use map at reasonable accuracy, training areas have been chosen with the help of different sources such as high resolution images (Aerial photography) and Google Earth. Aerial photography image was used to access the low resolution Landsat image. Google Earth provides an access of high resolution image on the internet. The study area has a high resolution Google Earth image, dated 2016. Clearly recognized objects on Google earth image were digitized and taken as AOI (Area Of Interest) and used to classify Landsat images.

GPS points and digital camera were used to locate some sample ground cover situation at the time of field visit. Some land use/land covers in urban area, like water body, woodlots, and built-up area stay for long time without change to other land use/land covers. in this study totally 40 samples were collected from field, whereas the remaining 90 points taken from Google earth map. Therefore, some GPS points collected from the field and some Google Earth image were used to minimize the processes of land use/land cover classification and as the same time used to validate the accuracy of land use/land cover results. Then, from the satellite imageries, seven classes were chosen. These were built-up area, forest, bare land, water body, shrub land, farm land and grass land.

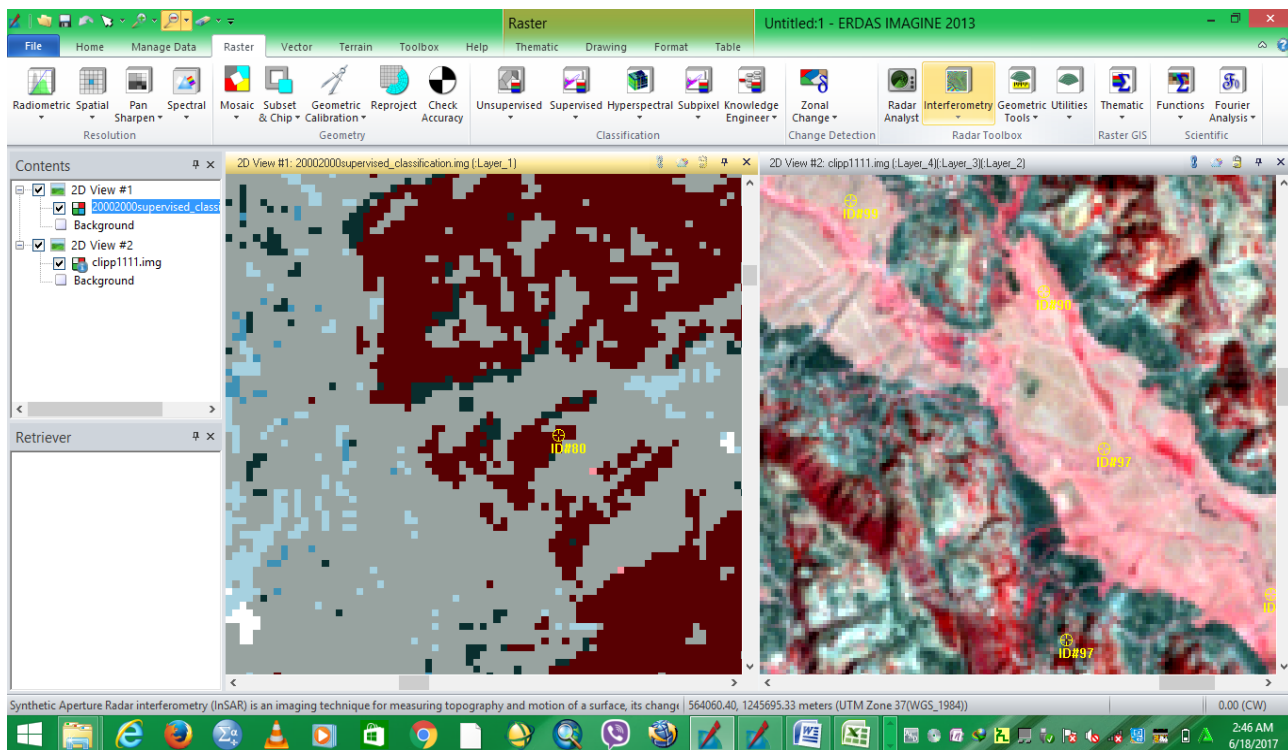


Figure 3.3. Land use/Land cover classification.

Source: Own computation, 2017.

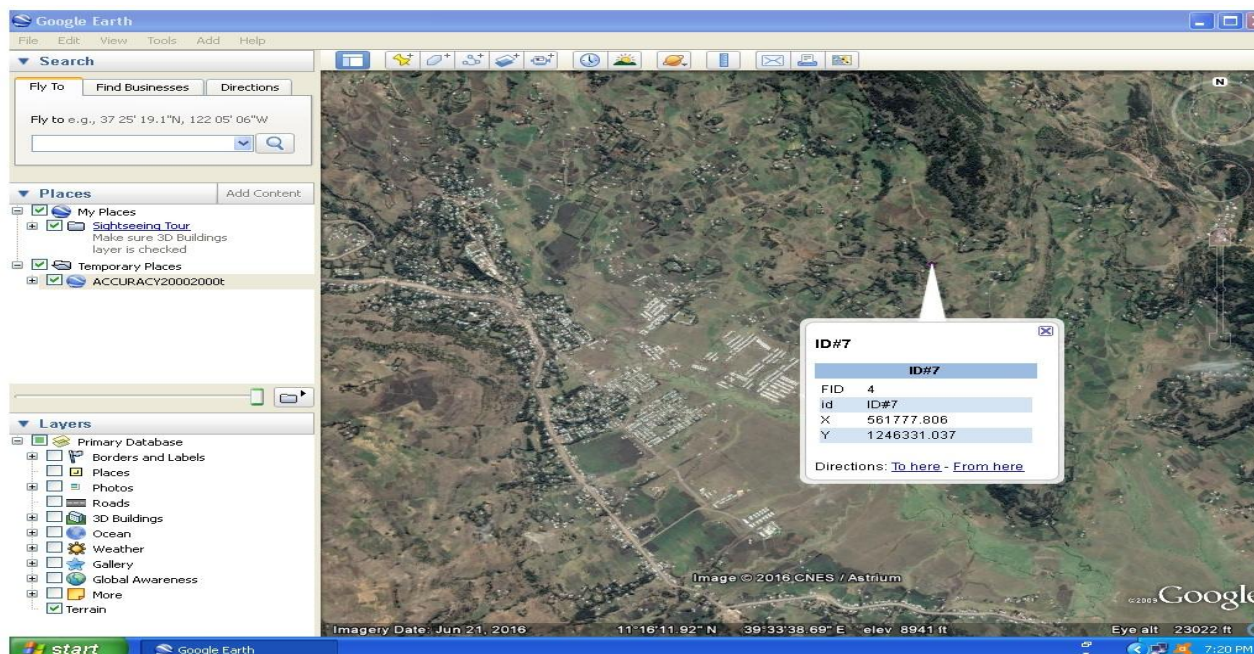


Figure 3.4. High resolution images (Google earth). **Source:** Google earth, (2016).





Figure 3.5. Ground truth data from field observations.

**Source:** Photo by author, 2017.

### Description of Land Use/Land Cover Classes

The classification process, it is rare to find clearly defined classes that one would like. Before collecting training samples, the land cover classes should be known so as to make the classification easier (Bekalo, 2009). This paper established its own classification scheme based on visual interpretation of satellite images.

Table 3.5. Land use/land cover classes descriptions.

No.	Land use/land cover	Descriptions
1	Built-up areas	Continuous and discontinuous urban fabric, residential, industrial and commercial units, road and other associated lands.
2	Forest	Areas covered by trees forming closed or nearly closed canopies
3	Bare lands	Open spaces with little or no vegetation, sands and rocky areas
4	Water body	including river, stream and lake
5	Shrub lands	Scattered trees and bush land
6	Farm lands	Irrigated and rain fed arable lands, crop land with permanent crops, farming and fallow fields
7	Grass lands	Areas with permanent grass cover along ridges steep slopes and plain areas used for grazing; usually private as well as communal.

**Source:** Own classification scheme, 2017.

There are two methods of image classification. Supervised image 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 used when less is known about the data before classification (Tadesse *et al.*, 2001). Due to similar spectral characteristics of grass, crop and bush lands, which was been determined to be independent classes before classification, the application of unsupervised classification may not give good results. As a result, supervised image classification was been used.

### **3.6. Output**

#### **3.6.1. Land cover / Land use Change Detection**

After determining the land cover features the next step was land cover change detection. Land cover change detection is the process of assessing the spatial and temporal land use/ land cover change in the study area. Land use/land covers has been consecutively analyzed using datasets from remotely sensed landsat imageries of 1986, 2000, and 2016 years a given land cover feature. This was done through overlaying the classified satellite imageries and analyzing by image differencing.

There are varies techniques in land use/ land cover change detection. From these the most common one is post classification comparative analysis of independently produced classifications from different dates map to map and image to image comparison (Alebachew, 2011). In the case of the post classification method, imageries from different archives in different year interval are classified and labeled individually.

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. And the primary data gathered from household interview, field supervisor were check every completed questionnaire then to analysis by using the Statistical Package for Social Sciences (SPSS) version 20 software and Micro-soft excel program.

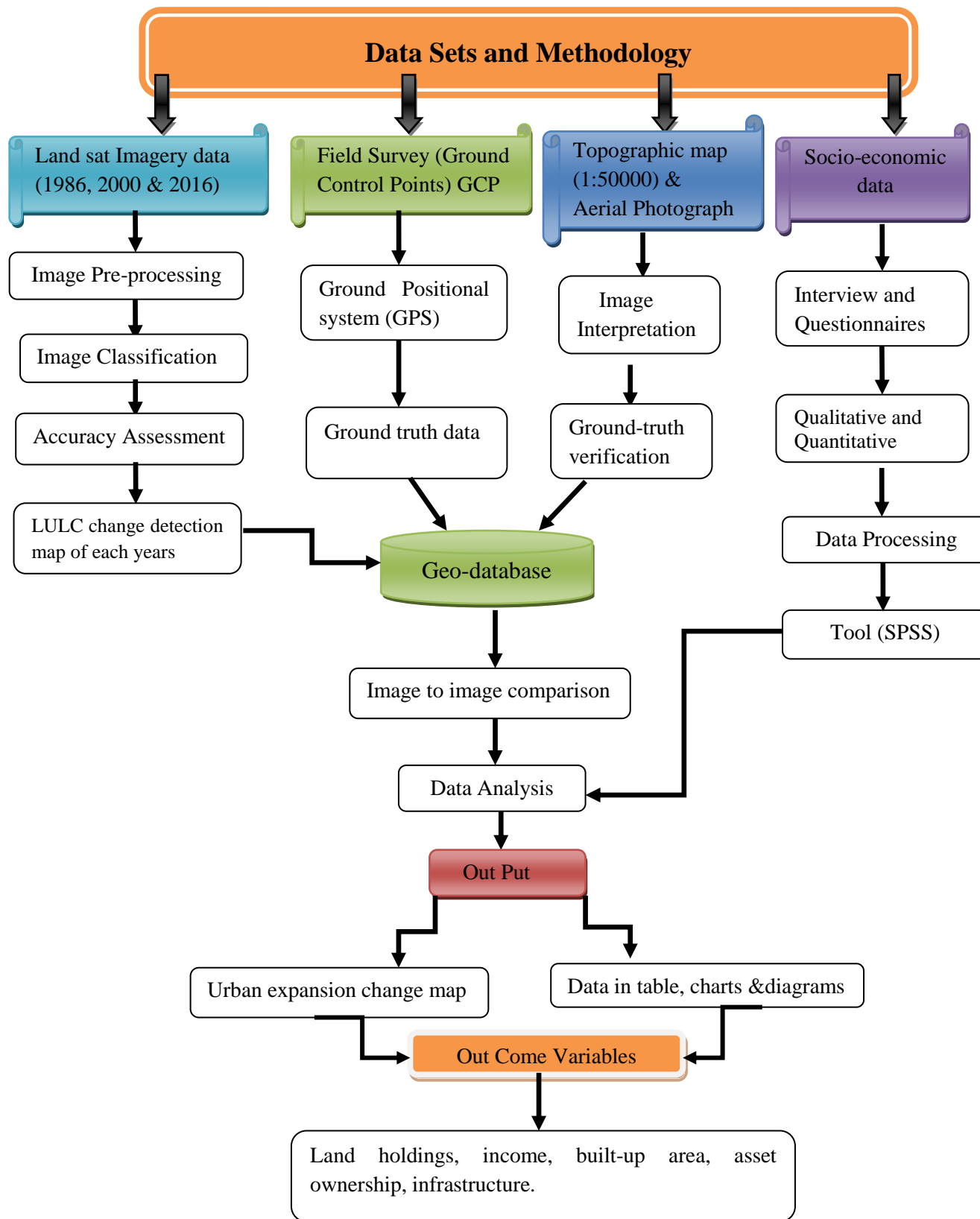


Figure 3.6. Flow chart of the Methodology

Source:- Owen competition, 2017

### **3.7. Reliability and Validity of Methods and Materials**

The reliability and validity of the outcome of the thesis report was ensure 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 and researchers) on issues that require expertise and crosschecking information was obtain through interviewing with information gathered from public records and published materials on the issue.

### **3.8. 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 maintain, all findings are portrayed in a confidential manner so that no personal or identifiable information is record or print in the study. Thus, the name of participants was not record during the data collection process. Therefore, before data collection, a formal letter was given to the researcher from Addis Ababa University and the researcher show to the concerned organization and explained the general objective of the study. Then, the researcher gathers the required data for the study after getting permission from the concerned organizations.

## CHAPTER FOUR: RESULTS AND DISCUSSIONS

### 4. Introduction

This chapter presents the main findings of the study concerning urban expansion and its impact on the livelihoods of peripheral farming community. The results presented in this chapter seek to achieve objective of the study, which is to assess urban expansion and its impact on livelihood of peripheral farming community of *Kutaber* town. This part of the thesis deals with the description of general characteristics of sample respondents and then information's are presenting, analyzing and interpreting collected/gathered from; farmers who were displaced from their land between 2006 -2016, from key informants who are interviewed such as formal and informal leaders and influential elders, municipal experts and official documents through conducting questionnaires, interviews and document analysis. Generally, it contains three cooperated or mutually coexisted, parts i.e. some deals with farmer's responses, others deal with the official administrative experts response to the questionnaires and interviews and some others also deal with the official (municipal) document analysis.

#### 4.1. Demographic Characteristics

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

##### 4.1.1. Sex Structure of the Respondents

Sex of the household head is an important variable influencing participation and decision making that in intern to influence the entire livelihood of the community. Table 4.1. displayed that the majority (82.07%) of the respondents are male headed and the rest(17.93%) were female.

Table 4.1. Sex of household head.

Sex of household head	Frequency	Percent
Male	119	82.1
Female	26	17.9
Total	145	100

Source: Own survey, 2017

##### 4.1.2. Households' Family Size

In (table 4.2) shows us, the sample household's respondents, 58 (40%) of the respondents have 1-3 family size, 72(49.7%) remain that 4-6 family sizes and 15 (10.3%) indicated 7-9 of family sizes of

the town. Therefore, the majority of the respondents were 4-6 family sizes in the area. An average family size is 5-6. From this, we can learn that those farmers in per-urban areas and whose land had been expropriated have a large family size burden under the narrower income source condition.

Table 4.2. Households' family size

<b>Households' Family Size</b>	<b>Frequency</b>	<b>Percent</b>
1-3	58	40.0
4-6	72	49.7
7-9	15	10.3
<b>Total</b>	<b>145</b>	<b>100.0</b>

Source: Own survey, 2017

#### 4.1.3. Marital Status of the Respondents

As it shown on (Table 4.3.), the majority of the respondents 87(60%) are married followed by single, divorced and widowed with 25(17.2%), 14(9.7% and 19(13.1%) respectively. Hence, the respondents could give their answer from their experience of administering family and caring responsibility.

Table 4.3. Marital status of households

<b>Marital Status</b>	<b>Frequency</b>	<b>Percent</b>
Married	87	60.0
Single	25	17.2
Divorced	14	9.7
Widowed	19	13.1
<b>Total</b>	<b>145</b>	<b>100.0</b>

Source: Own survey, 2017

#### 4.1.4. Age of Household Heads

As we can see from the (Table 4.4.), the majority respondents of the sample households were 40-49 age groups in the study area with mean of 2.6759 and median of 2.0000.

Table 4.4. Age of Household Head

Age of household head	Frequency	Percent	mean	Median
From 20-29	36	24.8	2.6759	2.0000
From 30-39	38	22.8		
From 40-49	33	26.6		
From 50-59	13	9.0		
60 and above	25	17.2		
Total	145	100.0		

Source: Own survey, 2017

#### 4.1.5. Education Status of the Respondents

The majority of the sample households (24.1%) able to read and write, (22.1%), (20.7%), (18.6%), (13.1%) and (0.7%) of the respondents have primary second cycle(5-8), secondary first cycle (9-10), illiterate, primary first cycle(1-4), secondary second cycle(11-12) and tertiary(college and university) respectively. However, majority the household number of the respondents (24.1%) are read and write educational level.

Table 4.5. Education status of the respondents.

Level of education of household head	Frequency	Percent
Illiterate	27	18.6
Read and write	35	24.1
Primary First Cycle (1-4)	19	13.1
Primary Second Cycle(5-8)	32	22.1
Secondary First Cycle (9-10)	30	20.7
Secondary Second Cycle(11-12)	1	0.7
Tertiary (college and university)	1	0.7
<b>Total</b>	<b>145</b>	<b>100.0</b>

Source: Own survey, 2017

## 4.2. Current Land Ownership of the Respondents

It is indicated in (table 4.6), that all of the respondents have their land in the study area. However, different in size.

Table 4.6. Whether the respondents have land or not

Response	Number of respondents	Percent
Yes	145	100
No	0	0
<b>Total</b>	<b>145</b>	<b>100</b>

Source: Own survey, 2017

### 4.2.1. Respondents Land size in Hectare

As it is indicated in (table 4.7), the average land holdings of the respondents is 2.56 Timad<sup>1</sup>. However, there are respondents who have a minimum of 1timad land and maximum of 5 timad land.

Table 4.7. Land holding size of respondents

Landholding size (ha)	N	Minimum	Maximum	Mean	Std. Deviation
	145	1	5	2.56	1.005

Source: Own survey, 2017

### 4.2.2. Respondents' Land Allotment Purposes

The respondents are also using their land for different purposes. Out of their total land, crop land 23.4%, grazing land 10.3%, fruits and vegetables 18.6%, crop land and grazing land 2.8% and the remaining 44.8% is used for all of the above purposes . 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. Most of respondents are claiming that their land is serving for all purposes followed by crop and fruits and vegetation.

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<sup>1</sup> 1 Hectare=4Timad=4 Gemmed in local measurement.

Table 4.8. Respondents' land allotment purposes

<b>Land use type</b>	<b>Number of respondents</b>	<b>Percent</b>
Crop land	34	23.4
Grazing land	15	10.3
Fruits and vegetation	27	18.6
Crop land and Grazing land	4	2.8
All purposes	65	44.8
<b>Total</b>	<b>145</b>	<b>100</b>

**Source:** Own survey, 2017

### **4.3. Urban Expansion impacts on Farmers' Financial Capital in 2006-2016**

According to (table 4.9), the sample households of respondents, 1(0.7%), 8(5.5%), 29(20%), 64 (44.1%) and 43(29.7%) reported that these households used to earn total annual income of 41-50 quintal, 31-40quintal, 21-30quintal, 11-20quintal and below 10quintals respectively before urban expansion. After urban expansion, they reported that to have earned 0(0%), 1(0.7%), 10(6.9%), 51(35.2%) and 83(57.2%) for 41-50quintal, 31-40quintal, 21-30quintal, 11-20quintal and below 10 quintals respectively. This indicates that annual production/ income decreased after urban expansion in the study area.

This can be seen from the following table that number of respondents who produced 41-50quintal decreased from 0.7% to 0%, 31-40quintal from 5.5% to 0.7%, 21-30quintal from 20% to 6.9% and 11-20quintal from 44.1% to 35.2%. But number of respondents who produce less than 10quintals increased their income from 29.7% to 57.2%. This is to mean that, the majority of the population produces fewer amounts less amount of quintals after urban expansion. This corresponds to the study by (Dayong, 2004) as displacing farmers cause to reduce the amount of production.

Table 4.9. Annual income before and after Urban Expansion in quintal and percent in 2006-2016

<b>Before urban expansion</b>			<b>After urban expansion</b>		
Quintal	Number of respondents	Percent	Quintal	Number of respondents	Percent
Below 10	43	29.7	Below 10	83	57.2
From11-20	64	44.1	From11-20	51	35.2
From21-30	29	20.0	From21-30	10	6.9
From31-40	8	5.5	From31-40	1	0.7
From41-50	1	0.7	From41-50	0	0
<b>Total</b>	<b>145</b>	<b>100</b>	<b>Total</b>	<b>145</b>	<b>100</b>

Source: Own survey, 2017

#### 4.4. Awareness of the house holds about Urban Expansion

As (table 4.10) shows us, about 106(73.1%) households agreed that they had awareness on the expansion program. The expansion program through the means of orientation, seminars and both by the town administration, while the rest, 39(26.9%) households believe that they were not aware. On the other hand, the key informants inform us that this community had been informed via different means that the land was to be taken for the town's development.

Table 4.10. Community's awareness on Urban Expansion

<b>Community's awareness on urban expansion</b>	<b>Number of respondents</b>	<b>Percent</b>
Yes	106	73.1
No	39	26.9
<b>Total</b>	<b>145</b>	<b>100</b>

Source: Own survey, 2017

#### 4.4.1. Ways of Households' Awareness about Urban Expansion

With regard to the ways of awareness of respondents, 43(30%) were through public orientation, 22(15.2%) through official meeting training and 41(28%) with both of the two ways. This indicated that the most respondents or about 106 (73.1%) were aware through different means of awareness (table 4.11).

Table 4.11. Means of awareness of Urban Expansion

Means of awareness	Number of respondents	Percent
Through public orientation	43	30.0
Through official meeting training	22	15.2
Both (public orientation and official meeting training)	41	28.0
Total	106	73.1
Neither public orientation nor official meeting trainings	39	26.9
<b>Total</b>	<b>145</b>	<b>100.0</b>

Source: Own survey, 2017

#### 4.5. Farmers' Participate in Decision making and Implementation of Expansion Program

As we can see from the (table 4.12) below, 55.9% agreed as they participate in the expansion program. While 44.1% said as they did not participate. This was organized by woreda administration in the last 10 years.

Table 4.12. Farmers' participate in decision making and implementation of expansion program?

Participate	Number of respondents	Percent
Yes	81	55.9
No	64	44.1
<b>Total</b>	<b>145</b>	<b>100.0</b>

Source: Own survey, 2017

#### 4.5.1. Benefits Farmers Gained as a Result of their Participation

As (table 4.13) shows us, about 44.8% of a farming community claimed that they had not participate in a benefit packages' and compensation decision making processes. On the other hand, about 55.2% of the farmers whose livelihood was affected agreed that they had participated in the program through different participation benefit packages.

Table 4.13. Benefits farmers gained from participation

<b>Participation benefit</b>	<b>Number of respondents</b>	<b>Percent</b>
Raised own interest	28	19.3
Expressed own opinion	12	8.3
Created access to benefit packages	14	9.7
All above benefit	26	17.9
Total	80	55.2
Missing System	65	44.8
<b>Total</b>	<b>145</b>	<b>100.0</b>

**Source:** Own survey, 2017

#### 4.6. The Impact of Urban Expansion on the Land holding of Farming Community

As we can see from the (table 4.14) below, 102(70.3%) said they lose their land while 43(29.7%) said they did not lose their land. This indicates that majority of farmers loosed their land. So, the expansion has an impact on household livelihood.

Table 4.14. The Impact of Urban Expansion on the land holding of farming community

<b>Lose of land</b>	<b>Number of respondents</b>	<b>Percent</b>
Yes	102	70.3
No	43	29.7
<b>Total</b>	<b>145</b>	<b>100.0</b>

**Source:** Own survey, 2017

##### 4.6.1. Amount of Land the Farmers Vacated

Table (4.15), depicts that farmers in the study area lose the mean of 1.45 with minimum of 1 timad and maximum of 2 timad.

Table 4.15. Amount of land the farmers vacated

Hectare Vacated	N	Minimum	Maximum	Mean	Standard deviation
	102	1	2	1.45	0.5

**Source:** Own survey, 2017

#### 4.6.2. Type of Land loss due to Urban Expansion

As it is indicated in (table 4.16), the respondents reacted that most of the respondents 70.3% loss of land which is the impact of urban expansion for farmers who are dependent on their land for means of earning their livelihood in one case or the other. From this, grass land vacated high percent which is 31% followed by residential lands with 15.9%, agricultural land and all type of lands respondents who loss with 11.7% for each.

Table 4.16. Type of land loss due to urban expansion

Type of land loss due to urban expansion	Number of respondents	Percent
Agricultural land	45	11.7
Residential land	23	15.9
Grass land	17	31.0
All type of land (agricultural, residential and grass lands)	17	11.7
Total	102	70.3
Missing System	43	29.7
<b>Total</b>	<b>145</b>	<b>100.0</b>

Source: Own survey, 2017

#### 4.7. Compensation Given instead of the Land Vacated

Most of the respondents get compensation for the land vacated from them with 101(69.7%) of the total. While 8(5.5%) 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 4.17. Compensation given for the land vacated

compensation	Number of respondents	Percent
Yes	101	69.7
No	8	5.5
Total	110	75.9
Missing System	36	24.8
<b>Total</b>	<b>145</b>	<b>100.0</b>

Source: Own survey, 2017

#### 4.7.1. Kinds of Compensation Paid

Compensation paid for land vacated was 61(42.1%) money, 25(17.2%) housing plots, 2(1.4). 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.

Table 4.18. Kinds of compensation paid

<b>kind of compensation</b>	<b>Number of respondents</b>	<b>Percent</b>
Compensation (money)	76	52.4
Housing plots	25	17.2
Total	101	69.7
Missing System	44	30.3
<b>Total</b>	<b>145</b>	<b>100.0</b>

Source: Own survey, 2017

#### 4.7.2. Levels of Farmers' Satisfaction with Compensation Served

In a relation with this, these households also had been asked whether they had been satisfied or not with the compensation given to them and benefits they had gained as a result of urban expansion towards their vicinity. As we can read from (table 4.19) below, 62.1% of the households had responded as they had not satisfied with the compensation they had been given and benefits these households whose livelihood had been affected cause of urban expansion had gained. 37.9% were satisfied. Most of the sampled households were not satisfied with compensation obtained. Their reason for the dissatisfaction is that the compensation provided were not enough to sustain their livelihood and replace their income that was previously earned from agricultural land.

Table 4.19. The recipients' satisfaction condition towards a served compensation

<b>farmers' satisfaction with compensation served</b>	<b>Number of respondents</b>	<b>Percent</b>
Satisfied	55	37.9
Dissatisfied	90	62.1
<b>Total</b>	<b>145</b>	<b>100</b>

Source: Own survey, 2017

#### 4.8. Whether or not required training was delivered to the evicted households

As it is indicated in (table 4.20) below, 100(69.0%) of the respondents get training after land was taken from them and 45(31.0%) of the respondents claimed that no any training was given for them when government took their land for different purposes. Hence, the concerned body is not working properly on farmers displaced because of urban expansion, which is at expense of their land.

Table 4.20. Whether or not required training was delivered to the evicted households

<b>Training</b>	<b>Number of respondents</b>	<b>Percent</b>
Yes	101	69.7
No	44	30.3
<b>Total</b>	<b>145</b>	<b>100.0</b>

**Source:** Own survey, 2017

#### 4.8.1. Types of Training on which the households Participated

Table (4.21) presents that only 100(69.0%) of the respondents get required training while evicted from their land. Hence, these segment of respondents asked type of training they get 25(17.3%) on private business development and management, 27(18.6%) on financial management or saving and the rest 4(2.8%), 2(1.4%), 13(9.0%), 29(20.0%) on basic entrepreneurship, social adjustment skill, technical training and all type training respectively. Although the training coverage is very small compared to the respondents' size. Training delivered is more or less important for farmers to cope up with change of livelihood or means of their earning.

Table 4.21. Types of training on which the households participated

<b>Type of training</b>	<b>Number of Respondents</b>	<b>Percent</b>
private business development and management	25	17.3
Financial management or saving	27	18.6
Basic entrepreneurship	4	2.8
Social adjustment skill training	3	2.0
Technical training	13	9.0
All type of training	29	20.0
Total	101	69.7
Missing System (No training)	44	30.3
<b>Total</b>	<b>145</b>	<b>100</b>

**Source:** Own survey, 2017

#### 4.9. The Impact of Urban Expansion on Livestock Production

Livestock productions that are commonly practiced by local farmers include Oxen, Cows, Sheep, Goats etc. Farmers in the area commonly use their livestock for farming activity, for transportation, for beef production and earn income.

##### 4.9.1. Oxen Possessed before and after Urban Expansion in Number

As we can see from (Table 4.22) below, before the urban expansion, most (38.6%) of the respondents had 3 oxen. But after then, currently, (Table 4.25) shows us, that most(69.7%) of the respondents had 1 ox.

Table 4.22. Oxen Possessed before and after Urban Expansion in Number

Before urban expansion			After urban expansion		
Number of oxen	Frequency	Percent	Number of oxen	Frequency	Percent
1	43	29.7	0	29	20.0
2	20	13.8	1	101	69.7
3	56	38.6	2	12	8.3
4	23	15.9	3	3	2.1
5	3	2.1	Total	145	100.0
Total	145	100.0			

Source: Own survey, 2017

##### 4.9.2. Cows Household Possessed before and after Urban Expansion in Number

As we can see from (Table 4.23) below, before the urban expansion, most (32.0%) of the respondents had 3 cows. But after then, currently, (Table 4.23) shows us, that most(52.4%) of the respondents had 1 cow.

Table 4.23 Cows Household Possessed before and after Urban Expansion in Number

Before urban expansion			After urban expansion		
Number of cows	Frequency	Percent	Number of cows	Frequency	Percent
1	12	8.3	0	39	26.9
2	44	30.0	1	76	52.4
3	46	32.0	2	28	19.3
4	41	28.3	3	2	1.4
5	2	1.4	Total	145	100.0
Total	145	100.0			

Source: Own survey, 2017

### 4.9.3. Sheep Possessed before and after Urban Expansion in Number

As we can see from (Table 4.24) below, before the urban expansion, majority (16.6%) of the respondents had 12 sheep. But after then, currently, (Table 4.24) shows us, that majority (20.7%) of the respondents had not sheep.

Table 4.24. Sheep Possessed before and after Urban Expansion in Number

Before urban expansion			After urban expansion		
Number of sheep	Frequency	Percent	Number of sheep	Frequency	Percent
8	1	0.7	0	30	20.7
9	2	1.4	1	26	17.9
10	22	15.2	2	22	15.2
11	16	11.0	3	21	14.5
12	24	16.6	4	15	10.3
13	14	9.7	5	11	7.6
14	12	8.3	6	3	2.1
15	16	11.0	7	4	2.8
16	7	4.8	8	3	2.1
17	7	4.8	9	2	1.4
18	7	4.8	10	2	1.4
19	7	4.8	11	1	0.7
20	10	6.9	13	1	0.7
Total	145	100.0	Total	145	100.0

Source: Own survey, 2017

### 4.9.4. Goats Possessed before and after Urban Expansion in Number

As we can see from (Table 4.25) below, before the urban expansion, majority (17.6%) of the respondents had 10 goats. But after then, currently, (Table 4.25) shows us, that majority (25.5%) of the respondents had not goats.

The implication was that the peri-urban agrarian community's average goats stock as a financial capital diminished. Generally, from all of these we can deduce that urban expansion has a negative impact on livestock holdings in the study area.

Table 4.25. Goats Possessed before and after Urban Expansion in Number

Before urban expansion			After urban expansion		
Number of sheep	Frequency	Percent	Number of sheep	Frequency	Percent
5	1	.7	0	37	25.5
6	3	2.1	1	35	24.1
7	11	7.6	2	21	14.5
8	18	12.1	3	13	9.0
9	21	14.5	4	14	9.7
10	24	17.6	5	9	6.2
11	19	12.4	6	5	3.4
12	20	13.8	7	1	0.7
13	8	5.5	8	3	2.1
14	10	6.9	9	1	.7
15	8	5.5	10	3	2.1
16	2	1.4	11	2	1.4
Total	145	100.0	Total	145	100.0

Source: Own survey, 2017

#### 4.10. Urban Expansion Impact on Farmers' housing Status

I employed number of rooms the house of these households had before urban expansion and latter on after the expansion as the measuring tool for physical capital of the peri-urban agricultural community livelihood. As (Table 4.26) shows us, this community majority(63.4%) had 3 rooms of house before urban expansion over there. However, (Table 4.26) shows us majority of respondents had 8 rooms of house after the expansion of the town then by showing the difference 5. On the other hand, data from the key informants, as well as own observation show that, the number of rooms the houses these households had after urban expansion of their area has shown a significant increased in quantity as well these households are getting the income from renting these houses.

From this we can concluded that urban expansion has positive impact on livelihood of peripheral farming community in the study area in terms of physical capital which is housing in rooms.

Table 4.26. House in room Possessed before and after Urban Expansion

Before urban expansion			After urban expansion		
Number of rooms the house	Frequency	Percent	Number of rooms the house	Frequency	Percent
2	3	2.1	3	1	0.7
3	44	30.3	4	3	2.1
4	92	63.4	5	5	3.4
5	6	4.1	6	46	31.7
Total	145	100.0	7	28	19.3
			8	47	32.4
			9	15	10.3
			Total	145	100.0

Source: Own survey, 2017

#### 4.11. Impact of Urban Expansion on Infrastructure of households

As we can see from the following (Table 4.27) below, 33 out of 145 respondents answered that they got all infrastructures followed by clinic and health institution with 25, school with 18, water supply with 17, credit service with 16, recreation with 15, road with 11, electricity with 6 and market accessibility with 4 respondents respectively and at least 33(23%) respondents answered as they got all infrastructures. Therefore, from this we can concluded that urban expansion has positive impact on peripheral farming community in terms of physical capital which is measured in terms of infrastructure in the study area.

Table 4.27 Impact of Urban Expansion on Infrastructure of households

Types of infrastructures	Frequency	Percent
Road	11	7.6
Electricity	6	4.1
Water supply	17	11.7
School	18	12.4
Clinic & other health institution	25	17.2
Credit service	16	11.0
Recreation	15	10.3
Market	4	2.8
All types of infrastructures	33	22.8
Total	145	100.0

Source: Own survey, 2017

#### 4.12. Job and Related condition of the Affected households in Post Expansion Periods

As (table 4.28) shows us, 101(69.7%) of households answered as they did not get job before urban expansion. While the rest, only 44(30.3%) did rather. Currently, 39(26.9%) of all households not have the job while the rest, 106(73.1%) answered as they are getting the job as depicted in (table 4.28). Among those who have job currently, those who have been employed by the government organization represented the least proportion, only 4(2.8%), while those employed in others represent 34(23.4%), 32(22.1%), 26(17.9%) and 11(7.6%) respectively were a daily laborers, employment in factory, employment in non-government organization and self employment in cottage industries, such as hand crafts etc, as can be seen from the (table 4.29).

Table 4.28. Whether these households believe that they get jobs before urban expansion

<b>Alternatives</b>	<b>Frequency</b>	<b>Percent</b>
Yes	44	30.3
No	101	69.7
<b>Total</b>	<b>145</b>	<b>100</b>

**Source:** Own survey, 2017

Table 4.29. Whether these households have a job currently.

<b>Alternatives</b>	<b>Frequency</b>	<b>Percent</b>
Yes	106	73.1
No	39	26.9
<b>Total</b>	<b>145</b>	<b>100</b>

**Source:** Own survey, 2017

Table 4.30. Job types the households have currently

<b>Job types</b>	<b>Frequency</b>	<b>Percent</b>
Daily laborer	34	23.4
Employment in factory	32	22.1
Self employment in cottage industries, such as hand crafts, etc	11	7.6
Employment in government organization	4	2.8
Employment in non-government	26	17.9
Total	107	73.8
Missing system	38	26.2
<b>Total</b>	<b>145</b>	<b>100</b>

**Source:** Own survey, 2017

#### 4.13. Land use/Land cover Change Detection

##### 4.13.1. Land use/Land cover in 1986

Table (4.31) and figure (4.1) shows us, land use/land cover (LULC) of the study area in quantity and thematic map respectively. In this year farm land and grass land cover were the highest coverage of the total area of the study area. Each of them constituted relatively larger proportions which was 31.984km<sup>2</sup>(36.981%) and 26.861km<sup>2</sup> (31.058%) of the total area. Besides, a relatively considerable amount of the area was covered by built-up areas 0.295km<sup>2</sup>(0.341%), forest land 22.299km<sup>2</sup> (25.783%), bare land 0.140km<sup>2</sup> (0.161%) and shrub land 4.882km<sup>2</sup>(5.644%). In this year water body covered the smallest share of the total area which was 0.025km<sup>2</sup>(0.028%). These conditions were considered as a baseline for change detection over the study years.

Table 4.31. Absolute area and percentage coverage land use/land cover of 1986

Class Name	Area in km <sup>2</sup>	Area %
Built-up areas	0.295	0.341
Farm land	31.984	36.981
Forest land	22.299	25.783
Grass land	26.861	31.058
Water body	0.025	0.028
Shrub land	4.882	5.644
Bare land	0.140	0.161
<b>Total</b>	<b>86.486</b>	<b>100</b>

**Source:** Analysis of satellite imageries.

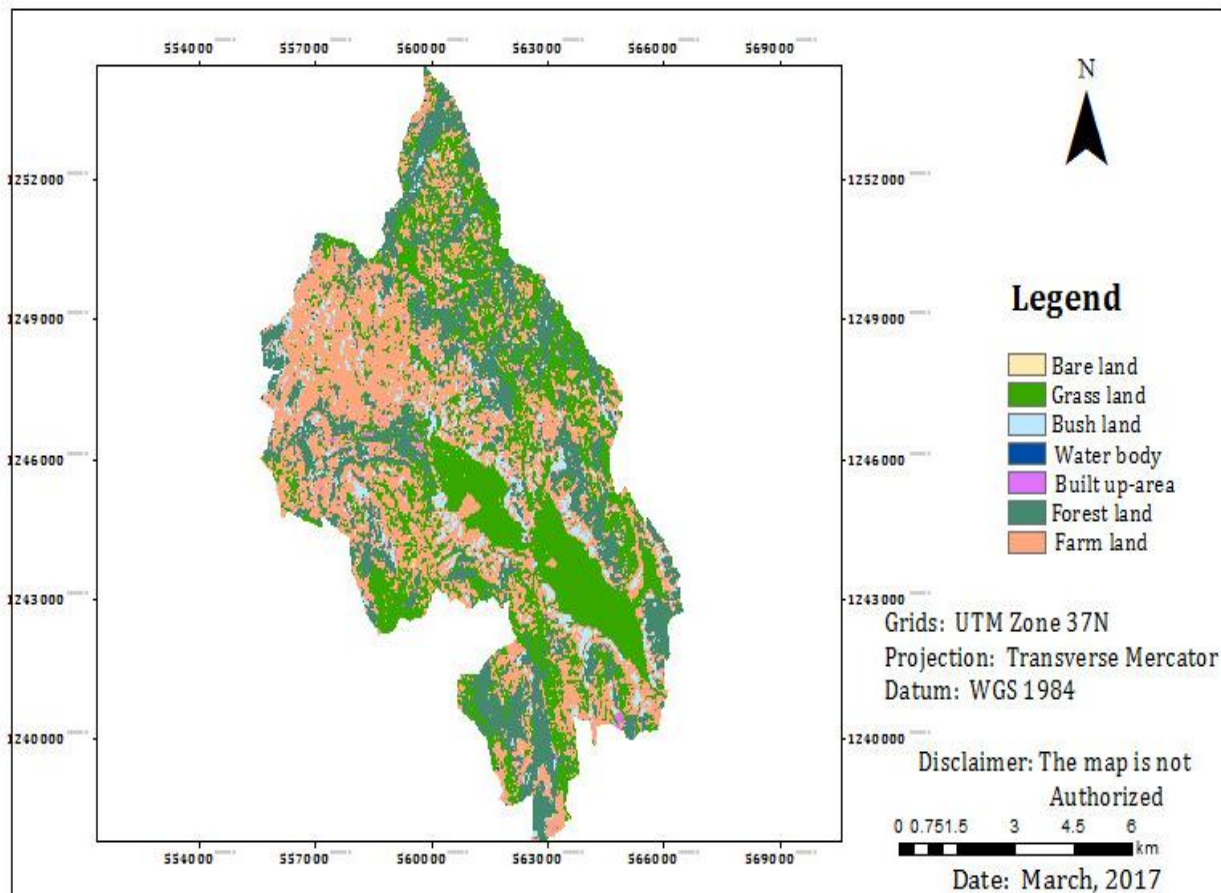


Figure 4.1. Land use/ land cover map of the study area in 1986

**Source:** Author's Analysis, March, 2017

#### 4.13.2. Land use/Land cover in 2000

In this year after 14 years (in 2000), the land use/land cover classes that covered the highest share of total area were built-up area and farm land. The shares of each of them land coverage were  $33.182\text{km}^2$  (33.182%) and  $28.865\text{km}^2$  (33.375%) respectively. Water body coverage the smallest one which was  $0.003\text{km}^2$ (0.003%). When it was compared with that of 1986 land use/land cover, the study area has undergone significant modifications and changes in this study year. Because grass land and water body were changed in to other LULC classes. In general in this year, the remain land use/land cover classes showed considerable decreased, while built-up area and farm land showed increased compared to the land use/land cover (LULC) setting of 1986.

Table 4.32. Absolute area and percentage coverage land use/ land cover of 2000

Class Name	Area in km <sup>2</sup>	Area %
Built-up area	33.182	38.366
Farm land	28.865	33.375
Forest land	11.124	12.862
Grass land	10.786	12.471
Water body	0.003	0.003
Shrub land	1.384	1.600
Bare land	1.152	1.332
<b>Total</b>	<b>86.486</b>	<b>100</b>

Source: Analysis of satellite imageries.

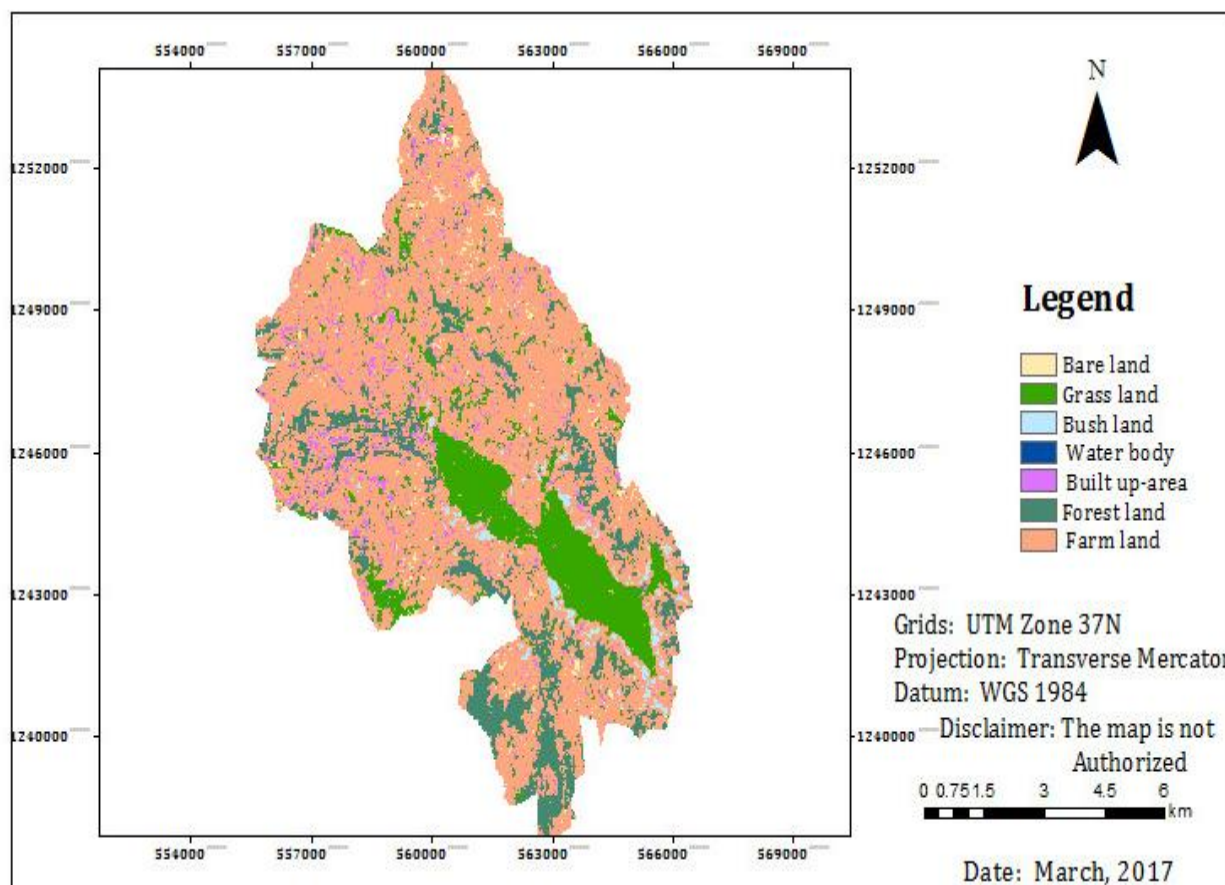


Figure 4.2. Land use/ land cover map of the study area in 2000

Source: Author's Analysis, March, 2017

### 4.13.3. Land use/ Land cover in 2016

After 30 years the land use/land cover (LULC) of the study area dramatically changed. Built-up area constituted more than half of the total area of land use/land cover arrangement. In this year 51.542km<sup>2</sup> (59.595%) of the total area of the town were covered by built-up area. The remaining portion of the area was covered by other LULC classes.

This year was the year at which considerable land use/land cover change dynamics was experienced in the study area. Grass land severely declined to 5.2011km<sup>2</sup>(6.013%). On the contrary, built-up area showed the highest rate of increased by 59.595%. The remain land use/land cover classes showed dramatically decreased and changed in to built-up areas over these 30 years. The accelerated increment of built-up area at the expense of other land use/land covers was attributed to the alarming rate growth of population resulted from natural increase, rural-urban and urban-urban migrations in the study area.

Table 4.33. Absolute area and percentage coverage land use /land cover of 2016

<b>Class Name</b>	<b>Area in km<sup>2</sup></b>	<b>Area %</b>
Built-up areas	51.542	59.595
Farm land	17.357	20.069
Forest land	10.337	11.952
Grass land	5.201	6.013
Water body	0.001	0.001
Shrub land	1.776	2.053
Bare land	0.203	0.234
<b>Total</b>	<b>86.486</b>	<b>100</b>

Source: Analysis of satellite imageries.

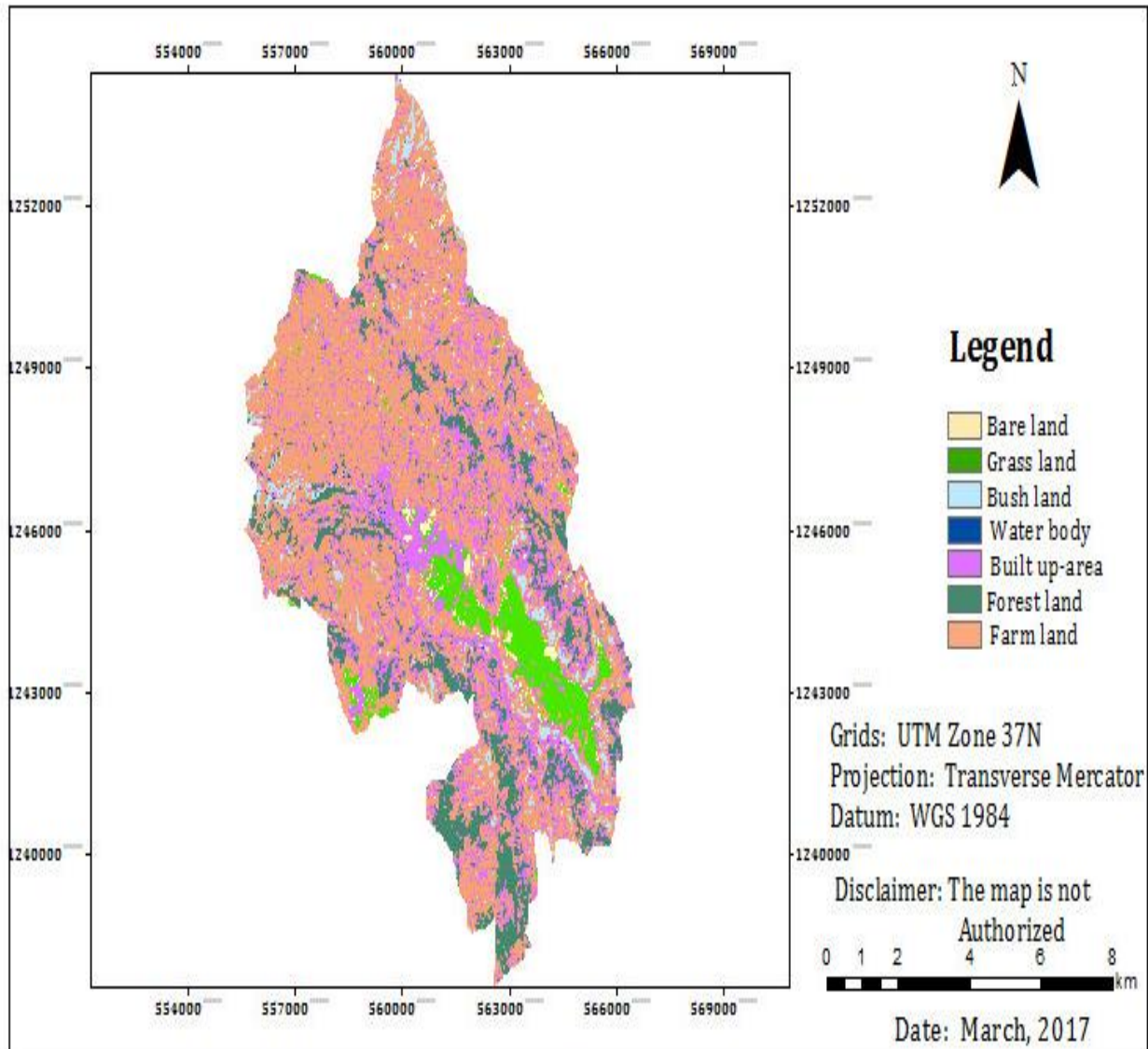


Figure 4.3. Land use/ land cover map of the study area in 2016

**Source:** Author's Analysis, March, 2017

#### 4.13.4. Land use/Land cover Change in (km<sup>2</sup>) and Percent (%) between 1986, 2000 and 2016.

The main target for generating classification maps from images of three different time periods was to determine how past and present human activities have been changing the landscape. These thematic maps were further used as inputs in a change analysis, which land cover/land use classes are changing in to other land cover/land use classes.

Table 4.34. Land use/land cover Change in (km<sup>2</sup>) and Percent (%) between 1986 and 2000.

Class Name	1986		2000		Change 1986-2000	
	Area in km <sup>2</sup>	Area %	Area in km <sup>2</sup>	Area %	Area in km <sup>2</sup>	Area %
Built-up areas	0.295	0.341	33.182	38.366	+32.887	+38.025
Farm land	31.984	36.981	28.865	33.375	-3.128	-3.616
Forest land	22.299	25.783	11.124	12.862	-11.175	-12.921
Grass land	26.861	31.058	10.786	12.471	-16.075	-18.586
Water body	0.025	0.028	0.003	0.003	-2.2	-2.543
Shrub land	4.882	5.644	1.384	1.600	-3.498	-4.044
Bare land	0.140	0.161	1.152	1.332	1.012	1.170
<b>Total</b>	<b>86.486</b>	<b>100</b>	<b>86.486</b>	<b>100</b>	<b>0</b>	<b>0</b>

Table 4.35. Land use/land cover Change in (km<sup>2</sup>) and Percent (%) between 2000 and 2016.

Class Name	2000		2016		Change 2000-2016	
	Area in km <sup>2</sup>	Area %	Area in km <sup>2</sup>	Area %	Area in km <sup>2</sup>	Area %
Built-up areas	33.182	38.366	51.542	59.595	+18.36	+21.228
Farm land	28.865	33.375	17.357	20.069	-11.508	-13.306
Forest land	11.124	12.862	10.337	11.952	-0.787	-0.909
Grass land	10.786	12.471	5.201	6.013	-5.585	-6.457
Water body	0.003	0.003	0.001	0.001	-0.002	-0.0023
Shrub land	1.384	1.600	1.776	2.053	-0.392	-0.453
Bare land	1.152	1.332	0.203	0.234	-0.949	-1.097
<b>Total</b>	<b>86.486</b>	<b>100</b>	<b>86.486</b>	<b>100</b>	<b>0</b>	<b>0</b>

Table 4.36. Land use/land cover Change in (km<sup>2</sup>) and Percent (%) between 1986 and 2016.

Class Name	1986		2016		Change 1986-2016	
	Area in km <sup>2</sup>	Area %	Area in km <sup>2</sup>	Area %	Area in km <sup>2</sup>	Area %
Built-up areas	0.295	0.341	51.542	59.595	+51.247	+59.254
Farm land	31.984	36.981	17.357	20.069	-14.627	-16.912
Forest land	22.299	25.783	10.337	11.952	-11.962	-13.831
Grass land	26.861	31.058	5.201	6.013	-21.66	-25.044
Water body	0.025	0.028	0.001	0.001	-0.024	-0.027
Shrub land	4.882	5.644	1.776	2.053	-3.106	-3.591
Bare land	0.140	0.161	0.203	0.234	-0.063	-0.072
<b>Total</b>	<b>86.486</b>	<b>100</b>	<b>86.486</b>	<b>100</b>	<b>0</b>	<b>0</b>

**Source:** Analysis of satellite imageries.

As we can see from the above (tables 4.34, 4.35, 4.36), the land use/land cover in the study area have significant modifications and changes in the course of the study years. Built-up area have shown fast increment from 0.295km<sup>2</sup> to 33.182km<sup>2</sup> by 32.887km<sup>2</sup> in the first analysis period (1986-2000) and it shown moderate increment from 33.182km<sup>2</sup> to 51.542km<sup>2</sup> by 18.36km<sup>2</sup> in the second analysis period (2000-2016), showing a total gain of built-up area 51.247km<sup>2</sup> within 30 years(1986-2016). On the other hand, other land use/land cover classes are decreased the first, the second and the entire study period. The total loss of farm, forest, grass, shrub, bare lands and water body are 16.912 km<sup>2</sup>, 13.831km<sup>2</sup>, 25.044km<sup>2</sup>, 3.591km<sup>2</sup>, 0.072 km<sup>2</sup>and 0.027km<sup>2</sup> respectively within 30 years.

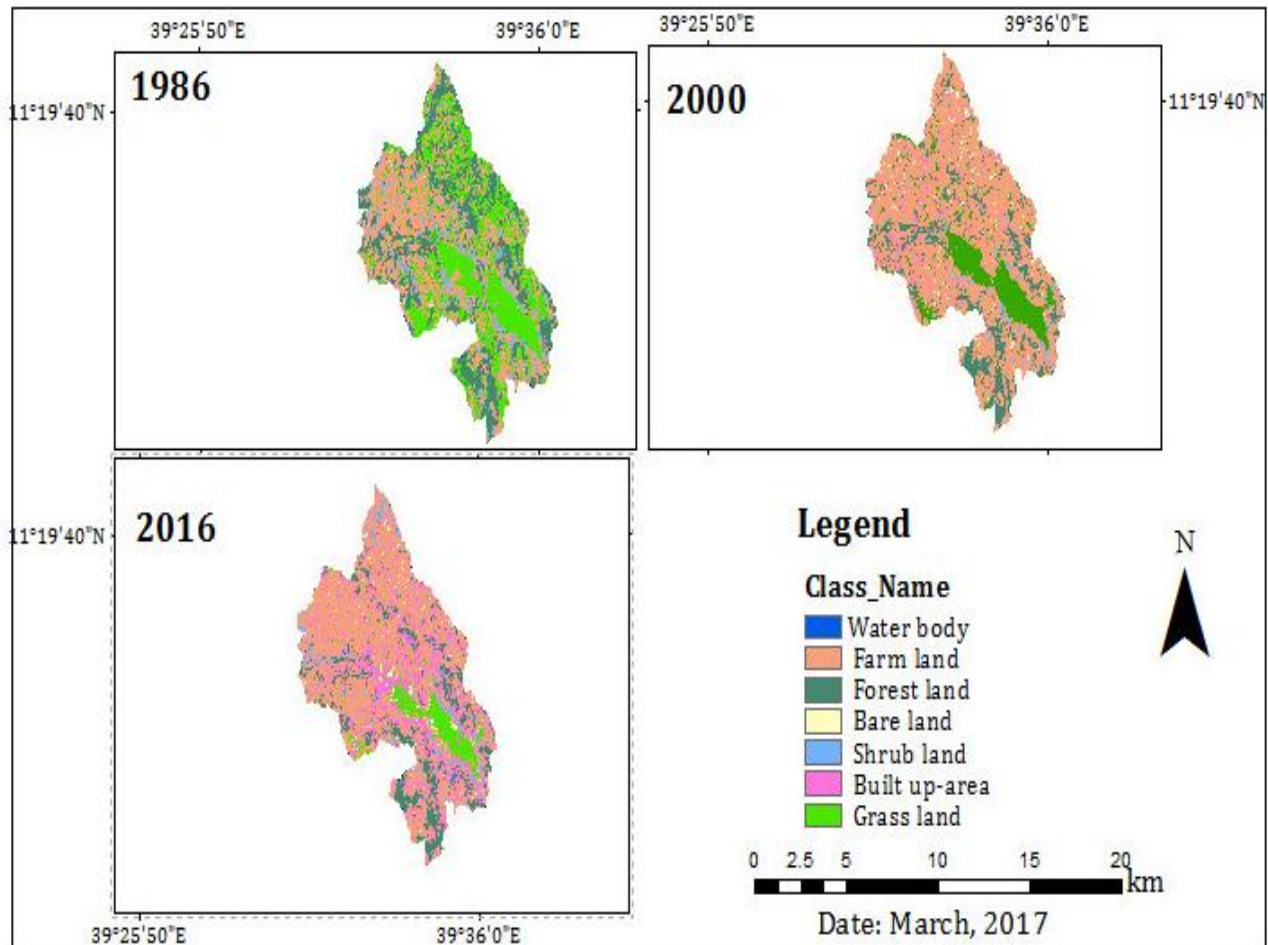


Figure 4.4. Land use/land cover map of the years 1986, 2000 and 2016.

**Source:** Author's Analysis, March, 2017

#### 4.14. Accuracy Assessment of the Image Classification Validation

Accuracy assessment is a process used to validate the accuracy of image classification by comparing the classified map with a reference data (Caetano *et al.*, 2005). It is critical for a map generated from any remote sensing data. Although accuracy assessment is important for traditional photographic remote sensing techniques, with the advent of more advanced digital satellite remote sensing the necessity and possibility of performing advanced accuracy assessment have received new interest (Congalton, 1991). Currently, accuracy assessment is considered as an integral part of any image classification. This is because image classification using different classification algorithms may classify pixels or group of pixels to the wrong classes. The most obvious types of error that occurs in image classifications.

In order to use the derived land use/land cover map for further change analysis, the errors need to be quantified and evaluated in terms of classification accuracy. This might help users and readers to understand some level of inaccuracy and imprecision during image classification. Hence, an accuracy assessment was carried out to assess the quality of the land cover maps.

One of the commonly used methods to assess the accuracy of classified image is the Confusion Matrix, a technique that provides some statistical and analytical approaches to explain the accuracy of the classification. In this study Confusion Matrix was applied with some quality measures like user, producer accuracy, overall accuracy and Kappa analysis. The reference data used for accuracy assessment are usually obtained from aerial photographs, high resolution images (Google earth) and field observations. The researcher has examined the test sample plots and assigned a class value to each.

The overall, user’s and producer’s accuracies, and the Kappa statistic were then calculated from the error matrices (table 4.37, 4.38, 4.39) and followed by a brief explanation of each type of accuracies and Kappa statistic.

**Table 4.37. Confusion matrix for land cover map of 1986**

	Class Name	Reference							Row Total	User accuracy
		Built-up area	Bare land	Farm land	Forest land	Grass land	Shrub land	Water body		
Classification	Built-up Area	14	1	0	0	0	1	0	16	87.5%
	Bare land	1	15	1	0	0	0	1	17	88.24%
	Farm land	4	0	56	1	1	1	2	65	86.15%
	Forest land	0	0	1	24	0	0	1	26	92.31%
	Grass land	0	0	0	0	26	0	1	27	96.30%
	Shrub land	1	0	0	0	0	29	0	30	96.67%
	Water body	0	0	0	0	2	2	23	27	85.19%
	Column Total	20	16	58	25	29	32	28	208	
producer Accuracy	70.0%	93.75%	96.55%	96.00%	89.66%	90.63%	82.14%			

$$\text{Overall Accuracy} = \frac{\sum X_{ii}}{N}$$

Where,  $X_{ii}$  = Number of correctly classified pixels, or the diagonal value and  
 $N$  = entire number of pixels in the matrix.

$$\begin{aligned} \text{Overall accuracy} &= (\text{the sum of diagonal matrix}) / (\text{total pixel}) * 100 \\ &= (14+15+56+24+26+29+23) / (239) * 100 \\ &= \mathbf{91.21\%} \end{aligned}$$

$$K = \frac{N \sum_{i=1}^r X_{ii} - \sum_{i=1}^r (X_{i+} \times X_{i+1})}{N^2 - \sum_{i=1}^r (X_{i+} \times X_{i+1})}$$

(Adopted from Congalton, 1991)

Where:  $r$  = is the number of rows in the matrix;  $X_{ii}$  = is the number of observations in rows  $i$  and column  $i$  (along the major diagonal);  $X_{i+}$  = the marginal total of row  $i$  (right of the matrix);  $X_{i+1}$  are the marginal totals of column  $i$  (bottom of the matrix);  $N$  is the total number of observations.

$$\text{Kappa coefficient}(K) = \mathbf{0.4368}$$

**Table 4.38. Confusion matrix for land cover map of 2000**

Class Name	Reference								Row Total	User accuracy
	Built-up area	Bare land	Farm land	Forest land	Grass land	Shrub land	Water body			
Built-up area	14	1	2	0	0	0	0	17	82.35%	
Bare land	0	9	0	0	0	0	2	11	81.82%	
Farm land	1	0	43	4	3	0	2	53	81.13%	
Forest land	0	0	0	31	1	0	0	32	96.88%	
Grass land	0	0	0	2	25	0	0	27	92.59%	
Shrub land	0	0	1	0	0	7	0	8	87.50%	
Water body	0	0	0	0	0	1	23	24	95.83%	
Column Total	15	10	46	37	29	8	27	172		
<b>producer Accuracy</b>	93.33%	90.00%	93.18%	83.78%	86.21%	87.50%	85.19%			

$$\text{Overall Accuracy} = \frac{\sum X_{ii}}{N}$$

Where, X<sub>ii</sub> = Number of correctly classified pixels, or the diagonal value and

N= entire number of pixels in the matrix.

$$\begin{aligned} \text{Overall accuracy} &= (\text{the sum of diagonal matrix}) / (\text{total pixel}) * 100 \\ &= (14+9+43+31+25+7+23) / (172) * 100 \\ &= \mathbf{88.37\%} \end{aligned}$$

$$K = \frac{N \sum_{i=1}^r X_{ii} - \sum_{i=1}^r (X_{i+} \times X_{i+1})}{N^2 - \sum_{i=1}^r (X_{i+} \times X_{i+1})}$$

**Kappa coefficient(K)= 0.8573**

**Table 4.39. Confusion matrix for land cover map of 2016**

	Class Name	Reference							Row Total	User accuracy
		Built-up area	Bare land	Farm land	Forest land	Grass land	Shrub land	Water body		
Classification	Built-up area	58	1	0	2	1	0	0	62	93.55%
	Bare land	1	14	0	0	0	0	0	15	93.33%
	Farm land	1	1	64	4	1	0	0	71	90.14%
	Forest land	0	0	1	29	0	1	0	31	93.55%
	Grass land	0	0	0	0	10	0	1	11	90.91%
	Shrub land	1	0	1	0	0	9	0	11	81.82%
	Water body	0	0	0	1	0	0	9	11	81.83%
	Column Total	61	16	67	36	12	10	10	<b>212</b>	
<b>producer Accuracy</b>	95.08%	87.50%	95.02%	80.56%	83.33%	90.00%	90.00%			

$$\text{Overall Accuracy} = \frac{\sum X_{ii}}{N}$$

Where, X<sub>ii</sub> = Number of correctly classified pixels, or the diagonal value and

N= entire number of pixels in the matrix.

$$\text{Overall accuracy} = (\text{the sum of diagonal matrix}) / (\text{total pixel}) * 100$$

$$= (58+14+64+29+10+9+9) / (212) *100$$

$$= \mathbf{91.04\%}$$

$$K = \frac{N \sum_{i=1}^r X_{ii} - \sum_{i=1}^r (X_{i+} \times X_{+i})}{N^2 - \sum_{i=1}^r (X_{i+} \times X_{+i})}$$

**Kappa coefficient(K) = 0.8839**

#### **4.14.1. Overall Accuracy**

This is computed by dividing the total correct number of pixels (i.e. summation of the diagonal) to the total number of pixels in the matrix (grand total). In some empirical studies (Anderson *et al.*, 1976), it is noted that the maximum accuracy value of 91.21%, where as the minimum accuracy value of 88.37% is required for effective and reliable land cover change analysis. Depending upon the purpose of the land cover map, different people use different accuracy levels. The present study's confusion matrix of all the derived land use/land cover maps has revealed the overall accuracy levels of more than the minimum accuracy threshold defined by Anderson.

#### **4.14.2. Producer Accuracy**

Producer's accuracy refers to the number of correctly classified pixels in each class (category) divided by the total number of pixels in the reference data to be of that category (column total). This value represents how well reference pixels of the ground cover type are classified. As showed in (table 4.40), in 1986 the maximum class accuracy was farm land which is 96.55%, where as the minimum class accuracy was water body which is 82.14%. Similarly, showed in (table 4.41), in 2000 the maximum class accuracy was built-up area which is 93.33% , where as the minimum class accuracy was forest land which is 83.78%. As showed in (table 4.42), in 2016 the maximum class accuracy was built-up areas which is 95.08%, where as the minimum class accuracy was forest land which is 80.56% , where as the other classes within each year has a good accuracy.

#### **4.14.3. User Accuracy**

Users accuracy refers to the number of correctly classified pixels in each class (category) divided by the total number of pixels that were classified in that category of the classified image (row total). It represents the probability that a pixel classified into a given category actually represents that category on the ground. Results of user's accuracy in this study showed that in 1986 the

maximum class accuracy was shrub land 96.67%, the minimum class accuracy was water body with accuracy of 85.19%. In 2000 the maximum class accuracy was forest land 96.88%; the minimum class accuracy was farm land with accuracy of 81.13%. Similarly, in 2016 the maximum class accuracy was built-up areas and forest land, which have the same accuracy 93.55%, where as the minimum was shrub land class with accuracy of 81.82%.

#### 4.14.4. Kappa Analysis

Kappa coefficient, which is one of the most popular measures in addressing the difference between the actual agreement and change agreement, was also calculated. The kappa was a discrete multivariate's technique used in accuracy assessment (Fan *et al.*, 2007). The kappa coefficients obtained for the classified imageries 0.4368(43.68%), 0.8573(85.73%) and 0.8839(88.39) for the year 1986, 2000 and 2016 respectively.

#### 4.14.5. Factors that contributed for the expansion of Kutaber Town

As we can see from table 4.32, majority of the respondents 50(34.5%) answered from the mentioned factors, demographic dynamics (high birth & low death rate), contribute more for urban expansion followed by in-migration 45(31.0%), All 24(16.2%) and reclassification 17(11.7%).

Table 4.40: Factors that contributed for the expansion of Kutaber Town

<b>Factors</b>	<b>Frequency</b>	<b>Percent</b>
Demographic dynamics (high birth & low death rate)	50	34.5
In-migration (rural to urban)	45	31.0
Reclassification	17	11.7
All factors	24	16.6
Total	136	93.8
Missing System	9	6.2
<b>Total</b>	<b>145</b>	<b>100.0</b>

## **CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS**

### **5.1. Conclusions**

Kutaber has been experiencing horizontal urban expansion that follows comfortable land scape, suitable for settlement and other infrastructure development, and then its impact is clear to the peripheral farming communities. During the town's expansion, despite of the community's awareness of the expansion through public orientation and official meeting training, all farming community was not made participant on the decisions about the kinds and amount of compensations and related benefits to them for the their land displaced vacated, for the property they lost and hence for their livelihood interruption and the resulting impact on their family. In fact, In most developing countries like Ethiopia participation of stock holders on the decision about urban expansion compensation is not customary. As a result dissatisfaction about the land compensation become goes from bad to worse. With the same vein, for most of the households in the study area, the town administration did compensation calculation of money and/or housing plots to the displaced placed without the agreement between the compensation taker and the responsible bodies.

Even though most of the households agreed, but with higher dissatisfaction, that they had been given 25(17.2%) housing plot and 76(52.4%) money. The urban expansion, that was carried out in this manner had brought a significant negative impact on the livelihood strategies of the peripheral farming community in terms of financial capital ( i.e. income and livestock holdings), natural capital (i.e. farming land, grazing land, forest and shrub lands).

While the physical capital i.e. housing or built up area and human capital i.e. education, health and other training skill, it has positive impact on them. This was examined with this study in the descriptive statistics and land use/land cover analysis. Therefore, this study had assessed and found that the urban expansion has an impact on the financial, natural, physical and human asset of the peripheral farming community's live livelihood.

Before the urban expansions considered in this study, an average annual income these households used to earn per year was varying from 10 quintals -50 quintals, where the yield of the majority was in the range of 11-20 quintals.

However, after urban expansion then, this study had scanned that there was no a single households earning above 40 quintals and the yield of the majority fell below 10 quintals per year. Similarly, the livestock holdings, before urban expansion these households had the an average oxen 2.22, cows 2.83, sheep 13.72, and goats 10.47. But after then, currently, these households had the average oxen 0.92, cows 0.95, sheep 3.01 and goats 2.42 as financial asset and land as natural asset/capital like farm land, forest land, grass land, water body, shrub land and bare land had shown a significant decline by 14.627km<sup>2</sup>, 11.962km<sup>2</sup>, 21.66km<sup>2</sup>, 0.024km<sup>2</sup>, 3.106km<sup>2</sup> and 0.063km<sup>2</sup> respectively.

As a coping mechanism, the households engaged in different livelihood strategies. Some shifted their strategies from farming to different job types, i.e. 34(23.4%) employment in daily laborer, 32(22.1%) employment in factory, 4(2.8%) employment in government organization, 26(17.9%) employment in non-government organization and 11(7.6%) self employment in cottage industries such as hand crafts, etc.

The post-classification analysis for the dynamics of land use/land cover changes using satellite data together with GIS indicates the increased land use/land cover changes due to rapid population growth resulted from natural increase, rural-urban and urban-urban migrations of the study area between 1986 and 2016. The analyses conducted for 1986 – 2016 have revealed that built-up areas has expanded significantly leading to removal of shrub land, forest land, agricultural land and grass land. Whereas the extent of water body, agricultural, grass, forest and shrub lands decreased. The study showed that the different land use/land cover classes has changed into built-up areas. Even though many changes have observed between 1986 and 2016, the highest negative rates of changes were seen in grass land and farm land which was averagely decreased by 21.66km<sup>2</sup>(25.044 %) and 14.627km<sup>2</sup>(16.912%) respectively. Whereas the highest positive rate of changes were seen in built up areas which were averagely increased by 51.247km<sup>2</sup> (59.254%).

## 5.2. Recommendations

Based on the designed objectives and the conclusion of this study; the following recommendations have been forwarded:

- One of the causes of horizontal expansion of the town is rapid population growth resulted from natural increase, rural-urban and urban-urban migrations; therefore improvements in national, regional, family planning, the spatial planning and urban planning should get considerable attention.
- Moreover, follow up needs to be made for displaced farming communities in general and for female headed households and not educated in particular, by creating and enlarging job opportunities and access to education and services.
- The government shall be revised compensation policies that serve on the side of displaced people & become best alternatives.
- Sustainable use of land resources and avoiding agricultural land loss by uncontrolled horizontal urban expansion.

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7. Religion- a) Christianity b) Muslim c) If any other specify\_\_\_\_\_

## Part II. Socio- Economic Profile

8. Do you have land? a) Yes b) No

9. If your answer for question No 8 is yes, how many Hectare<sup>2</sup>/Timad of land do you have?  
\_\_\_\_\_

10. For what purposes have you been using your land?

a) Crop b) Grazing c) Fruits and vegetation d) all e) If any other please mention\_\_\_\_\_

11. Before urban expansion how many quintals you produced in a year?

a) above 51 b) 41-50 c) 31-40  
d) 21-30 e) 11-20 f) below 10 quintals

12. After urban expansion how many quintals you produced in a year?

a) above 51 b) 41-50 c) 31-40  
d) 21-30 e) 11-20 f) below 10 quintals

13. Were you aware of the urban expansion program in your former vicinity?

a) Yes b) No

14. If your answer for the question No 13 is yes, how?

a) Through public orientation b) Through official meeting training  
c) Both d) Other specify \_\_\_\_\_

15. Did you participate in decision making process in the implementation of expansion program?

a) Yes b) No

16. If your answer for the question No 15 is yes, what are benefits you obtained because of participation? a) Raised own interest b) Expressed own opinion

c) Created access to benefit packages d) All e) other specify\_\_\_\_\_

17. Did you have lose your land due to an expansion of Kutaber town?

a) Yes b) No

18. If yes, how much hectare/Timad did you lose? \_\_\_\_\_

19. What type of land did you lose due to urban expansion?

a) Agricultural land b) Residential land  
c) Grass land d) If any other please mention\_\_\_\_\_

20. If a plot of land has been taken from you because of urban expansion, when was it taken?  
\_\_\_\_\_

<sup>2</sup> 1 hectare=4 Timade=4 Gemed in local measurement.



28. If your answer for the question No 27 is yes, what do you think are the factors that contributed to such expansion of the town?

- a) Demographic dynamics (high birth & low death rate)
- b) In-migration (rural to urban)
- c) Reclassification
- d) All
- e) If any other please mention \_\_\_\_\_

**Part IV. Impacts of the expansion on the surrounding farmstead's**

29. What was the base of your livelihood before the coming reclassification of your land to urban area?

- a) Farming on land
- b) Raising cattle
- c) Fodder production
- d) a and b
- e) All
- f) Others specify \_\_\_\_\_

30. Do you think that the expansion of the town has an impact on your privileges?

- a) Yes
- b) No

31. If your answer for question No 30 is yes, what are the impacts?

- a) Loss of land
- b) Loss of farm activity
- c) Loss of homestead
- d) Loss of clean environment
- e) All
- f) If any other please specify \_\_\_\_\_

32. What have you gained as a result of the expansion of Kutaber that you do not have before?

- |                                      |                          |                         |                          |
|--------------------------------------|--------------------------|-------------------------|--------------------------|
| A. Road                              | <input type="checkbox"/> | F. Telephone            | <input type="checkbox"/> |
| B. Electricity                       | <input type="checkbox"/> | G. Credit service       | <input type="checkbox"/> |
| C. Water supply                      | <input type="checkbox"/> | H. Recreation           | <input type="checkbox"/> |
| D. School                            | <input type="checkbox"/> | I. Market               | <input type="checkbox"/> |
| E. Clinic & other health institution | <input type="checkbox"/> | J. Other, specify _____ |                          |

33. Do you have any other source of income today?

- a) Yes
- b) No

34. If "Yes", which of these?

- a) Rental income
- b) Remittances
- c) Supplementary small and micro enterprises
- d) Other, specify \_\_\_\_\_

**Part v. Livelihood strategies**

35. Have you modified your previous occupation due to the town expansion?

- a) Yes
- b) No

36. If your answer for the question No 35 is yes, indicate the area of the modification

Previous income earning activities	Current income earning activities
-----	-----
-----	-----
-----	-----

37. What are the reasons that forced you to modify your previous income earning activities?
- a) Due to reduction in production from your current land size
  - b) Present occupation is pleasant and higher in payment than the previous one
  - c) Both
  - d) Other reasons, specify\_\_\_\_\_
38. Were you practicing off-farm activities before the town's expansion?
- a)Yes
  - b) No
39. If yes, indicate the area of activity you engaged in.
- a) Daily laborer
  - b) Employment in factory
  - c) Self employment in cottage industries, such as hand crafts, etc
  - d) Employment in government organization
  - e) Employment in non-government organization
  - f) Others( specify)\_\_\_\_\_
40. Were you practicing off-farm activities after the town's expansion?
- a)Yes
  - b)No
41. If yes, indicate the area of activity you engaged in.
- a) Daily laborer
  - b) Employment in factory
  - c) Self employment in cottage industries, such as hand crafts, etc
  - d) Employment in government organization
  - e) Employment in non-government organization
  - f) Others( specify)\_\_\_\_\_

## Appendex-2

**Addis Ababa University**  
**College of Social Science**  
**Department of Geography and Environmental Study**

### Interview Questions for key informants

**Dear respondent: -**

The main aim of this questionnaire is to collect data as input for the study titled *Urban Expansion and its Impact on the Livelihood of Peripheral Farming Communities: the case of Kutaber Town, Amhara Region, Ethiopia*. The sole purpose is to qualify the requirement for awarding the Masters of Art degree (M. A) at Addis Ababa University. Dear respondents, you are expected to provide genuine, accurate and balanced information with respect to urban expansion and displacement process. Your accurate information is highly valuable as it determines the success of this study. Therefore, the researcher is very much grateful for the sacrifice you pay to this end and the information gathered will be highly confidential and will be only for the purpose of this research.

**Thank you!!**

#### **Part I: - Background of Respondent**

1. Address \_\_\_\_\_
2. Kebele \_\_\_\_\_
3. Sex \_\_\_\_\_
4. Age \_\_\_\_\_
5. Level of education \_\_\_\_\_
6. Occupation \_\_\_\_\_
7. Your position in this organization \_\_\_\_\_
8. Year of services in this organization \_\_\_\_\_

#### **Part II: - Interviews about Kutaber town expansion**

9. What do you think are the factors that contributed for rapid expansion of the town in:-
  - a) 1986 \_\_\_\_\_
  - b) 2000 \_\_\_\_\_ and
  - c) 2016 \_\_\_\_\_
10. What is your view about the positive impacts of urban expansion on social and economic conditions of the households?
11. What is your view about the negative impacts of urban expansion on social and economic conditions of households?
12. What are the solutions you propose for the challenge faced as a result of expansion of the town?

**Appendix-3**

**Original Aerial photographs and topographic map of the study area**

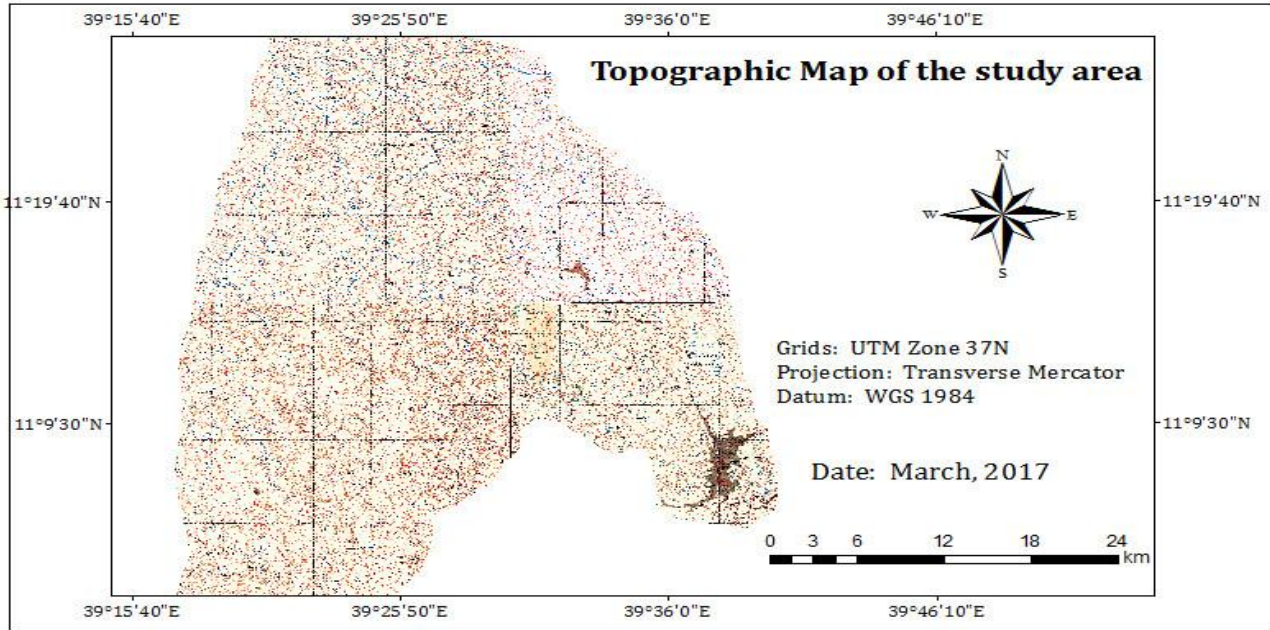


Figure 4.18. Topographic map of the study area  
Source: Ethiopian Mapping Agency

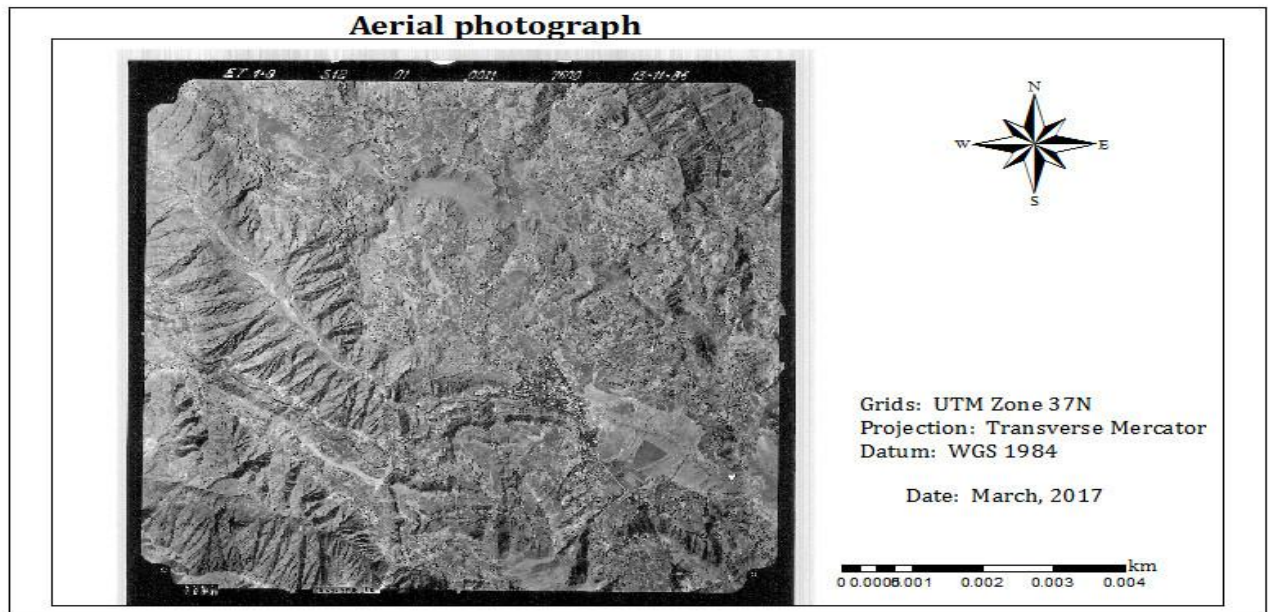


Figure 4.19. Aerial photograph map of the study area(1987)  
Source: Ethiopian Mapping Agency

## Appendex-4

### Partial view of Urban Expansion in study Area



Urban Expansion in study Area (Photo by Ahlam Yimam March, 2017)

