

**THE EFFECT OF URBAN EXPANSION ON THE LIVELIHOOD OF  
PERI-URBAN FARMERS IN ETHIOPIA: THE CASE OF BOKU  
SHENEN SUBCITY, ADAMA TOWN**



Meseret Kebede Tola

A Thesis Submitted to the department of Architecture, School of Civil Engineering and  
Architecture

Presented in Partial Fulfillment of the Requirement for the Degree of Master's in Urban  
Planning and Design

Office of Graduate Studies  
Adama Science and Technology University

June, 2024  
Adama, Ethiopia

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## DECLARATION

I declare that this thesis entitled “the effect of urban expansion on the livelihood of peri-urban farmers in Ethiopia: The Case of Boku Shenen Sub-city, Adama Town” is my own work and has not been submitted to any university for similar purpose. The references used in this thesis are duly recognized by proper citations.

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### **Recommendation of Advisors/ Supervisors**

I, the major advisor of this research thesis, hereby certify that I have closely advised/supervised the student while developing this thesis and read the draft thesis entitled “the effect of urban expansion on the livelihood of peri-urban farmers in Ethiopia: The Case of Boku Shenen Sub-city, Adama Town” prepared under my guidance by Meseret Kebede Tola. Therefore, I recommend the submission of the thesis to the department for further review and evaluation.

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## **ACKNOWLEDGEMENT**

I would like to sincerely thank my PhD adviser at ASTU's School of Civil Engineering and Architecture, Department of Architecture, Sileshi Azagew, for his insightful counsel, unwavering support, and expert assistance. I also like to express my gratitude to the Architecture Department faculty for their academic and scientific guidance during my time at ASTU.

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## **LIST OF ACRONYM**

|      |                                             |
|------|---------------------------------------------|
| BC   | Before Century                              |
| RII  | Relative importance index                   |
| SPSS | Statistical Package for the Social Sciences |
| LULC | land use land cover                         |
| USGS | United States Geological Survey             |
| GIS  | Geometric information system                |
| NDVI | Normalized Difference Vegetable Index       |
| NDBI | Normalized Difference builds up Index       |
| NDWI | Normalized Difference water Index           |

## ABSTRACT

*Rapid urbanization and the expansion of cities have significant consequences for agricultural practices and the livelihoods of farmers residing in peri-urban areas. The study aims to investigate the impact of urbanization on the livelihoods of farmers on the outskirts of Adama, Boku Shenan sub-city. The specific objectives include to examining changes in land use patterns due to urban expansion, examining the impact on market opportunities for peri-urban farmers, identifying challenges faced by peri-urban farmers in adapting to urbanization, and exploring potential solutions to help them maintain their livelihoods. To achieve these objectives, the study would employ a mixed-methods research approach, combining quantitative and qualitative research approach. Data are acquired by using a questionnaire, interview, remote sensing technique and focus group discussions. The research design was used a combination of descriptive and exploratory research design; a purposive sampling technique was use. The data analysis methods would use descriptive analysis techniques and exploratory analysis techniques using mean scores and relative important index method. The results indicated that, peri-urban farmers in Adama's Boku Shenan sub-city face significant challenges in adjusting to urbanization and maintaining their livelihoods. These challenges include the lack of good governance and corruption (RII: 0.847), improper utilization of compensation (RII: 0.846), unfair and inadequate monetary compensation (RII: 0.838), increased competition for resources (RII: 0.829), and limited access to sufficient land for agriculture (RII: 0.828). These factors have collectively impacted the productivity and market opportunities of peri-urban farmers, posing a threat to their livelihoods. Addressing these issues will be crucial in ensuring the sustainability of peri-urban farming in the face of ongoing urbanization. Efforts should be made to improve governance, provide fair and adequate compensation, and support farmers in accessing resources and land for agriculture. The urban expansion in Adama's Boku Shenan sub-city has had significant negative impacts on peri-urban farmers' market opportunities and their ability to sell their produce. The government should provide adequate compensation and training to help mitigate these challenges. Additionally, the reduction of livestock, loss of social bonds and networks, and physical assets of the land have all contributed to the difficulties faced by peri-urban farmers in accessing markets. As a result, urban expansion has led to a decrease in available market opportunities for these farmers. Efforts need to be made to address these issues and support the livelihoods of peri-urban farmers in the face of ongoing urbanization. By recognizing the socio-economic and environmental impacts of urban expansion on peri-urban agriculture, policymakers, planners, and stakeholders can work towards sustainable development pathways that prioritize the needs and well-being of peri-urban farmers. The study recommends that urban planners should promoting and support the adoption of diversified farming systems, including agroforestry, intercropping, and livestock integration, to enhance resilience and income opportunities for peri-urban farmers in Adama.*

**Key Words:** - Urbanization, Urban Expansion, Farmers and Peri-Urban

## **CHAPTER ONE**

### **1. INTRODUCTION**

This chapter covers background information, statement of the research problem, research questions and research objectives. It further presents the significance of the study, scope of the study, the expected outcomes of the study, operational definition and structure of research.

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

Ethiopia is characterized by fast population growing and this resulted in unplanned urban expansion towards peri-urban areas. The Ethiopian urban population was 11.4% by 1984 whereas increased 13.6% in 1994 and 16% by 2007. By 2050, the urban centers of Ethiopia will reach 42%. The mentioned population growth indicated expansion in urban areas but shrinking in rural land. To accommodate the ever increasing of population, cities have been expanding horizontally towards peri-urban areas. In the case of Oromia Region, the share of urban inhabitants account for 11.3% by 2007 census. The population of Sebeta town has increased from 49,331 (2007) to 256,868 by 2015/16; an increment of about 86.93% (Tikur, 2017).

Rapid urbanization and the expansion of cities have significant consequences for agricultural practices and the livelihoods of farmers residing in peri-urban areas. As urban areas expand, agricultural lands are often converted into residential, commercial, or industrial zones. This process not only reduces the availability and suitability of land for farming but also leads to changes in infrastructure, resource access, and market dynamics, impacting the livelihoods of peri-urban farmers (Argaie et al., 2022; Ayele & Tarekegn, 2020; Labiso, 2020; Yusuf, 2013).

Peri-urban farmers play a vital role in meeting the food demands of urban populations and contributing to local and regional food systems. However, their proximity to urban areas exposes them to unique challenges and opportunities arising from urban expansion. Despite the growing recognition of peri-urban agriculture's importance, there is a dearth of comprehensive studies focusing on the specific effects of urban expansion on farmers' livelihoods in peri-urban areas (Ingersoll, 2012; Lee-Smith et al., 2019a; Nath, 2021).

Urban expansion and the rapid growth of cities have significant implications for peri-urban farmers, who often find themselves on the outskirts of urban areas. However, there is a lack of

comprehensive understanding regarding the specific impacts of urban expansion on the livelihoods of peri-urban farmers (Kosa et al., 2017; Terfa et al., 2019).

The expansion of urban areas is a global phenomenon that has been occurring at an unprecedented rate in recent years. As cities grow, the peri-urban areas that surround them are becoming increasingly valuable for development. These areas, which are located at the interface between urban and rural environments, are often characterized by a mix of agricultural and non-agricultural land uses. Peri-urban farmers in these areas rely on the land for their income and food security, but as urbanization encroaches on their farms, they may face challenges such as loss of access to land, increased competition for resources, and changes in market demand (Angel, 2023; Mahtta et al., 2022; Samat et al., 2014).

Furthermore, urban expansion has also impacted market opportunities for peri-urban farmers. The proximity to urban areas was once an advantage for farmers as they could easily access markets and sell their produce. However, with urbanization, the competition from large-scale commercial farms and the rise of supermarkets has made it challenging for peri-urban farmers to sell their produce (A.E, 2018; Alamneh et al., 2023; Ayele & Tarekegn, 2020; Haregeweyn et al., 2012).

Despite these challenges, the specific challenges faced by peri-urban farmers in adapting to urbanization and maintaining their livelihoods are not well understood. Therefore, this research aims to identify the changes in land use patterns resulting from urban expansion and their impact on farmers' livelihoods. Additionally, the study will examine the impact of urban expansion on market opportunities for peri-urban farmers and their ability to sell their produce. The research will also identify the challenges faced by peri-urban farmers in adapting to urbanization and maintaining their livelihoods (Allen et al., 1999; Wadduwage, 2021).

According to Ayele & Tarekegn (2020); Worku (2020), indicated that the despite the potential consequences of urban expansion on peri-urban farmers, there is limited research that has examined this issue in depth. Most studies on urbanization have focused on its impact on the environment, infrastructure, and social dynamics of urban area; while relatively little attention has been paid to the effects of urbanization on peri-urban agriculture and the livelihoods of peri-urban farmers.

Understanding the impact of urban expansion on peri-urban farmers' livelihoods is critical for several reasons. Firstly, it sheds light on the socio-economic implications of urbanization and its potential to adversely affect the viability and sustainability of agricultural activities. Secondly, it helps identify the challenges faced by peri-urban farmers in adapting to urbanization, providing valuable insights for policy formulation and interventions to ensure their resilience and well-being (A.E, 2017; Argaie et al., 2022; Ayele & Tarekegn, 2020; Yusuf, 2013).

Therefore, this study aims to fill this gap in the literature by exploring the impact of urban expansion on the livelihoods of peri-urban farmers in Adama, Boku Shenen sub-city. The study deals with examine how changes in land use, market demand, and competition for resources affect the income and food security of peri-urban farmers. The study is identified strategies that can help these farmers adapt to changing conditions and maintain their livelihoods in the face of urbanization.

The findings of this study is relevant not only to peri-urban farmers of Adama, Boku Shenen sub-city but also to policymakers, urban planners, and development practitioners who are interested in promoting sustainable urban development and supporting the livelihoods of vulnerable populations. By shedding light on the challenges faced by peri-urban farmers and the strategies that can help them adapt to changing conditions, this study would contribute to a better understanding of the complex interactions between urbanization and agriculture and inform policies and interventions that can promote sustainable urban development and support the livelihoods of peri-urban farmers in Adama, Boku Shenen sub-city.

Finally, the study is explored potential solutions and strategies that can help peri-urban farmers of Adama, Boku Shenen sub-city adapt to urbanization and maintain their livelihoods. These solutions may include policy interventions, such as zoning laws or incentives for small-scale agriculture, or technological innovations that can help farmers of Adama, Boku Shenen sub-city increase their productivity and profitability. Overall, this research is essential in understanding the impact of urban expansion on peri-urban farmers of Adama, Boku Shenen sub-city and developing strategies to support their livelihoods.

## **1.2.Statement of the Problems**

According to Achamyeleh (2017); Alamneh et al. (2023); Worku (2020), indicated that as cities continue to expand, the peri-urban areas that surround them are becoming increasingly valuable for development. This urban expansion often leads to changes in land use, which can have a significant impact on the livelihoods of peri-urban farmers. These farmers rely on the land for their income and food security, but as urbanization encroaches on their farms, they may face challenges such as loss of access to land, increased competition for resources, and changes in market demand.

Moreover, as urbanization continues to expand rapidly, the livelihoods of peri-urban farmers are increasingly at risk. The effect of urban expansion on the livelihood of peri-urban farmers is a critical issue that requires attention. The problem is that urban expansion is resulting in changes in land use patterns in peri-urban areas, which is impacting the livelihoods of peri-urban farmers. Additionally, urban expansion is affecting market opportunities for peri-urban farmers, making it difficult for them to sell their product. Furthermore, the challenges faced by peri-urban farmers in adapting to urbanization and maintaining their livelihoods are not well understood (Argaie et al., 2022; Ayele & Tarekegn, 2020; Labiso, 2020; Yusuf, 2013).

According to Leulseged et al. (2012), indicated that the impact of urban expansion on peri-urban environment and livelihoods show mixed results: positive and negative aspects. The negative aspects revealed that some dislocated households are working on agriculture with limited access to land, few work as daily laborer and others are in worsening situation as a result of the change in the mode of life. According to Yusuf (2013), indicated that the socio-economic consequences of urban expansion were high competition for jobs, increasing loss of identity, loss of mutual trust, loss of traditional way of life, corruption in land administration, population displacement, high cost of living and lack of basic services.

Labiso (2020), also indicated that there is infrastructural improvement, socio economic growth, rapid population growth and also socio-economic problems related to urban expansion in studied area. There is great spatial and temporal land use land cover modification more towards to build up land uses. The livelihood condition of per-urban community changed to non-agricultural form but there are policy and strategy gaps of expropriating, compensating for affected community in ground implementation. According to Woldegebriel (2023), indicated that the expansion of

urban areas to surrounding rural farm areas have impacts on the displaced farm land size, farmers' social and economic levels, due to the change of the living style and means of livelihood from agriculture to urban life style. Therefore, farm land size, income of households, compensation paid, tropical livestock unit, social relation and occupation were found to have positive and significant influence on the livelihood of displaced farmers. The factors together with personal, socio-economic, technical, institutional and regulatory framework were greatly affected the livelihood of evicted farmers household.

According to Tikur (2017), indicated that the urban expansion has resulted in positive and negative effects. The livelihoods of this group are identified as challenging. Most of them are left jobless; and experiencing low standard of livelihood. Majority of the farmers were not benefited from rehabilitation strategies set by the government. Compensation is expected to be fair to reimburse the value of lost properties. But the study revealed that the payment is mainly unjust in amount and takes long period. 79.4% of the expropriated farmers were paid from 9 months to 2 years. According to Kosa et al. (2017); Terfa et al. (2019), indicated that the urban expansion and the rapid growth of cities have significant implications for peri-urban farmers, who often find themselves on the outskirts of urban areas. However, there is a lack of comprehensive understanding regarding the specific impacts of urban expansion on the livelihoods of peri-urban farmers of Adama.

Rapid urban expansion in Adama is leading to significant changes in land use patterns in surrounding peri-urban areas. Agricultural land is being converted into residential, commercial, and industrial areas at an alarming rate, putting pressure on agricultural production and threatening the livelihoods of peri-urban farmers. The lack of comprehensive and up-to-date data on land use changes, coupled with an inadequate understanding of the drivers of these changes, hinders effective policy interventions aimed at mitigating the negative consequences of urban sprawl (Argaie et al., 2022).

Urban expansion in Adama is transforming market dynamics for agricultural products, presenting both opportunities and challenges for peri-urban farmers. While an expanding urban population creates demand for fresh produce, peri-urban farmers face increasing competition from larger-scale producers and a lack of infrastructure to access urban markets efficiently. The limited understanding of market dynamics and the inadequate support for peri-urban farmers to

navigate these changes jeopardize their ability to maintain profitable livelihoods (Dadi et al., 2022).

Peri-urban farmers in Adama are facing significant challenges in adapting to rapid urban expansion and maintaining their livelihoods. The conversion of agricultural land into urban areas, increasing competition for markets, and limited access to resources and support services are eroding their economic base and forcing them to adopt unsustainable practices. The lack of in-depth research on the specific challenges faced by peri-urban farmers, coupled with limited data on their adaptation strategies, hinders the development of targeted and effective solutions to support their livelihoods (Bonye et al., 2021).

Despite the growing challenges faced by peri-urban farmers, the lack of comprehensive and locally-tailored solutions to support their adaptation to urban expansion is hindering their ability to maintain sustainable livelihoods. There is a need for research and development of innovative strategies that address the specific needs of peri-urban farmers in Adama, considering their unique circumstances, access to resources, and market opportunities. The lack of evidence-based solutions and effective policy interventions risks further marginalizing peri-urban farmers and exacerbating the negative impacts of urban expansion on rural communities (Frantzeskaki et al., 2019).

Therefore, there is a need to investigate the effect of urban expansion on the livelihood of peri-urban farmers and identify potential solutions to support these farmers of Adama town, Boku Shenen sub-city. This study aims to explore the effect of urban expansion on the livelihoods of peri-urban farmers of Adama, Boku Shenen sub-city, with the goal of identifying strategies that can help these farmers adapt to changing conditions and maintain their livelihoods in the face of urbanization, focusing on changes in land use patterns, market opportunities, challenges faced, and potential solutions.

### **1.3.Objective of the study**

#### **1.3.1. General objective of the study**

The general objective of this study is to investigate the impact of urban expansion on the livelihoods of peri-urban farmers of Adama, Boku Shenen sub-city.

### **1.3.2. Specific objectives of the study**

The specific objectives of this study are:

- To examine the changes in land use patterns in peri-urban areas as a result of urban expansion.
- To examine the impact of urban expansion on market opportunities for peri-urban farmers and their ability to sell their product in Adama.
- To identify the challenges faced by peri-urban farmers in adapting to urban expansion and maintaining their livelihoods.
- To explore potential solutions and strategies that can help peri-urban farmers adapt to urban expansion and maintain their livelihoods in Adama, Boku Shenen sub-city.

### **1.4. Research Questions**

In relation to the research questions, this study seeks to answer the following questions:

- How has urban expansion affected land use patterns in peri-urban areas?
- What is the impact of urban expansion on market opportunities for peri-urban farmers and their ability to sell their product in Adama?
- What are the challenges faced by peri-urban farmers in adapting to urban expansion and maintaining their livelihoods?
- What potential solutions and strategies can help peri-urban farmers adapt to urban expansion and maintain their livelihoods in Adama, Boku Shenen sub-city?

### **1.5. Scope of the study**

The scope of this research focus on the impact of urban expansion on the livelihood of peri-urban farmers in Adama town, which is a town divided into six sub-city Administrative units. The study conducted in peri-urban areas of Adama town, by taking the case of Boku Shenen sub-city that is located at the interface between urban and rural environments. The study deals with examine the changes in land use patterns, market opportunities, and challenges faced by peri-urban farmers as a result of urbanization. Finally, the potential solutions and strategies that can help these farmers adapt to changing conditions and maintain their livelihoods would explored, including alternative income-generating activities, training and technical assistance, market linkages, and sustainable agriculture practices.

The thematic scope of the study includes examining the effects of urban expansion on peri-urban areas in Adama, Ethiopia, with a focus on the changes in land use patterns, the impact on market opportunities for peri-urban farmers, the challenges faced by farmers in adapting to urban expansion, and potential solutions and strategies to support their livelihoods. The study aims to provide a comprehensive understanding of the dynamics between urban expansion and peri-urban agriculture in Adama and to identify practical interventions to address the challenges faced by peri-urban farmers.

### **1.6. Significances of the study**

The significance of this study lies in its contribution to the understanding of the impact of urban expansion on the livelihoods of peri-urban farmers in Adama, Boku Shenen sub-city. As urbanization continues to expand rapidly, the livelihoods of peri-urban farmers are increasingly at risk. By identifying the changes in land use patterns resulting from urban expansion and their impact on farmers' livelihoods, the study could provide insights into the challenges faced by peri-urban farmers in Adama, Boku Shenen sub-city. Additionally, by examining the impact of urban expansion on market opportunities for peri-urban farmers, the study would help identify potential solutions to support these farmers in maintaining their livelihoods. The findings of this study could inform policy decisions and interventions aimed at supporting peri-urban farmers in adapting to urbanization and sustaining their livelihoods. Overall, this study is important for promoting sustainable agriculture practices and ensuring food security in peri-urban areas in Adama, Boku Shenen sub-city. Overall, the study is significant because it addresses an important issue that has been largely overlooked in the literature on urbanization. The findings of the study is relevant not only to peri-urban farmers in Adama, Boku Shenen sub-city but also to policymakers, urban planners, and development practitioners who are interested in promoting sustainable urban development and supporting the livelihoods of vulnerable populations.

This study requires a mixed-methods approach that combines quantitative data analysis with qualitative research to provide a comprehensive understanding of the complex interplay of urban expansion, land use change, market dynamics, and the challenges faced by peri-urban farmers. The study should involve rigorous data collection, analysis, and interpretation, drawing upon multiple sources of information and perspectives.

### **1.7.Operational Definitions**

Urbanization: it is shift of population from rural areas to cities, and the resulting growth of urban areas.

Urban Expansion: is an increase in the built-up area of a settlement or collection of settlements.

Peri-urban area: is the landscape interface between town and country, or also as the rural-urban transition zone where urban and rural uses mix and often clash.

Livelihood: is a set of activities essential to everyday life that is conducted over one's life span.

### **1.8.Limitation of the Study**

The limitations of this analysis include the small number of prior studies that condensed the empirical data. There aren't many recent research published in the local context, and the example city's restricted access to historical data may limit how broadly and robustly the conclusions may be applied. Nonetheless, using reliable statistical techniques and methods greatly aids in drawing conclusions and deductions about comparable situations in a just and prudent manner.

### **1.9.Organization of the Thesis**

The cover page, title page, approval sheet, acknowledgment, table of contents, list of tables, list of figures, acronyms, and abstract comprised the preliminary pages of the thesis document. The body section is divided into five chapters, each of which contains a variety of connected but distinct subtopics. The background data, problem statement, objectives, research questions, significance, scope, operational definition, limitations, and study organization are all included in the introduction section, which is covered in the first chapter. The section on the literature review was contained in the second chapter. Research methodologies, sample size determination, demographic and sampling frame, research methodology, research design, data collection and analysis methods, validity and reliability, and ethical considerations are all covered in the third chapter on research methods and materials. The study's results and discussion section, which focuses on data presentation and discussions, are covered in the fourth chapter. This detailed how the mixed research approach was used to analyze the primary and secondary facts. The study's results and recommendations were presented in the final chapter.

## **CHAPTER TWO**

### **2. REVIEW OF RELATED LITERATURE**

#### **2.1.Introduction**

This chapter discusses related literature review that would be used in the research study. These include the research theory, concepts and ideology that exist with regard to the theoretical and empirical issue of the impacts of urban expansion on the livelihood of peri-urban farmers.

#### **2.2.Theoretical Literature Review**

##### **2.2.1. Urban expansion and its impact on peri-urban areas**

Urban expansion is not a modern phenomenon; it has been occurring since about 5000 B.C. The level of urbanization, measured by the proportion of urban population to total population, has been increasing over the years. After the Second World War, urbanization took place rapidly around the globe (Özden & Enwere, 2012). Rapid urbanization, one of the greatest socio-economic changes during the last five decades or so, has caused the burgeoning of new kinds of slums, the growth of squatter and informal housing all around the rapidly expanding cities of the developing Countries (Marutlulle, 2017).

According to Yusuf (2013), indicated that urbanization in its modern sense is a new phenomenon in Ethiopia. Though the process of urban development has been marked by a great deal of discontinuity, historical evidences show that the long history of Ethiopia was not without some form of urban episodes. The first systems of towns were developed during the time of Axumite civilization in small part of the northern high lands of contemporary Ethiopia. But this system disappeared during the time when the Axum was destroyed.

According to Kimbonguila et al. (2019), indicated that urbanization refers to the increasing population and economic activity in urban areas, leading to the expansion of cities and towns. This phenomenon has significant implications for peri-urban areas, which are the transitional zones between urban and rural areas. Urbanization and its impact on peri-urban areas provide valuable insights into the challenges and opportunities associated with this process. In the other hand, urbanization is the rapid growth of cities, which often leads to the encroachment of urban development into peri-urban areas. This can result in land use conflicts, as agricultural land is converted for residential, commercial, or industrial purposes. The importance of land use planning and management to mitigate these conflicts and ensure sustainable development in peri-

urban areas (Troin, 2018). Another important consideration is the provision of infrastructure and services in peri-urban areas. As urbanization accelerates, peri-urban areas may experience increased demand for basic amenities such as water, sanitation, and transportation (Malano et al., 2014).

Furthermore, urbanization can have social and environmental impacts on peri-urban communities, such as social exclusion, loss of traditional livelihoods, and environmental degradation resulting from urban expansion. It underscores the importance of inclusive and sustainable development strategies that address the needs of peri-urban residents and protect natural resources (Seifollahi-Aghmiuni et al., 2022). In addition, explores the economic dynamics of peri-urban areas in the context of urbanization. It discusses the potential for peri-urban areas to serve as hubs for economic activities such as agribusiness, small-scale manufacturing, and service industries. However, it also raises concerns about disparities in access to employment and income-generating opportunities between peri-urban and urban populations (Iaquinta & Drescher, 2000).

Overall, urbanization and its impact on peri-urban areas provide a comprehensive understanding of the complex dynamics at play in these transitional zones. It underscores the importance of integrated planning, inclusive development strategies, and sustainable resource management to address the challenges and harness the potential of peri-urban areas in the context of urbanization.

### **2.2.2. Changes in land use patterns and urban expansion**

The rapid urban expansion in peri-urban areas has led to significant changes in land use patterns, impacting farmers' livelihoods and agricultural activities. This literature review explores existing studies on the transformations in land use in peri-urban areas as a result of urbanization and the implications for farmers' livelihoods.

According to Rana & Sarkar (2021), study indicated that the changes in land use patterns type were explored in developing countries. The researchers found that changes in land use patterns in the extant literature and therefore bring together a set of most notable types of changes in land use patterns as shown in table 2.1.

Table 2. 1: Land use patterns classes

| Land use types    | Descriptions                                                                                                                                                          |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Urban             | All residential, commercial, industrial, transportation, and settlements                                                                                              |
| Agricultural land | Cropland, cultivated land, urban agricultural land, low lying area, and marshy land                                                                                   |
| Vegetation        | Trees, shrub land, semi-natural vegetation, deciduous and coniferous forest, inter-city recreational areas, parks and playground, grassland, vegetation area, garden, |
| Water body        | River, lakes, pond, permanent open water, channel.                                                                                                                    |
| Bare ground       | The landfilling site, constructions site, development land, bare and exposed soils, open space.                                                                       |

Source: (Rana & Sarkar, 2021)

According to Rana & Sarkar (2021), indicates that the fast urbanization and practical development led to rapid urban growth between 1998 and 2018. Between 1998 and 2018, the urban built-up area expanded by 19.63%, from 3.39 km<sup>2</sup> to 31.93 km<sup>2</sup>. Urbanization is facilitated by the reduction in size of all other land cover types. Between 1998 and 2008, the amount of vegetation and water bodies decreased by 8.16% and 5.79%, respectively. The projected land cover maps for 2023 and 2028 indicate that the current urban expansion trend is likely to continue. The area of land used for urban development will increase from 3.39 km<sup>2</sup> in 1998 to 11.01 km<sup>2</sup> in 2023 and 12.44 km<sup>2</sup> in 2028. In 2028, there was 0.49 km<sup>2</sup> of bare ground and 4.13 km<sup>2</sup> of vegetated land cover, respectively. This represents a progressive decrease from 1.11 km<sup>2</sup> and 8.10 km<sup>2</sup> in 1998. The total area of agricultural land was 9.39 km<sup>2</sup> in 1998; by 2023 and 2028, it is expected to have decreased to 7.44 km<sup>2</sup> and 6.78 km<sup>2</sup>, respectively. A water body shows a similar declining tendency, shrinking from 5.55 km<sup>2</sup> in 1998 to 3.70 km<sup>2</sup> in 2028. This study demonstrates that satellite remote sensing data helps detect land cover changes and spatial patterns of urban growth. However, the images were three historical periods' data, which impacted interpretation results. The more reliable result is found for the short interval time-series satellite data. As a result, a robust and credible dataset should consider for more accuracy. The findings from the results highlighted that the changes in land cover affect the urban environmental condition. Therefore, the urban planner and city planning authority should monitor the rate and dimension of urban expansion to ensure sustainable development. The policymaker could consider urban growth factors under different land cover scenarios to alleviate the negative consequence caused by unplanned and haphazard urban development.

According to Fenta et al. (2017), study indicated that the changes in land use pattern in the periods 1984 – 1994, 1994 – 2004, and 2004 – 2014, the built-up area increased annually by 10%, 9%, and 8%, respectively; with an average annual increment of 19% (100 ha per year ), from 531 ha in 1984 to 3524 ha in 2014. Between 1984 and 2014, about 88% of the gain in built-up area was from conversion of agricultural lands, which decreased by 39%. Extension of existing urban areas was the dominant growth type, which accounted for 54%, 75%, and 81% of the total new development during 1984 – 1994, 1994 – 2004, and 2004 – 2014, respectively. The spatial metrics analyses revealed urban sprawl, with increased heterogeneity and gradual dispersion in the outskirts of the city. The per capita land consumption rate (ha per person) increased from 0.009 in 1984 to 0.014 in 2014, indicating low density urban growth. Based on the prediction result, the current (2014) built-up area will double by 2035, and this is likely to have multiple socioeconomic and environmental consequences unless sustainable urban planning and development policies are devised.

According to Argaie et al. (2022), indicated that the land-use intensity encountered significant changes and trends during the ten years explored in the research. There are six land classes were defined: Arable land, Woodland, Grassland, Built-up land, Water-body land, and unused land. Results showed that arable land occupied 47.33% of the entire area in 2010, 39.72% in 2015, and 35.46% in 2020. These clear trends show that 11.87% of cultivable land experienced a conversion to other land uses in just a decade. Meanwhile, the built-up land took the opposite trends, occupying 30.63%, 39.03%, and 46.62% in the same given periods, respectively. These findings indicate that the aggressive and rapid encroachment of built-up land was the primary factor for the sharp decline of farmland in 2020.

According to Rudel (2021), indicated that changes in land use patterns and urban expansion refer to the transformation of peri-urban areas from rural or natural landscapes to urbanized environments, characterized by residential, commercial, and industrial developments. This process is driven by factors such as population growth, economic development, and infrastructure expansion, leading to the conversion of agricultural land, fragmentation of natural habitats, and loss of open spaces. These changes have significant environmental, social, and economic implications, including habitat loss, soil degradation, displacement of rural communities, and unequal access to resources and opportunities. According to Ahmed et al.

(2010), indicated that the effective land use planning, governance, and conservation efforts are essential for managing urban expansion in peri-urban areas and addressing the challenges and opportunities associated with this dynamic process.

According to Alemineh (2018), indicated that urban expansion induced displacement has negatively affected the marginalized farming communities and forced them to loss their land, production and livestock and other land assets. Most evicted farmers were not interested to change their means of livelihood even after the land expropriation. Majority of evicted farmers want to continue in agricultural working. From farmers who want to change their means of livelihood, most were preferred to purchase vehicle, build house at the city and grinding mills. Livelihood change was mainly determined by size of land, education and skill of individuals. However, education played a vital role to change farmers' livelihood or to assure their sustainability. A considerable proportion of illiterate farmers are engaged in petty trade activities and daily labors which are not sustainable to the further livelihood of the household. The study also found that the expansion of urban places has far reaching consequences on the social life of affected communities. For instance, family disturbance, neighbor conflict, and unemployment induce seasonal migration were mentioned among the social problems that evicted households were encountered.

### **2.2.3. Impact of urbanization on peri-urban farmers**

The rapid urban expansion in peri-urban areas has significant implications for market opportunities for farmers and their ability to sell their produce. This literature review explores existing studies on the impact of urbanization on market access and sales channels for peri-urban farmers.

Economic impacts of urban expansion on peri-urban farmers are Reduction of crop production and productivity: the loss of farmland and the amount of compensation money is directly associated with the production and productivity of farmers, Loss of assets of the land: the livelihood assets in the context of rural agricultural communities include permanent tree and fruits such as eucalyptus tree (Baherzaf), acacia (Girar) as well as other large and small trees, and Reduction of livestock: the urban expansion had directly or indirectly affected the production of livestock of rural communities which played multiple roles in creating wealth for farmers (Alemineh, 2018).

Social impacts of urban expansion on peri-urban farmers are social capital, social network, unemployment, Conflict related to resources competition: Competition for resources like water is one of the main reasons for the conflict among newly residents in the expanded area and the original farming people, Family disturbance: urban expansion program also challenged the stability of farming households, and Conflict with neighbors: this was resulted due to lack of knowledge and skills to manage compensated money (Alemineh, 2018).

According to Talema & Nigusie (2023), the study's indicated that the urban expansion has increased at an alarming rate at the expense of peri-urban farming households whereby their main source of income (agricultural land) has been lost permanently without putting in place any tangible rehabilitation and livelihood restoration schemes. The economic situation of farming households has deteriorated as a result of unfair compensation payments due to the country's land policy which made all land public property, hence taking out land from the formal market. The unfair compensation payment and the acute shortage of land supply through the formal system has, on the other hand, aggravated the informal transaction of farm land in fear of unfair expropriation acts. Though informal land transaction has helped farmers to secure more payment per unit of land compared to government compensation, but cumulatively they are at disadvantage as the transaction is informal, income does not come in a planned manner. Moreover, gradual loss of farmland results in diminished income from agriculture hence deterioration of livelihood sets in gradually.

According to Weldearegay et al. (2022), indicated that the regression result showed being displaced positively influences peri-urban farmers' poverty. Whereas; family size, farming experience, and market distance were negatively and statistically significant effects on peri-urban farmers' poverty. Therefore, concerned governmental and non-governmental bodies should develop strong policies and strategies to minimize the ramifications of displacement on smallholder peri-urban farmers. In the short term, the government should provide adequate compensation and training on how to diversify their livelihoods and utilization of the money. Whereas, in the long term, a separate department should be established to strictly evaluate and monitor the condition of displaced households. Besides, the government should make a policy change regarding residential house construction from horizontal to vertical.

According to Chandel & Mathewos (2023), indicated that the study highlights the negative impact of unplanned and unregulated urban expansion on the environment, economy, and social fabric of the town. The results of the study demonstrate that urbanization puts pressure on the natural resources and traditional livelihoods of peripheral communities. The study also emphasizes the importance of sustainable urban development that prioritizes environmental protection, social inclusion, and economic growth. The findings of the study can be used to inform policy-making and urban planning decisions aimed at achieving sustainable development in developing countries.

According to Yusuf (2013), indicated that in developing countries people are migrating from rural areas to urban centers and from the center the poor also move to the periphery for urban renewal or squatting. These areas need provision of infrastructure like road, power line, water pipes and drainage line. This requires high development cost that draws on the financial capacity of the municipal government. In many cases the municipality cannot afford to provide and people remain deficient of basic means of life. Because of this most of the residents are exposed relatively to high cost of living. There is also limited work opportunity in the area. The challenge is more intense to the dislocated and evicted farming community since they lose their means of livelihood.

The economic impact of urbanization on peri-urban farmers is significant and multifaceted. As urban areas expand into peri-urban areas, agricultural land is often converted into residential, commercial, and industrial developments, leading to the loss of valuable farmland for farmers. This can result in the displacement of farmers and the loss of their livelihoods, as well as a decrease in agricultural productivity and food security (Ayele & Tarekegn, 2020). Additionally, the influx of people into peri-urban areas due to urbanization can create opportunities for farmers to diversify their crops and products to meet the demands of the growing urban population. This can lead to increased market access and higher incomes for peri-urban farmers (Thuo, 2020). However, urbanization can also bring challenges for peri-urban farmers, such as increased competition for land and resources, rising land prices, and changes in consumer preferences. These challenges can make it difficult for peri-urban farmers to sustain their agricultural activities and may lead to a loss of traditional farming practices and knowledge (Mohammed et al., 2020).

According to Mohammed et al. (2020), indicated that the efforts to support peri-urban farmers in the face of urbanization include providing access to training, resources, and markets, as well as implementing policies and regulations that protect agricultural land and support sustainable farming practices. Additionally, partnerships between urban and peri-urban areas can create opportunities for collaboration and mutual benefit, such as through direct sales of agricultural products to urban consumers or the development of agro-tourism initiatives.

#### **2.2.4. Challenges faced by peri-urban farmers in adapting to urbanization**

The rapid urbanization of peri-urban areas poses significant challenges for farmers in adapting to changing socio-economic and environmental conditions while maintaining their livelihoods. This literature review explores existing studies on the challenges faced by peri-urban farmers in adapting to urbanization.

According to Mohammed et al. (2020), study indicated that the challenges faced by peri-urban farmers due to urbanization were explored in developing countries. The researchers found that challenges faced by peri-urban farmers due to urbanization in the extant literature and therefore bring together a set of most notable challenges faced by peri-urban farmers due to urbanization as shown in table 2.2.

Table 2. 2: Challenges of peri-urban farmers due to urbanization

| R. No | Challenges of peri-urban farmers due to urbanization | Mean | Standard deviation | Pearson correlation coefficient |
|-------|------------------------------------------------------|------|--------------------|---------------------------------|
| 1     | Lack of skills and knowledge of evicted farmers      | 3.83 | 1.24               | 0.520                           |
| 2     | Lack of good governance and corruption               | 3.09 | 1.29               | 0.610                           |
| 3     | Improper utilization of compensation by farmers      | 4.20 | 0.987              | 0.484                           |
| 4     | Unfair and in-adequate monetary compensation         | 4.22 | 0.950              | 0.479                           |
| 5     | Lack of municipality follow up and support           | 3.28 | 1.34               | 0.567                           |
| 6     | Lack of providing information to farmers             | 3.25 | 1.41               | 0.559                           |
| 7     | Un-enforceable policy                                | 2.91 | 1.36               | 0.546                           |

Source: (Mohammed et al., 2020)

According to Tadesse & Imana (2006), indicated that the key findings of the study, living patterns of the community were safe. However, after urbanization the community has undergone several transformations which include both positive and negative patterns changes. The previous patterns have been almost eroded and invaded by the new and incompatible patterns.

Economically, the community has been impoverished through different mechanisms. The community's economic status has been deteriorated. Their capacity of meeting even their basic need has been lowered. The community almost lacked diversification in generating income. The most important factor that facilitated the deterioration of the economy of the community is land dispossession. Nowadays, land grabbing is the newly emerging and prevailing problem that forced the community to suffer. The study area has been highly exposed to land grabbing which aggravated and escalated the challenges of urban sprawl. Generally speaking, the community have been victimized since they lost their fundamental patterns of life.

According to Yusuf (2013), indicated that many cities in developing countries have expanded into highly fertile areas. Thus, loss of agricultural land and forest land with valuable ecological function is another negative consequence of uncontrolled city expansion. The problem of city expansion towards agricultural land is generally not one of lack of vacant land but rather lack of appropriate government policy and strategy to guide new developments on land other than the best farm land and to ensure that vacant and urbanized land are fully used. In Egypt, more than 10% of the nation's most productive land has been lost to city expansion, much of it through squatter settlements, yet at the same time prime sites within cities remain undeveloped.

The challenges faced by peri-urban farmers in adapting to urbanization are Land competition, Changes in consumer preferences, Access to markets, Infrastructure and services, Environmental impacts and Socio-economic changes. Land competition: As urban areas expand, peri-urban farmers often face increasing competition for land, leading to higher land prices and reduced availability of agricultural land. This can make it difficult for farmers to expand their operations or even maintain their current levels of production (Lee-Smith et al., 2019a; Malano et al., 2014).

Changes in consumer preferences: Urbanization can lead to changes in consumer preferences, with urban consumers often demanding different types of products or production methods than traditional peri-urban farmers are accustomed to. This can require farmers to adapt their practices and diversify their crops and products, which can be challenging and require investment in new infrastructure and knowledge (Hidayat, 2014).

Access to markets: While urbanization can create opportunities for peri-urban farmers to access new markets, it can also present challenges in terms of transportation, distribution, and

marketing. Farmers may struggle to reach urban consumers or compete with larger, more established suppliers (A.E, 2017).

Infrastructure and services: Urbanization can put pressure on peri-urban infrastructure and services, such as water, electricity, and transportation. Farmers may struggle to access these essential services, which can impact their ability to operate effectively (Kanai & Schindler, 2022).

Environmental impacts: Urbanization can lead to environmental degradation in peri-urban areas, such as pollution, loss of biodiversity, and depletion of natural resources. This can have a direct impact on farming activities and the long-term sustainability of agricultural production (Seifollahi-Aghmiuni et al., 2022).

Socio-economic changes: Urbanization can bring about changes in the socio-economic dynamics of peri-urban areas, such as increased inequality, gentrification, and social tensions. These changes can impact the livelihoods and well-being of peri-urban farmers and their communities (Di Clemente et al., 2021).

Addressing these challenges requires a multi-faceted approach that includes policies and regulations to protect agricultural land, investment in infrastructure and services, support for market access and diversification, and efforts to promote sustainable farming practices. Collaboration between urban and peri-urban stakeholders is also essential to ensure that the economic impact of urbanization on peri-urban farmers is managed in a way that supports the long-term viability of agriculture in these areas.

#### **2.2.5. Potential solutions and strategies for peri-urban farmers to adapt to urbanization**

Peri-urban farmers can adapt to changing consumer preferences by diversifying their crops and products to meet the demands of urban consumers. This may involve investing in new infrastructure and knowledge to produce different types of products, such as organic produce, specialty crops, or value-added products like jams or preserves (Zasada, 2011). Peri-urban farmers can improve their access to urban markets by developing strong linkages with local retailers, restaurants, and farmers' markets. This may involve forming cooperatives or networks

to collectively market their products and negotiate better prices and distribution channels (Wadduwage, 2021).

To address environmental impacts, peri-urban farmers can adopt sustainable farming practices such as agro-ecology, organic farming, and water conservation techniques. This can help mitigate the environmental degradation caused by urbanization and ensure the long-term viability of agricultural production in peri-urban areas (Dube et al., 2021). Policymakers can play a key role in protecting agricultural land in peri-urban areas through land use planning, zoning regulations, and incentives for preserving farmland. This can help ensure that peri-urban farmers have access to the land they need to continue their operations despite urban expansion (Simon & Adam-Bradford, 2016).

Governments and development organizations can invest in peri-urban infrastructure and services, such as irrigation systems, transportation networks, and market facilities, to support the needs of peri-urban farmers. This can help improve access to essential services and reduce the logistical challenges of farming in peri-urban areas (Ingwani et al., 2023). Efforts to support peri-urban farmers should include capacity building programs, training, and knowledge transfer to help farmers adapt to changing market demands, adopt new technologies, and improve their farming practices (Lopez & Pastor, 2015). Collaboration between urban and peri-urban stakeholders is essential to address the challenges faced by peri-urban farmers. This may involve advocacy efforts to raise awareness about the importance of peri-urban agriculture and promote policies that support the long-term viability of farming in peri-urban areas (Herremans et al., 2016).

In terms of policy and strategic limits relating to city expansion, there was no prior notification or education provided to farmers and expropriated communities. Most expropriated households received less compensation for their land, and most family members under the age of 18 were denied access to even a plot of land. This demonstrates policy and strategy gaps in issues related to the expansion program, and this policy issue has hampered the city's development and created a severe good governance problem in the area. The concern was raised by nearly all key informants and focus group discussion participants, who said that the valuation of property generated and farmland lost was unfairly in contrast to the nationally asserted valuation technique (Woldegebriel, 2023).

By implementing these potential solutions and strategies, peri-urban farmers can better adapt to urbanization and continue to thrive in the face of changing socio-economic dynamics and environmental pressures.

### **2.3. Empirical Literature Review**

According to Yusuf (2013), indicated that the socio-economic consequences of urban expansion were high competition for jobs, increasing loss of identity, loss of mutual trust, loss of traditional way of life, corruption in land administration, population displacement, high cost of living and lack of basic services. The major environment consequences of urban expansion on drainage system have caused accumulation of wastes, stagnation of water and flooding in the study area. The causes of the environmental problems were ranked as poor municipal services, lack of committed leadership, lack of environmental awareness and poor residential waste management.

According to Woldegebriel (2023), indicated that the expansion of urban areas to surrounding rural farm areas have impacts on the displaced farm land size, farmers' social and economic levels, due to the change of the living style and means of livelihood from agriculture to urban life style. From the observed ten variables compensation have significant correlation at 0.01% affected the livelihood of expropriated family and farm land size, occupation, family income and social relation have significant correlations at 0.05% level (Rebira, 2017). The remaining variables sex, age, education level, family sizes do not have significant correlations after land expropriation. Therefore, farm land size, income of households, compensation paid, tropical livestock unit, social relation and occupation were found to have positive and significant influence on the livelihood of displaced farmers. The factors together with personal, socio-economic, technical, institutional and regulatory framework were greatly affected the livelihood of evicted farmers household (Emeru et al., 2022).

According to Tikur (2017), indicated that the urbanization has resulted in positive and negative effects. From the positive side, it improved access to better social services and infrastructures. Landholders displaced due to urbanization were paid compensation. 9.4% of them have exhausted for investment, and thus their livelihoods have been well improved (Negese, 2021). But 90.6% of them spent on consumption good. The livelihoods of this group are identified as challenging. Most of them are left jobless; and experiencing low standard of livelihood. Majority of the farmers were not benefited from rehabilitation strategies set by the government.

Compensation is expected to be fair to reimburse the value of lost properties. But the study revealed that the payment is mainly unjust in amount and takes long period. 79.4% of the expropriated farmers were paid from 9 months to 2 years (Tikur, 2017).

According to Argaie et al. (2022), indicated that land-use intensity encountered significant changes and trends during the ten years explored in the research. There are six land classes were defined: Arable land, Woodland, Grassland, Built-up land, Water-body land, and unused land. Results showed that arable land occupied 47.33% of the entire area in 2010, 39.72% in 2015, and 35.46% in 2020. These clear trends show that 11.87% of cultivable land experienced a conversion to other land uses in just a decade. Meanwhile, the built-up land took the opposite trends, occupying 30.63%, 39.03%, and 46.62% in the same given periods, respectively (Abdurahman et al., 2023). The aggressive and rapid encroachment of built-up land was the primary factor for the sharp decline of farmland in 2020. The agricultural land faces severe degradation due to urbanization. A total of 86.282 km<sup>2</sup> of farmland land has been converted to built-up land within a decade. Cultivable land is the most impacted among all land classes, where 78.65% of the land has been converted into urban or metropolitan areas (Ayele & Tarekegn, 2020). Nonetheless, with proper management and planning, government officials at regional and local levels can balance urban development and population growth in Addis Ababa more efficiently and effectively (Dargie Chekole, 2020).

According to Ayele & Tarekegn (2020); Labiso (2020); Yusuf (2013), indicated that the effect of urban expansion on the livelihood of peri-urban farmers is a critical issue that requires attention. The problem is that urban expansion is resulting in changes in land use patterns in peri-urban areas, which is impacting the livelihoods of peri-urban farmers. Additionally, urban expansion is affecting market opportunities for peri-urban farmers, making it difficult for them to sell their produce. Furthermore, the challenges faced by peri-urban farmers in adapting to urbanization and maintaining their livelihoods are not well understood.

According to Achamyeh (2017); Alamneh et al. (2023); Leulseged et al. (2012); Worku (2020), indicated that as cities continue to expand, the peri-urban areas that surround them are becoming increasingly valuable for development. This urban expansion often leads to changes in land use, which can have a significant impact on the livelihoods of peri-urban farmers. These farmers rely on the land for their income and food security, but as urbanization encroaches on

their farms, they may face challenges such as loss of access to land, increased competition for resources, and changes in market demand.

According to Kosa et al. (2017); Terfa et al. (2019), indicated that the urban expansion and the rapid growth of cities have significant implications for peri-urban farmers, who often find themselves on the outskirts of urban areas. However, there is a lack of comprehensive understanding regarding the specific impacts of urban expansion on the livelihoods of peri-urban farmers.

Therefore, there is a need to investigate the effect of urban expansion on the livelihood of peri-urban farmers and identify potential solutions to support these farmers of Adama, Boku Shenen sub-city. This study aims to explore the effect of urban expansion on the livelihoods of peri-urban farmers of Adama, Boku Shenen sub-city, with the goal of identifying strategies that can help these farmers adapt to changing conditions and maintain their livelihoods in the face of urbanization, focusing on changes in land use patterns, market opportunities, challenges faced, and potential solutions in Adama, Boku Shenen sub-city.

#### **2.4.Gap of the Study**

Some potential research gaps in the study can includes:

**Specific Changes in Land Use Patterns:** There is a gap in the study regarding a limited understanding of the specific changes in land use patterns in peri-urban areas resulting from urban expansion. This gap suggests the need for more detailed research to identify and analyze the nuances of land use changes, such as shifts from agricultural to residential or commercial use, and their implications (Belay, 2016; Koroso et al., 2020).

**Direct Impact on Farmers' Livelihoods:** Another research gap is the lack of comprehensive understanding of how these changes in land use patterns directly impact farmers' livelihoods. There is a need to investigate the socio-economic repercussions on farmers, such as changes in income, access to resources, employment opportunities, and overall well-being as a result of urban expansion in peri-urban areas (Ayele & Tarekegn, 2020; Bonye et al., 2021).

**Specific Market Opportunities for Peri-urban Farmers:** There is a gap in the study concerning the limited investigation into the specific market opportunities available for peri-urban farmers in Adama. Understanding the market dynamics, demand-supply chains, and potential avenues for

selling produce can provide insights into enhancing farmers' income and sustainable agricultural practices in peri-urban areas (Ayele & Tarekegn, 2020; Lee-Smith et al., 2019b).

**Barriers Faced in Selling their agricultural Product in Adama:** The insufficient exploration of the barriers that peri-urban farmers face in selling their produce in Adama is another research gap. Identifying challenges such as transportation issues, market access limitations, price fluctuations, or lack of market information can help in devising targeted interventions to support farmers in overcoming these obstacles (Dhillon & Moncur, 2023; Shiferaw et al., 2016).

**Challenges in Adapting to Urbanization:** The inadequate exploration of the nuanced challenges faced by peri-urban farmers in adapting to urbanization, including social, economic, and environmental impacts on their livelihoods, presents a significant research gap. Delving deeper into these multifaceted challenges can provide a holistic view of the complexities involved and guide policy-making towards sustainable urban development that considers the needs of peri-urban farmers (Varkey & Manasi, 2019).

**Exploration of Solutions and Strategies:** The limited exploration of potential solutions and strategies to help peri-urban farmers adapt to urbanization and maintain their livelihoods is a crucial research gap. Investigating best practices, innovative approaches, and supportive policies can offer practical recommendations for empowering peri-urban farmers, enhancing their resilience, and ensuring their socio-economic well-being amidst urban expansion.

By addressing these research gaps, the study can offer a more comprehensive understanding of the impact of urbanization on peri-urban farmers in Adama, Boku Shenen Sub-City. Moreover, it can contribute to the development of effective strategies that support the livelihoods of farmers in peri-urban areas faced with the challenges of urban expansion.

## **2.5. Conceptual Framework**

This framework examines the interconnectedness between urban expansion, land use changes, and the livelihoods of peri-urban farmers. It aims to understand the challenges they face and potential solutions to sustain their farming practices in a changing landscape.

**Changes in land use patterns:** Urban sprawl which is as cities expand, peri-urban areas are increasingly incorporated into urban landscapes, leading to conversion of agricultural land for

housing, infrastructure, and commercial development. Loss of farmland conversion diminishes the amount of land available for agriculture, reducing the potential for crop production and livestock rearing. Fragmentation of landholdings which is expansion can lead to the subdivision of larger farms into smaller plots, hindering economies of scale and efficient farming practices. Increased land prices which are raising demand for land in peri-urban areas drives up prices, making it difficult for farmers to acquire or maintain land for agricultural purposes (Zscheischler & Rogga, 2021).

Impact on market opportunities: shifting consumer preferences which is urban expansion can lead to a demand for different types of produce and agricultural products. Farmers may need to adapt to changing consumer needs. Competition from large-scale farms which is increased proximity to urban markets can lead to competition from larger-scale farms and agricultural businesses with better resources and economies of scale. Limited access to urban markets which is despite proximity, access to urban markets can be restricted due to lack of infrastructure, transportation, and formal marketing channels. Loss of traditional markets which is urban expansion can erode traditional markets for local produce, making it difficult for farmers to sell their products (de Bruin et al., 2021).

Challenges faced by peri-urban farmers: adapting to new technologies and practices which is to stay competitive, farmers may need to adopt new technologies, farming techniques, and sustainable agricultural practices. Maintaining livelihoods which is limited access to land and market opportunities can make it difficult for farmers to maintain their livelihoods and income. Limited access to resources and support which is peri-urban farmers may face limited access to financial support, training programs, and technical assistance for adapting to urban expansion. Social and cultural impacts which are urban expansion can lead to changes in community structure, social networks, and traditional farming practices (Malano et al., 2014).

Potential solutions and strategies: Urban agriculture and vertical farming which is exploring alternative farming methods like rooftop gardens, vertical farms, and urban gardening to maximize land use and adapt to urban environments. Developing sustainable farming practices which is implementing environmentally friendly and sustainable farming practices to improve soil fertility, water management, and resource efficiency. Strengthening local markets and value chains which is establishing local farmers markets, cooperatives, and community-supported

agriculture programs to improve access to urban markets and connect directly with consumers. Government support and policy which is implementing policies that support peri-urban agriculture, provide incentives for sustainable farming practices, and offer land-use planning that protects agricultural land. Community collaboration which is encouraging collaboration between peri-urban farmers, urban consumers, and local governments to develop innovative solutions and create sustainable food systems which is the conceptual framework diagram can be visualized with a diagram Figure 2.1 shown the interconnectedness as follow (Oh & Lu, 2023).

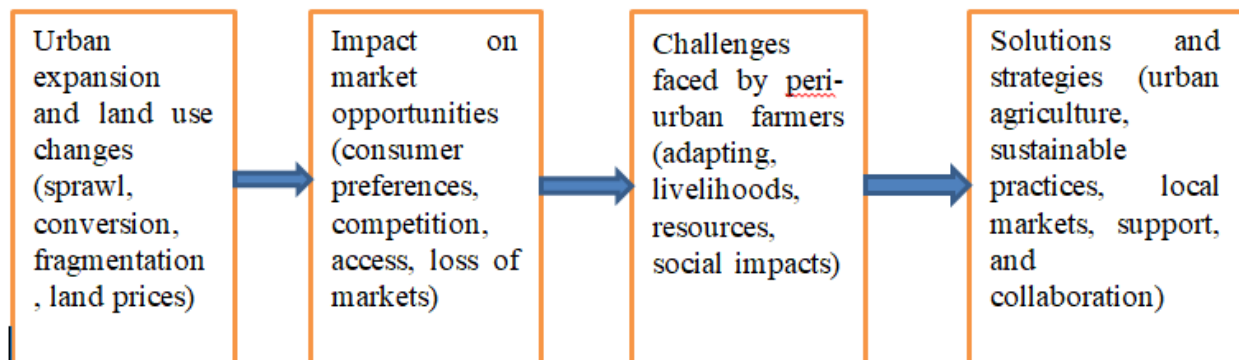


Figure 2. 1: The conceptual framework of impact of urban expansion on the livelihoods of peri-urban farmers

## **CHAPTER THREE**

### **3. Methods and Materials**

#### **3.1.Introduction**

This section describes the research method and material that was used in the research study. These include the study area, research approach, research design, population and sampling frame of the study, sampling technique, sample size determination, data collection method, the process of data analysis techniques, tests of reliability and validity of questionnaire and the ethical consideration. The collected data was analyzed using excel and SPSS software. The research methodology adopted qualitative and quantitative research approach which is for this study; a mixed research approach is the recommended research strategy.

#### **3.2.Study Area**

The study area is peri-urban farmers located in Adama, Boku Shenen sub city, which is the specific area of interest for the research. The study areas were selected based on their proximity to urban centers and the extent of agricultural activities being carried out by peri-urban farmers in Adama, Boku Shenen sub city. The study area was focus on the impact of urban expansion on the livelihood of peri-urban farmers in Adama, Boku Shenen sub city. This may include individuals who have been involved in peri-urban farming, have knowledge of the impact of urban expansion on land use patterns, market opportunities for peri-urban farmers, and have experience in analyzing the challenges faced by peri-urban farmers in adapting to urbanization and potential solutions to help them adapt to urbanization. The research was conducted with peri-urban farmers in Adama, Boku Shenen sub city, agricultural extension officers, local government officials, urban planners, and researchers with expertise in peri-urban agriculture and urbanization in Adama, Boku Shenen sub city. Additionally, stakeholders involved in the agricultural industry, such as market vendors, agricultural cooperatives, and agricultural input suppliers in Adama, Boku Shenen sub city, were also included in the sampling frame. Figure 3.1, as provided below, provides a graphic representation of the research area's spatial description within the context of the Adama, Boku Shenen sub city map.

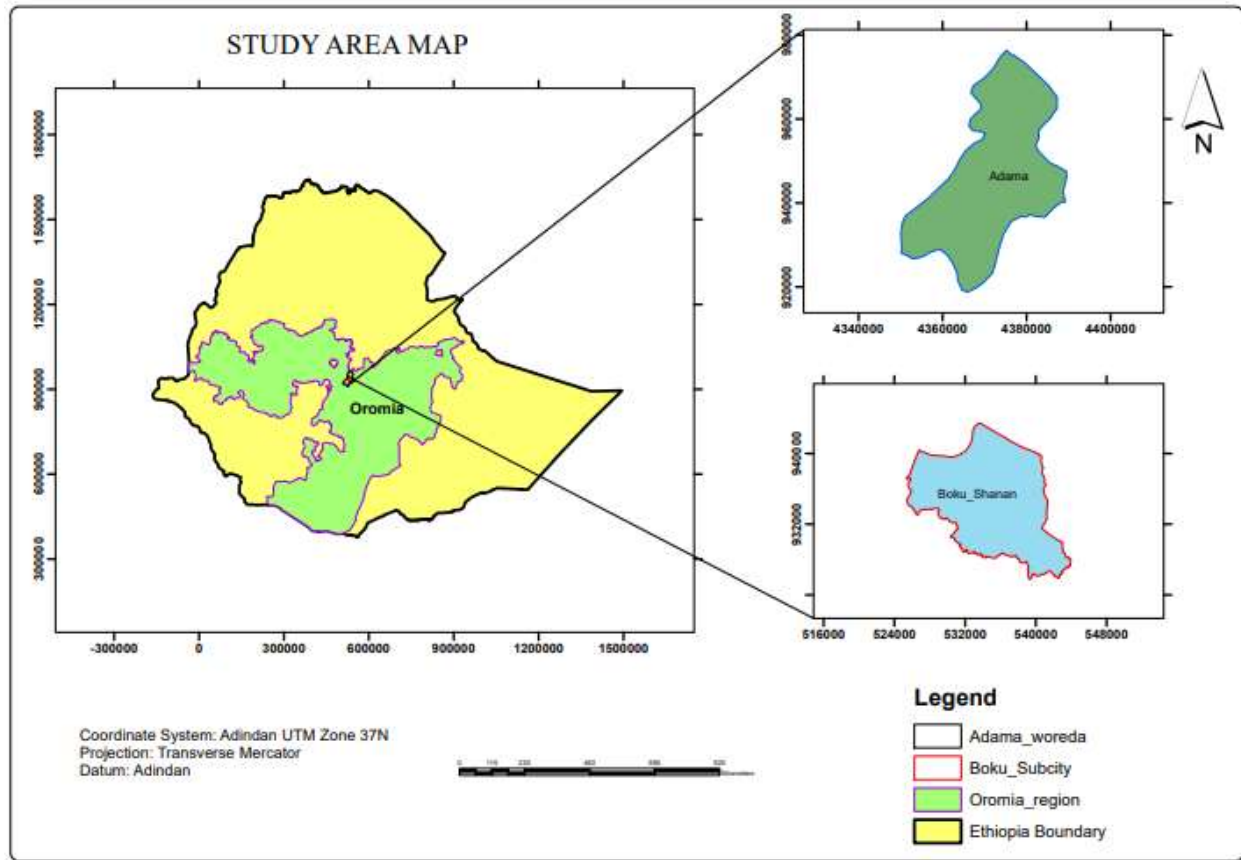


Figure 3. 1: Map of Adama, Boku Shenen sub city

### 3.3. Research design

A research approach is a plan or strategy that guides the entire research process. It outlines how you will collect, analyze, and interpret data to answer your research question(s) (Grover, 2015). This study used a mixed-research approach, which includes both quantitative and qualitative data gathering and analysis methods. This method would enable a thorough understanding of the impact of urban expansion on peri-urban farmers' livelihoods in Adama, Boku Shenen sub-city.

The research design refers to the specific plan or blueprint that a researcher uses to execute their research approach (Schantz & Lindeman, 1982). It involves the selection of research methods, data collection techniques, and data analysis procedures that would use to answer the research questions or hypotheses. The researcher for this study used there are 6 research designs under this approach. These include sequential explanatory research design, sequential exploratory research design, sequential transformative research design, concurrent triangulation research design, concurrent nested research design and concurrent transformative research design.

Sequential explanatory research design involves two phases of data collection and analysis. In the first phase, quantitative data is collected and analyzed to identify patterns or relationships. In the second phase, qualitative data is collected to provide a deeper understanding of the quantitative results. This design helps researchers to explore complex phenomena in more depth.

Sequential exploratory research design, researchers first collect qualitative data to explore a topic or phenomenon in-depth. Based on the findings from the qualitative phase, researchers then design a quantitative study to test hypotheses or generalize findings to a larger population. This design is useful when little is known about a topic and a comprehensive understanding is needed.

Sequential transformative research design aims to bring about social change or transformation through research. It involves a series of iterative cycles of data collection, analysis, and action, with the goal of empowering marginalized communities or addressing social inequalities. This design is often used in participatory action research or community-based research projects.

Concurrent triangulation research design, researchers collect both quantitative and qualitative data concurrently and compare the results to gain a more comprehensive understanding of a research problem. The two types of data are triangulated to validate findings and provide a more robust interpretation of the results. This design is useful for confirming or complementing findings from different data sources.

Concurrent nested research design involves embedding one type of data within another to provide additional insights into a research problem. For example, qualitative data may be nested within quantitative data to provide richer context or explanations for quantitative findings. This design allows for a more nuanced understanding of complex phenomena by integrating different types of data.

Concurrent transformative research design which is similar to sequential transformative research design, this design aims to bring about social change or transformation through research. However, in this design, data collection, analysis, and action occur concurrently rather than in sequential cycles. Researchers work collaboratively with stakeholders to address social issues and create positive change in real-time. This design emphasizes participatory approaches and community engagement in the research process.

### **3.4. Population and Sampling Frame**

The population refers to the entire group of individuals or objects that meet a certain set of criteria and are of interest to the researcher (Majid, 2018). The target populations of the study are peri-urban farmers living on the outskirts of Adama, Boku shenen sub city. This were include farmers who are directly impacted by urban expansion and changes in land use patterns, as well as those who rely on agriculture for their livelihoods and face challenges related to market opportunities and adapting to urbanization. The study were also involve relevant stakeholders such as local government officials, urban planners, and agricultural extension workers who are involved in decision-making processes related to urban expansion and its impact on peri-urban farmers' livelihoods.

A sample frame is a list or representation of the population from which a sample is drawn for the research study. The sampling frame of the study were include a list of peri-urban farmers living on the outskirts of Adama, Boku shenen sub city, as well as relevant stakeholders such as agricultural extension officers, local government officials, urban planners, and researchers with expertise in peri-urban agriculture and urbanization in Adama, Boku shenen sub city. Additionally, stakeholders involved in the agricultural industry, such as market vendors, agricultural cooperatives, and agricultural input suppliers in Adama, were also included in the sampling frame. This are help ensure that the study includes a representative sample of individuals who are directly impacted by urban expansion and changes in land use patterns, as well as those who are involved in decision-making processes related to urban expansion and its impact on peri-urban farmers' livelihoods.

### **3.5. Sampling Technique**

The sampling technique that is used for this study is purposive sampling can select a diverse group of farmers who represent the varied experiences and challenges related to urban expansion on the outskirts of Adama, Boku Shenen sub-city. Purposive sampling allows the researcher to select participants who are most relevant to the study objectives and who can provide valuable insights into the impact of urbanization on peri-urban farmers' livelihoods. In this case, the researcher was purposefully select peri-urban farmers living on the outskirts of Adama, Boku Shenen sub city, as well as relevant stakeholders such as local government officials, urban planners, and agricultural extension workers. This approach would ensures that the study

includes individuals who have direct experience with the impact of urban expansion on peri-urban farming and who are involved in decision-making processes related to urban expansion and its impact on farmers' livelihoods.

### 3.6. Sample size determination

Sample size determination is the process of selecting representative units of peri-urban farming parties for the study in research investigation. It is important to ensure that the sample size is large enough to provide reliable and valid results for the study. The sample size of total sampling frame was drawn to make the required number of respondents (representatives) (Dell et al., 2002). The target population frame for this study is made up of 99,603 peri-urban farmers in total, who are included in the population frame. This method will yield more representative and trustworthy data collection.

Thus, the respondents are regarded as sample representatives in this research work; the sample size of the target population frame is determined using equation 1 (Dillman, 2000):

$$n = \frac{NZ^2Pq}{e^2(N-1) + Z^2Pq} \quad \dots \dots \dots \text{Eq. 1}$$

The target population size (N = 99603), the desired sample size (n), the target population size (N = N), the standard normal deviation (Z) (typically set at 1.96 for a 95% confidence level), the proportion of the target population with a specific characteristic (P = 50% if no estimate is available), q = one minus P, and the acceptable sample error (e) are recorded.

Using equation 1, the sample size of responders can be determined as follows:

$$n = \frac{NZ^2Pq}{e^2(N-1) + Z^2Pq} = \frac{99603(1.96)^2(0.5)(0.5)}{(0.1)^2(99603-1) + (1.96)^2(0.5)(0.5)} = 196$$

Therefore, the sample size is selected 196 respondents.

### 3.7. Data Collection Method

This study was carried out using a variety of data collection techniques. Data, both primary and secondary, has been gathered. The primary data is gathered by the researcher through interviews, and self-administered questionnaires given to the respondents.

In order to obtain information from standard papers, maps, plans, public and unpublished documents, statistical data, and other relevant information gathered from many sources, the researcher gathers secondary data types. In order to obtain information and studies on the effects of urban expansion on the livelihood of peri-urban farmers, a thorough evaluation of the literature must be conducted.

A questionnaire and interview were used as the main tools to collect a primary data from the target respondents. The following data collection techniques have been used:

### **3.7.1. Questionnaires/Surveys**

The researcher was designing and distributing questionnaires to a sample of peri-urban farmers' livelihoods stakeholders, including local government officials, urban planners, agricultural extension workers, and peri-urban farmers in Adama, Boku Shenen sub city. Questionnaires are used to gather quantitative data on specific aspects of the impact of urbanization on peri-urban farmers' livelihoods, such as changes in income levels, access to markets, and land use patterns.

There are two sections to the questionnaire. The questionnaire's initial section collects background information from the respondents. The second part question number-2 of the questionnaire collects data regarding how urban expansion has affected peri-urban farmers' market opportunities and ability to sell their produce; and the third part question number-3 of the questionnaire collects data regarding the difficulties faced by peri-urban farmers in Adama, Boku Shenen sub-city, in adapting to urbanization and maintaining their standard of living.

### **3.7.2. Interview**

In-depth interviews with peri-urban farmer which is in-depth interviews was allow the researchers to gain a deeper understanding of the changes in land use patterns, the impact of urban expansion on market opportunities, and the challenges faced by peri-urban farmers. These interviews were also providing valuable insights into potential solutions and strategies for adaptation. Key informant interviews with relevant stakeholders such as local government officials, urban planners, and agricultural extension workers: Key informant interviews would provide additional perspectives on the impact of urbanization on peri-urban farming and potential solutions and strategies for adaptation.

For the interview 10 total populations were purposively selected key informants: two from local government officials, two from urban planners, two from agricultural extension workers, four from peri-urban farmers to answer question about issue regarding the urban expansion and its impact on peri-urban farmers' livelihoods in Adama, Boku Shenen sub city.

### **3.7.3. Remote sensing technique**

Satellite data obtained from Landsat 4-5 TM and Landsat 8 for the years 1992 and 2022 respectively using USGS-glovis internet browser, reasons for choosing these specific years likely strategic, aiming to capture the significant changes in land use patterns associated with rapid urbanization in the study area. Unsupervised classification, Hybrid classification, Fuzzy classification, we have applied supervised classification technique. Data were pre-processed in GIS for atmosphere correction which is removes distortions caused by atmospheric conditions, increase Landsat images which are often calibrated to have Top-of-Atmosphere (TOA) reflectance, to create band and subset image for Area of interest.

The data collection process using remote sensing technique:

**Image Acquisition:** Acquire satellite imagery, aerial photographs, or LiDAR data covering the peri-urban area of interest.

**Pre-Processing:** By performing these pre-processing steps, the researcher ensuring that the data used for the LULC analysis in your study on the impact of urbanization on farmers is high-quality, accurate, and reliable. This will lead to more robust and meaningful results.

**Land Use Classification:** Use image classification techniques, such as supervised or unsupervised classification, to identify and map different land use types.

**Change Detection:** Compare land use maps from different time periods to identify areas of change.

**Analysis:** Quantify and analyze the changes in land use patterns, including the rate of urban expansion, conversion of different land types, and spatial distribution of changes.

By using a combination of these data collection techniques, the researcher was gather comprehensive and nuanced insights into the impact of urbanization on peri-urban farmers'

livelihoods in Adama, Boku Shenen sub city, and identify potential pathways for adaptation and resilience.

### **3.8.Land Use Land Cove Change Detection**

#### **3.8.1. Remote Sensing Data Acquisition**

Application of remotely sensed data made possible to study the changes in the land cover in less time, at low cost, and with better accuracy in association with GIS that provides suitable platform for data analysis, update and retrieval. The advantage of high spatial resolution satellite imagery and more advanced image processing and GIS technologies, has resulted in updating land use/cover maps.

Data acquisition methods have downloading from data portals which is Access freely available satellite imagery from data portals like USGS Earth Explorer, ESA's Copernicus open access hub, and planet's website. Ordering from commercial providers which are for specific requirements or higher-resolution imagery, consider ordering data from commercial providers like planet, digital globe, or airbus. Using APIs which is some provider's offer application programming interfaces (APIs) for automated data acquisition and processing.

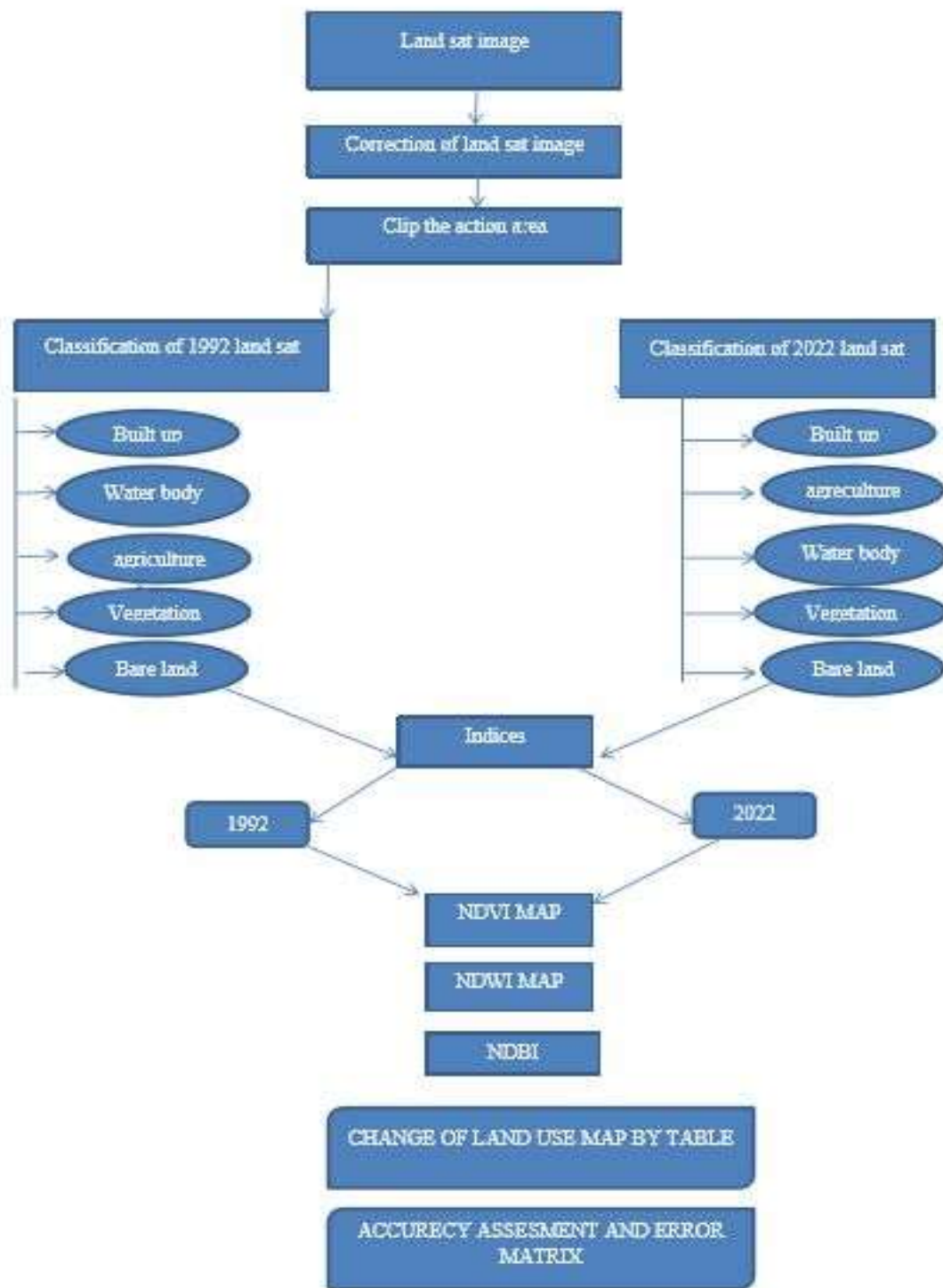


Figure 3. 2: Flow charts of methodology for land use/land cover and change detection

### **3.8.2. Land use and land cover classification**

The terms 'land use' and 'land cover' are sometimes used interchangeably, each has a distinct meaning. Land cover is the bio-physical layer covering the earth surface, while land use represents the human utilization of the land cover. Land cover includes earth's land surface distribution of vegetation, water, desert and ice as well as the biota, soil, topography. Land use is attributed to how humans exploit the land cover to serve their own purposes and includes features such as residential zones, agricultural farms, logging areas etc (Zubair, 2006; Oumer, 2009)

In order to do picture classification, the raw data needs to be appropriately preprocessed and prepared in order to account for errors caused by atmospheric, radiometric, and earth geometry factors. The identification and restoration of problematic lines, geometric rectification or picture registration, radiometric calibration is a crucial step in LULC classification, it's important to consider the specific needs of the study, the quality of the data, and the time and resources available, atmospheric correction, and topographic correction have all been standard procedures in the p-reprocessing stage (Sanghvi et al., 2021).

### **Supervised image classification in this process**

The researcher chooses pixels that show patterns that the researcher is aware of or that the researcher may detect with the use of information from other sources (such as Google Earth). Prior to choosing training samples, the researcher needed to be aware of the available data, the classes they wanted to use, and the techniques that would be employed. The researcher supervised the classification of pixels by assigning a class value and defining priority for these classes (Halefom & Teshome, 2018).

### **3.8.3. Accuracy Assessment**

Accuracy Assessment is a kind of process to compare the classification with ground truth or other data. Reference pixels are points on the classified image. Each point of reference pixels represents specific geographic coordinate of the image. These reference pixels are randomly selected. The randomly selected points within the classified image list two sets of class. The first set of class values represents the actual land cover type. The second set of class values are known as reference values. An error matrix is a square assortment of numbers defined in rows and columns that represent the number of sample units assigned to a particular category relative to

the actual category as confirmed on the ground. The rows in the matrix represent the remote sensing derived land use map, while the columns represent the reference data that will be collect from fieldwork. The error matrix tables produce many statistical measures of thematic accuracy including overall classification accuracy, percentage of omission and commission error and kappa coefficient that estimates in the influence of chance.

### **3.9.Data analysis Method**

For the data analysis techniques, a combination of descriptive analysis and exploration analysis are most suitable for this study. Descriptive analysis was used to quantify and summarize the changes in land use patterns, market opportunities, and challenges faced by peri-urban farmers. This would involve using statistical measures such as mean & standard deviation, and relative importance index to describe the data.

Exploration analysis was used to identify patterns and relationships within the data, such as the impact of urban expansion on farmers' livelihoods and potential solutions to support them. This would involve techniques such as cluster analysis, and factor analysis to explore the complex dynamics of urbanization on peri-urban agriculture. Additionally, narrative analysis was used to complement the quantitative data by providing in-depth insights into the experiences and perspectives of peri-urban farmers through qualitative interviews and focus group discussions. This was help to contextualize the quantitative findings and provide a more comprehensive understanding of the impact of urbanization on farmers' livelihoods.

Frequencies, charts, and percentages were used in a descriptive analysis of the data gathered from the respondent's profile, which is the first section of the questionnaire. The data included the respondent's residential address, sex, age, educational background, marital status, and size of family.

#### **Mean score and Standard deviation technique**

Data collected from the changes in land use patterns in peri-urban areas as a result of urban expansion of the questionnaire is analyzed by mean score technique was used to determine the average of the changes in land use patterns in peri-urban areas as a result of urban expansion in Adama, Boku Shenen sub-city using the following a 5-point likert scale: Strongly Disagree (SD) = 1, Disagree (D) = 2, moderately Agree (MA) = 3, Agree (A) = 4 and Strongly Agree (SA) = 5.

### Relative Importance Index (RII) Technique

The relative influence impacts as a result of urban expansion on market opportunities for peri-urban farmers and their ability to sell their produce in Adama, Boku Shenen sub-city using five likert scale: Very low impact (VLI) = 1, Low impact (LI) = 2, Medium impact (MI) = 3, High impact (HI) = 4 and Very high impact (VHI) = 5 were ascertained by using the relative importance index technique to analyze data collected from the questionnaire on the impact of urban expansion on these opportunities.

The relative importance index technique was utilized to analyze the data collected from the questionnaire regarding the challenges faced by peri-urban farmers in adapting to urbanization and maintaining their livelihoods. Five likert scales: 1 = Very Low Challenge, 2 = Low Challenge, 3 = Moderately Challenge, 4 = High Challenge and 5 = Very High Challenge were used to determine the relative most significant challenges faced by peri-urban farmers in Adama, Boku Shenen sub-city. Equation 2 is employed in the data analysis method using RII to calculate the relative importance index, as indicated below (Joro, 2013):

$$RII = \frac{\sum W_i f_{xi}}{AN} = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{AN} \quad \dots \quad Eq. 2$$

The weight assigned to each response is denoted by the variables  $i = 1, 2, 3, 4$ , and  $5$ . These variables represent the frequency of responses, the total number of responses, the relative importance indices (RII), the highest weight (i.e.,  $5$  in this case), and the number of respondents for each value are represented by the variables  $N$ , value  $5$ , value  $4$ , value  $3$ , value  $2$ , and value  $1$ .

Using data from primary and secondary sources, a descriptive and exploratory analysis of the issue was conducted. Relevant conclusions were then produced using SPSS and Excel software based on the findings.

#### 3.10. Validity and Reliability

Validity and reliability are concepts used to evaluate the quality of research and they indicate how well a method, technique, or test measures something. According to Stilwell & Hoskins (2013), study indicated that the reliability and validity are two main criteria for determining data quality control where validity presumes reliability. Validity refers to accuracy or truthfulness of a study's results, while reliability refers to the consistency or stability of those results over time

and across different situations. Both validity and reliability are important considerations in research design and data analysis.

### **3.10.1. Validity of the research method**

The Validity in the research refers to the degree to which a study accurately measures what it is intended to measure and the validity of the questionnaire data depends in a crucial way on the ability and willingness of the respondents to provide the information requested. The questionnaire employ was adapted from reviewed literatures and similar study instruments and made suit for the existing research environment. Furthermore the questionnaires adapted were pilot test by advisors, professionals from the area and experts to be validated. Overall, the researchers aim to maximize the validity of their studies by using appropriate measures, controlling for confounding variables, and ensuring that their findings would be generalized to other populations or settings.

In this sense, the intended purpose (research question) of the study was accurately and clearly addressed in its design. This was ensured by the measurement instrument's similarity to other urban expansion measurement scales for peri-urban farmers' livelihood, the comprehensive literature reviews of the constructs/concepts identified by the variables in the two parts of the questionnaires, the advisor's review, the comments from university instructors, and the subsequent steps in the process that followed a formal statistical/scientific approach in answering the research questions.

### **3.10.2. Reliability of Questionnaire**

The reliability of a questionnaire refers to its consistency and stability over time. A reliable questionnaire was produce consistent results when administered to the same group of people at different times or when administered by different researchers. To ensure the reliability of a questionnaire, it is important to use standardized questions, clear instructions, and a consistent format. Additionally, pilot testing the questionnaire on a small sample would be help identify any issues with the questions or format before administering it to a larger sample. Overall, a reliable questionnaire is essential for obtaining accurate and trustworthy data for research purposes.

Cronbach's alpha coefficient is a statistical measure that assesses the internal consistency of questionnaire reliability was tested. It indicates how closely related a set of items are as a group,

and how would they measure the same underlying construct. A high Cronbach's alpha coefficient (typically above 0.7) suggests that the questionnaire is reliable and consistent in measuring what it is intended to measure. However, it is important to note that reliability is just one aspect of questionnaire validity, and other factors such as content validity and construct validity were considered.

A test's effectiveness can be determined in part by the information gathered from the respondent profile of the questionnaire reliability, which includes test participants' personal qualities about the test setting and their overall health. Using the purposeful sampling method, the researcher selects the target population based on the competency and dependability of the informant. This is a legitimate worry, particularly in light of the important informants who provide the majority of the data quality.

Information gathered from the ways that urban growth has changed the land use patterns in peri-urban areas, how this has affected the markets available to peri-urban farmers and their capacity to sell their goods, and how difficult it has been for them to adjust to urbanization and preserve their means of subsistence Cronbach's alpha coefficient, which is graded on a five-point Likert scale, is used to test dependability. Cronbach's alpha scores for each construct's elements were used to test the reliability of the data. For Cronbach's alpha to yield a distinct estimate of reliability, only one test administration is necessary.

The range of Cronbach's alpha typically falls between 0 and 1, which is the interpretation of the alpha. They have offered guidelines, as indicated in Table 3.1, for evaluating the validity of any data.

Table 3. 1: Guideline for assessing reliability results

| S. No | Range         | Reliability |
|-------|---------------|-------------|
| 1     | 0.9 and above | Excellent   |
| 2     | 0.7 – 0.9     | High        |
| 3     | 0.5 - 0.7     | Moderate    |
| 4     | 0.5 and below | Low         |

Source: (Perry R. Hinton & Brownlow, 2014)

Reliability Analysis Outcomes which is using a five-point Likert scale, Cronbach analysis was performed to determine the internal consistency of the questions prior to performing an analysis based on the questionnaire responses. As demonstrated below, Table 3.2 displays the Cronbach Alpha test results that demonstrate the reliability of the questionnaire and the reliability test results regarding the changes in land use patterns in peri-urban areas as a result of urban expansion and its impact on farmers' livelihoods, the impact of urban expansion on market opportunities for peri-urban farmers and their ability to sell their produce, and the difficulties faced by peri-urban farmers in Adama, Boku Shenen sub-city in adapting to urbanization and maintaining their livelihoods.

Table 3. 2: Result of Reliability test

| <b>Reliability Statistics</b>                                                                                              | <b>Cronbach's Alpha</b> |
|----------------------------------------------------------------------------------------------------------------------------|-------------------------|
| The changes in land use patterns in peri-urban areas as a result of urban expansion and its impact on farmers' livelihoods | 0.787                   |
| The impact of urban expansion on market opportunities for peri-urban farmers and their ability to sell their produce       | 0.859                   |
| The challenges faced by peri-urban farmers in adapting to urbanization and maintaining their livelihoods                   | 0.919                   |

Source: Own survey data analysis

The result indicates that the 16 items in the changes in land use patterns in peri-urban areas as a result of urban expansion and its impact on farmers' livelihoods in Adama, Boku Shenen sub-city are correlated. There is internal consistency between the items. Since the data collected was based on five Likert-scales; therefore to check reliability of the research Cronbach's Alpha method was used and all the components is high or close to 1. As a matter of fact the overall Cronbach Alpha value for the 16 items is 0.787 which showed high reliability of the data.

The outcome shows a correlation between the 23 components in the effect of urban growth on peri-urban farmers' market possibilities and their capacity to sell their produce in the sub-city of Adama, Boku Shenen. The components are consistent with one another internally. Since the data was gathered using five Likert scales, Cronbach's Alpha was utilized to assess the research's reliability, and every component is at or near 1. In actuality, the 23 items' total Cronbach Alpha value of 0.859 indicates that the data were very reliable.

The findings show a correlation between the 20 items in the list of difficulties peri-urban farmers in Adama, Boku Shenen sub-city have in adjusting to urbanization and sustaining their means of subsistence. The components are consistent with one another internally. Since the data was gathered using five Likert scales, Cronbach's Alpha was utilized to assess the research's reliability, and every component is at or near 1. In actuality, the 20 elements' total Cronbach Alpha value of 0.919 indicates very good data dependability. As a result, the researchers draw the conclusion that the questions and test were trustworthy.

### **3.11. Ethical consideration**

There were several ethical concerns with this study. It is crucial to take ethical considerations like informed consent, confidentiality, and privacy into account while creating and implementing a questionnaire. The rights of the research participants and the manner in which their data was utilized were explained in detail, along with the goal of the study. Furthermore, there was no penalty for research participants who choose to decline participation or leave the study at any time. Additionally, it's critical to safeguard research participants' privacy and confidentiality by employing anonymous or pseudonymous identifiers and securely storing data. Lastly, the researcher made sure that any possible risks or harm to participants did not exceed the potential benefits of the study.

The study guarantees the confidentiality of the data and does not reveal the identity of any participant. Making sure that participants don't suffer from the research's conclusions is another ethical responsibility. It is forbidden for the author to purposefully misreport results that could harm the participants.

## CHAPTER FOUR

### 4. RESULTS AND DISCUSSIONS

#### 4.1. Introduction

The most significant portion of the study is the discussion and outcomes. This topic presents the findings and is organized in accordance with the research purpose. The significant findings were closely related to how Adama, Boku Shenen sub-city's peri-urban farmers fared as a result of urban growth. As a result, the results are presented in this topic together with a discussion of the findings' significance for the goals of the study as stated in the introduction.

Respondents to the survey received 196 questionnaires covering topics such as shifting land use patterns, how urban growth affects market opportunities, obstacles peri-urban farmers in Adama, Boku Shenen sub-city face, and possible solutions and tactics to help them adapt to urbanization and continue to support their families. Only 164 surveys were gathered, and of those, 84% of the replies were useful. Interviews and pertinent documents were also examined. An 84% response rate was comparatively extremely good (Baruch, 1999), given the challenges associated with gathering data from peri-urban farmers. This is displayed in Table 4.1 below.

Table 4. 1: Frequency distribution of sample respondent's rate

| No of distributed questionnaire | No of returned Responses | % of returned Responses |
|---------------------------------|--------------------------|-------------------------|
| 196                             | 164                      | 84%                     |

Source: Own survey data analysis

#### 4.2. Respondent's General Information

Out of the total respondents that have been requested during the survey 58.5 percent and 41.5 percent were male and female respectively. Table 4.2 below demonstrates the percentage of the respondents' sex.

Table 4. 2: Sexes of the Respondents

|       |        | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|--------|-----------|---------|---------------|--------------------|
| Valid | Male   | 96        | 58.5    | 58.5          | 58.5               |
|       | Female | 68        | 41.5    | 41.5          | 100.0              |
|       | Total  | 164       | 100.0   | 100.0         |                    |

Source: Own survey data analysis

From the table 4.2, the majority of the respondents were male. This suggests that both genders participated in the study to a reasonable extent and equality of gender.

To come with the age of the respondents 15.2 percent were less than 30 years old, 56.1 percent were 30 - 60 years. 28.7 percent were above 60 years. This implies that the majority of the respondents were aged 30 - 60 (56.1 percent) and the smallest numbers of the respondents were aged less than 30 (15.2 percent). This shows that majority of the households were in the active age group who feel the problem of urban expansion on the surrounding Environment and this information clearly exposed in the table 4.3 below.

Table 4. 3: Age of the respondents

|       |              | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|--------------|-----------|---------|---------------|--------------------|
| Valid | Less than 30 | 25        | 15.2    | 15.2          | 15.2               |
|       | 30 - 60      | 92        | 56.1    | 56.1          | 71.3               |
|       | More than 60 | 47        | 28.7    | 28.7          | 100.0              |
|       | Total        | 164       | 100.0   | 100.0         |                    |

Source: Own survey data analysis

As one of the cultural necessities of man, education is the most crucial element in fostering holistic development. Additionally, it is essential to raise one's capacity for teamwork, since this might, to some extent, affect the process of urban expansion. The educational backgrounds of the respondents' sample are given in Table 4.4, which is seen below.

Table 4. 4: Respondents Level of qualification/Educational Background

|       |                  | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|------------------|-----------|---------|---------------|--------------------|
| Valid | Illiterate       | 64        | 39.0    | 39.0          | 39.0               |
|       | primary school   | 51        | 31.1    | 31.1          | 70.1               |
|       | secondary school | 33        | 20.1    | 20.1          | 90.2               |
|       | Diploma          | 16        | 9.8     | 9.8           | 100.0              |
|       | Total            | 164       | 100.0   | 100.0         |                    |

Source: Own survey data analysis

With reference to the educational level of the respondents 39.0 percent were illiterate, 31.1 percent were those completed their elementary and intermediate level, 20.1 percent completed

secondary school and 9.8 percent earned certificate and above from Colleges and Universities. This indicates that most of the responds were able to read and write that made for the possible to have an understanding of how urban expansion affected their different environments.

According to the survey result, 66.5% of the target respondents are married whereas the remaining 33.5% are identified as the sum of single, divorced and widowed family. By analyzing the data and conducting further research can gain valuable insights into how marital status interacts with the impact of urbanization on farmers in the study area. Marital statuses of the sample of the respondents have been presented in the following Figure 4.1.

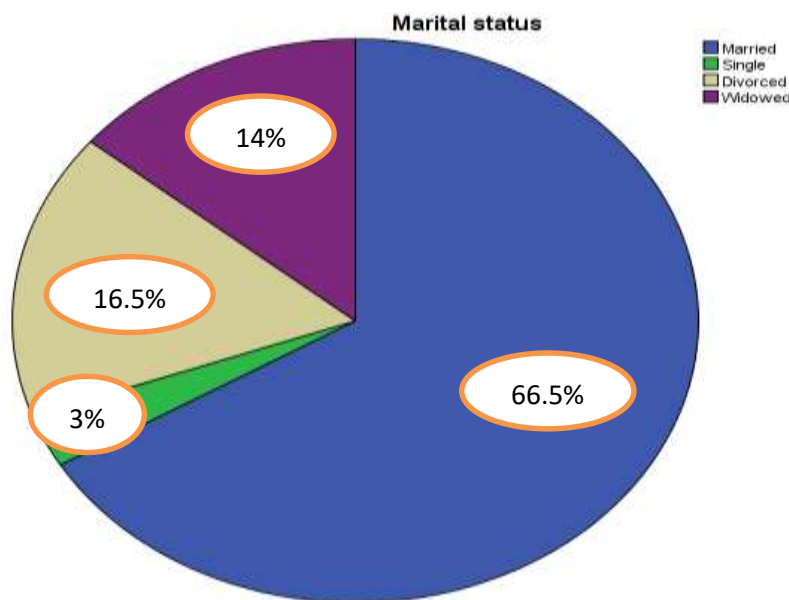


Figure 4. 1: Respondents marital status

**Source:** Own survey data analysis

According to frequency figure 4.2, of all respondents, 46 (28%) have a family size of less than three, 89 (54%) have a family size of between three and seven, and 29 (18%) have a family size of more than seven. The findings of the respondent's family size survey are displayed in figure 4.2 below.

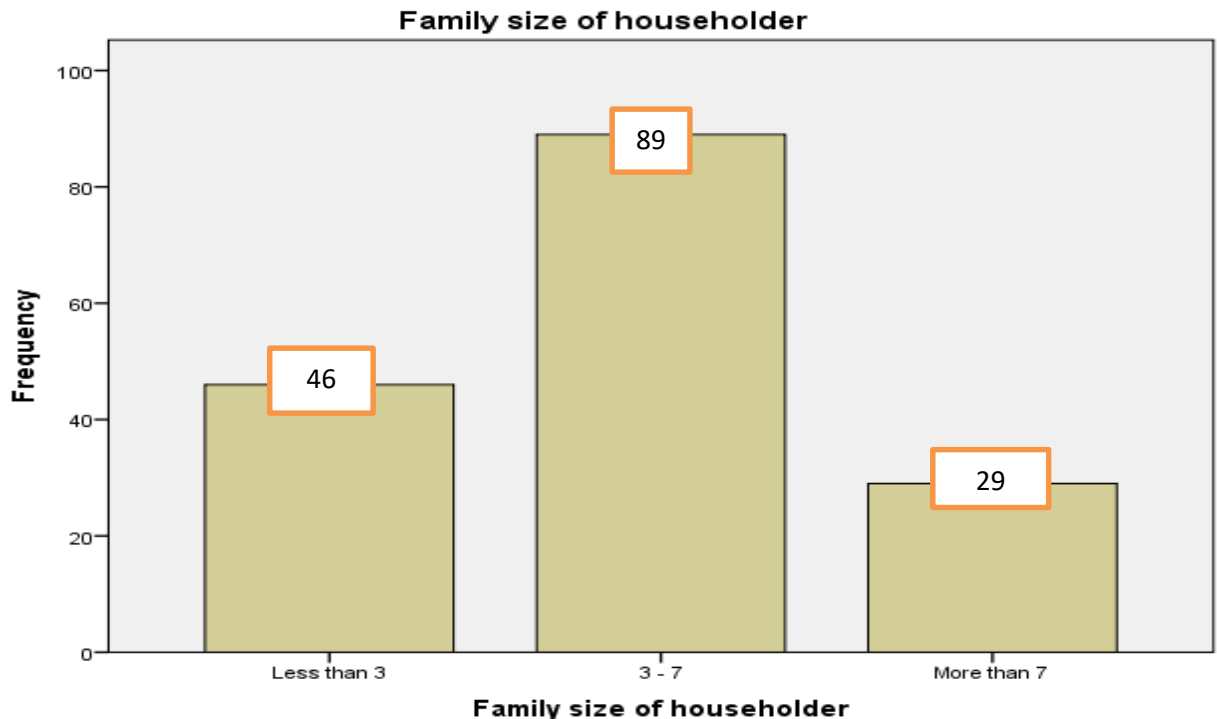


Figure 4. 2: Respondents family size householder

Source: Own survey data analysis

The data shows that more than 54% of the sampled households have a family size of between 3 and 7 persons. By analyzing family size in relation to other factors and exploring its implications for livelihood strategies can gain a more nuanced understanding of how urbanization impacts farming communities in the study area. The impact of high family size on the livelihood of a household in urban settings is an area for further investigation.

### 4.3. Land use Changes patterns Analysis in peri-urban areas of Adama city

#### 4.3.1. GIS Based Land use Changes patterns Analysis in peri-urban areas of Adama city

Assessment of the degree to which each of the selected primary qualities has been realized and the impact that urban growth has had on peri-urban land use patterns. In order to do picture classification, the raw data needs to be appropriately preprocessed and prepared in order to account for errors caused by atmospheric, radiometric, and earth geometry factors. The identification and restoration of problematic lines, geometric rectification or picture registration,

radiometric calibration, atmospheric correction, and topography correction have all been standard procedures at the initial reprocessing stage.

Because of their cost-effectiveness and high temporal resolution, remote sensing and GIS-based change detection methods are frequently employed. Multi-temporal data sets can be used from different dates to discriminate each other and detect the changes. In order to find areas of change, the post classification comparison technique includes classifying images and comparing the relevant classes. The post classification comparison approach obtained the greatest classification accuracy in a comparative analysis of diverse techniques.

A method of post-classification comparison based on the MLC algorithm was used with Land sat data to validate land-use changes in the Adama town. The post-classification comparison was conducted by converting the classified raster images into vector layers. The changes in LULC were calculated for each land cover type and represented in separate images in this investigation for better understanding. The quality of the thematic maps that image categorization produces determines how accurate the results are land use land cover change detected. There are five land use land cover types are identified in the study include built-up land, vegetation, bare land, water body and agriculture.

Table 4. 5: Area coverage of Land covers (hectares) class in Adama 1992

| Class name   | Area (Hector) | Percentage |
|--------------|---------------|------------|
| Built-up     | 2268.981      | 7.2%       |
| Water bodies | 24.29981      | 0.1%       |
| Vegetation   | 7145.843      | 22.8%      |
| Agriculture  | 19706.94      | 63.0%      |
| Bare land    | 2154.199      | 6.9%       |
| Total        | 31300.26      | 100.0%     |

Source: Own GIS data analysis

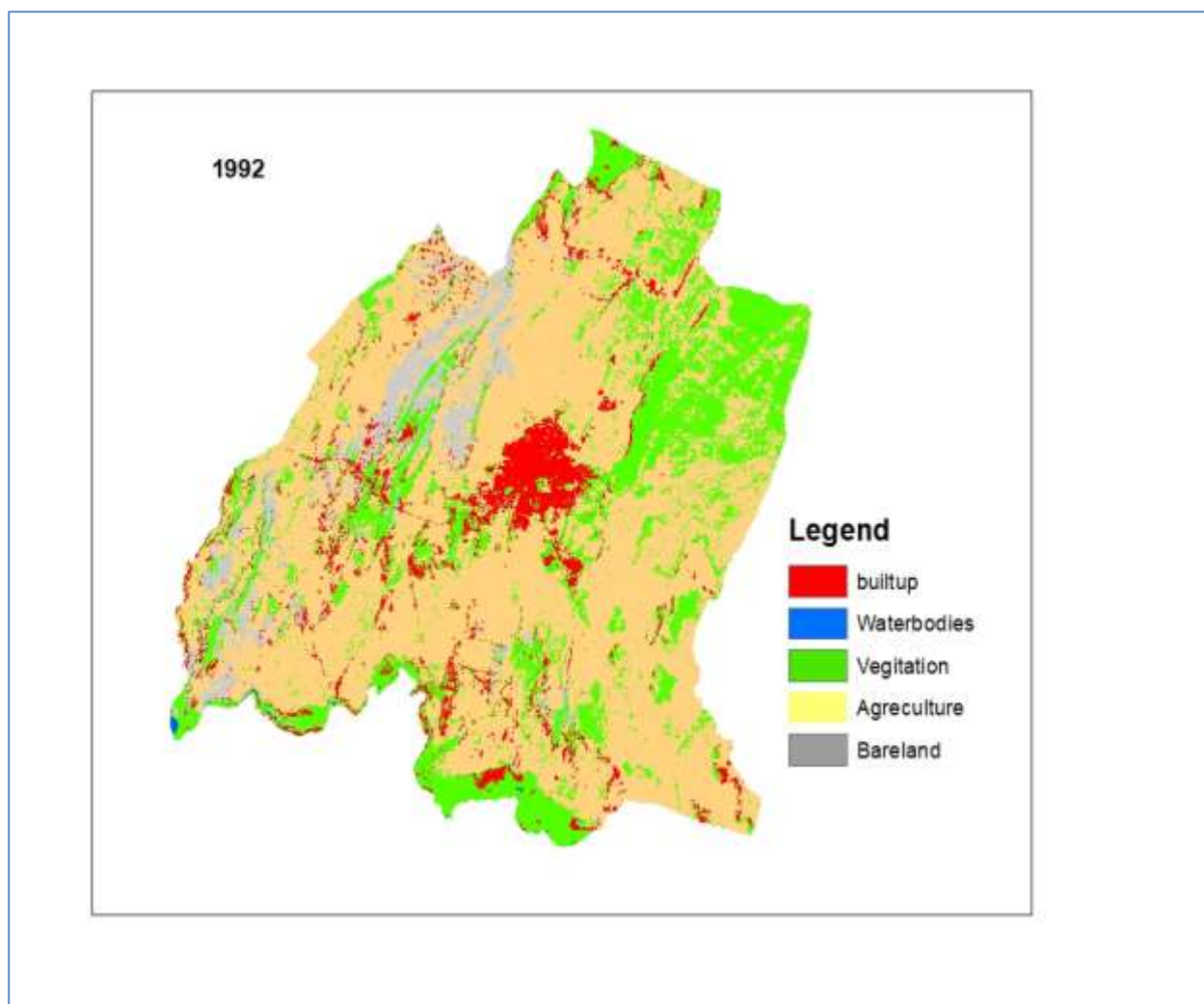


Figure 4. 3: Land cover map of Adama town in 1992

Source: Own GIS data analysis

Table 4. 6: Area coverage of Land covers (hectares) class in Adama 2022

| Class name   | Area (Hector) | Percentage |
|--------------|---------------|------------|
| Built-up     | 8266.13       | 26.4%      |
| Water bodies | 29.13         | 0.1%       |
| Vegetation   | 4090.61       | 13.1%      |
| Agriculture  | 15923.58      | 50.9%      |
| Bare land    | 2988.81       | 9.5%       |
| Total        | 31298.25      | 100.0%     |

Source: Own GIS data analysis

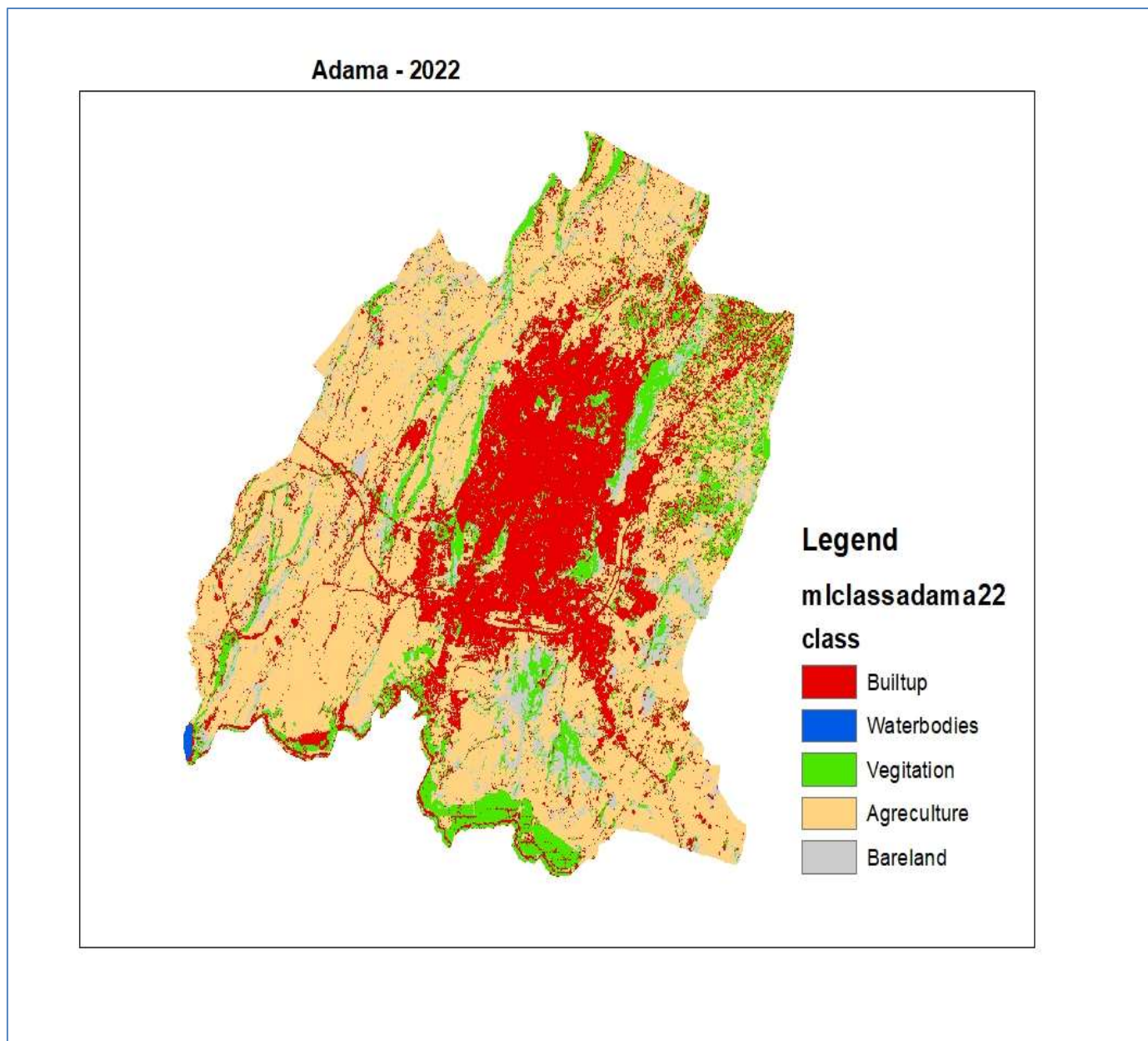


Figure 4. 4: Land cover map of Adama town in 2022

Source: Own GIS data analysis

#### **4.3.1.1. Accuracy assessment**

To evaluate a categorized image or change detection map's accuracy and performance which is a kind of process to compare the classification with ground truth or other data. Reference pixels are points on the classified image. Each point of reference pixels represents specific geographic coordinate of the image., it must be compared to reference data that is taken to be accurate

(Tewabe & Fentahun, 2020). A reference map and the classified map were compared in order to determine the image classification process' accuracy. Consequently, the report on overall accuracy, User accuracy, and Producer accuracy that was examined using the Kappa coefficient must be included in the entire accuracy evaluation. Let C1 is water bodies, C2 is vegetation, C3 is Agriculture, C4 is bare land, C5 is built Up, U (User) is Accuracy and P is (Producer Accuracy)

Table 4. 7: Accuracy assessment and error matrix of land cover of Adama town in 1992

| Objected | Class Value | C1   | C2   | C3   | C4 | C5 | Total | U- Accuracy | Kappa |
|----------|-------------|------|------|------|----|----|-------|-------------|-------|
| 1        | C1          | 8    | 2    | 0    | 0  | 0  | 10    | 0.8         | 0     |
| 2        | C2          | 1    | 8    | 1    | 0  | 0  | 10    | 0.8         | 0     |
| 3        | C3          | 0    | 2    | 17   | 0  | 0  | 19    | 0.89        | 0     |
| 4        | C4          | 0    | 0    | 1    | 9  | 0  | 10    | 0.9         | 0     |
| 5        | C5          | 0    | 0    | 1    | 0  | 9  | 10    | 0.9         | 0     |
| 6        | Total       | 9    | 12   | 20   | 9  | 9  | 59    | 0           | 0     |
| 7        | P Accuracy  | 0.89 | 0.67 | 0.85 | 1  | 1  | 0     | 0.86        | 0     |
| 8        | Kappa       | 0    | 0    | 0    | 0  | 0  | 0     | 0           | 0.83  |

Source: Own GIS data analysis

Overall Accuracy Assessment land cover in 1992 of Adama town is 86.14% with kappa coefficient is 0.83.

Table 4. 8: Accuracy assessment and error matrix of land cover of Adama town in 2022

| Objected | Class Value | C1 | C2 | C3 | C4 | C5 | Total | U- Accuracy | Kappa |
|----------|-------------|----|----|----|----|----|-------|-------------|-------|
| 1        | C1          | 12 | 0  | 0  | 1  | 0  | 13    | 0.92        | 0     |
| 2        | C2          | 0  | 8  | 0  | 1  | 1  | 10    | 0.8         | 0     |
| 3        | C3          | 0  | 0  | 10 | 0  | 0  | 10    | 1           | 0     |
| 4        | C4          | 1  | 0  | 0  | 24 | 0  | 25    | 0.96        | 0     |

|   |            |      |   |      |      |      |    |      |      |
|---|------------|------|---|------|------|------|----|------|------|
| 5 | C5         | 0    | 0 | 1    | 1    | 8    | 10 | 0.8  | 0    |
| 6 | Total      | 13   | 8 | 11   | 27   | 9    | 68 | 0    | 0    |
| 7 | P Accuracy | 0.92 | 1 | 0.91 | 0.89 | 0.89 | 0  | 0.91 | 0    |
| 8 | Kappa      | 0    | 0 | 0    | 0    | 0    | 0  | 0    | 0.88 |

Source: Own GIS data analysis

Overall Accuracy Assessment in 2022 of Adama town is 91.17% with kappa coefficient is 0.88.

#### 4.3.1.2.Land Use Land Cover Change detection from 1992 to 2022 year

The Change Analysis used for the rapid assessment of changes such as gains and losses, net change, persistence and specific transitions both in map and graphical form. The change between 1992 -2022 is calculated using image. Difference (later- earlier) of classified LULC in Adama Town of thirty different years. It contains the computed land use and land cover change detection. Vegetation land and agricultural land mostly decreased in the last two decades by about 9.7% and 12.1% respectively as well as the Water body has remain the same . On the other hand, the buildup area and barren land have increased by 19.2% and 2.7% respectively.

Table 4. 9: Change detection from 1992-2022

| class name  | 1992       |       | 2022       |       | Change     |            |  |
|-------------|------------|-------|------------|-------|------------|------------|--|
|             | Area (hec) | %     | Area (hec) | %     | Area (hec) | Percentage |  |
| Built-up    | 2268.981   | 7.2   | 8266.13    | 26.4  | 5997.15    | 19.2       |  |
| Water       | 24.29981   | 0.1   | 29.13      | 0.1   | 4.83       | 0.0        |  |
| Vegetation  | 7145.843   | 22.8  | 4090.61    | 13.1  | -3055.24   | -9.8       |  |
| Agriculture | 19706.94   | 63.0  | 15923.58   | 50.9  | -3783.36   | -12.1      |  |
| Bare land   | 2154.199   | 6.9   | 2988.81    | 9.5   | 834.61     | 2.7        |  |
| Total       | 31300.26   | 100.0 | 31298.25   | 100.0 | -2.01      | 0.0        |  |

Source: Own GIS data analysis

Change in vegetation land has been shown in the deep green color area describes the decrease vegetation area which is about 9.8%. The non-vegetation land to vegetation land has been described by the lite green color which area is about 2.2%. And the lightest green color area is indicating the vegetation land. Agriculture land turned into vegetation land as authors include all types of grassland and planted garden and shrub land in this class this region has been increased (Seyam et al., 2023).

The changes in the water body are shown in table. It has been calculated that the water body has remain the same in 1992 and 2022, when see by percentage even if there is a little expansion by area coverage. The navy-blue color indicates the unchanged water body 0.1%. Moreover, the wetland is also converted to other land types due to increasing the selling price of the area and despite of decreasing wetland area, in some place wetland area increasing.

The major change that has occurred in this study area is the built up area. It has increased more than any other classes. The Built up area in 1992 was 7.2% which has increased in 2022 was 26.4%. It is really so first and rapid change based on the other classes, it has increased buildup area by 19.2% land changes. Normal yellow indicates the built up area to the buildup area which means the newly developed Built-up area, the light yellow color indicates the built up area. Advanced industrialization requires educated and skilled workforces, which are generally concentrated in city areas for a better quality of life. Which foster the Urbanization process. For those reasons, maybe the buildup area shows the most rapid change in Adama town.

The purpose of the spatial analysis was to characterize the general changes in land use over time as well as patterns of land cover change. In Adama town, the main land cover and use classes were built-up, water, vegetation, agricultural, and residential areas.

Overall accuracy: This accuracy provides the confusion matrix's overall findings. It is computed by dividing the overall confusion matrix pixel count by the total number of accurate pixels (diagonal values). Tewabe & Fentahun (2020) state that an accurate land covers classification must have a minimum accuracy value of 86%.

Confusion matrix comprising overall, user, and producer accuracy was utilized to evaluate the categorization accuracy. When the accuracy of the classification is evaluated using the established Kappa statistics, it is considered complete (Tewabe & Fentahun, 2020).

Overall accuracy: This accuracy provides the confusion matrix's overall findings. It is computed by dividing the overall confusion matrix pixel count by the total number of accurate pixels (diagonal values). Tewabe & Fentahun (2020), state that a minimum accuracy value of 91.17% is required for a dependable land cover classification.

The Kappa statistic is employed to assess the degree of agreement between two sets of dataset categorizations and to calculate the prediction model's accuracy by assessing the degree of agreement between the model and a collection of field survey sample points (Warrens, 2015).

The total accuracy for 1992 was 86.14%, according to the data, while the accuracy for producers and users ranged from 67% to 89% and 80% to 90%, respectively. Based on calculations made using the error matrix, Kappa statistics yielded an 83% classification coefficient for 1992. As a result, the categorization falls within a very good range based on (Warrens, 2015) classification scale.

In general, the findings demonstrated that the overall accuracy for the years 1992 and 2022 was 86.14% and 91.17%, respectively. This result was better than the categorized picture from 1992 and met the minimum accuracy requirement for land cover change (Anderson, 1976). In this study, the accuracy of producers and users spans from 67% to 89% and 80% to 90% in 1992 and 89% to 92% and 80 to 96% in 2022, respectively. In 1992 and 2022, the classification's Kappa coefficient was 83% and 88%, respectively. As a result, in 1992 and 2022, respectively, the classification falls into a very good range and an excellent scale, under (Anderson (1976) classification scale.

The purpose of the spatial analysis was to characterize the general changes in land use over time as well as patterns of land cover change. The main land use and land cover classes were built-up, water, vegetation, agricultural, and residential areas.

The high overall accuracy of 86.14% in 1992 and 91.17% in 2022 indicates that the land cover classification using remote sensing data was successful in discriminating between different land

cover types. This accuracy level meets the minimum accuracy requirement for land cover change analysis as suggested by Anderson (1976).

The producer's and user's accuracies for individual land cover classes ranged from 67% to 89% and 80% to 90% in 1992, and 89% to 92% and 80% to 96% in 2022, respectively. These values indicate that the classification was able to correctly identify most of the pixels belonging to each land cover class, and that the classified land cover map is reliable for representing the actual land cover conditions on the ground.

The Kappa coefficient values of 83% in 1992 and 88% in 2022 fall within the "very good" and "excellent" ranges, respectively, according to the classification scale proposed by Warrens (2015). This further supports the high accuracy and reliability of the land cover classification. Overall, the findings demonstrate that the remote sensing-based land cover classification approach used in this study was effective in producing accurate and reliable land cover maps for both 1992 and 2022. This provides a solid foundation for subsequent analysis of land cover change and its implications for land use planning and environmental management.

#### **4.3.2. Changes in land use patterns in peri-urban areas Based on Field survey/Questioner**

Assessment of changes in land use patterns in peri-urban areas as a result of urban expansion level of achievement for each selected major attributes. By considering the degree to which the land use patterns in peri-urban areas effectively supports each of the attributes. This study is intended to analyzing the changes in land use patterns in peri-urban areas as a result of urban expansion in the alignment of how the changes in land use patterns in peri-urban areas and the approaches for each attribute where contribute providers to investigate the impact of urbanization on the livelihoods of farmers on the outskirts of Adama, Boku Shenen sub-city.

The overview evaluation was done by utilizing mean score strategy and respondents were asked to score which changes in land use patterns in peri-urban areas are considered to be urban expansion in Adama, Boku Shenen sub-city. Ranking of the various changes in land use patterns in peri-urban areas according to their mean value and the interpretation of the mean values, mean is ranked from the highest to the lowest which is rankings of 16 common changes in land use patterns in peri-urban areas as a result of urban expansion as per previous studies and practices

were ranked. This means that all the sixteen variables are considered as the changes in land use patterns in peri-urban areas as a result of urban expansion in Adama, Boku Shenen sub-city. The value analysis carried out on the data mean score is shown in the Table 4.10 as follow.

Table 4. 10: changes in land use patterns in peri-urban areas

| <b>Changes in land use patterns in peri-urban areas</b>                                                                      | <b>N</b> | <b>Mean</b> | <b>Std. Dev.</b> | <b>Rank</b> |
|------------------------------------------------------------------------------------------------------------------------------|----------|-------------|------------------|-------------|
| They have observed a shift from agricultural land to non-agricultural uses due to urban expansion.                           | 164      | 3.57        | 1.028            | 1           |
| The changes in land use patterns have affected farmers' access to agricultural land.                                         | 164      | 3.49        | 1.094            | 2           |
| Farmers have experienced a decline in agricultural productivity due to urban expansion.                                      | 164      | 3.41        | 1.090            | 3           |
| The changes in land use have affected the social and community aspects of peri-urban farming.                                | 164      | 3.37        | 1.168            | 4           |
| The urban expansion has resulted in increased pressure on peri-urban farming resources (water, soil, etc.).                  | 164      | 3.29        | 1.119            | 5           |
| The shift in land use patterns has affected the traditional farming practices of the local community.                        | 164      | 3.27        | 1.162            | 6           |
| The changes in land use patterns have impacted farmers' income and livelihoods.                                              | 164      | 3.24        | 1.178            | 7           |
| The changes in land use patterns have led to increased competition for resources among farmers in peri-urban areas.          | 164      | 3.23        | 1.023            | 8           |
| Farmers have had to change their agricultural practices due to the changing land use patterns in peri-urban areas.           | 164      | 3.20        | 1.172            | 9           |
| The changes in land use patterns have affected the overall quality of life for farmers in peri-urban areas.                  | 164      | 3.18        | 1.135            | 10          |
| Efforts to diversify farming activities have played a role in mitigating the impact of land use changes in peri-urban areas. | 164      | 3.16        | 1.151            | 11          |

|                                                                                                                     |     |      |       |    |
|---------------------------------------------------------------------------------------------------------------------|-----|------|-------|----|
| Farmers have faced challenges in accessing water resources for agricultural activities due to urban expansion.      | 164 | 3.12 | 1.169 | 12 |
| The changes in land use patterns have affected the income opportunities for peri-urban farmers.                     | 164 | 3.09 | 1.155 | 13 |
| Peri-urban farmers have adopted new strategies to cope with the changes in land use patterns.                       | 164 | 3.04 | 1.200 | 14 |
| Urban expansion has led to changes in land use patterns in peri-urban areas.                                        | 164 | 3.02 | 1.226 | 15 |
| The local authorities have sufficient measures in place to support peri-urban farmers affected by land use changes. | 164 | 2.96 | 1.215 | 16 |
| Valid N (list wise)                                                                                                 | 164 |      |       |    |

**Source:** Own survey data analysis

As the results of the study shown above it clear indicates that the dominant changes in land use patterns in peri-urban areas as a result of urban expansion is a shift from agricultural land to non-agricultural uses due to urban expansion with the mean value of 3.57. The changes in land use patterns have affected farmers' access to agricultural land is the second rank with the mean value of 3.49. Farmers have experienced a decline in agricultural productivity due to urban expansion is the third rank with the mean value of 3.41. The fourth rank is changes in land use have affected the social and community aspects of peri-urban farming with the mean value of 3.37. The fifth rank is urban expansion has resulted in increased pressure on peri-urban farming resources (water, soil, etc.) with the mean value of 3.29 and sixth rank is shift in land use patterns has affected the traditional farming practices of the local community with the mean value of 3.27 as well as seventh rank is changes in land use patterns have impacted farmers' income and livelihoods with the mean value of 3.24. These are the top seven relatively most significant changes in land use patterns in peri-urban areas as a result of urban expansion and its impact on farmers' livelihoods in Adama, Boku Shenen sub-city among all the 16 variables.

Discussion and conclusions on changes in land use patterns in peri-urban areas due to urban expansion and their impact on farmers' livelihoods: shift from agricultural to non-agricultural land use which is urban expansion has led to a significant shift in land use patterns in peri-urban areas, with agricultural land being converted to non-agricultural uses such as residential,

commercial, or industrial development. This conversion diminishes the available land for farming activities, altering the landscape and threatening the agricultural sustainability of peri-urban communities.

Impact on farmers' access to agricultural land which is the changes in land use patterns have adversely affected farmers' access to agricultural land in peri-urban areas. As urbanization encroaches upon agricultural spaces, farmers face challenges in securing land tenure, leading to land fragmentation, land tenure insecurity, and reduced opportunities for agricultural expansion or intensification.

Decline in agricultural productivity which is urban expansion has resulted in a decline in agricultural productivity for peri-urban farmers. Loss of fertile agricultural land, environmental degradation, and increased pollution levels diminish the quality of farming resources, leading to decreased yields, lower income levels, and heightened economic vulnerabilities among farmers.

Social and community impacts which are the changes in land use patterns have broader social and community implications for peri-urban farming communities. Traditional social structures, cultural practices, and community cohesion may be disrupted as urban expansion alters the physical and social fabric of peri-urban areas, leading to changes in community dynamics and social interactions among farmers.

Increased pressure on farming resources which is urban expansion exerts increased pressure on peri-urban farming resources such as water, soil, and agricultural inputs. Competition for limited resources with urban sectors, pollution from urban activities, and land degradation exacerbate resource scarcity, posing challenges for farmers in sustaining agricultural production and maintaining their livelihoods.

Impact on traditional farming practices which is the shift in land use patterns has significant implications for the traditional farming practices of the local community in peri-urban areas. Changes in land tenure, reduced agricultural land availability, and shifts in market demand may compel farmers to adapt or abandon traditional farming methods, impacting cultural heritage and local agricultural knowledge systems.

Impact on income and livelihoods which is ultimately, the changes in land use patterns have a direct impact on farmers' income and livelihoods in peri-urban areas. Loss of agricultural land, decreased productivity, and market disruptions contribute to income instability, poverty risks, and reduced overall well-being among peri-urban farming households.

In concluding, the findings highlight the complex interplay between urban expansion and changes in land use patterns, underscoring the multifaceted challenges faced by peri-urban farmers in maintaining their livelihoods. Addressing these challenges requires integrated strategies that promote sustainable land management practices, secure land tenure rights, foster community resilience, and support diversified livelihood opportunities for peri-urban farming communities. By recognizing the socio-economic and environmental impacts of urban expansion on peri-urban agriculture, policymakers, planners, and stakeholders can work towards sustainable development pathways that prioritize the needs and well-being of peri-urban farmers.

Therefore, the findings of the study provide valuable insights into the challenges faced by peri-urban farmers and the need for integrated strategies to support their livelihoods. The improved accuracy of the classification from 1992 to 2022 suggests that there is a growing awareness of the importance of peri-urban agriculture and the need to protect it from the impacts of urban expansion.

**4.4. The Impact of urban expansion on market opportunities for peri-urban farmers**

Each variable's contribution to the overall impacts was evaluated, and the attributes were ranked according to the respondents' perceived criticality. This was done and analyzed using the RII technique, a five-point Likert scale (1 = Very low impact, 2 = Low impact, 3 = Medium impact, 4 = High impact and 5 = Very high impact). The equation was used to compute the rankings of 23 common impacts of urban expansion on peri-urban farmers' market opportunities and ability to sell their produce, based on prior research. The analysis is reported in Tables 4.11, as shown below, and the results indicate that all respondents felt that the impacts of urban growth on market prospects for peri-urban farmers were the largest impact. These impacts were recognized and rated with RII values.

Table 4. 11: The impact of urban expansion on market opportunities for peri-urban farmers

| The impact of urban expansion on market opportunities for peri-urban farmers                                                       | N   | RII   | Rank |
|------------------------------------------------------------------------------------------------------------------------------------|-----|-------|------|
| The government should provide adequate compensation and training.                                                                  | 164 | 0.858 | 1    |
| Reduction of livestock                                                                                                             | 164 | 0.851 | 2    |
| Social bond and network                                                                                                            | 164 | 0.844 | 3    |
| Loss of physical asset of the land                                                                                                 | 164 | 0.841 | 4    |
| Urban expansion has led to a decrease in available market opportunities for peri-urban farmers                                     | 164 | 0.838 | 5    |
| Unemployment                                                                                                                       | 164 | 0.833 | 6    |
| Urban expansion has resulted in increased competition for market access among peri-urban farmers                                   | 164 | 0.825 | 7    |
| Urban expansion has led to changes in consumer preferences and demand for peri-urban farmers' produce                              | 164 | 0.824 | 8    |
| Peri-urban farmers have experienced challenges in accessing markets for selling their produce due to urban expansion               | 164 | 0.823 | 9    |
| Peri-urban farmers perceive a decrease in the profitability of selling produce due to urban expansion                              | 164 | 0.821 | 10   |
| Family disturbance                                                                                                                 | 164 | 0.819 | 11   |
| The ability of peri-urban farmers to sell their produce has been significantly affected by urban expansion                         | 164 | 0.807 | 12   |
| Social capital                                                                                                                     | 164 | 0.804 | 13   |
| The transportation and logistics for selling produce have been negatively affected by urban expansion                              | 164 | 0.803 | 14   |
| Peri-urban farmers have had to adapt their marketing strategies to cope with the impact of urban expansion on market opportunities | 164 | 0.786 | 15   |
| Conflict with neighbors                                                                                                            | 164 | 0.784 | 16   |
| The pricing of agricultural produce from peri-urban areas has been negatively impacted by urban expansion                          | 164 | 0.782 | 17   |
| Peri-urban farmers face heightened competition with urban producers for market space                                               | 164 | 0.775 | 18   |
| Reduction of production and productivity                                                                                           | 164 | 0.769 | 19   |

|                                                                                                                                   |     |       |    |
|-----------------------------------------------------------------------------------------------------------------------------------|-----|-------|----|
| Conflict related to resources competition                                                                                         | 164 | 0.764 | 20 |
| The changes in market opportunities due to urban expansion have negatively impacted the income of peri-urban farmers              | 164 | 0.763 | 21 |
| Peri-urban farmers have had to travel longer distances to access markets for selling their produce as a result of urban expansion | 164 | 0.758 | 22 |
| Peri-urban farmers have effectively adapted to changing market dynamics resulting from urban expansion                            | 164 | 0.756 | 23 |
| Valid N (list wise)                                                                                                               | 164 |       |    |

Source: Own survey data analysis

Therefore, based on the analysis of the responses, it can be concluded that the dominant impacts of urban expansion on peri-urban farmers' market opportunities and their ability to sell their produce in Adama, Boku Shenen sub-city is the government should offer sufficient compensation and training with a RII value of 0.858. The second impacts of urban expansion on market opportunities for peri-urban farmers is the reduction of livestock, with a RII value of 0.851; the third impact is the loss of social bonds and networks, with a RII value of 0.844; the fourth impact is the loss of physical assets of the land, with a RII value of 0.841; the fifth impact of urban expansion on market opportunities for peri-urban farmers is urban expansion has led to a decrease in available market opportunities for peri-urban farmers with RII value of 0.838, the sixth impact of urban expansion on market opportunities for peri-urban farmers is unemployment with RII value of 0.833, the seventh impact of urban expansion on market opportunities for peri-urban farmers are urban expansion has resulted in increased competition for market access among peri-urban farmers, urban expansion has led to changes in consumer preferences and demand for peri-urban farmers' produce and peri-urban farmers have experienced challenges in accessing markets for selling their produce due to urban expansion with RII value of 0.825 as well as the tenth impact of urban expansion on market opportunities for peri-urban farmers is peri-urban farmers perceive a decrease in the profitability of selling produce due to urban expansion with RII value of 0.822 in the process.

Generally speaking, the survey data are analyzed, and the RII technique is used to rank how urban growth affects peri-urban farmers' access to markets and their capacity to sell their produce in Adama, Boku Shenen sub-city. Out of a total of 23 variables, the survey revealed that all

participants generally agree that the top six significant impacts of urban expansion on market prospects for peri-urban farmers are as follows, arranged in descending order of RII:

- Government should provide adequate compensation and training.
- Reduction of livestock.
- Social bond and network.
- Loss of physical asset of the land.
- Urban expansion has led to a decrease in available market opportunities for peri-urban farmers.
- Unemployment.

Discussion and conclusions on the impact of urban expansion on market opportunities for peri-urban farmers and their ability to sell their produce: discuss government intervention for compensation and training which the findings are suggest that government intervention is crucial to address the challenges faced by peri-urban farmers due to urban expansion. Adequate compensation for land acquisition and training programs tailored to farmers needs can help mitigate the adverse effects of displacement and equip farmers with the skills required to adapt to changing market dynamics.

Livestock reduction as a response which is peri-urban farmers may respond to the challenges of urban expansion by reducing their livestock holdings. This adjustment reflects farmers' efforts to adapt to shrinking agricultural land and changing land use patterns, which may limit their ability to maintain traditional farming practices and diversify their income sources.

Importance of social bonds and networks which is the preservation and strengthening of social bonds and networks among peri-urban farmers emerge as critical factors in mitigating the impact of urban expansion on market opportunities. Collaborative efforts, knowledge-sharing, and collective action within farming communities can help farmers navigate challenges, access resources, and explore new market channels.

Loss of physical assets which is the findings highlight the significant loss of physical assets, particularly agricultural land, experienced by peri-urban farmers due to urban expansion. This loss not only diminishes farmers' access to productive land but also erodes their long-term

livelihood security and undermines their ability to generate income through agricultural activities.

Decrease in available market opportunities which is urban expansion has resulted in a decrease in available market opportunities for peri-urban farmers. This decline stems from factors such as land conversion, increased competition from urban-based suppliers, and limited access to urban markets, constraining farmers' ability to sell their produce and sustain their livelihoods.

Impact on employment which is the findings suggests that urban expansion exacerbates unemployment among peri-urban farmers as a result of reduced market opportunities and land availability. The displacement of farmers from agricultural land and the decline in agricultural productivity contribute to livelihood insecurity, posing challenges for farmers to find alternative sources of employment.

In summary, the impact of urban expansion on market opportunities for peri-urban farmers and their ability to sell produce is multifaceted, requiring comprehensive interventions that address land tenure issues, market access barriers, and livelihood diversification strategies. Government support, social cohesion, and sustainable land management practices are essential for mitigating the adverse effects of urban expansion on peri-urban farming communities and fostering their resilience in the face of urbanization challenges.

#### **4.5. The challenges faced by peri-urban farmers in adapting to urbanization and maintaining their livelihoods**

The third objective of the study was to determine the challenges faced by peri-urban farmers in adapting to urbanization and maintaining their livelihoods in Adama, Boku Shenen sub-city. The respondents were asked to indicate the extent to which the different challenges faced by peri-urban farmers in adapting to urbanization. Analysis of the data was done using RII technique a five point likert scale (1 = Very Low Challenge, 2 = Low Challenge, 3 = Moderately Challenge, 4 = High Challenge and 5 = Very High Challenge) to obtaining most significant challenges faced for samples of 164 participants on the 20 variables which, as can be seen below, is how the analysis's findings are displayed in Tables 4.12.

Table 4. 12: The challenges faced by peri-urban farmers in adapting to urbanization

| <b>The challenges faced by peri-urban farmers in adapting to urbanization</b>                                                                 | <b>N</b> | <b>RII</b> | <b>Rank</b> |
|-----------------------------------------------------------------------------------------------------------------------------------------------|----------|------------|-------------|
| Lack of good governance and corruption                                                                                                        | 164      | 0.847      | 1           |
| Improper utilization of compensation by farmers                                                                                               | 164      | 0.846      | 2           |
| Unfair and in-adequate monetary compensation                                                                                                  | 164      | 0.838      | 3           |
| Urbanization has led to increased competition for resources such as labor and agricultural inputs, impacting peri-urban farmers' productivity | 164      | 0.829      | 4           |
| it's for peri-urban farmers to access sufficient land for agriculture                                                                         | 164      | 0.828      | 5           |
| Lack of municipality follow up and support                                                                                                    | 164      | 0.826      | 6           |
| Challenges in dealing with environmental pollution and degradation                                                                            | 164      | 0.825      | 7           |
| The increasing cost of living in peri-urban areas                                                                                             | 164      | 0.822      | 8           |
| Encountering social challenges in maintaining traditional farming practices                                                                   | 164      | 0.821      | 9           |
| Urbanization has increased financial burdens for peri-urban farmers in sustaining their livelihoods                                           | 164      | 0.818      | 10          |
| Lack of skills and knowledge of evicted farmers                                                                                               | 164      | 0.816      | 11          |
| Un-enforceable policy                                                                                                                         | 164      | 0.811      | 12          |
| The evolving community dynamics resulting from urbanization have impacted the support systems available to peri-urban farmers.                | 164      | 0.809      | 13          |
| Peri-urban farmers have experienced difficulties in marketing their produce as a result of urbanization                                       | 164      | 0.808      | 14          |
| Urbanization has led to changes in land use patterns, affecting peri-urban farmers' traditional farming practices                             | 164      | 0.805      | 15          |
| Peri-urban farmers perceive a decrease in the profitability of farming activities due to urbanization                                         | 164      | 0.803      | 16          |
| Peri-urban farmers face challenges in accessing water resources for irrigation due to increasing urbanization                                 | 164      | 0.785      | 17          |
| The expanding urban setting has limited peri-urban farmers' access to necessary agricultural inputs                                           | 164      | 0.779      | 18          |
| Peri-urban farmers have found it challenging to adapt their farming practices to meet the changing demands of urban consumers                 | 164      | 0.755      | 19          |
| Lack of providing information to farmers                                                                                                      | 164      | 0.741      | 20          |

|                     |     |  |  |
|---------------------|-----|--|--|
| Valid N (list wise) | 164 |  |  |
|---------------------|-----|--|--|

**Source:** Own survey data analysis

The following, in chronological order, are the relative challenges that peri-urban farmers in Adama, Boku Shenen sub-city faced in adjusting to urbanization and maintaining their livelihoods, as determined by the RII technique used in Table 4.12 above. Thus, lack of good governance and corruption was the first ranked among 20 challenges faced by peri-urban farmers in adapting to urbanization, with RII value of 0.847, improper utilization of compensation by farmers was the second ranked, with RII value of 0.846, Unfair and in-adequate monetary compensation was the third ranked, with RII value of 0.838, Urbanization has led to increased competition for resources such as labor and agricultural inputs, impacting peri-urban farmers' productivity was the fourth ranked, with RII value of 0.829, peri-urban farmers to access sufficient land for agriculture was the fifth ranked, with RII value of 0.828, Lack of municipality follow up and support was the sixth ranked, with RII value of 0.826, challenges in dealing with environmental pollution and degradation was the seventh ranked, with RII value of 0.825, The increasing cost of living in peri-urban areas was the eighth ranked, with RII value of 0.822 and encountering social challenges in maintaining traditional farming practices was the ninth ranked, with RII value of 0.821 as well as Urbanization has increased financial burdens for peri-urban farmers in sustaining their livelihoods was the tenth ranked, with RII value of 0.818. These are the top ten relatively more significant challenges faced by peri-urban farmers in adapting to urbanization among all the 20 challenges faced by peri-urban farmers in adapting to urbanization and maintaining their livelihoods in Adama, Boku Shenen sub-city.

Discussion and conclusions on challenges faced by peri-urban farmers in adapting to urbanization and maintaining their livelihoods: governance issues and corruption which is the challenges faced by peri-urban farmers are exacerbated by issues such as lack of good governance and corruption. Inefficient governance structures and corrupt practices can lead to unfair land acquisition processes, inadequate compensation, and lack of transparency in decision-making, hindering farmers' ability to adapt to urbanization and protect their livelihoods.

Improper utilization of compensation which is farmers may encounter challenges related to the improper utilization of compensation received for land acquisition. Mismanagement of funds, lack of financial literacy, or inadequate support mechanisms can result in the misallocation of

compensation resources, leaving farmers without the necessary capital to reinvest in alternative livelihood opportunities or sustain their farming operations.

Unfair and inadequate monetary compensation which is issues of unfairness and inadequacy in monetary compensation further compound the challenges faced by peri-urban farmers. Unjust compensation rates, lack of consultation with affected farmers, and disparities in compensation distribution can result in financial hardships for farmers who rely on their land for sustenance and income, undermining their livelihood security.

Competition for resources which is urbanization brings increased competition for resources such as labor and agricultural inputs, impacting peri-urban farmers' productivity. Limited availability of skilled labor, rising input costs, and heightened competition from urban sectors can strain farmers' capacity to maintain efficient farming practices and meet market demands, posing challenges to their economic viability.

A land accessibility challenge which is the expansion of urban areas restricts peri-urban farmers' access to sufficient land for agriculture. Land scarcity, land use changes, and encroachment of urban development's diminish the available arable land for farming activities, limiting farmers' ability to expand their operations, diversify crops, or adopt sustainable farming practices required for livelihood resilience.

Lack of municipality follow-up and support which is peri-urban farmers faces challenges due to the lack of follow-up and support from municipal authorities. Inadequate infrastructure, limited access to extension services, and insufficient policy frameworks tailored to peri-urban agriculture impede farmers' efforts to adapt to urbanization, navigate market challenges, and secure their livelihoods in rapidly changing peri-urban landscapes.

In conclusion, the challenges faced by peri-urban farmers in adapting to urbanization and maintaining their livelihoods demand multi-faceted solutions that address governance issues, compensation fairness, resource competition, land accessibility, and institutional support. Enhancing governance transparency, ensuring fair compensation practices, promoting resource efficiency, securing land tenure rights, and providing tailored support services are vital for empowering peri-urban farmers to navigate urbanization challenges, sustain their livelihoods, and foster resilient agricultural systems in peri-urban regions. Collaborative efforts involving

government, civil society, and local communities are essential to create enabling environments that promote the long-term viability and well-being of peri-urban farmers amidst urban expansion pressures.

#### **4.6. Potential solutions and strategies for peri-urban farmers adapt to urbanization**

Discussion and conclusions on potential solutions and strategies for peri-urban farmers to adapt to urbanization in Adama, Boku Shenen sub-city:

Diversification of agricultural practices which is encouraging peri-urban farmers to diversify their agricultural practices can enhance resilience to urbanization. By growing a variety of crops, raising livestock, and exploring value-added processing, farmers can adapt to changing market demands, mitigate risks, and secure multiple income streams (Barman et al., 2022).

Capacity building and training which is providing relevant training and capacity-building programs tailored to peri-urban farmers can improve their skills and knowledge in sustainable farming practices, financial management, and market access. Empowering farmers with the necessary tools and expertise enables them to navigate urbanization challenges effectively (Tayang et al., 2023).

Market linkages and networking which is facilitating market linkages with urban centers, establishing farmer cooperatives, and fostering networking opportunities can enhance peri-urban farmers' access to markets and promote collective bargaining power. Strengthening market connections helps farmers sell their produce efficiently, negotiate better prices, and expand their market reach (Ma et al., 2024).

Support for sustainable land management which is promoting sustainable land management practices such as agroforestry, organic farming, and soil conservation techniques can help peri-urban farmers safeguard their land, preserve natural resources, and enhance agricultural resilience. Implementing environmentally friendly practices ensures long-term land productivity and sustainability (Vivien, 2023).

Supportive policies and regulations which is implementing supportive policies and regulations that prioritize peri-urban agriculture, land tenure security, access to credit, and agricultural extension services can create an enabling environment for farmers to adapt to urbanization.

Policy interventions should also consider the conservation of peri-urban green spaces and sustainable land use practices (Eshetu et al., 2021).

Community engagement and networking which is encouraging community engagement, farmer cooperatives, and networking initiatives can foster knowledge-sharing, collective action, and solidarity among peri-urban farmers. Strengthening social capital and collaborative efforts can help farmers address common challenges and leverage collective resources for sustainable agriculture practices (Velten et al., 2021).

Technology adoption which is embracing appropriate technologies such as precision agriculture, drip irrigation, and mechanized farming equipment can boost peri-urban farmers' productivity and efficiency. Integrating technological innovations into farming practices enhances production capacity, minimizes resource wastage, and optimizes farm operations in response to urbanization challenges (Pradhan & Sahoo, 2023).

In conclusion, implementing a combination of solutions and strategies tailored to the needs of peri-urban farmers in Adama, Boku Shenen sub-city is essential for their successful adaptation to urbanization. Diversifying agricultural activities, building capacities, establishing market linkages, promoting sustainable land management, advocating for supportive policies, and adopting appropriate technologies are key pillars in empowering peri-urban farmers to thrive amidst urban expansion. By fostering a supportive ecosystem that prioritizes resilience, innovation, and sustainable practices, peri-urban farmers can overcome challenges and secure their livelihoods in the evolving agricultural landscape of Adama, Boku Shenen sub-city.

## CHAPTER FIVE

### 5. CONCLUSIONS AND RECOMMENDATIONS

In this chapter major findings of this study were addressed and recommendations for procuring entities and future research were drawn.

#### 5.1. Conclusion

The overall objective of this research was to investigate the impact of urban expansion on the livelihoods of farmers on the outskirts of Adama, Boku Shenen sub-city. The specific objectives included to examine the changes in land use patterns, to examine the impact, to identify the challenges faced and to explore potential solutions and strategies that can help peri-urban farmers adapt to urbanization and maintain their livelihoods in Adama, Boku Shenen sub-city. In light of this, the conclusion explicitly outlines the key conclusions drawn from the data analysis. As a result, the researcher came to the following conclusion:

The highest changes in land use patterns in peri-urban areas as a result of urban expansion, overall, the findings demonstrate that the remote sensing-based land cover classification approach used in this study was effective in producing accurate and reliable land cover maps for both 1992 and 2022. This provides a solid foundation for subsequent analysis of land cover change and its implications for land use planning and environmental management. The Kappa coefficient values of 83% in 1992 and 88% in 2022 fall within the "very good" and "excellent" ranges, respectively, according to the classification scale proposed. This further supports the high accuracy and reliability of the land cover classification..

The impact of urban expansion on market opportunities for peri-urban farmers and their ability to sell produce is multifaceted, requiring comprehensive interventions that address land tenure issues, market access barriers, and livelihood diversification strategies. Government support, social cohesion, and sustainable land management practices are essential for mitigating the adverse effects of urban expansion on peri-urban farming communities and fostering their resilience in the face of urbanization challenges.

The challenges faced by peri-urban farmers in adapting to urbanization and maintaining their livelihoods demand multi-faceted solutions that address governance issues, compensation fairness, resource competition, land accessibility, and institutional support. Enhancing

governance transparency, ensuring fair compensation practices, promoting resource efficiency, securing land tenure rights, and providing tailored support services are vital for empowering peri-urban farmers to navigate urbanization challenges, sustain their livelihoods, and foster resilient agricultural systems in peri-urban regions. Collaborative efforts involving government, civil society, and local communities are essential to create enabling environments that promote the long-term viability and well-being of peri-urban farmers amidst urban expansion pressures.

Implementing a combination of solutions and strategies tailored to the needs of peri-urban farmers in Adama, Boku Shenen sub-city is essential for their successful adaptation to urbanization. Diversifying agricultural activities, building capacities, establishing market linkages, promoting sustainable land management, advocating for supportive policies, and adopting appropriate technologies are key pillars in empowering peri-urban farmers to thrive amidst urban expansion. By fostering a supportive ecosystem that prioritizes resilience, innovation, and sustainable practices, peri-urban farmers can overcome challenges and secure their livelihoods in the evolving agricultural landscape of Adama, Boku Shenen sub-city.

## **5.2.Recommendation**

Recommendations for effective implementation of potential solutions and strategies for peri-urban farmers to adapt to urbanization outcomes in Adama, Boku Shenen sub-city:

### **Recommendations for Government:**

- Diversification of agricultural practices which is promoting and support the adoption of diversified farming systems, including agroforestry, intercropping, and livestock integration, to enhance resilience and income opportunities for peri-urban farmers.
- Capacity building and training which is providing training and extension services to peri-urban farmers on sustainable agricultural practices, market linkages, and business management skills to improve their productivity and competitiveness.
- Market linkages and networking which is facilitating market linkages between peri-urban farmers and urban consumers through farmers' markets, cooperatives, and other marketing channels.
- Support for sustainable land management which is implement policies and programs to protect and sustainably manage peri-urban land resources, including zoning regulations, land use planning, and soil conservation measures.

- Supportive policies and regulations which is develop and enforce supportive policies and regulations that promote peri-urban agriculture, such as tax incentives for farmers and zoning regulations that allow for agricultural activities in peri-urban areas.
- Community engagement and networking which is foster community engagement and networking among peri-urban farmers to share knowledge, resources, and support.
- Technology adoption which is promotes the adoption of appropriate technologies, such as drip irrigation and greenhouses, to enhance water efficiency and productivity in peri-urban agriculture.

#### **Recommendations for Peri-Urban Farmers:**

- Diversification of agricultural practices which is explores and adopts diversified farming systems to reduce risk and increase income opportunities.
- Capacity building and training which is seek out and participate in training and extension programs to improve agricultural knowledge and skills.
- Market linkages and networking which is join farmers' cooperatives and participate in farmers' markets and other marketing channels to connect with urban consumers.
- Sustainable land management which is adopting sustainable land management practices, such as composting, mulching, and crop rotation, to maintain soil health and productivity.
- Community engagement and networking which is collaborate with other peri-urban farmers to share knowledge, resources, and support.
- Technology adoption which is explores and adopts appropriate technologies that can enhance productivity and efficiency, such as drip irrigation and greenhouses.

By implementing these recommendations, stakeholders in Adama, Boku Shenen sub-city can support peri-urban farmers in adapting to urbanization outcomes and ensuring the continued viability and productivity of peri-urban agriculture.

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## APPENDIX

### Appendix A: Survey Questionnaire



Adama Science and Technology University

School of Civil Engineering and Architecture

Department of Architecture (Specialized in Urban Planning and Design)

Questionnaire Survey for Thesis Paper on the Impact of Urban Expansion on the Livelihood of Peri-Urban Farmers in Ethiopia, Adama Town, Boku Shenan Sub-City

**Dear/Sir;**

In order to fulfill the requirements for the Master of Science degree in the department of architecture with a focus on urban planning and design, data for the research study "the effect of urban expansion on the livelihood of peri-urban farmers in Ethiopia, Adama town, Boku Shenan sub-city" will be gathered using the information provided in this questionnaire. Your prompt comments and sincere professional opinion will therefore be crucial in determining the outcome of this study. Please be aware that any information disclosed will be kept private and that the data you supply will only be utilized for academic purposes. In order to further develop similar initiatives in the future, we humbly ask that you contribute your share by honestly and responsibly completing the questionnaires. I appreciate your cooperation in advance!!!

Please use the following address to get in touch with me if you require any additional clarification:

Meseret Kebede Tola,      Mobile Number: +2519-14-415293 or +2519-11-378589

Email: kirumamgold@gmail.com

#### General Instruction:

- There is no need to write your name or address.
- For questions that have alternatives, mark your answer by typing " ✓ " in the designated space.
- For any additional option or explanation you are kindly requested to write briefly on the space provided.

**Part One: - Overview of the respondents' personal details**

1. Residential address: in Boku Shenen sub-city, Woreda \_\_\_\_\_.
  - a. Aroreti
  - b. Torben obo
  - c. Awash Melka sea
2. Sex:
  - a) Male
  - b) female
3. Age (in year):
  - a) Less than 30
  - b) 30 -60
  - c) More than 60
4. Educational back ground:
  - a) Illiterate
  - b) primary school
  - c) secondary school
  - d) above
5. Marital status:
  - a) Married
  - b) Single
  - c) Divorced
  - d) Widowed
6. Family size of householder:
  - a) Less than 3
  - b) 3 – 7
  - c) More than 7

**Part Two: - The Urban Expansion**

1. To what extent are you agree with the changes in land use patterns in peri-urban areas as a result of urban expansion and its impact on farmers' livelihoods in Adama, Boku Shenen sub-city? Please indicate the changes in land use patterns level by making on the appropriate box using the following a 5-point likert scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Moderately Agree, 4 = Agree and 5 = Strongly Agree.

| <b>The changes in land use patterns in peri-urban areas as a result of urban expansion</b> | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> |
|--------------------------------------------------------------------------------------------|----------|----------|----------|----------|----------|
| Urban expansion has led to changes in land use patterns in peri-urban areas.               |          |          |          |          |          |
| The changes in land use patterns have affected farmers' access to agricultural land.       |          |          |          |          |          |
| Farmers have experienced a decline in agricultural productivity due to urban expansion.    |          |          |          |          |          |
| The changes in land use patterns have impacted farmers' income and livelihoods.            |          |          |          |          |          |
| Farmers have faced challenges in accessing water resources for agricultural                |          |          |          |          |          |

|                                                                                                                              |  |  |  |  |  |
|------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|
| activities due to urban expansion.                                                                                           |  |  |  |  |  |
| The changes in land use patterns have led to increased competition for resources among farmers in peri-urban areas.          |  |  |  |  |  |
| Farmers have had to change their agricultural practices due to the changing land use patterns in peri-urban areas.           |  |  |  |  |  |
| The changes in land use patterns have affected the overall quality of life for farmers in peri-urban areas.                  |  |  |  |  |  |
| The shift in land use patterns has affected the traditional farming practices of the local community.                        |  |  |  |  |  |
| Are you have observed a shift from agricultural land to non-agricultural uses due to urban expansion.                        |  |  |  |  |  |
| The changes in land use patterns have affected the income opportunities for peri-urban farmers.                              |  |  |  |  |  |
| The urban expansion has resulted in increased pressure on peri-urban farming resources (water, soil, etc.).                  |  |  |  |  |  |
| The changes in land use have affected the social and community aspects of peri-urban farming.                                |  |  |  |  |  |
| Peri-urban farmers have adopted new strategies to cope with the changes in land use patterns.                                |  |  |  |  |  |
| The local authorities have sufficient measures in place to support peri-urban farmers affected by land use changes.          |  |  |  |  |  |
| Efforts to diversify farming activities have played a role in mitigating the impact of land use changes in peri-urban areas. |  |  |  |  |  |

2. To what extent are you influence of the following impact of urban expansion on market opportunities for peri-urban farmers and their ability to sell their produce in Adama, Boku Shenen sub-city? Please indicate the influence impact by making on the appropriate box using the following a 5-point likert scale: 1 = Very low impact, 2 = Low impact, 3 = Medium impact, 4 = High impact and 5 = Very high impact.

|                                                                  |          |          |          |          |          |
|------------------------------------------------------------------|----------|----------|----------|----------|----------|
| <b>The impact of urban expansion on market opportunities for</b> | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> |
|------------------------------------------------------------------|----------|----------|----------|----------|----------|

|                                                                                                                                     |  |  |  |  |  |
|-------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|
| <b>peri-urban farmers and their ability to sell their produce</b>                                                                   |  |  |  |  |  |
| Reduction of production and productivity                                                                                            |  |  |  |  |  |
| Loss of physical asset of the land                                                                                                  |  |  |  |  |  |
| Reduction of livestock                                                                                                              |  |  |  |  |  |
| Social capital                                                                                                                      |  |  |  |  |  |
| Social bond and network                                                                                                             |  |  |  |  |  |
| Unemployment                                                                                                                        |  |  |  |  |  |
| Conflict related to resources competition                                                                                           |  |  |  |  |  |
| Family disturbance                                                                                                                  |  |  |  |  |  |
| Conflict with neighbors                                                                                                             |  |  |  |  |  |
| Urban expansion has led to a decrease in available market opportunities for peri-urban farmers.                                     |  |  |  |  |  |
| Peri-urban farmers have experienced challenges in accessing markets for selling their produce due to urban expansion.               |  |  |  |  |  |
| Urban expansion has resulted in increased competition for market access among peri-urban farmers.                                   |  |  |  |  |  |
| Peri-urban farmers have had to travel longer distances to access markets for selling their produce as a result of urban expansion.  |  |  |  |  |  |
| The changes in market opportunities due to urban expansion have negatively impacted the income of peri-urban farmers.               |  |  |  |  |  |
| Urban expansion has led to changes in consumer preferences and demand for peri-urban farmers' produce.                              |  |  |  |  |  |
| Peri-urban farmers have had to adapt their marketing strategies to cope with the impact of urban expansion on market opportunities. |  |  |  |  |  |
| The ability of peri-urban farmers to sell their produce has been significantly affected by urban expansion.                         |  |  |  |  |  |
| Peri-urban farmers face heightened competition with urban producers for market space.                                               |  |  |  |  |  |
| The transportation and logistics for selling produce have been negatively affected by urban expansion.                              |  |  |  |  |  |

|                                                                                                            |  |  |  |  |  |
|------------------------------------------------------------------------------------------------------------|--|--|--|--|--|
| Peri-urban farmers perceive a decrease in the profitability of selling produce due to urban expansion.     |  |  |  |  |  |
| The pricing of agricultural produce from peri-urban areas has been negatively impacted by urban expansion. |  |  |  |  |  |
| Peri-urban farmers have effectively adapted to changing market dynamics resulting from urban expansion.    |  |  |  |  |  |
| The government should provide adequate compensation and training.                                          |  |  |  |  |  |

3. To what extent are you agree with the challenges faced by peri-urban farmers in adapting to urbanization and maintaining their livelihoods in Adama, Boku Shenen sub-city? Please indicate the challenges faced level by making on the appropriate box using the following a 5-point likert scale: 1 = Very Low Challenge, 2 = Low Challenge, 3 = Moderately Challenge, 4 = High Challenge and 5 = Very High Challenge.

| <b>The challenges faced by peri-urban farmers in adapting to urbanization and maintaining their livelihoods</b>                                | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> |
|------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|----------|----------|----------|
| The expansion of urban areas has made it difficult for peri-urban farmers to access sufficient land for agriculture.                           |          |          |          |          |          |
| Peri-urban farmers face challenges in accessing water resources for irrigation due to increasing urbanization.                                 |          |          |          |          |          |
| Urbanization has led to increased competition for resources such as labor and agricultural inputs, impacting peri-urban farmers' productivity. |          |          |          |          |          |
| Peri-urban farmers have experienced difficulties in marketing their produce as a result of urbanization.                                       |          |          |          |          |          |
| Urbanization has led to changes in land use patterns, affecting peri-urban farmers' traditional farming practices.                             |          |          |          |          |          |
| Peri-urban farmers have faced challenges in dealing with environmental pollution and degradation caused by urbanization.                       |          |          |          |          |          |
| The increasing cost of living in peri-urban areas due to urbanization                                                                          |          |          |          |          |          |

|                                                                                                                                  |  |  |  |  |  |
|----------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|
| has impacted the economic stability of peri-urban farmers.                                                                       |  |  |  |  |  |
| Peri-urban farmers have found it challenging to adapt their farming practices to meet the changing demands of urban consumers.   |  |  |  |  |  |
| Peri-urban farmers perceive a decrease in the profitability of farming activities due to urbanization.                           |  |  |  |  |  |
| The expanding urban setting has limited peri-urban farmers' access to necessary agricultural inputs.                             |  |  |  |  |  |
| Urbanization has increased financial burdens for peri-urban farmers in sustaining their livelihoods.                             |  |  |  |  |  |
| Peri-urban farmers are encountering social challenges in maintaining their traditional farming practices amidst urban expansion. |  |  |  |  |  |
| The evolving community dynamics resulting from urbanization have impacted the support systems available to peri-urban farmers.   |  |  |  |  |  |
| Lack of skills and knowledge of evicted farmers                                                                                  |  |  |  |  |  |
| Lack of good governance and corruption                                                                                           |  |  |  |  |  |
| Improper utilization of compensation by farmers                                                                                  |  |  |  |  |  |
| Unfair and in-adequate monetary compensation                                                                                     |  |  |  |  |  |
| Lack of municipality follow up and support                                                                                       |  |  |  |  |  |
| Lack of providing information to farmers                                                                                         |  |  |  |  |  |
| Un-enforceable policy                                                                                                            |  |  |  |  |  |

## **Appendix B: Interviews questionnaires**

1. How has land use patterns changed in the peri-urban areas of Adama, Boku Shenan sub-city in recent years?
2. What are the main drivers of these changes?
3. How have these changes impacted the livelihoods of peri-urban farmers?
4. What are the specific challenges that peri-urban farmers face as a result of these land use changes?
5. How has urban expansion affected market opportunities for peri-urban farmers?
6. What are the challenges that peri-urban farmers face in selling their produce in urban markets?
7. Are there any specific market opportunities that have emerged as a result of urban expansion?
8. How can peri-urban farmers be better connected to urban markets?
9. What are the main challenges that peri-urban farmers face in adapting to urbanization?
10. How do these challenges affect their livelihoods?
11. What potential solutions and strategies could help peri-urban farmers adapt to urbanization and maintain their livelihoods?
12. What are the specific benefits and challenges of each potential solution or strategy?