

**ASSESSING THE EFFECT OF URBAN GROWTH AND LAND USE/ COVER
CHANGE ON THE LIVELIHOODS OF SMALLHOLDER FARMERS IN JINJA
DISTRICT, UGANDA**

BY

**WANDYAKA RICHARD
18/U/GMAG/19859/PD**

**A DISSERTATION SUBMITTED TO THE DIRECTORATE OF RESEARCH AND
GRADUATE TRAINING IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE AWARD OF THE DEGREE
OF MASTER OF ARTS (GEOGRAPHY) OF
KYAMBOGO UNIVERSITY**

APRIL, 2025

DECLARATION

I, **WANDYAKA RICHARD** declare that this dissertation report titled “***ASSESSING THE EFFECT OF URBAN GROWTH AND LAND USE/ COVER CHANGE ON THE LIVELIHOODS OF SMALLHOLDER FARMERS IN JINJA DISTRICT, UGANDA***” is my original work and has never been submitted or presented to any university or institution of higher learning.

Signed.....

Date.....

Wandyaka Richard

18/U/GMAG/19859/PD

APPROVAL

We the undersigned certify that this dissertation entitled “***ASSESSING THE EFFECT OF URBAN GROWTH AND LAND USE/ COVER CHANGE ON THE LIVELIHOODS OF SMALLHOLDER FARMERS IN JINJA DISTRICT, UGANDA***” has been compiled under our guidance and supervision. It is now ready for submission to the Directorate of Research and Graduate Training with our approval.

Signed..... Date.....

LOY TURYABANAWE GUMISIRIZA (PhD)

Signed..... Date.....

GEOFREY GABIRI (PhD)

DEDICATION

I dedicate this book to my family for the tremendous encouragement towards the completion of my course. Special thanks go to my wife for being so supporting in this study amidst the meager resources and financial constraints during my study.

ACKNOWLEDGEMENT

The Almighty God took lead in the entire journey of this course, I honorably acknowledge his grace and Mercy granted to me to complete this course.

With honor and respect, I acknowledge the efforts of my supervisors Dr. Turyabanawe Loy Gumisiriza and Dr. Gabiri Geoffrey. You're such an awesome team with high integrity.

To my course mates, I humbly appreciate for the support

And lastly special thanks go to my parents, I cannot undermine the great work you have done since I was born, thank you for the great support you have always rendered to me. Your tireless efforts and support has enable me achieve the best and become the person I am. May the Almighty reward you abundantly and grant life to reap the fruits of your son's academic sweat.

TABLE OF CONTENTS

DECLARATION.....	i
APPROVAL	ii
DEDICATION.....	iii
ACKNOWLEDGEMENT.....	iv
LIST OF TABLES	x
LIST OF FIGURES	xi
ACRONYMS	xii
DEFINITION OF OPERATIONAL TERMS.....	xiii
ABSTRACT	xiv
CHAPTER ONE	1
INTRODUCTION.....	1
1.1 Study back ground.....	1
1.2 Problem Statement	6
1.3 Objectives of the study	7
1.3.1 General objective of the study	7
1.3.2 Specific objectives.....	7
1.4 Research Questions	7
1.5 Justification of the study	7
1.6 Significance of Study	8
1.7 Scope of the Study.....	9
1.8 Conceptual Frame Work	9
CHAPTER TWO	11
LITERATURE REVIEW	11
2.1 Urban growth.....	11

2.2 Factors that Underlie Urban Growth and land use/cover change.....	12
2.3 Effects of urban growth on land use/ cover change	15
2.4 The effect of urban growth and land use/cover change on livelihoods of the smallholder farmers.	16
2.5 Coping strategies to the effects of urban growth on land use/cover change and livelihoods of the smallholder farmers.	19
CHAPTER THREE	21
METHODOLOGY	21
3.1 Introduction	21
3.2 Study Area.....	21
3.2.1 Location.....	21
3.2.2 Climate.....	22
3.2.3 Topography	22
3.2.4 Geology and Soils	23
3.2.5 Vegetation	23
3.3 Research design.....	23
3.4 Population under study.....	24
3.5 Sample Size	24
3.6 Sampling Technique.....	25
3.7 Data sources	25
3.8 Data Collection Methods.....	25
3.8.1 Spatio - temporal pattern	26
3.8.2 Data collection instruments.....	27
3.9 Data analysis	27
3.9.1 Spatio - temporal pattern	27

3.9.2. Effect of urban growth on land use/cover and livelihoods of smallholder famers.....	28
3.9.3 Coping mechanisms of smallholder farmers	28
CHAPTER FOUR.....	29
PRESENTATION OF RESULTS	29
4.1 Introduction	29
4.1.1 Spatio-temporal pattern and extent of land use/cover change in Jinja district.....	29
4.1.2 Urban growth Extent and land use/cover change in Jinja district	31
4.2 Effect of Urban growth on land use/cover change and livelihoods of the smallholder farmers in Jinja district.....	32
4.2.1 Socio – demographic data	32
4.2.2 Effect of land use/cover change on livelihoods of smallholder farmers	35
4.2.3 Urban growth and land use/cover change affecting livelihood. 35	
4.2.4 Effect of urban growth and land use/cover change on the livelihoods of smallholder farmers in Jinja district.....	36
4.2.5 Urban growth and land use/cover change and its effect on smallholder farmers’ food production	37
4.2.6 Effect of urban growth and land use/cover change on ecology in Jinja district.....	37
4.2.7 Opportunities brought about by urban growth and land use/cover change in Jinja district	38

4.2.8 Most pronounced urban growth and land use/cover change opportunities in Jinja district.....	39
4.3 The coping mechanisms of smallholder farmers to the effects of urban growth and land use/cover changes in Jinja district.	41
4.3.1 Existence of farm and non-farm livelihood strategies existed in Jinja district.....	41
4.3.2 Coping strategies of smallholder farmers to the effects of urban growth and land use/cover change in Jinja district	42
4.3.3 Strategies under taken by smallholder farmers to improve on their livelihood in Jinja district	43
4.3.4 Most witnessed livelihood outcome in Jinja district	43
CHAPTER FIVE	45
DISCUSSIONS.....	45
5.1 Introduction	45
5.2 Discussion of finding	45
5.2.1 Spatio-temporal Pattern and extent of Urban Growth on land use/cover change in Jinja district	45
5.2.2 Effect of urban growth and land use/cover change on the Livelihood of smallholder farmers in Jinja district.....	47
5.2.3 Coping mechanisms of smallholder farmers to the effects of urban growth and land use/cover change in Jinja district.	50
CHAPTER SIX	52
CONCLUSION AND RECOMMENDATIONS.....	52
6.1 Introduction	52
6.2 Summary and Conclusion of findings.....	52

6.3 Recommendations	53
REFERENCES.....	54
APPENDICES.....	59
Appendix 1: Questionnaire.....	59
Appendix 2: Self-Administered questionnaire for urban planners and agricultural extension workers.....	66

LIST OF TABLES

Table 3. 1: Sample Size and sampling procedure.....	25
Table 3. 2: Land Use/cover and their description.....	27
Table 4. 1: Extent of land use/cover change in Jinja District	30
Table 4. 2: Urban growth extent between the year 2002, and 2022 in Jinja district	32
Table 4. 3: Socio – demographic data.....	33
Table 4. 4: Effect of urban growth and land use/cover change on the livelihoods of smallholder farmers	36
Table 4. 5: Urban growth and land use/cover change and their effect on smallholder farmers’ food production in Jinja district.....	37
Table 4. 6: Effect of urban growth and land use/cover change on ecology.....	38
Table 4. 7: Most pronounced urban growth and land use/cover change opportunities in Jinja district	39
Table 4. 8: Correlation coefficients	40
Table 4. 9: Strategies under taken by smallholder farmers to improve on their livelihood	43
Table 4. 10: The most witnessed livelihood outcome in Jinja district.....	44

LIST OF FIGURES

Figure 1. 1: Conceptual Frame work	10
Figure 3. 1: Location of the study area	22
Figure 4. 1: Spatio-temporal patterns of urban growth and land use/cover change in Jinja district	29
Figure 4. 2: Urban growth extent and land use/cover change in Jinja district.....	31
Figure 4. 3: Urban growth and land use/cover change on livelihoods	35
Figure 4. 4: Opportunities brought by urban growth and land use/cover change.....	39
Figure 4. 5: Existence of farm and non-farm livelihood strategies in Jinja district.....	41
Figure 4. 6: Smallholder farmers coping strategies to the effects of urban growth and land use/cover change	42

ACRONYMS

FAO	Food and Agriculture Organization of United Nations
GOU	Government of Uganda
GIS	Geographical Information Systems
LULC	Land Use/Land Cover
MSE	Micro-Soft Excel
MDG	Millennium Development Goal
MoFPED	Ministry of Finance Economic Planning and Development
NGO	Non-Government Organization
RS	Remote Sensing
SMDGs	Sustainable Millennium Development Goals
SSA	Sub Saharan Africa
UBOS	Uganda Bureau of Statistics
UN	United Nations

DEFINITION OF OPERATIONAL TERMS

Smallholder farmers: A community of both tenured, seasoned, experienced farmers who have lived through both the pains and abundant yields that come with farming, as well younger, newer farmers who bring with them more modern perspectives and have less than two acres of farming land and less than ten heads of animals (FAO) Uganda.

Livelihoods: The adequate stock and flow of food and cash with an individual or a family to meet its basic needs (Kabila, et al., 2019). The study livelihood specifically looked at food security, ecology loss and income of the smallholder farmers.

Multiple portfolios: A combination of livelihood activities taken up by households as a way of living to cope with the new changing realities in an urban setting combining both farm and non-farm livelihoods (Adjei et al., (2019).

Coping mechanisms: These are patterns and behaviours people use to deal with unusually stressful situations (Günerale, 2017).

Urban growth According to the study this refers to increase in the proportion of people living in urban areas and the physical expansion of already existing urban centers (Samson, 2009).

Land cover: These are the physical conditions, attributes, composition and characteristics of the earth's surface (Mitsch and Gosselink, 2015).

Land use: This composes the human activities that are set up on the earth's surface (Mertz, 2017).

ABSTRACT

The increasing characteristically unplanned and unregulated urban expansion of Jinja district has highly resulted into conversion of land use/cover into built up areas (urban growth). This change of land use/covers such as farmlands, wetlands, forests, open water and many others into built-up areas is affecting the livelihoods of smallholder farmers who depend on the small piece of arable land for crop/animal production. This study assessed the effect of urban growth on land use/cover change and the livelihoods of smallholder farmers in Jinja district. Specifically, the objectives were (i) to determine the extent and spatio-temporal pattern of urban growth and land use/cover changes in Jinja district between the period of 2002 and 2022; (ii) to determine the effects of urban growth on land use/cover change and smallholder farmer's livelihoods in Jinja district and (iii) to assess the existing coping mechanisms of smallholder farmers to the effects of urban growth and land use/cover change in Jinja district. Remote sensing and GIS were used to determine the extent and Spatio temporal patterns of land use/cover change for the last 30 years (2002 -2022). Cross sectional research design was adopted to explore the effects of urban growth on land cover change and the livelihood of smallholder farmers and their coping mechanisms to the effects. A total of 276 respondents were surveyed, which included; Planner 1, Heads of department 10, Agriculture extension workers 15, these were purposively sampled. The Multiple income earners 118 and urban farmers 132 these were randomly sampled. The results show that built-up area (urban growth) has significantly increased by 10% for the period 2002-2012 and 20% for the period 2012-2022. Farmlands decreased by 3.6%, (i.e. from 27.2% in 2002 to 23.6% in 2022), woodlands significantly decreased from 13.9% in 2002, to 8.9% in 2012, and 2.9% in 2022. Results revealed that there several effects as result of urban growth like loss of vegetation, food shortage, pollution, loss of wetlands. Results revealed that smallholder farmers in Jinja district have adapted to a range of coping mechanisms like back yard farming, water harvesting, crop diversification as a way of responding to an experienced impact of urban growth to reduce the effects/ shocks and changes on their livelihood. The study recommended the ministry of Urban Development to set up policies to consider residents in cities to have skills and knowledge on other income generating activities besides farming which is greatly affected by urban growth and land use/cover change as a way to sustain their livelihoods.

CHAPTER ONE

INTRODUCTION

1.1 Study back ground

Urban growth is the mass movement of populations from rural to urban settings leading to physical changes of urban land use/cover. According to Samson, (2009), urban growth refers to increase in the proportion of people living in urban areas and the physical expansion of already existing urban centers. It also denotes expansion of urban land uses and spatial concentration of people working in non-agricultural activities (Alaci, 2010). Urban expansion is the outcome of the socio-economic and political developments that have led to urban concentration and changes in land use/cover of the area (Samson, 2009). In 2019, the United Nations estimated that half of the world's population (4.2 billion) now lives in urban areas and by 2041 they will increase to 6 billion people (Tania, 2014). It is predicted that by year 2030, the number of District dwellers world over will reach 60%, this urban population growth will be most significant in developing countries, notable in Africa and Asia (United Nations report, 2018). The urban areas cover a very small percentage of the World's land cover; their rapid growth has greatly changed the physical land use/cover of many parts of the world (sun et al, 2013). They have created socio-economic, ecosystem and environmental impacts. The urban growth and land use/cover change represents the economic and cultural activities for example agricultural, residential, industrial, mining, and recreational uses that are practiced at a given place (Herzog, 2014). Throughout human history urban growth and land use/cover change has played an important role in changing the agricultural livelihoods of smallholder farmers in cities (Zhang, 2019). These urban centers have been Centers of setting up major economic, social and political transformations more so the agricultural society (sun et al., 2013). Urban areas are the Centre and heart of advancement in technology as well economic growth of different countries (Walf and Wu, 2010). This is why many countries and regions are taking it as an intervention for development (Kuddus et al, 2022).

Despite all the above, the world is losing nature due to increasing population of the world deciding to settle urban areas as the population requires more habitat places to live and protect themselves from the various factors of environment (Zhang, 2019). This has led to destruction of natural resources and altering land use/covers (Habibi and Asadi, 2011). Urban growth involves the loss of rural land at the periphery of the District and consumes immeasurable acres

of forests, farmlands, woodlands, and wetlands hence affecting the livelihoods more the farming communities. The growth leads to increase in impermeable surfaces which affect other types of land use/covers (Francesca, 2022). The change in land use/cover triggers a series of effects on the environment which results in various effects of the human lives and the agricultural livelihoods of smallholder farmers (Kuddus et al., 2020). The population concentration and economic activity in urban areas may increase either because agents migrate from rural to urban areas leading into dramatic changes of land use/cover (Bekeele, 2010).

Although these areas are certain to be centers of multifaceted uses in all Nations; they equally, work as breeding areas for income inequality, poverty, environmental degradation and communicable disease hence affecting the agricultural livelihoods of smallholder farmers (Kuddus, et al., 2020). Montgomery, (2008) adds that, the more a large number of the population congregate in urban areas many problems crop up, particularly for the urban poor (Mutuga, 2009). This involves the transformation of rural land or open space into built up areas, making changes in land use/cover over time (Todd, 2009). Many rural–urban migrants, who come to stay in urban slum areas, move with their families and their domestic animals, this influx of humans and animals increases the vulnerability of the urban people to acquiring communicable diseases and establishing a potential ground for urban disease transmission cycle (Kuddu, et al., 2020). Many of the urban poor people live in unplanned and unregulated slum areas characterized by congestion conditions, overcrowded. They are positioned close to open sewers as well restricted to geographically dangerous regions like river banks, steep hillsides, wetlands, which are more subjected to flooding, landslides and industrial wastes making them more vulnerable (Mubea et al., 2017). The outbreak of non-communicable diseases, communicable diseases, pollution, traffic congestion, poor nutrition and many others this makes the agricultural smallholder farmers more vulnerable making them look for alternatives in order to cope up with the new situation (Kuddus et al., 2020).

Urban growth in Sub Saharan Africa has gradually manifested itself from the colonial era period, when Cities and urban centers of growth, were clearly marked along racial, and occupational lines of the European staying in sub-urban neighborhoods while the black Africans occupied the peripheral and segregated neighborhoods (Kaplan et al., 2012). Urban population in most African countries is increasing faster than anywhere else in the world with a population of over 60% living in central cities (Mubea et al., 2017).

All the African countries conform to high speed of urban growth and use/cover change (UN report, 2014). It was estimated that, 35 percent of the population lived in urban centers by the end of the 20th century (Marshall, 2019) and in 2009 it was 40 percent and 41 percent in 2012 (UN report, 2014). Today although worldwide, Africa is the least urbanized, the continent is experiencing the highest pace of urban growth and land use/cover changes with their immense effects on the agricultural livelihoods of smallholder farmers (Mubea et al., 2017). It is suggested that the African continent by 2050 will meet its urban age where 50% of its population will live in urban centres. This is because urbanization has been emphasized as a strategy for development at the expense of agriculture and rural development (Kempe, 2014). African urban growth and land use/cover change would not be a problem as such but its outward expansion characterized by unregulated and unplanned developments has negatively affected the way land is being used (Kabila et al., 2019). Such crisis heavily affects the urban poor and the low-income agricultural smallholder farming societies thus affecting their livelihoods (Kempe, 2014). These urban areas are over-stressed with uncontrolled and unsustainable levels of rural urban movements, majorly brought about by urban growth economic hubs (Mahuri and Kumar, 2020). The direct result of the urban economies has led to many better socio – economic benefits as a result of urban growth on the African continent (Kempe, 2014). For example, Cities provide many better means of livelihoods more so in developing countries; however, these centers have inadequate residential infrastructure and resources to provide decent quality housing to the urban population leading to unplanned land use/cover changes (Kuddus, et al., 2020). This is majorly as a result of administrators and politicians neglecting urban planning, difficulties in physical and financial process of buildings, transportation and other similar infrastructure (Madhuri and Kumar, 2020).

Further, most of the Sub-Saharan Africa (SSA) urban areas lack professional work force to manage urban development (Habibi and Asadi, 2011). They have inadequate legal and institutions of administration to effectively carry on service delivery, urban planning management, tenure of land and finance (Madhuri and Kumar, 2020). The above leads to advance land use/cover changes with great effects on the agricultural livelihoods of the smallholder farmers, these have lost their farmlands as land appreciates (Marshall, 2019). The effects (negative) are due to adjustments occurring in land use/cover, waste management, dumping, increasing competition for agricultural and residential use of natural resources (UN Habitat report, 2010). As a result urban growth and use/cover has contributed to drastic increase

in the concentration of urban poverty and environmental degradation in agricultural smallholder urban zones of the cities (Bhatta, 2010).

In East Africa, urbanization though still low in relation to other areas in the world, the region is among the areas with the fast-growing urban growth rates today (Kempe, 2014). It was estimated that by 2025 around 57.9 percent of the population in the region will live in Cities with an average 3.43 percent urban growth rate, accounting to one of the highest on the African continent (UN, 2016). Un-habitat (2008) adds that, the region will experience total and urban population growth rate significantly higher than the average on the African continent. The genesis of urban growth in East Africa emanates from the regions colonial history where colonialists started their centres of life manifested in economic, cultural, recreational and administrative centres (Kuddus et al., 2020). In the process even after colonialism much of the population has moved towards these economies and become strongly attached to these urban areas (UN, 2016). Being the primary centres of economic activities even after the colonial era, the centres attracted a mass of population towards the cities, more so in the twentieth century (Kempe, 2014). The decline in rural development funding is one of the major causes of people shifting towards urban centres as they look for employment and quality social services (UN, 2014). The drive is majorly associated to economic growth and employment transforming partners, which is due to urban bias strategies of development, like, development of industry, commerce, transportation emergency, services in education, communication and other urban infrastructures (Kuddus, et al., 2020). Though people migrate to get better service in Cities, this leads to development of slums for the low income earners which are the breeding ground for poverty related problems, this is if the growth is not combined with employment opportunities (World Bank, 2010).

In Uganda Urban growth has been perceived as a pre-requisite for the people to achieve the middle-income status, as well to achieve vision 2040, (MOFPED, 2016). The urban process in the country has been heavily due to the natural population growth rate, rural-urban migration into Cities, and territory reclassification by the government (MOFPED, 2016). In principle, rapid population growth is not a necessary condition for rapid urbanization; urban growth can proceed with zero population growth (Kyohabriwa, 2020). Uganda's population in urban areas may sound not to be a problem as compared to other Cities in countries like China or India, if the urban growth is accompanied by regulatory laws, urban plans and necessary infrastructure development (UN HABITAT, 2010). However, Uganda's urban growth is majorly

characterized with unregulated/unplanned horizontal growth due to poorly implemented policies (GOU, 2016). This has led to structural, socio-economic problems for all cities, the most witnessed challenges (World Bank, 2010). For example, development of slums with its associated problems, environmental mismanagement and degradation, Policy briefing, urban poverty more so due to unemployment, poor housing, crime, inadequate clean water sources leading to health concerns (Onyach et al., 2019). Land use/cover change due to poor implementation of land policies and environmental unsustainable urban development leading to unplanned and uncoordinated built-up areas with great effects on the agricultural livelihoods of the smallholder farmers in the cities of Uganda (Ogutu et al, 2020).

Jinja District in particular is not exception of the current urban growth wave and land use/cover change trends with its growing population. The District is going through significant negative land use/cover and environmental transformations due to the rapid urban growth triggered by population increase in the District (Kwamboka, 2020).

According to Katie, et al. (2018), urban growth and land use/cover affects many different aspects of urban livelihoods mostly the agricultural smallholder livelihoods of farmers as these have less alternatives. This has led to growing recognition of the need to understand lived experiences of urban growth and land use/cover change with the context of urban livelihood, where even small urban shocks have led to significant implications for the livelihood of smallholder farmers (Kuddus, et al., 2020). The urban and land use/cover change situation is contributing to the existing vulnerabilities in health, water availability and food production (Onyach et al., 2019). This contributes to an increased incidence of regional livelihood choices across cities which are informal and economically insecure (Katie, et al., 2018). Though the choices are in place, the weak links between urban growth and economic growth hinders the struggle to generate the required level of urban livelihoods among the smallholder farmers in cities (Wako, 2019). The created livelihood choices are in most cases exploitative and stigmatizing in nature (Kwamboka, 2020). In Jinja for example many of the people earn their livelihood from self-initiated, unregulated, often illegal and environmentally unsustainable strategies which include tree cutting for charcoal making, brick burning and wetland encroachment for farming and settlement (Wako, 2019). These livelihood strategies increase on the vulnerabilities of the agricultural smallholder farmers in Jinja District yet substantial proportion of these still live in poverty (Kempe, 2014). Thus as the urban agricultural smallholder farmers increasingly experience the effects of an erratic urban growth and land

use/cover change, their adaptive capacity District to cope up to other socio-economic shocks is increasingly under threat (Ogutu et al., 2020).

It's therefore important to understand the effect of urban growth on land use/cover change and the livelihoods of smallholder farmers in Jinja city. It is argued that, the inputs into physical planning for urban centres and urban fringe, relies on understanding of human settlement patterns, land use/cover and physical resources that support economic activities in line with the Network of infrastructure which support, connect and serve them (UNPDP, Draft, 2019 – 2040). Therefore, cities must set up conditions to help them record data accurately which will enable them fully understand, document and anticipate trends of urban growth and land use/cover or contraction of certain areas (Habibi and Asadi, 2011). If cities are to be in position to develop better strategies of urban expansion, land use/cover change and recovery livelihood strategies (Kwamboka, 2020).

1.2 Problem Statement

The increasing unplanned and unregulated land/cover change due to urban growth of Jinja District has highly resulted into the conversion of farmlands, and other land use/covers into built-up areas. The problem is that farming which serves as the main source of livelihood to the smallholder farmers in Jinja district has been highly encroached upon by urban growth leading to land use/cover change. Whereas land use/cover change is regional problem most studies have focused on major capital cities in east Africa like Kampala, Nairobi, Dar es salam. Yet there is a gap in the study of land use/cover change affecting the livelihoods of smallholder farmers the context developing districts.

According to the National slum federation of Uganda 2020 report, Jinja district is undergoing the problem of rapid unplanned urban growth development and land use/cover change putting a threat on fragile urban ecosystems such as wetlands turning into built-ups. Unplanned urban growth has led to development of slums by the low-income earners which are breeding grounds for poverty related problems hence leading to vulnerabilities in health, water and food. It has led to environmental degradation and loss of arable land for farming by the smallholder farmers' hence affecting their livelihoods (Wako, 2019). The change in land use/cover has led to development of poor infrastructure, inadequate health service, which exposes the smallholder farmers to the vulnerability of income, food insecurity, health, and nutritional

risks. This threat has a direct effect on the local smallholder farmer's quality of life and most likely becoming urban poor through the elimination of their farming livelihoods.

It's upon this therefore, that the researcher was prompted to assess the effect of Urban growth and land use/cover change on the livelihoods of smallholder farmers in Jinja district.

1.3 Objectives of the study

1.3.1 General objective of the study

The general objective of the study was to contribute to the improved understanding of the spatio -temporal characteristics of urban growth and its implications on land use/cover change and the livelihoods of smallholder farmers in Jinja district.

1.3.2 Specific objectives.

- i. To determine the extent and spatio - temporal pattern of urban growth and land use/cover changes in Jinja district (2002 – 2022).
- ii. To determine the effect of urban growth on land use/cover change and smallholder farmer's livelihoods in Jinja district.
- iii. To assess the existing coping mechanisms of smallholder farmers to the effects of urban growth and land use/cover change in Jinja district.

1.4 Research Questions

- i. What are the spatio - temporal patterns of urban growth and land use/cover changes in Jinja district (2002 – 2022)?
- ii. What are the effects of urban growth on land use/cover change and the smallholder farmers' livelihoods in Jinja district?
- iii. How are the smallholder farmers coping up to the effects of urban growth and land use/cover change in Jinja district?

1.5 Justification of the study

In order for Uganda's population to reach middle income status and realize Vision 2040, urbanization has been highlighted as a necessary condition (MOFFED, 2016). Furthermore, in comparison to rural areas, urbanization is equally prioritized by the UN Millennium

Development Goal Number II.3, which emphasizes that urban areas have easy access to better socio-economic services.

However, in the absence of ancillary infrastructure and social services, urban growth puts more strain on land use/cover, causing environmental degradation in various forms. For example, loss of wetlands, traffic congestion, overcrowding, pollution of the air and water. They are characterized by regular outbreak of communicable and non-communicable diseases, the loss of farm-lands, shortage of food, unemployment, hence ultimately increased urban poverty.

The economy of Uganda and Jinja district in particular, is largely dependent on rain-fed farming for income and food supply. The agricultural sector employs over 70% of the population and contributes 45% of the gross domestic product (World Bank report, 2013). The rain fed farming has been greatly affected by urban growth and land use/cover change. It's upon this background that the researcher was prompted to conduct research on assessment of the effect of land use/cover change on the livelihoods of smallholder farmers in Jinja district. This study intended to help ensure orderly developments in the urban sphere and sustainable development in towns. This information will be vital in developing and recommending appropriate urban policies to aid devise means to control, mitigate and sustainably manage urban growth and land use/cover change for developing towns.

1.6 Significance of Study

The study's findings will be beneficial and of great importance to the urban authorities, environmental conservationists and urban policy makers and implementers in the following ways;

The study will help in providing recent information to the community authorities on how urban growth has affected on land use/cover and the livelihoods of smallholder farmers in the District and hence a bench mark for other urban areas. Equally findings will enable urban areas and policy makers to formulate concrete policies/laws and adherence to them to ensure orderly developments in the urban sphere leading to sustainable development in cities. Further the study will be of great importance to the District authorities as it will provide recommendations that would be platforms for identifying better coping strategies that can help the District farming communities improve their livelihoods in the new event of urban growth and land use/cover change. Finally, the study findings will add onto the existing body of knowledge on

urban growth and land use /cover change and its effects on livelihoods of smallholder farmers for future research needs and reference thus, this will be useful to scholars and researchers.

1.7 Scope of the Study

This study was conducted in Jinja district which is located in the south east of Uganda, 54 miles (87 km) north east of the capital, Kampala. The study focused on the spatio-temporal extent (where the spatio-temporal extent maps) covered the whole Jinja district. The study also focused on the effects of urban growth on land use/cover change and livelihoods Smallholder farmers and their coping mechanisms to the effects.

Data collection concentrated in the northern division specifically in the parish of Wanyange-lake-zone, Bugembe-Budhumbuli and Musima. These communities were selected because were, and still farming dominated, but has degenerated due to land use/cover change as a result of urban growth.

1.8 Conceptual Frame Work

The conceptual frame work in this study illustrates the links between rapid urban growth is justified through (built up areas that's road network, paved surfaces and industrialization) and land use/cover change and its effect on livelihood of the smallholder farmers. (Figure 1.1) The indicators of land use/cover are witnessed in decline of wetlands, woodlands, farms and the livelihood indicators are decline income, food, crops, and farming-land. As the changes goes on smallholder farmers will look for short- and long-term livelihood coping mechanisms like multiple income portfolios, Petty businesses, Crop intensification, and crop diversification such as back yard farming. These further strains farming because the people who used to offer labor in farming seek for other alternatives; farming is left in the hands of vulnerable groups like the elderly and women. Others stretch to other land use/covers like wetlands, forests and grasslands creating new livelihoods among the smallholder farmers. However, Government Policy, Political interferences, Access to credit facilities and business financing may rise as the intervening variables in the process. Adopted from (Kofi Dabie, 2015).

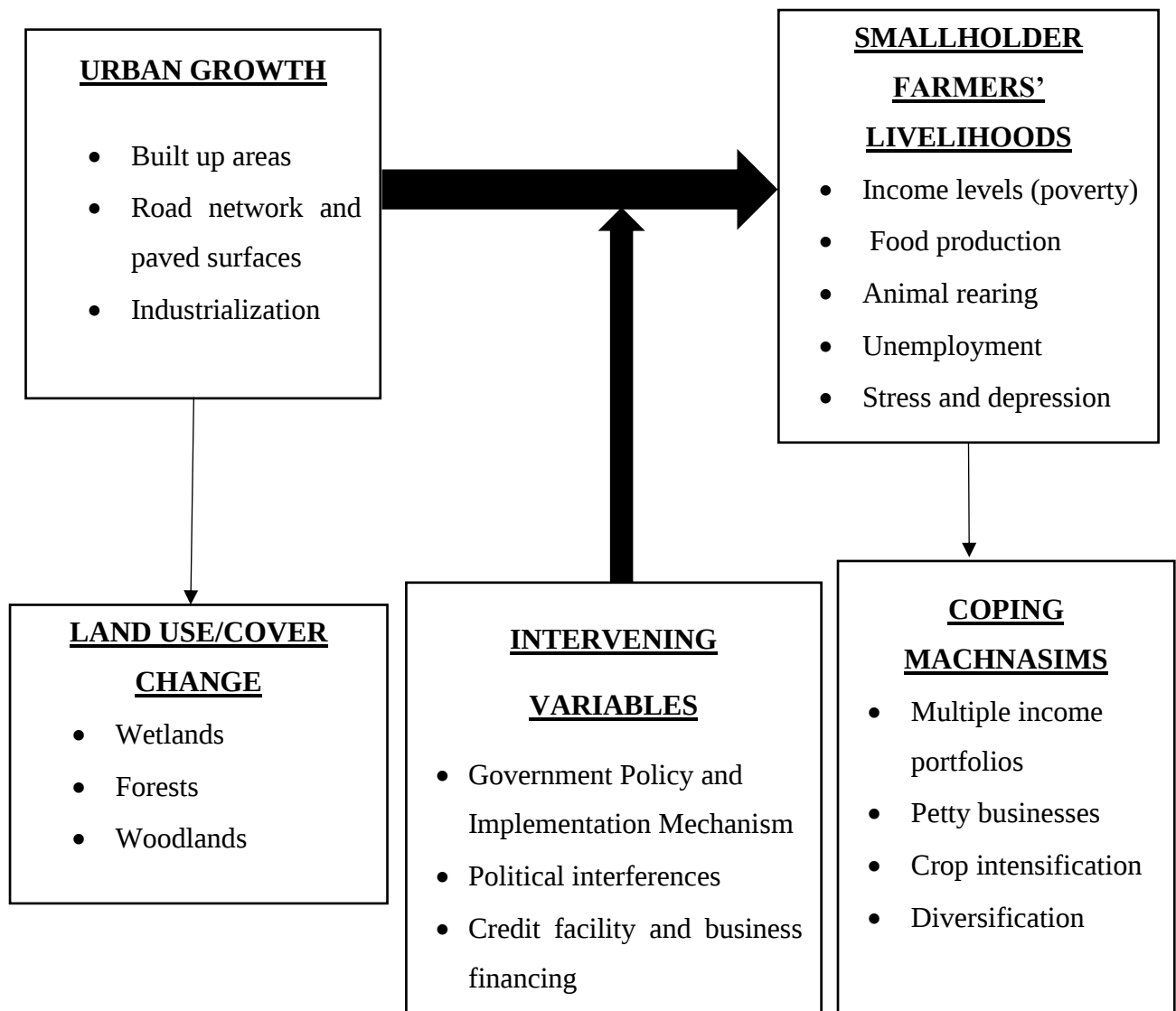


Figure 1. 1: Conceptual Frame work

CHAPTER TWO

LITERATURE REVIEW

2.1 Urban growth

According to Oguttu et al. (2020), urban growth-typifies an increasing population and infrastructure development which is one of the most critical land use activities leading to changes in land use/cover. Nuwagira, et al. (2023) defines urban growth as the expansion of human population into the central city. As the population grows into the District center, with time the expansion moves towards the out skirts of the District and they cause effects to land use/cover. The expansion of the District with the unsustainable movement of people from rural areas due to the economic hubs comes with challenges such as unplanned and uncontrolled urban growth which greatly alters land use/cover (Madhuri and Kumar, 2022). Nuwagira, et al (2023), adds that, the population explosion is documented and evidenced to be the main factor that accounts for land use/cover transformations in cities. These transformations are highly linked with population increase in a region, in Africa this has been a key note in several cities.

Madhuri and Kumar (2022), further stresses that urban growth and land use/cover changes directly have effects on the agricultural livelihoods of the farming communities in the city. According to Wuo, (2014), urban growth and land use/cover changes threaten biodiversity through vegetation loss yet they are associated with critical environmental functions like air filtering, local climate regulation, runoff and the well-being of urban residents.

According to United Nations (2018) report, urban growth improves the economic progress of a certain area in order to lessen poverty thus improving on the livelihoods of the households. Bosiu et al., (2022) emphases that urban growth brings major modifications in the land use/cover pattern of the particular area if well planned and regulations adhered to as they develop. But urban areas in most cases still operate in an ad hock situation and this hinders proper planning leading to great negative effects on land use/cover Wuo, (2014). The ad hock situation mostly hit agriculture as many of the farmers offer their land to the market due to the increased value as result this change their livelihoods yet they have few alternative coping strategies (Baig et al., 2022).

Mukwaya, et al., (2020), adds that if the development is well planned it will accelerate the economic progress of the District but improper planning of different land uses/covers in many urban areas in given region leads to the destruction of important things like agricultural land. Madhuri and Kumar (2022) further stressed that urban growth and land use/cover change promotes development of slums and unplanned settlements thus leading to the degradation of important eco-systems. This further worsens the livelihoods of especially the urban poor and the smallholder farmers are not exempted.

According to Mbabazi and Atukunda, (2020), urban growth alters land use/covers which lead to food insecurity creating a major challenge which leads to competition for the limited land resource and food sources. They further stressed that this forces many people to move to eco system preserved places like wetlands and forests as they look for alternative livelihoods. Baig et al., (2022) added that it reduces the vegetated and green spaces and thereby increases the impervious surfaces in cities; this in turn increases the surface temperature of cities when compared to the rural regions resulting in the formation of urban heat island something which has direct effect on the wellbeing of the households (Aarthi et al., 2022).

It is argued that, the costs that result from lack of urban planning can be reversed if regulation, coordination and planning are undertaken this will help to improve on the household livelihoods (Hayden, 2014).

2.2 Factors that Underlie Urban Growth and land use/cover change

According to Hong and Qi, (2019), population growth through natural increase and migration greatly leads to urbanization. Rural–urban movement of people within the country is one of the most significant factors. Also international migration is contributing, this takes up labor migration, refugees and Undocumented migrants contributing to increase in demand for housing hence urban growth and land use/cover changes (Tateishi and tang, 2016). Rapid urban expansion and land use/cover change of cities stresses the cape city to provide services like education, Energy, health care, transport services, sanitation and physical security as governments has less income to spend on the basic up keep of cities as well provision of services to the people. Therefore, increasing the vulnerability of smallholder farmers in the District to the effects urban growth and land use/cover change on their livelihoods (Sturm, 2018).

Baumesiter; (2012), adds that economic expansion base leads to increase of the per capital income, this leads to increase on the number of working persons which creates demand for housing facilities stimulating the urban growth and land use/cover change in given area. When household income raises many residents prefers better space for individual homes making them to move to the out skirts of the District hence worsening the situation of urban growth and land use/cover (Mbabazi and Atukunda, 2020). The above encourages land developers to rapidly construct new better Houses to meet the demand and other urban related infrastructures leading to discontinuous developments. Explosive developments are owed to inadequate time to plan and coordinate among developers, proponents and government agencies (Hayden, 2014).

Sturm, (2018) further adds that, urbanization leads to a wave of industrialization to the District side, which increase the influx of people to come and work in these industries but the workers equally need housing for accommodation. The change from agriculture to industrial employment demands for more urban housing (Weziak, 2016). Single storey, low density industrial parks surrounded by parking lots increase the expansion (Hayden, 2014). The cheaper land at the edge of the District contributes to the industrial growth (Waizek, 2016). Land speculation to increase value in future makes estate developers to acquire more land at the edge of the city. These even forces government to spontaneously change policies and build facilities like transportation routes prematurely (Mulugoja, et al., 2019). This kind of growth leads to improper urbanization as there is no time for proper planning and coordination worsening the effects of urban growth and land use/cover on the agricultural livelihoods the smallholder farmers (Hayden, 2014).

Political manifestos that encourage people to speculate the direction and magnitude for future expansion forces many move into the urban area (Hong and Qi, 2019). Government and private individuals often have a number of expectations for the future and a variety of development demands so that decisions can be taken to meet the future expectations as well the demands (Sturm 2018). When a District lacks a master plan as a whole the above is true and ultimately leads to uncontrolled, uncoordinated and unplanned growth of the urban area (Bameister, 2012). The end result is the discontinuous and uncoordinated pattern of urban development as expectations of land owners vary from land owners to another as does the suitability of land development (Mulugoja, et al., 2019). The higher the rate of expansion in the out skirts the greater the expectations of land to appreciate, in the end more land is withheld for future development yet this would have been used for farming (Hirsehhorn, 2005). Also, the physical

nature of the land scape/terrains may hinder continuous development making many urban people to settle in a particular area, the terrains may include wetlands, water bodies or ragged terrains (sturm, 2014). Local tax systems usually require developers to pay only a fraction of the community infrastructure and a public service cost associated with their projects which makes development look artificially cheap and encourages excessive expansion of cities (Baimester, 2012). Harvey and Clark (1965) noted that, most of the urban people seek to settle within the central City but due to lower living and property cost attract them to move to urban fringes of the town. The need for more living space this forces the residents to move to the countryside in need for more spaces, this forces rapid low-density development in such areas which is an indicator of urban expansion (Harvey and Clark, 2015). Outside the main town there is less controlled and loosely regulated public regulation therefore; many developers find these places more suitable for new construction (Wali, 2015). In such areas developers fail to adhere to the government policies of planning to control the new construction in compact and sustainable way (Kimberly, 2019). Opening access by constructing transporting routes in the countryside this is responsible for linear branch development further, express ways and highway construction leads to rapid outward expansion, transport routes more roads are widely used modeling and forecasting urban growth (Kimberly, 2019). Many cities do not have consistent and well experimented plans, this accounts for urban expansion though the District may have exclusive zoning policies like residential areas different from industrial /commercial zones but this creates isolated islands of each type of development (Wali, 2015). Local zoning ordinances have always fostered expansion as they may prohibit mixing up of the different kinds of land use like commercial, industry, residential areas (Harvey and Clark, 2015).

Kimberly, (2019) adds that, access to credit facilities speed up growth as individuals buy homes before achieving the financial capability. Besides increase in wealth makes people to change preferences and many resort to residential areas with large living space, a life style that demands to settle in areas with low density settings which are isolated from the problems of the District this further expands the District (Hong and Qi, 2019).

2.3 Effects of urban growth on land use/ cover change

Land cover; these are the physical conditions, attributes, composition and characteristics of the earth's surface (Mitsch and Gosselink, 2015). Land use composes the human activities that are set up on the earth's surface (Mertz, 2017). Land use also takes the systematic process of assessing and evaluating land and its existing uses. Urbanization is a depiction of land use, this majorly takes up commercial areas, transportation and industrial land use types as these are classified according to the most suitable functions for urban planners and practitioners (Muntunga, 2012). Urban centres are heterogeneous set ups of land cover types which contains a number of vegetation types (grass, shrubs and trees and human made structures (Mertz, 2017). Therefore, physical attributes can be used to explain urban areas, these are regions widely dominated by built up environments that takes up all the non-vegetative man constructed elements like buildings, Roads, Runways, paved surfaces etc. Yet dominance implies coverage greater than or equal to 50% of a given land scape surface unit (Tumuhimbise, 2017).

Land is one of the most important natural resources, once mismanaged it has enormous effects on humanity, yet many are irreversible with immerse negative effects on the surrounding and humanity (Hward, 2018). According to Anurag and Poona, (2012), the indiscriminate expansion due to urban growth distorts the urban fabric of the City which leads to lack of harmony between land uses because it is carried out without planning. It is responsible for transformations in urban form and spatial structure. Harward, (2018) adds that, desertification is accelerated by urban growth on the environment. Urban growth leads to loss of fertile soils and loss of land for organic elements necessary for plant growth making it unfit for crop cultivation and plant vegetation (Muntunga, 2012). It is likely that the rapid urbanization and population growth will result in anthropogenic Land Use/Cover Change, with many negative effects on the environment, including the Urban Heat Island effect, hence higher Land Surface Temperatures in urban areas (Kabila and Agyemanga, 2018). Further Urban growth leads to increment of temperature of certain area where it consumes natural vegetation (Harward, 2018). Wafa, (2014) contends that, cities with high level of urban growth have more than twice as many days with extreme heat as compared to towns with uncompact growth patterns.

Expansion leads to rise in fossil fuel consumption and emission of greenhouse gases (Acharaya, 2016). Urbanization often results in deforestation, habitat loss, and the extraction of freshwater from the environment (Mertz, 2017). The above decrease biodiversity and alter species ranges and interactions (Shaayo, 2020). Human activities in urban areas, such as the burning of fossil fuels and industrial waste also increase pollutants in the environment that can affect the health of humans and other species (Kabila et al., 2018).

Unsustainable urban expansion which encourages low density living pattern styles this causes high traffic congestion and automobile dependence which further increases reliance on fossil fuel leading poor air quality as well as health challenges (Harward, 2018). An effect on ecosystems and wild life in regions where urban growth is uncontrolled there is a change in pattern of ecosystem (Wafa, 2014). The situation affects quantity and quality of water; this is because large amounts of land are covered with paved / impervious materials like concrete. Which lead to less percolation of water to the ground water aquifers and this exposes the region to increased flood hazards and erosion (Aurag and Poona, 2012). Depletion of valuable agricultural land is the most immediate effect of urban growth; this leads to reduction of food production in an area yet in most cases it is the back born of the economy thus affecting the income of households and food security of the country (Omasire et al., 2020). There is high cost of providing infrastructure as many people are buying vehicles and living in large more spread-out spaces which generally make public services expensive (Brahima and shixiang, 2020). Urban growth comes with disparities in the social life of urban people between the wealth in the cities and those in the suburbs with effects on public and social health as a result people get weaker physically due to stress and depression (Acharaya, 2016). Urban growth also leads to disintegration of social communities (Tumuhibise, 2017). Omasire, (2020) asserts that, houses in the out skirts have large backyards well fenced this tends to separate neighbors hence limiting social interaction among neighbors in these regions. The effects urban growths are many yet their magnitude varies from District to District (Brahima and shixiang, 2020).

2.4 The effect of urban growth and land use/cover change on livelihoods of the smallholder farmers.

According to Omasire et al., (2020), agriculture is the growing and rearing of animals while Livelihood is the well-being /welfare of people in a given community. Shaayo, (2020) adds that, Livelihood is improved wellbeing, vulnerability reduction, food security improvement and more sustainability use of natural resources, or livelihood comprises of assets, capabilities

and activities that are required for a means of living. A livelihood is sustainable, when it can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets in order to provide sustainable livelihood opportunities for the next generation as it meets the present needs (Omasire et al., 2020).

According to Brahima and Shixiang, (2020), urban growth and land use/cover change effects are both positive and negative though the negative effects far outweigh the positive effects. The most significant negative effect is diminishing agricultural land (Work, 2020). Rapid urban expansion pushes some of the fertile lands out of agricultural use. Also the increased demands for construction material like sand and top soil for building and landscaping in the emerging housing industry consumes more of the agricultural land (Marshal, 2019). This reduces agricultural production and definitely an effect on the livelihoods of smallholder farmers (Omasire, 2020). Further urban expansion accelerates the loss of agricultural land which raises concerns for the provision of food to indigenous citizens and this changes the farmers' livelihoods in order to meet their food demands and other needs of life (Brahima and Shixiang, 2020).

According to Maxwell, (2018), uncontrolled urbanization is the genesis of disorder and urban poverty as more farms are taken up by built ups making the smallholder farmers more vulnerable in their livelihoods as they have few alternatives. Urban expansion does not lead to sustainable economic development or transformation in the economic growth foundations hence negatively having effects on the livelihoods of residents (Maxwell, 2018). This is because nonagricultural activities may fail to develop at the same rate as urban growth leaving people with distorted incomes (Margaret, et al., 2019). According to Marshal, (2019) urbanization is taken to be a source of social economic progress and modernization more so in the developed world. This is not the case with developing countries; it has only led to loss of farm lands and increasing the unemployment rate making the residents to be more vulnerable to the effects of urban growth and land use/cover change on their livelihoods (Marshal, 2019).

Guneralpe, (2017), adds that urban expansion occurring on what used to be farms in the outskirts of the town, this leads to reduction of agricultural food sources for the population hence affecting their livelihoods. More livelihood challenges are seen as more farm land is lost, the natural capital, this with time leads to loss of the traditional on farm skills, reduction of food supply and less agricultural income (Omasire, 2020). This has negative impacts on strategies

of livelihood to the smallholder farmers who heavily and partially survive on farm production and other natural resources.

According to Worku, (2020), urban growth contributes to loss of natural beauties like park, range lands and sceneries which equally results in the transformation of livelihoods for the residents. Other effects include poorly developed and physical infrastructure, distortion and shortage of housing, lack of recreation areas, inadequate and poor waste management (Maxwell, 2018). Less integrated linkages of urban–rural, uncoordinated / unbalanced urban expansion with weakly developed national and regional urban systems (Margaret, et al., 2019). To worsen the situation there is change in attitude from young people on agriculture, they search non-farm better jobs with easily earned income leaving seasonal agriculture in the hands of women and elderly. Although they enjoy better incomes and improve on their standards of living, food still remains a burden in the area making their livelihoods questionable (Nuwagira, et al., 2023). Urban growth and land use/cover change increases demand for water and energy from the growing cities which further constrains farming communities and end up looking for livelihoods by encroachment on wetlands (Omasire, 2020).

In spite the negative effects of urban growth and use/cover change, the expansion offers opportunities to the population in the area (Foeken, 2015). Much as vast arable land is being converted to urban development and major changes in land use/cover there is rise in the demand for land which has enormous positive implications for the livelihoods of the people (Margaret, et al., 2019). According to Shaoyao, (2018), many offer their land to the market which helps them to earn income to do alternative activities like business hence improving on their wellbeing.

Urban growth is a modern way of life, bringing economic growth and development in a given area, for example the creation of job opportunities and provision of better basic needs to households to improve on livelihoods (Omasire, 2020). It helps to provide better services to the households and surrounding community, people will get access to better roads, water, education, health and electric District services as offered by the urban authorities (Shaoyao, 2018).

According to Günerale, (2017), occupational structure to a large extent change and off-farm employment opportunity increase, Forestland decreases whereas transportation facilities increase. Production and yield of crops decrease and quality of arable land worsens but medical

and educational facilities increase hence improving on the health quality and level of education this partly improves on the livelihood of the people. In conclusion, urban growth alters other land uses/cover in general and change people's livelihoods in particular, it brings positive social – economic changes and if properly planned sustainable development can be realized despite the change in livelihood of households.

2.5 Coping strategies to the effects of urban growth on land use/cover change and livelihoods of the smallholder farmers.

According to Günerale, (2017), coping up is that when people come under the threat from shocks and stressors on urban growth and land use/cover change households are forced to take up different livelihoods in order to help themselves. Communities in many parts of the world have often tried to use a range of coping mechanisms as a way of responding to an experienced impact with a short-term vision in order to reduce the effects/ shocks and changes on their livelihoods (Alejandro, 2013). According to Cooper, (2008), the people tend to use a combination of livelihood strategies to mobilize resources and opportunities to overcome the new challenges. Urban households, the well off and the poor are obliged to use a number of livelihood interventions or strategies in their attempt to manage socio - economic, environmental and circumstance changes (Foeken, 2015).

In contextual way for the smallholder farmers' survival according to their socio – economic, political and environmental circumstances, their strategies will differ from individual to individual (Worku, 2020). Traditional coping methods will be adapted based on accumulated experience over years and passed on from generation to another (Omasire, et al., 2020). For example, Onwuchekwa and Ukandu, (2020) supplemented that, among the smallholder farmers crop intensification is taken up which involves growing quick growing or maturing and hybrid crops to ensure household food security in order to reduce on household food expenditure. The intervention helps to supplement on their income and reducing much of their disposable income on food as they cope with the new experience in the District (Shaoyao, 2018). In response to cope up with energy concerns many urban dwellers shift their dietary towards more processed and easily prepared foods as a way to sustain themselves (Omasire, et al., 2020).

According to Adjei et al., (2019), crop diversification that is mixed cropping is also adapted to; where different crops are grown on some piece of land, although the practice is not entirely new but land shortage reinforces the need for smallholder farmers to cope to it. Many

smallholder farmers resort to many livelihood portfolios as a strategy for survival combining both farm and non-farm livelihood activities to help them cope with the changing realities of life (Maxwell, 2018). Kabat, (2012), adds that, women and men begin carrying on multiple economic activities like wholesale business to small scale businesses. Many in the region are absorbed in formal employment like nurses, doctors, teaching, lawyers while others in semi and unskilled manual jobs within the town (Cooper, 2008). Also, smallholder urban Farmers have managed to cope up with these effects through rain water harvesting, re-use of water for example water from washing clothes or utensils to irrigate crops in the backyard gardens and nurseries (Onwuchekwa and Ukandu, 2020). Furthermore, communities have employed coping mechanisms like reliance on social networks for example, sharing of experiences, emotional support, petty trade, temporary migration; women making handicrafts to sell in nearby markets and relying on friends for help and accessing credit facilities (Kabat, 2012).

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter entails the background information on the study area, the methods used in data collection, sampling, study design and strategy.

3.2 Study Area

3.2.1 Location

The study was conducted in northern division of Jinja District Uganda (figure, 3.1), the division comprises of the former Bugembe town council, Budondo Sub County, and Mafubira Sub County which were reclassified with Jinja municipality to form the city. It's located 54 miles (87 km) north east of the capital, Kampala on Latitude: 0° 26' 20.47" N, Longitude: 33° 12' 11.41" E on the shores of Lake Victoria (UBOS 2022 report) and bordered by Njeru municipality (Buikwe district) in the west, Budondo sub county in the north, kakira town council in the east and Lake Victoria in the south. The division has a high population growth rate due to natural population growth and migrations from neighboring districts (Namisi and Kasiko, 2019). This has led to its rapid spatiotemporal expansion as a result leading to a high diversity of land use/cover changes more so the unplanned and uncoordinated urban growth indicators for the last 30 years, hence making the study area ideal to be a test-bed for study.

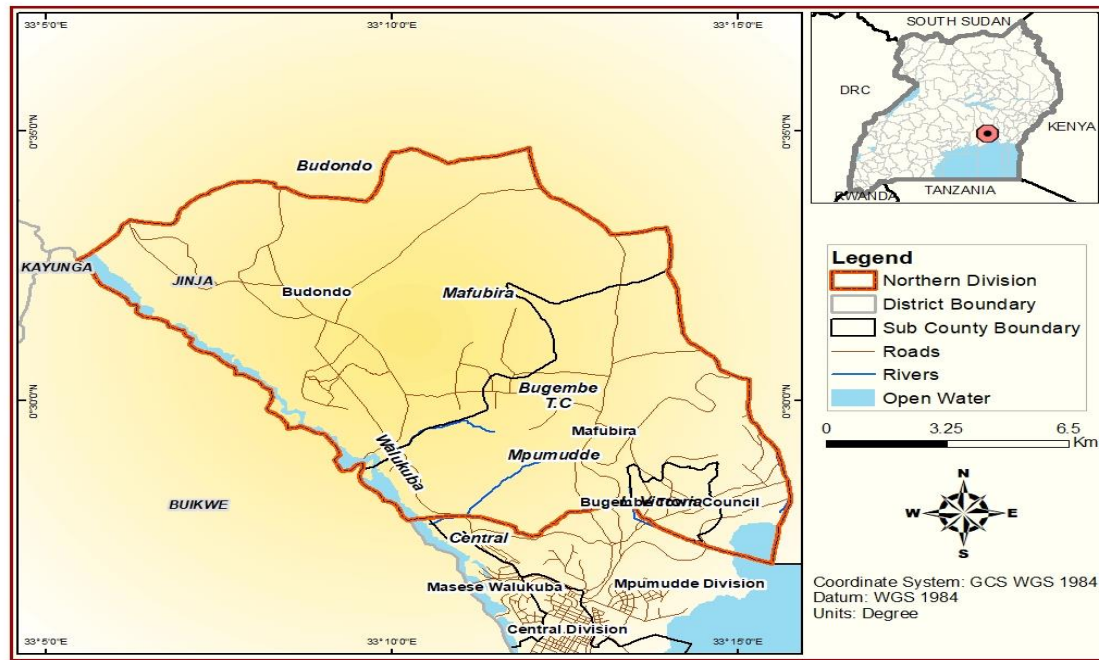


Figure 3. 1: Location of the study area

3.2.2 Climate

The District is located within the Lake Victoria basin, which experience bimodal rainfall peaks and less seasonal variations in temperature, the average annual maximum temperature does not exceed 30oC and close to 80% humidity throughout the year (Sengendo, 2016). The main factors accounting for the climate characteristics in Jinja District include elevation, (with an average elevation of 1224 m above sea level), air currents and proximity to a large water body (Lake Victoria). The District experiences an average annual rainfall of about 1180 mm with march to May being months of highest rainfall but April registers the highest peak. The months of June to august and December to February are the dry periods of the District (Namisi and Kasiko, 2019). Because of its location near Lake Victoria, strong lake breeze modifies temperatures over the area and makes the climate a rather pleasant one (Sengendo, 2016).

3.2.3 Topography

The relief of the area consists of gently sloping relief, which is occasionally interrupted by conical shaped hills and valleys. The highest elevation of 1342 meters with an average height above sea level of 1200 metres with several isolated flat-topped hills (Sengendo, 2019).

3.2.4 Geology and Soils

A basement complex underlies Jinja District with un-differential gneisses formerly seen as part of the City. The most predominant soil type Rhodi ferrelitic Nitisol comprising 42% of the total land area (3015.64ha), these have patches of Epi/Endopetric plinth sols (constituting 0.8% of total land area with 595.1ha) superimposed on the Nit sols in isolated and very small areas, this is mainly in the Northern division (FAO, 2017).

The District area is generally thinly covered with loamy top soils, formation of laterite clay soils, weathered gneiss and fresh granites (Namisi and Kasiko, 2019). Much of the clay, sandy and light soils are commonly found in the valleys with a well-defined course and shallow alluvium beds. The ferrisol soils (red soils) on basic rocks are found (Waibi, 2019).

3.2.5 Vegetation

The vegetation in the study area ranges from woodlands, forests, and grass lands, the vegetation has been modified due to rapid urbanization, residential activities, commercial and industrialization (Mbugga, et al, 2016). The boarder of Lake Victoria such as Walukuba division has savannah vegetation while forest/savannah mosaic remnants are found in some parts of the central Jinja City, the region bordering the Victoria Nile composes of medium altitude moist deciduous forests (Munabi.C, 2009). In the same perspective, Jinja District is well served with numerous surface drainage features like Lake Victoria to the south, River Nile in the west and several wetlands. Some parts of the study area drain into Lake Victoria and swamps exist as extended arms of Lake Victoria to the north east of the District (Njiru M, and Ojuok, 2010).

3.3 Research design

The study employed geo-spatial and cross-sectional study designs; geo-spatial data was obtained from remote sensing. Here regular satellite images of Jinja District were downloaded for the years 2002, 2012 and 2022 to get the spatio-temporal extent of urban growth and land use/cover changes (Worku, 2020). A cross-sectional study design was also applied where data was collected from the field during a single field visit of respondents. Both quantitative and qualitative data analysis methodologies were used (Kabat, 2012). Quantitative helped to develop and employ graphs, percentages, frequencies, tables, while qualitative data gathering

procedures were vital to the diversity of multiple realities that were found in the field (Amin - 2015).

3.4 Population under study

The study population of 398 respondents was considered, and it was narrowed to a sample size of 276 respondents with the help of Krejcie and Morgan 1970 sample size determination Table (Appendix 1). The projected population number in the northern division is 85600 according to UBOS, (2022), out of which 43100 are male and 42500 are female and the average number of households is 5 persons. These are dominated by the Basoga as the main ethnic group and the main language spoken is Lusoga. Nevertheless, the District hosts a mixture of religious denominations but the major ones being Anglican, Pentecostal, Catholics and Muslims (UBOS, 2016).

3.5 Sample Size

The sample size was determined on the basis of the total population number in the area of study. To calculate sample size, the formula below of Yamane (1967) was used;

$$n = \frac{N}{1 + N(e^2)}$$

Where; n = size of sample, N = total estimated population size of the household, e = designates maximum variability or margin error (6%).

$$n = \frac{17120}{1+17120 (0.06)}$$

Hence a population size of 389 respondents was sampled. The sample size was narrowed to 276 respondents (Morgan 2006). The sample frame work is depicted in table 3.1 below.

Table 3. 1: Sample Size and sampling procedure

Category	Population	Sample Size	Sampling techniques
Planner	1	1	Purposive
Heads of department	10	10	Purposive
Agriculture extension workers	17	15	Purposive
Multiple income earners	170	118	Simple Random
Urban farmers	200	132	Simple Random
Total	398	276	

3.6 Sampling Technique

Simple random sampling was used to identify multiple income earners and urban farmers; this was appropriate due to its flexibility and equal chances to the respondents to participate in the study (Dillman, 2011). Purposive sampling was used to specifically select District Planner, Heads of departments and agriculture extension workers due to their tight schedules and yet their responses meant a lot in the study (Rubin and Rubin, 1995). The questionnaire was pre tested on fifteen smallholder farmers within the study area and these were exempted from the main sample study. This helped to check for errors and ambiguity hence improving on the validity of the survey tool (Grimm, 2010).

3.7 Data sources

Data was generated from both primary and secondary data sources. **Primary data** was collected in the field using enumerator administered Questionnaire (appendix 1) and self-administered questionnaire (appendix 2) as these had relevant and sufficient questions about the study (Omasire, et al., 2020). In the same vain, **Secondary data** was in form of spatio datasets from GIS and Remote sensing data bases. Remote sensing data was derived from Landsat imagery data sets for the respective years of study.

3.8 Data Collection Methods

This research used data retrieved from remote sensing and GIS for the years 2002, 2012, 2022 and data generated from the survey enumerate questionnaire/self-administered questionnaire

guided to get the relevant information concerning the topic of study in line with the study objectives (Masammam et al., 2016).

3.8.1 Spatio - temporal pattern

Landsat TM images for the years 2002, 2012 and 2022 were outsourced freely from the United States Geological Survey (USGS) website (<http://earthexplorer.usgs.gov/>) path 170, row 60. These satellite images were analyzed to reveal the pattern of urban extent and its effect on land use/cover change (Kiggundu et al., 2018). Factors which were considered in selecting these Landsat images in this study include; presence of quality Landsat images for the intended year of study, and degree of cloud cover (Aggarwal, 2011). This is because the monitoring and analyzing of urban growth is mostly measured by their indicators but today most scholars acknowledge and emphasize the use of Remote Sensing and Geographical information systems in combination with statistical techniques (Masammam et al, 2016). These have proved today as one of the most attractive and effective valuable tools for estimating and monitoring urban expansion over a time period (Aggarwal, 2011). The tools are cost effective and not time consuming (Masammam et al., 2016).

3.8.1.1 Image Classification

The Landsat imageries were classified using a hybrid classification algorithms unsupervised classification in Arc Map software version 10.8 for spectral reflectance clustering (Caprioli and Tarantino, 2013). Un-supervised image classification was used to classify images. This is the method where pixels are assigned to spectral (information) classes without the user having prior names of the classes (Azizo et al., 2020). Assigning of classes was done by selecting different colors to represent a given land use type guided by Google Earth historical imagery. Six Land use/ land cover classes were generated for each year 2002, 2012, and 2022 which are reflected in table 3.2 below and their representative descriptions.

Table 3. 2: Land Use/cover and their description

Land use/cover classification	Description
1. Built up area	Industrial areas, roads, residential areas, commercial centers and recreational centers.
2. Farmlands	Land under cultivation, commercial or substance farming
3. Grass lands	Green belts, spaces and bushes
4. Open water	Represented by lakes, rivers/streams
5. Wetlands	Swamps and papyrus vegetation
6. Woodlands	Collection of trees (planted or natural)

3.8.2 Data collection instruments

3.8.2.1 Enumerator administered Questionnaire

This was adopted because it is free from bias of the interviewer since answers are in the respondent's own words thus the results can be more valid and Reliable (Kothari 2015). The enumerator administered questionnaire consisted of close-ended questions which were administered to multiple income earners and urban smallholder farmer respondents. It was vital to collect data on the effect of urban growth on land use/cover change and livelihood of smallholder farmers and the existing coping mechanisms in Jinja City.

3.8.2.2 Self-administered Questionnaire

This was used to generate data from the District Planner, Heads of departments and agriculture extension workers due to their tight schedules. The questionnaire contained closed ended where questions and questionnaires were issued and collected on later. This helped increase the response rate and saved time.

3.9 Data analysis

3.9.1 Spatio - temporal pattern

The obtained data with land use/cover classes was analyzed using quantitative techniques of geo-spatial analysis and computations from extracted attribute tables. The data was subjected

to micro-soft excel software to calculate percentages, percentage change and annual percentage change of land use/cover changes which was used in descriptive statistics.

3.9.2. Effect of urban growth on land use/cover and livelihoods of smallholder famers

The primary data collected using enumerator/self-administered questionnaire on the effect of urban growth was coded and analyzed using the Statistical Packages for Social Scientists (SPSS) version 23.0, tested for significance at linear correlation tests at 5% level of significance. Descriptive statistics like graphs and tables were used to describe, display and present research findings through raw data classification into some purposeful and useable categories.

3.9.3 Coping mechanisms of smallholder farmers

The data collected using enumerator questionnaire and self-administered questionnaire on coping mechanisms was coded and analyzed using SPSS. Descriptive statistics like graphs and tables were used to describe, display and present study findings through raw data classification into some purposeful meanings.

CHAPTER FOUR

PRESENTATION OF RESULTS

4.1 Introduction

This chapter concentrates on reporting of data findings collected for this study as per the specific objectives.

4.1.1 Spatio-temporal pattern and extent of land use/cover change in Jinja district

In this study, six land use/cover classes (built-up areas, farmlands, grasslands, open water, wetlands, and woodlands) were classified for the years 2002, 2012 and 2022 and results are depicted in figure 4.1 below.

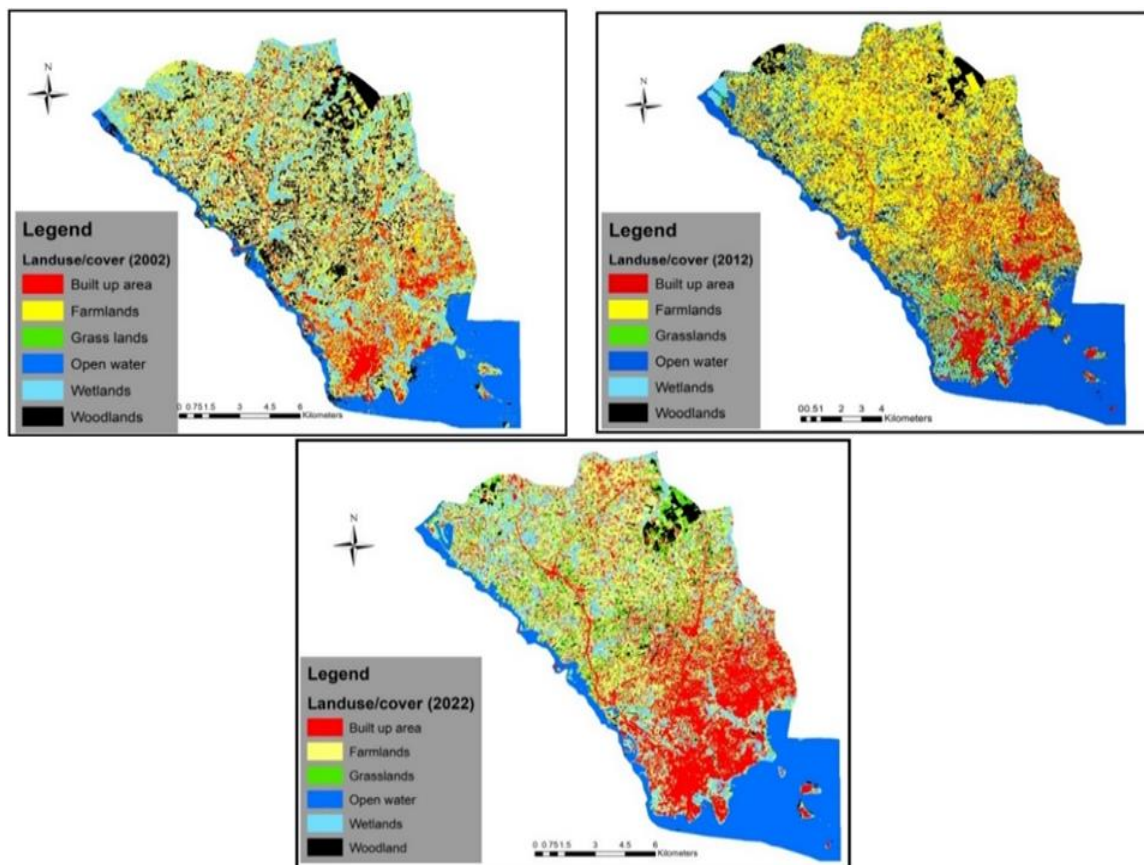


Figure 4. 1: Spatio-temporal patterns of urban growth and land use/cover change in Jinja district

Figure 4.1 shows the overall land conversions for each cover type in Jinja district which were calculated and presented in table 4.1 below.

Table 4. 1: Extent of land use/cover change in Jinja District

	2002		2012		2022		% change		% annual rate of change	
Land use/cover	Area (Km2)	%	Area (Km2)	%	Area (Km2)	%	2012-2002	2022-2012	2012-2002	2022-2012
Built-up area	24.5	11.4	45.6	21.1	67.6	31.4	85.09	48.8	8.50	4.88
Farmlands	58.6	27.2	64.0	29.7	51.0	23.6	9.19	0.91	-0.91	-2.05
Grasslands	23.0	10.6	18.8	8.7	17.8	8.3	-17.92	-4.59	-1.79	-0.45
Open water	36.2	16.8	36.0	16.7	39.1	18.2	-0.60	-0.05	8.98	0.89
Wetlands	43.4	20.1	32.0	14.8	33.8	15.7	-26.36	-2.63	6.08	0.60
Woodlands	29.9	13.9	19.2	8.9	6.3	2.9	-35.97	-67.41	-3.59	-6.74
Total	216	100	216	100	216	100				

Results from table 4.1 shows that, urban growth (built-up area) of Jinja district has expanded from 2002 where it covered 11.4% of the total area of the district. This increased by 9.7% in the year 2012 to 21.1% and increased by 10.3% in the year 2022 to 31.4% hence experiencing the highest percentage of built-up areas. This trend has had a percentage change of 85.1% (at an annual rate of 8.50%) and 48.8% percentage change (at an annual rate of 3.9%) between 2002 - 2012, and 2012 - 2022, respectively.

In 2002 farmlands in Jinja district covered percentage total land area of 27.2%, this percentage rose by 2.5% to 29.7% in 2012; however, it dropped by 6.1% to 23.6% from 2012 to 2022. Farmlands witnessed a percentage change of 9.19% (at an annual rate of 0.91%) for the period 2002-2012 and a percentage change of -0.91% (at an annual rate of -2.05%) for the period 2012-2022. The percentage coverage of grasslands in Jinja district dropped since 2002 where it covered 10.6%, this reduced to 8.7% in the year 2012 and dropped further to 8.3% in 2022. This accounted to a percentage change of -17.19% (at an annual rate of -79%) for the period 2002-2012 and -4.59% percentage change (at annual rate of -0.45%) for the period 2012-2022.

Open water in 2002 covered a percentage area of 16.8%, this slightly dropped to 16.7% in 2012 but the coverage increased to 18.2% in the period the year 2022. This had -0.60% percentage change of (at an annual rate of 8.98%) for the period 2002-2012 and 0.05% percentage change (at an annual rate of 0.89%) for the period 2012-2022. Wetlands occupied 20.1% in 2002; this percentage cover dropped by 5.3% to 14.8% in the year 2012. In the period 2012-2022 the wetland coverage increased by 0.9% to 15.7% in the year 2022. This witnessed a percentage change -26.36% (at an annual rate of 6.08%) for the period 2002-2012 while -2.63% changes (at an annual rate of 0.89%) for the period 2012-2022.

Woodlands in 2002 covered 13.9% this reduced by 5% to 8.9% in year 2012 and further dropped by 6% to 6.3% in the year 2022. This accounted to a percentage change of -35.59% (at an annual rate of -6.74% for the period 2002-2012 and -3.59% changes (at an annual rate of -6.74%) for the period 2012-2022. During the study period land covered by built up areas (urban growth) has gradually risen from 24.5sqkm in 2002 to 31.4sqkm in 2022 but this growth is at the expense of the other land use/cover types in the district.

4.1.2 Urban growth Extent and land use/cover change in Jinja district

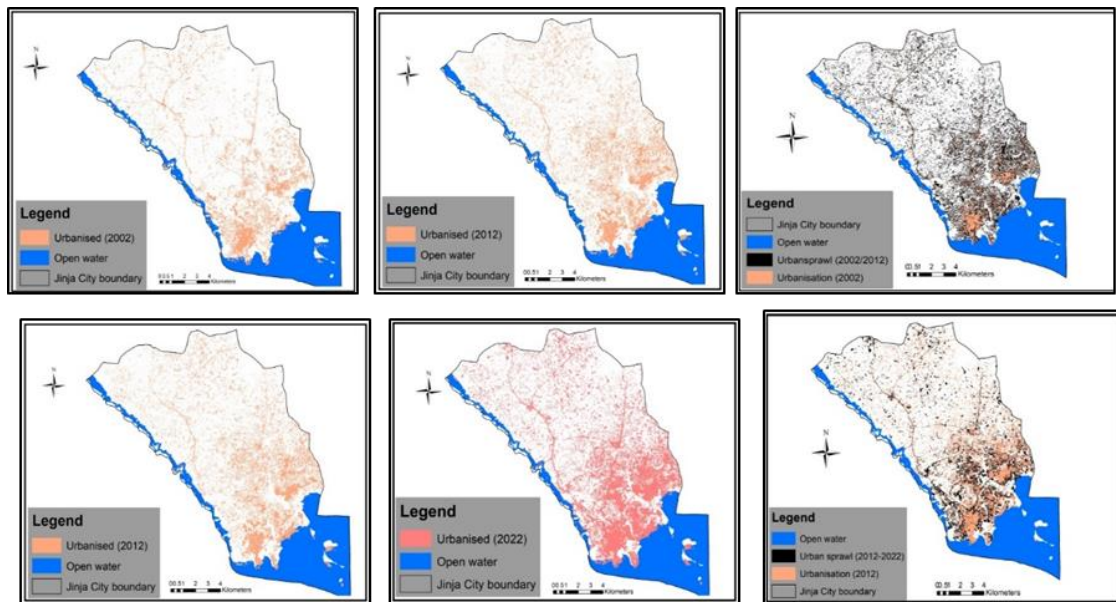


Figure 4. 2: Urban growth extent and land use/cover change in Jinja district.

Table 4. 2: Urban growth extent between the year 2002, and 2022 in Jinja district

	2002		2012		2022		% change		% annual rate of change	
	Area						2012-	2022-	2012-	2022-
	Km2	%	Area(Km2)	%	Area(Km2)	%	2002	2012	2002	2012
Urbanized	24.5	11.4	45.6	21.1	67.6	31.4	85	48	8.50	4.88
Non-urbanized	191.1	88.6	170.0	78.9	147.9	68.6	-10	-13	-1.09	-1.30
Total	216	100	216	100	216	100				

Table.2 shows the extent of urban growth and land use/cover change in Jinja district. Results indicate that there is an increase in built up areas (urban growth) throughout the study period. Built-up areas have increased to cover a total land area of 31.4% by the year 2022 from 21.1% in 2012 and 11.4% in 2002 with a percentage change increase of 85% (at an annual rate 8.50%) and 48% (at an annual rate 4.88%) 2002-2012 and 2012-2022 respectively. This increment affected other land use/covers; results show a reduction of -13% (at an annual rate -1.30%) and -10% (at an annual rate -1.09%) for the period 2002-2012 and 2012-2022 respective.

4.2 Effect of Urban growth on land use/cover change and livelihoods of the smallholder farmers in Jinja district.

4.2.1 Socio – demographic data

The study engaged in analysis of socio – economic background of the respondents who participated in the study. These included genders, age, marital status, level of education, source of income and household size and the results are depicted in table 4.3 below.

Table 4. 3: Socio – demographic data

Variable		Frequency	Percent
Gender	Male	123	44.6
	Female	153	55.4
	Total	276	100
Age group	18-28	55	19.9
	29-39	86	31.2
	40-50	72	26.1
	51-59	39	14.1
	Above 60	24	8.7
	Total	276	100
Marital status	Single	78	28.3
	Married	146	52.9
	Divorced	31	11.2
	Widow/widower	21	7.6
	Total	276	100
Level of education	University	67	24.3
	Tertiary	71	25.7
	Secondary	89	32.2
	Primary	29	10.5
	None	20	7.2
	Total	276	100
Employment status	Formal employment	119	43.1
	Non formal employment	99	35.9
	Unemployed	58	21
	Total	276	100
Source of income	Farming	44	15.9
	Self Employed	62	22.5
	Business man/woman	58	58
	Public servant	53	19.2
	Daily manual labor	47	17.0
	Others	12	4.3
	Total	276	100
Household size	1-4 members	119	43.1
	5-8 members	98	35.5
	9-12 members	33	12
	12 members and above	26	9.4
	Total	276	100

The study considered the sex of the respondents in order to find out the number of female and male respondents who participated in the study. Study finding in Table 4.3, revealed that 55.4% respondents were female who participated in the study and 44.6% of the respondents were male.

It was also crucial to consider the age group of the respondents as study was interested in finding out the category of age group which highly participated in the study. Results show majority of the respondents in this study were between the age group of 29-39 years with 31.2%, 26.1% of the respondents were between the age bracket of 40-50 years, further still 19.9% were between age group of 18-28 years, 14.1% of the respondents came from the age group of 51-59 years and the least number of respondents were from those above 60 years with 8.7%.

The marital status of the respondents was also important to be considered since the marital status can determine the number of respondents who have other responsibilities for example looking after their families. Marital status results revealed that the highest were those who are married at 52.9%,

28.3% were single, 11.2% of the respondents who participated were divorced and the least were widow/widower at 7.6% out of the total percentage of the respondents.

Further the study was interested in finding out the education level of the participants who engaged in the study. Findings revealed that majority of 32.2% had attained secondary education, 25.7% had attained tertiary education, 24.3% University level, 10.5% had attained primary and 7.2% had not attended school all.

The employment status results revealed that 43.1% of the respondents had formal employment, 35.9% had non-formal employment, and 21.0% were unemployed. The major sources of income of respondents were those who were self-employed accounted to 22.5%, 21.0% got their income from business, public servants accounted for 19.2%, 17.0% got their income through daily manual labor, 15.9% said received their income from farming and 4.3% covered for other income sources not in line with the categories in the study. Household size, the household range of 1-4 members was the highest in this study with 43.1%, those with 5-8 members accounted to 35.5%, 9-12 members were 12.0% and 12 and above members was

9.4% having the lowest category. This implies that majority of the respondents were from the age group 1-4 members.

4.2.2 Effect of land use/cover change on livelihoods of smallholder farmers

The study engaged in analysis of how land use/cover changes affected the livelihoods of the smallholder farmers in Jinja city.

4.2.3 Urban growth and land use/cover change affecting livelihood.

The study endeavored to establish whether the respondents had noticed changes in land use/covers for the last 30 years and the results are depicted in figure 4.3 below. which show that, 92.4% of the respondents in the study agreed that urban growth affects land use/cover.

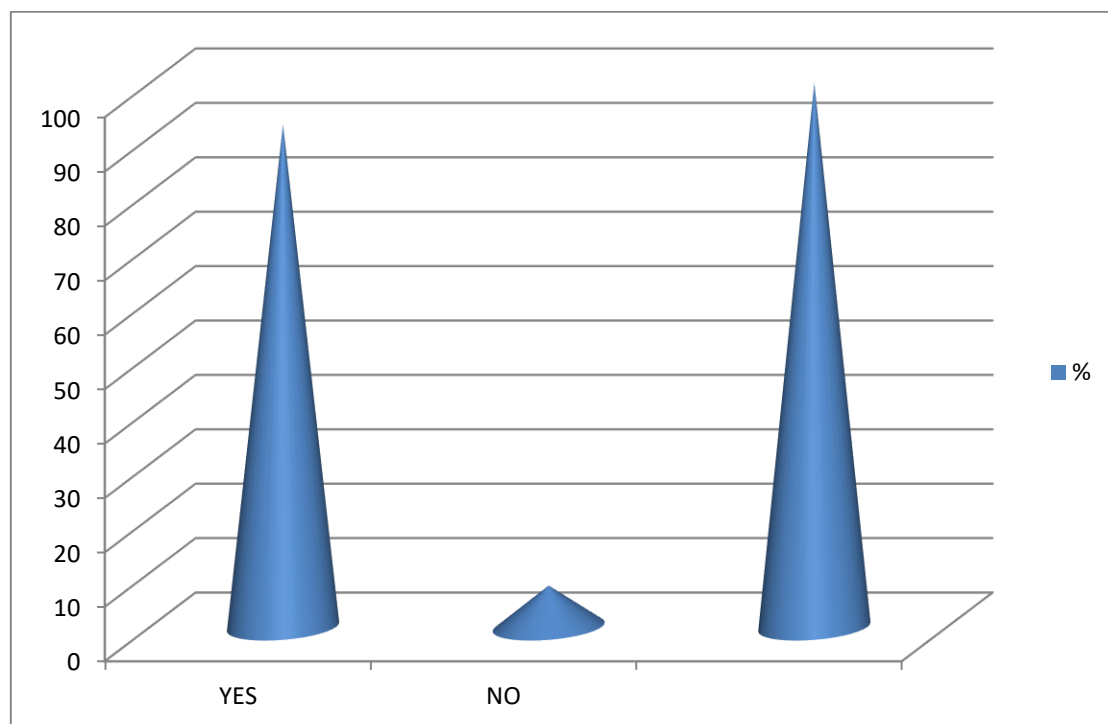


Figure 4. 3: Urban growth and land use/cover change on livelihoods

Results cover change and livelihood of smallholder farmers. Only 7.6% of the respondents disagreed that urban growth had effects on land use/cover change and their livelihoods.

4.2.4 Effect of urban growth and land use/cover change on the livelihoods of smallholder farmers in Jinja district.

This was raised to ascertain whether urban growth had negatively affected the livelihoods of the smallholder farmers in Jinja District and results are presented in table 4.4 below.

Table 4. 4: Effect of urban growth and land use/cover change on the livelihoods of smallholder farmers

Responses	Frequency	Percentage
Reduced agricultural output income	35	12.7
High cost of living	111	40.2
Increasing uncontrolled housing development	26	9.4
Hygiene and nutritional deficiencies	11	4.0
Loss of farmlands	66	23.9
Increasing land disputes	11	4.0
Unequal access to social amenities	8	2.9
Traffic congestion	4	1.4
Others	4	1.4
Total	276	100

The study findings in table 4.3 above shows that, high cost of living accounted for 40.2%, loss of farmlands 23.9%, increasing land disputes 4.0%, reduced agricultural output income 12.7%, increasing uncontrolled housing development 9.4%, hygiene and nutritional deficiencies 4.0%, unequal access to social amenities 2.9%, District traffic congestion 1.4% and others accounting 1.4%. The majority of the respondents (40.2%) agreed with the indicator of the high cost of living as a contributing factor of urban growth and use/cover which affects the livelihoods of smallholder farmers and their sustainability in the city.

4.2.5 Urban growth and land use/cover change and its effect on smallholder farmers' food production

This was raised to understand whether urban growth and land use cover change had effects on food production in Jinja District as this has a direct effect on the livelihoods of people and the results are presented in table 4.5 below.

Table 4. 5: Urban growth and land use/cover change and their effect on smallholder farmers' food production in Jinja district.

Responses	Frequency	Percentage
Decline in arable land for agriculture	122	44.2
Decline in a variety of crops grown	62	22.5
Decline in agricultural output and income levels	44	15.9
High prices of food, utilities, and general social services	41	14.9
Others	7	2.5
Total	276	100

The results in table 4.4 shows that, there was decline in arable land which accounted for 44.2%, reduction on crops grown at 22.5%, decline in agricultural output was at 15.9%, increased high prices of food was at 14.9%, and others forms not mentioned in the study at 2.5%. Therefore, the highest effect was decline in the arable land at (44.2%) as result of urban growth and land use/cover change.

4.2.6 Effect of urban growth and land use/cover change on ecology in Jinja district.

The study endeavored to establish the effect of urban growth and land use/cover change on the ecology of the District and results are presented in table 4.6 below.

Table 4. 6: Effect of urban growth and land use/cover change on ecology

Responses	Frequency	Percentages
Clearance of vegetation for residential purposes	119	43.1
Loss of indigenous medicinal plants and rare species	33	12.0
Increased land pollution due to waste disposal	44	15.9
Increased heat and emission of fumes from cars and industries	26	9.4
Increased encroachment of wetlands and thus loss of wetlands	46	16.7
Others	8	2.9
Total	276	100

Table 4.6 shows that urban growth and land use/cover change had led to clearance of vegetation for residential purposes which accounted for 43.1%, increased encroachment of wetlands or loss of wetlands 16.7%, increased land pollution due to waste disposal 15.9%, loss of indigenous medicinal plants and rare species 12.0%, increased heat and emission fumes from cars and industries 9.4% and only 2.9% accounted for others factors not unmentioned in the tool. Therefore, clearance of vegetation for residential purposes which accounted for 43.1% was the strongest effect of urban growth and land use/cover change on the ecology in Jinja city.

4.2.7 Opportunities brought about by urban growth and land use/cover change in Jinja district

Interest was to ascertain whether there are opportunities brought about by urban growth and land use/cover change for the smallholder famers in Jinja District and the findings are presented in figure 4.4 below.

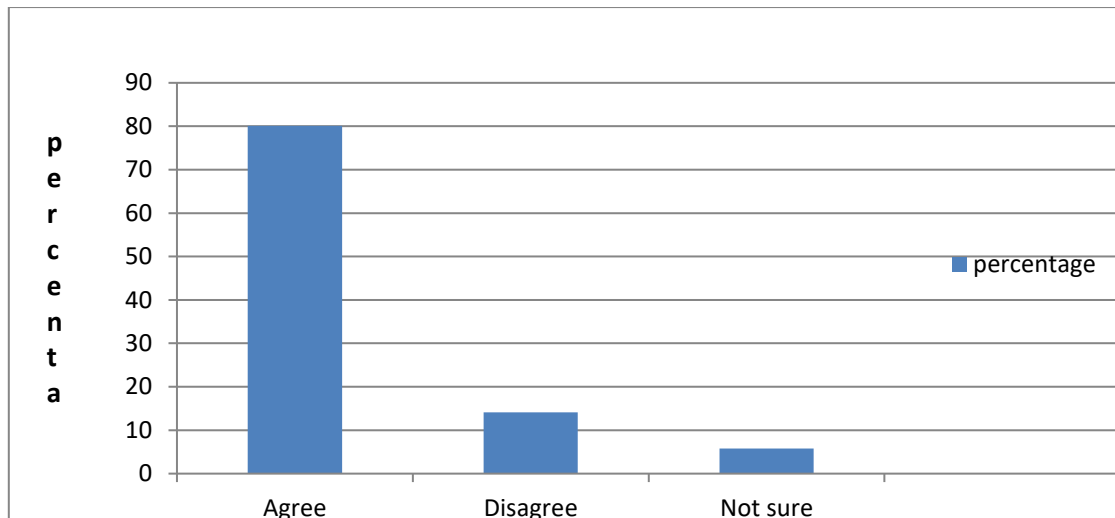


Figure 4. 4: Opportunities brought by urban growth and land use/cover change

Results in figure 4.4, revealed that 80.1% of the respondents agreed that urban growth had brought opportunities to people of Jinja city. 14.1% of the disagreed and 5.8% were not sure. Majority of the respondents (80.1%) agreed that there are opportunities as result of urban growth and land use/cover change for the people in the city.

4.2.8 Most pronounced urban growth and land use/cover change opportunities in Jinja district

This was set to identify the most pronounced opportunities brought about by urban growth and land use/cover changes in Jinja District as presented in table 4.7 below.

Table 4. 7: Most pronounced urban growth and land use/cover change opportunities in Jinja district

Opportunities	Frequency	Percentage
Creation and access to urban market	54	19.6
Increase in land value	128	46.4
Employment opportunities (off farm)	66	23.9
Access to social services (health, education)	23	8.3
Any other	5	1.8
Total	276	100

The responses in table 4.7 shows that 46.4% of the respondents acknowledged there was increase in the land value, 23.9%, said off-farm employment opportunities were realized, 19.6%, was creation and access to urban market, while 8.3% of the respondents said access to social services and 1.8% were for others indicators not mentioned in the study tool. Therefore, an increase in land value (46.4%) is the highest indicator for opportunities brought about by urban growth and land use/cover changes in Jinja city.

Table 4. 8: Correlation coefficients

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.292	.198		6.511	.000
	Coping up	.063	.064	.057	.978	.329
	Urban growth	.272	.060	.264	4.523	.000
a. Dependent Variable: livelihood						
Model Summary						
Model	R	R Square	Adjusted R Square		Std. Error of the Estimate	
1	.269	.072	.065		.56229	
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.709	2	3.354	10.609	.000 ^b
	Residual	86.314	273	.316		
	Total	93.023	275			
a. Dependent Variable: livelihood						
b. Predictors: (Constant), Urban Growth, coping up						

The model summary shows that urban growth affects the livelihood of smallholder farmers in Jinja District at .269. Urban growth significantly correlated with the livelihood of smallholder farmers (R Square) 0.072 at P (Sig. F.C) = 0.00. This implies that an increase in urban growth results in .269 increased effects on the livelihood of small-holder farmers. Urban growth

contributes .072 towards the livelihood of smallholder farmers of Jinja city. .060 Std. Errors is an indication that the sample is a more accurate and reflects the actual population mean of the study.

4.3 The coping mechanisms of smallholder farmers to the effects of urban growth and land use/cover changes in Jinja district.

The respondents were asked to show their responses on various questions. These were important question as they helped the researcher to understand coping mechanisms of smallholder farmers to the effects of urban growth on land use/cover changes in Jinja District and the findings are presented as below.

4.3.1 Existence of farm and non-farm livelihood strategies existed in Jinja district

The interest was to ascertain whether respondents confirm that they had farm and non-farm coping strategies in Jinja District and results are presented in figure 4.5 below.

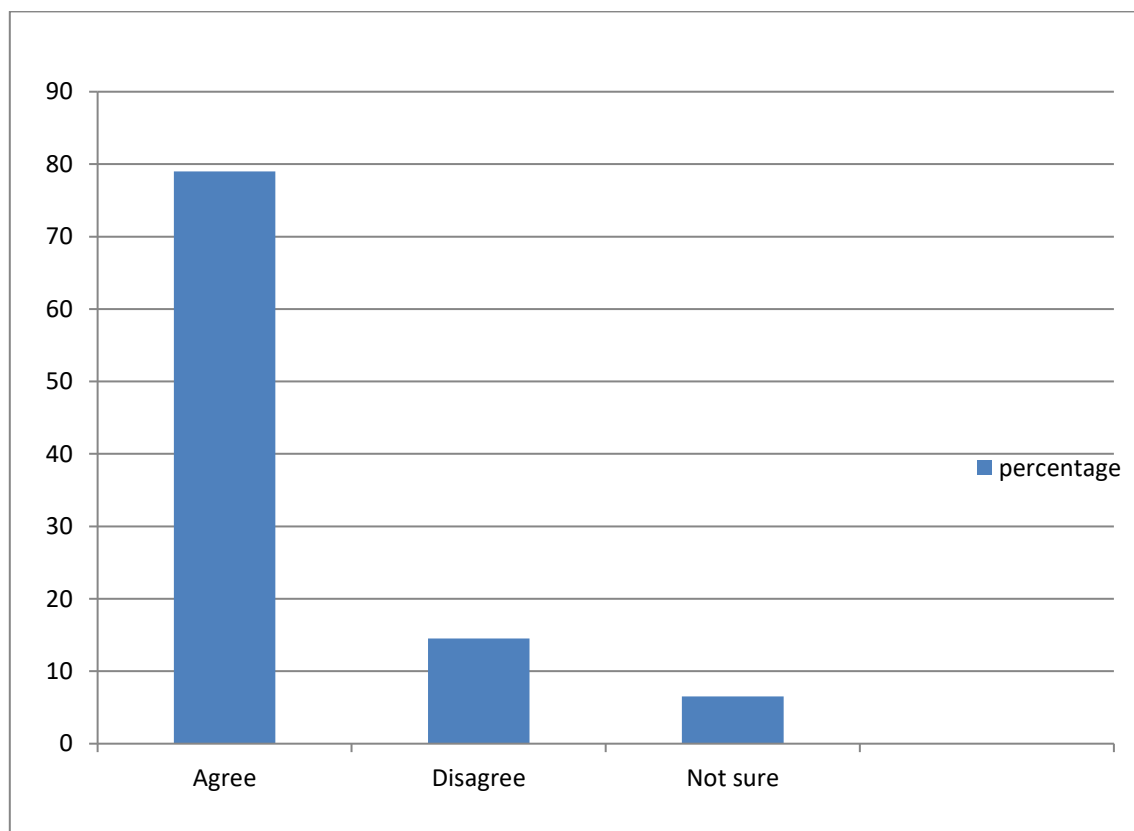


Figure 4. 5: Existence of farm and non-farm livelihood strategies in Jinja district

The findings in figure 4.5 above shows that 79% of the respondents agreed, 14.5% disagreed and 6.5% were not sure. Therefore, majority (79%) of the respondents agreed there are farm and non-farm coping strategies by the smallholder farmers in Jinja City. District.

4.3.2 Coping strategies of smallholder farmers to the effects of urban growth and land use/cover change in Jinja district

This was raised to assess the existing coping strategies to the effects of urban growth and land use/cover changes among the smallholder farmers in Jinja District and the results are presented in figure 4.10 below.

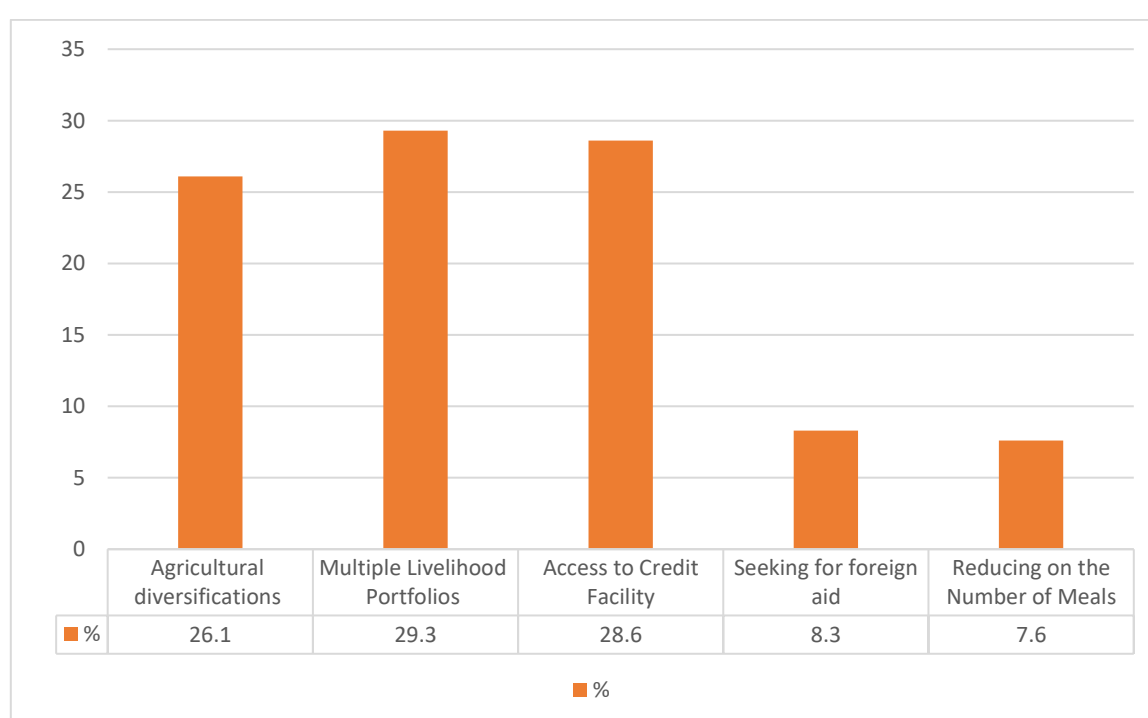


Figure 4. 6: Smallholder farmers coping strategies to the effects of urban growth and land use/cover change

Results in Figure 4.10 above reveals that 26.1% of the respondents carried out agricultural diversification, 29.3% of the smallholder farmers said they coped up to the effects of urban growth and land use/cover through multiple livelihood earnings. Those who got access to credit as way to sustain them-selves were 28.6%, while 8.3% received aid from government and non-government organizations and 7.6% of the respondents coped up through reduction on the number of meals per day.

4.3.3 Strategies under taken by smallholder farmers to improve on their livelihood in Jinja district

Several responses were presented to the respondents in order to help identify the magnitude of each strategy they were using to improve on their livelihood as a way to reduce on the effects of urban growth and land use/cover changes; and results are presented in table 4.9 below.

Table 4. 9: Strategies under taken by smallholder farmers to improve on their livelihood

Responses	Frequency	Percentage
Getting jobs outside agriculture	132	47.8
Rearing improved animal breeds	55	19.9
Growing improved crop varieties	42	15.2
Compound back yard farming and rearing animals	39	14.1
Others	8	2.9
Total	276	100

Study findings in table 4.9 indicate that, majority of the respondents 47.8% got jobs outside agriculture, 19.9% were rearing improved animal breeds, 15.2% took up growing quick maturing/ improved crop varieties, 14.1% took up compound back-yard farming and 2.9% of the respondents used other forms of livelihood strategies not mentioned in the study.

4.3.4 Most witnessed livelihood outcome in Jinja district

Interest was to identify the most livelihoods out come as identified in the study and findings are presented in table 4.10 below.

Table 4. 10: The most witnessed livelihood outcome in Jinja district

Responses	Frequency	Percentage
Increased income	45	16.3
Increased well being	107	38.8
Improved food security	44	15.9
Reduced vulnerability	80	29.0
Total	276	100

Findings in table 4.10 above shows that, 38.8% of the respondents realized increased well-being as they got used to the new situation, 29% realized reduced vulnerability, 16.3% increased on their income and 15.9% improved food security.

CHAPTER FIVE

DISCUSSIONS

5.1 Introduction

This chapter presents discussions of findings drawn from the results presented in chapter four.

5.2 Discussion of finding

In this section the study come up with discussions of results that were presented in the previous chapter and these are presented in line with the objectives of the study

5.2.1 Spatio-temporal Pattern and extent of Urban Growth on land use/cover change in Jinja district

Land conversion refers to the changing of the status of land from one use to another. Land cover is influential in determining which land use types are suitable for particular area over a given period of time. In Jinja district, different land cover types have been used for different land uses since 2002, and therefore, cover types have been changing from one type to another. As a result of this interaction of land uses, Jinja district has seen losses and gains in different land cover types over for the period between 2002 - 2022. There has been a general increase in built-up area in Jinja district for the last 30 years.

Results from (table 3) indicate that built-up areas have increased to cover 31.4% by the year 2022 from 11.4% in 2002. The district has a percentage change increase of 85% (at an annual rate 8.50%) and 48% (at an annual rate 4.88%) for the 2002-2012 and 2012-2022 respectively. It can therefore be concluded that these losses and gains are greatly attributed to Jinja district's built-up area over the last 30 years period. The results significantly show that built-up area has expanded since 2002 and this has come at expense of all other cover types. Results show that the non-urbanized areas covered a total area of 88.6% in 2002 this changed to 68.6% by the year 2022. There was a reduction of -13% (at an annual rate -1.30%) and -10% (at an annual rate -1.09%) for the period 2002-2012 and 2012-2022 for other land use/cover types respectively.

The major drivers of urban growth and land use/cover change in Jinja district were population increase at 46.7% and search for employment opportunities at 20.7% offered by the increasing industrial sector. This is in agreement with other previous studies (Omasire et al 2020, Worku, 2020, Maxwell, 2018). These attributed to urban expansion to an increase in population, natural and migrated as many were looking for jobs and this led to the demand for housing. Though the population size in Jinja district cannot be compared to other cities like Lagos, Nairobi, and Cape Town whose populations double that of Jinja (Maxwell, 2018). This suggests that the numbers are low hence less effect on land use/cover. The concern in the case of Jinja district is that there is the inability to provide for those few people and adherence to physical plan hence leading to unplanned, uncoordinated and un-regulated expansion of built-up areas.

There are remarkable changes in urban growth for the last 30 years and the most affected land use/cover due to urban growth are woodlands and grasslands. Results reveal that wood lands occupied 13.9% in 2002 they reduced to 2.95% in 2022 while grasslands in 2002 occupied 10.6% reduced to 8.3% in 2022. The major reasons for their reduction were demand for more land for farming as farming land was replaced by settlement, industrialization and other related structures. This coincides with previous studies of (Banon, 2022, Kabila and Adjei, 2019, Yin et al, 2018). Farmers resorted to open up more land to grow crops and rear animals where forests, wetlands, grasslands came to be replaced with farms, factories, roads, streets, and markets. The corresponding rise in built-up area was a result of the need for settlement and an increase in commercial activities.

In Jinja district in particular the energy demands like wood fuel, charcoal needed domestically in homes, burning bricks and in industries especially the steel industries. Such could well explain the decline in coverage of woodlands and grasslands in Jinja district during the period 2002 to 2022. Urban growth has attracted land fragmentations and slum developments in places like Budhumbuli, Musiima and Wanyange leading to further reduction of farmlands, wetlands, woodlands, and grasslands in Jinja district. For example, farmlands which accounted for 27.2% in 2002 reduced to 23.6% in 2022, this is attributed to the demand for land for settlement and other related structures. Previous studies such as Mbambazi and Atukunda, (2020) acknowledges the demand for food and as well explain the reason for encroachment of wetlands. In general, urban growth has had remarkable effects on land use/cover changes for the last 30 years in Jinja district at the expense of other land covers.

5.2.2 Effect of urban growth and land use/cover change on the Livelihood of smallholder farmers in Jinja district

Evidence from enumerator administered and self-administered questionnaires confirm that urban growth has greatly affected land use/cover change and the livelihood of the smallholder farmers in Jinja district. Findings show that, 92.4% of the respondents were in agreement that urban growth had greatly affected land use/cover change and the livelihood of the smallholder farmers. Results underscored the fact that population growth in search for employment opportunities have been key to uncontrolled horizontal expansion in Jinja district. The conversion of one land use form to another, in the process the wetlands, woodlands and grasslands have been sacrificed. As urban centres expand both in numbers and spatial terms, demand for land for residential and other urban land-use forms inevitably rises (Abass et al. 2018). In Jinja district there is a general decline in arable land for farming at (44.2%), and this raises concerns for the provision of food to the smallholder farmers hence affecting their livelihoods. This study is in agreement with previous studies such as Worku, (2020), who asserted that rapid urban expansion has pushed some of the fertile lands out of farming. Also, the increased demands for construction material like sand and top soil for building and landscaping in the emerging housing industry consumes more of the agricultural land which reduces food production and definitely has an effect on the livelihood of smallholder farmers. Respondents acknowledged clearance of vegetation at (43.1%) as they try to meet energy demands like wood fuel, charcoal needed domestically in homes, burning bricks and in industries especially the steel and sugar industries. This has led to increase in heat and emissions in the District which accounted for (12.0%) due to increase in industries, automobiles and congested settlements. There is loss of farmlands with a percentage of (23.9%) as per respondent and coincides with data from (table 3) which revealed (-2.05%) annual rate of change in the period 2012-2022. Scholars like Maxwell, (2018) further stated that, urban expansion accelerates the loss of agricultural land which raises concerns for the provision of food to indigenous citizens and has effects on smallholder farmers' income therefore Jinja district is not exempted from the scenario above.

Goward et al, (2018) argues that, planned urban settlement patterns are not wasteful of land and reduce the cost of providing services to the residents. The case in Jinja district is different in that most of the settlements are largely unplanned and where plans exist they are often not adhered to affecting land use/cover change and the livelihood of the smallholder farmers in the district. Previous studies of, Banon, (2022) and Brahima et al, (2020), stated that, this has led to development of slums and altering other land use/cover. In Jinja District evidence is seen in places like Budumbuli, Wanyange, masese, Musiima to mention. Slum development comes with effects like congestion which respondents acknowledged at 1.4%. Though the study is in agreement with previous studies like those above, in most case studies farmers had modern farming management schemes for example, greenhouse farming. The case of Jinja district, smallholder farmers don't have such, they still depend on traditional rain fed farming with erratic variability of onset and cessation of rain leading to frequent incidences of crop failure. This has been made worse with the reduction of the farms due to urban growth and land use/cover change imposing great effects to their income and food security. Urban growth in Jinja district has come with higher levels of pollution of land, garbage collection is still a challenge by the District authorities, and households' still use pit latrines as most slum areas don't have sewage systems these have a threat on their health. Poor soil management systems which lead to soil erosion are still practiced leading to less food production hence leading to hygiene and nutritional deficiencies among the smallholder farmers in Jinja district.

In Uganda planned urban growth and land use/cover has been argued to enable the cities perform their cardinal roles in driving economic development (MOFPED, 2016). Jinja district in particular despite the policies and physical plan in place these have not been adhered to. The growth is unplanned and extending in uncontrolled pattern turning most farms into built up areas this made farmers to encroach on wetlands, woodlands and grasslands as people look for sustainability. These great effects on the environment perhaps are the cause for the unreliable rainfalls received in the District something threatening the food security in the district. Farming though is one of the major livelihood activities in Jinja district it has been hit worse as many people have moved away from farming to offer labor in other sectors.

Results revealed (table 4.11) shows that, 47.8% of respondents confirmed that many got jobs outside farming leaving the sector to vulnerable groups like the elderly and women thus threatening smallholders' incomes and regular food insecurities in Jinja district. Banon, (2022), had this to say, smallholder farmers and the urban poor are agents of environmental degradation

because they have limited livelihood alternatives and at the sometime are victims of environmental degradation because their coping abilities are limited, they still seek their livelihood in farming in the District despite new dynamics. Katie et al, (2018) adds the population in Jinja district has increased; most people have been forced to go into things of trying to become hazardous. They have started chopping trees in order to sell them to get an income to sustain their families. Wako, (2019) pointed out that, in Jinja District for example many of the people earn their livelihood from self-initiated, unregulated, often illegal and environmentally unsustainable strategies which include tree cutting for charcoal making, brick burning and wetland encroachment for farming and settlement. These livelihood strategies increase on the vulnerabilities of the agricultural smallholder farmers Jinja district yet substantial proportion of these still live in poverty says Kempe, (2014).

Despite all the above, urban growth has also brought in opportunities to the smallholder farmers in Jinja city. Results (figure 4.12) revealed that 80.1% of respondents agreed there were opportunities as result of urban growth. According to (table 4.9) the most pronounced opportunity in Jinja is increase in land value at 46.4% this has made many to offer their farmland to market which has helped them to get capital to do business in order to sustain themselves. Brahim et al, (2020) asserts that, Increase in land values and housing cost/rentals brings higher returns to the real estate investors/ landowners. For instance, once a farm has changed user into residential user, the value would go up and the investor would earn more from his investment. They have realized off farm employment (table 9), at 23.9% from the growing industrial sector in the District which offer more regular rewards than the seasonal farming this improving on their standards of living. This is evident with the major drivers of urban growth in Jinja district that's population increase at 46.7% and employment at 20.7%. This means there is migrated population as they seek for employment definitely leading to the demand for housing in the District causing the rapid unplanned urban expansion. Access to urban market 19.6% of the respondents confirmed that it has been realized and other social services like health, education, piped water in some communities.

The model summary shows that urban growth affects the livelihood of smallholder farmers in Jinja district at .269. Urban growth significantly correlated with the agricultural livelihood of smallholder farmers (R Square) 0.072 at P (Sig. F.C) = 0.00. Implying that an increase in urban growth results in .269 increased effects on land use/cover change and livelihood of small-

holder farmers. Urban growth also contributes .072 toward the livelihood of smallholder farmers of Jinja district. .060 Std.

5.2.3 Coping mechanisms of smallholder farmers to the effects of urban growth and land use/cover change in Jinja district.

According to Katie et al, (2018), an expanding urban area comes with both opportunities and threats for the households particularly to the smallholder farmer's interface. But as they noted, these opportunities and threats are very often not evenly spread either within space or among the people inhabiting, creating both winners and losers. In Jinja district respondents revealed that; 79% of the respondents agreed there were coping mechanisms by smallholder farmers to the effects of urban growth and land use/cover change. These responses in the form of livelihood strategies were also shaped by a mix of livelihood capital possessed by the smallholder farmers in Jinja district. This is in agreement with Kabila et al, (2019) who stated that, in the existence of urban growth, many smallholder farmers resort to many livelihood portfolios as a strategy for survival combining both farm and non-farm mechanisms to help them cope with the changing realities of urban growth.

In Jinja district most male residents have resorted to non-farm livelihood activities like petty businesses, offering cheap labour in industries, road side selling merchandise, and daily labor. One of the respondents said that, urban growth has coincided with strict laws on the lake, many had abandoned fishing turning to farming but the gardens are too small to sustain their wellbeing. Also crop failure due to weather uncertainties yet they cannot afford irrigation equipment this has made many to resort to brick making, charcoal burning, collecting scrap and plastics to sale to steel/plastic factories. Women carry out home back yard farming, craft making, and making savings groups to help generate capital and welfare security. Previous studies like that of, Kabat, (2012), equally reported that, communities have also employed coping mechanisms like reliance on social networks such as sharing of experiences, emotional support, petty trade, temporary migration; women making handicrafts to sell in nearby markets, and accessing credit facilities. In Jinja district there is less emotional support, and credit accessibility many residents don't have security they resort to money leaders and microfinance with fewer requirements to get credit. Many of them fail to pay they have lost their property, increasing domestic violence in the community, family breakdown, and creating more threats to the residents.

Nevertheless, Cooper, (2008) confirms that Urban Farmers have managed to cope with the effects of urban growth through rainwater harvesting and the reuse of water for example water from washing clothes or utensils to irrigate crops in backyard gardens and nurseries. Case in Jinja residents are carrying out mixed cropping, an adjustment in land to backyard farming and crop management but backyard farming and rearing of animals have been taken up as new modes of livelihoods in the city. However, these have generated significant pollution problems in the district as there are no proper industrial, domestic, farms and animal waste management programs something which undermine the quality of life of residents.

Many of the residents still use biomass as energy sources, despite the efforts to diversify clean energy sources through government promotion of renewable energy such as solar and electricity. Unfortunately the investment required is still at a level that the urban poor can afford, most of the smallholder farmers still use biomass which increases pollution hence lowering the quality of life of the residents. The study results show there was a positive correlation between the two variables and this implies that there is a direct relationship between the variables. The model summary shows that coping mechanism of households is at .329. The results also showed that there is no significant correlation between urban growth with coping mechanism of smallholder farmers in Jinja district by 0.63 at $P=.329$. A unit increase in urban growth results in an increase of 0.63 in coping mechanism of households in Jinja city. However, in terms of effect urban growth contributes to .057 coping mechanism in Jinja district. In conclusion smallholder farmers are using different strategies to cope up with the new realities of life but some strategy choices like missing meals per day to sustain themselves lead to health vulnerabilities hence undermining the quality of their life.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter presents conclusions and recommendations based on the study objectives. The recommendations encompass areas connected to policy and future research needs.

6.2 Summary and Conclusion of findings.

The major finding from this study show that urban growth has significantly affected land use/cover change in Jinja district, the continued trend of land use change of Jinja district is largely attributed to the increase of the built-up area between 2002 to 2022 due to increase in population. These changes were quantified with the use of statistics obtained from land cover maps generated through remote sensing and GIS. Although remote sensing was largely successful in detecting and studying land cover dynamics in Jinja district between 2002 and 2022, it cannot be heavily relied on as different images from different time periods possess different attributes and this makes it harder for image interpretation hence errors may occur.

It's evident from the analysis that urban growth has a great effect on land use/cover change and the livelihoods of small holder farmers. In Jinja district farming has been one of the major livelihoods of the people therefore, the gradual conversion into built-up land like industrial, residential, commercial and other urban uses has left them with less alternatives for survival. Worse still urban growth in Jinja district is without any systematic development despite the presence of physical plan. This has greatly affected the livelihood of the smallholder farmers hence increasing on the house hold vulnerability. This threat requires immediate attention from the District planners, policy makers and administrators.

Different coping mechanisms has been taken up by the smallholder farmers including both farm and non-farm like mixed cropping, backyard farming and rearing, crop management, multiple income portfolios, roadside farming. Despite the various coping mechanisms being taken up by the smallholder farmers there is need for an appropriate urban planning policy which should be designed to reduce the adverse effect of urban expansion on the livelihoods smallholder farmers in Jinja district.

Finally, the research demonstrates a deeper understanding of the threats of urban growth on land use/cover change on livelihoods, opportunities and aids to design programs for sustainable urban development.

6.3 Recommendations

Based on the research findings, the researcher makes the following recommendations to improve on the “effects of land use/cover change on the livelihoods of smallholder farmers in Jinja district;

The government through the ministry of Urban Development should set policies to consider residents in cities to have skills and knowledge on other income generating activities besides farming which is greatly affected by urban growth hence land use/cover change.

The National Environmental Management Authority (NEMA) should have restrictions and implement of laws regarding wetland occupation and use to avoid clearing water basins in search for farm land to replace the build-up areas in urban areas. There is need by district authorities to enforce and adhere to existing policies/laws in order to enhance the sustainability of urban development as well environmental resource utilization.

In order to improve on the productivity of the remaining farming land, government should avail smallholder farmers with farming incentives in order help them to use modern urban farming method like use of fertilizers and irrigation to help generate sufficient food demands to sustain the growing urban population.

Although remote sensing was largely successful in detecting and studying land cover dynamics in Jinja district between 2002 and 2022. It cannot be heavily relied on as different images from different time periods possess different attributes and this makes it harder for image interpretation hence errors may occur. Therefore, more studies should be done using shorter time series and relate with population growth and socio-economic factors.

REFERENCES

- Acharya, S. V. (2016). Sustainable Agriculture and Rural livelihood, *Agricultural Economics Research Review* Vol, 19, pp. 205-217
- Adjei, et al (2019) Urban sprawl: a view from developing and developed countries. *African Journal of Geography and Regional Planning*.
- Aggarwal, (2018) Managing physical development in peri-urban areas of Kumasi, Ghana: A case of Abuakwa. *Journal of Urban and Environmental Engineering*.
- Alaci, S., & Cerlincă, D. A. (2010). Proposed Method For Measuring The Coefficient Of Restitution. *Annals of the Oradea University. Fascicle of Management and Technological Engineering*.
- Alpopi, C., Manole, C., & Elena, C. S. (2022). Assessment of the Sustainable Urban Development level through the use of indicators of Sustainability Research Center in Public Administration and Public Services
- Amadi, O.P., Youdewei, P., and Ogbji, S.I., (2021). Spatio Analysis of Urbanization on Rate of Wetland loss in Port Harcourt Metropolis
- Amin, M.E. (2015). *Social science research; Conception, Methodology and Analysis*, Makerere University, Kampala
- Anurag, O. and Poona, M. (2012). Urban Sprawl Mapping and Land use change Detection Using Remote Sensing and GIS
- Atiqur, R., Shiv, P.A., Maik, N., and Shahab, F., (2023). Monitoring Urban Sprawl Using Remote Sensing and GIS Techniques of a Fast Growing Urban Centre, India; *journal of Selected Topics in Applied Earth Observations and Remote sensing*, vol. 4.
- Auraya, (2016) Urban Sprawl Causes and Impacts on Agricultural Land in Wote Town Area of Makueni County, Kenya
- Azizo, et al (2020) Urbanization, Urban Environment and Land Use: Challenges and Opportunities.

- Baimeister, M. (2012). *Managing Urban Growth*, Canada
- Banon, F. (2022). Spatio-Temporal Land Cover Analysis and the Impact of Land Cover Variability Indices on Land Surface Temperature in Greater Accra, Ghana Using Multi Temporal Landsat Data; *Journal of Geographic Information System*, 14(3): 240-258.
- Belayneh, B. and Eyasu, E. (2020). *Land Use/Land Cover Change and Its Driving Forces in Shenkolla Watershed, South Central Ethiopia*. Center for Environmental Science, College of Natural and Computational Sciences, Addis Ababa University, Addis Ababa, Ethiopia.
- Bimenyimana, T. & Bugenima E. D., (2022). *Impact of Urbanization on Land use and Land Cover Changes in Growing Cities of Rwanda*.
- Bongaarts, J. (2015). *Global and Regional Population Projections to 2025*" in Nurul Islam *Population and Food in the Early Twenty-First Century: Meeting Future Food Demand of an Increasing Population*. Washington, DC: International Food Policy Research Institute.
- Bosiu, E. L., Adriaan, V.W., & Sifiso, X., (2022). *Fine-Scale Classification of Urban Land Use and Land Cover with Planet Scope Imagery and Machine Learning Strategies in the District of Cape Town, South Africa*.
- Brahima, C. and Shixianga, Li. (2020). *Impact of Agricultural land loss on rural livelihoods in Peri-Urban Areas: Empirical Evidence from Sebougou, Mali*.
- Brugmann, R. (2016). *Sprawl; A compact History*, University press of Chicago
- Bwanika, B. (2015). *Temporal and Spatio Patterns of Urban Sprawl and their Implications on environmental Planning in Mbarara Municipality*
- Caleb, M. (2020). *Impact of urban land cover change on the garden District status and land surface temperature of Kumasi*, *Cogent Environmental Science*, pp. 30-35
- Clarke, P. A. and Buckley, M. R. (2019). *Urbanization and Growth Setting the Context*

- Dan, A., Azo, E., & Andogah, G., (2018). Spatio Assessment on Rural Livelihood in Peri-Urban areas: Empirical Evidence from Sebougou.
- Devendran, A.A. and Banon, F. (2022). Spatio-Temporal Land Cover Analysis and the Impact of Land Cover Variability Indices on Land Surface Temperature in Greater Accra, Ghana Using Multi-Temporal Landsat Data. *Journal of Geographic Information System*, 1(4(3): 240-258.
- Eseate, D. (2015). An Evaluation and Analysis of Urban Expansion Kampala from 1995 to 2015
- Gezahegn, A. A. (2013). Quantifying Urban Growth Pattern in Developing Countries Using Remote Sensing and Spatio Metrics; case study in Kampala, Uganda
- Gondwe, J.F., Sun, Lin, & Munthali, R.M. (2021). Analysis of land use and land cover changes in Urban Areas Using Remote sensing case study of Blantyre DistrictChina
- Gondwe, J.M. & Rodger, M. (2023). Analysis of Land Use and Land Cover Changes in Urban Areas Using Remote Sensing: Case of Blantyre City, College of Geomatics Shandong University of Science and Technology.
- Hassan, M.M., Tavakali, N., and Kazemi, M. (2016). Monitoring land use change and Measuring Urban sprawl based on its spatio forms, the case of Qom city.
- Hayden, D. (2004). A Field Guide to Sprawl
- Heng, S., Wayne, F., and Nigal, W., (2017). Modeling urban land use and Urban sprawl; Calgary, Alberta, Canada.
- Hirsch, J. (2005). Sprawl kills, New York.
- Iheke, R. and Ihuoma, U. (2015). Effect of Urbanization on Agricultural production in Abia State Ghana.
- Kabila, A., Selase, A., and Agyemang, S. (2018). Peri- urbanization and loss of Arable land in Kumasi Metropolis in three decades; Evidence from remote sensing image Analysis.

- Kiggundu et al., (2017) Assessing Land Use and Land Cover Changes in the Murchison Bay Catchment of Lake Victoria Basin in Uganda; Department of Agricultural and Biosystems Engineering, Makerere University.
- Kuddu, A., Tynan, E., and McBryd, E. (2020). Urbanization: a problem for the rich and the poor? Australian Institute of Tropical Health and Medicine, James Cook University, Citysville, Australia
- Lützkendorfa, T., & Maria, B. (2017). Assessing a Sustainable Urban Development: Typology of Indicators and Sources of Information
- Madhuri, S. & Kumar, A. (2022). Urban growth and quality of life: inter-district and intra-district analysis of housing in NCT-Delhi, 2001–2011–2020.
- Mehari, M., Li, J., & Melesse, M. (2022). Land use / land cover change analysis and detection of its drivers using geospatial techniques; A case of south- central Ethiopia.
- Muhammad, A. et al., (2020). Comparative Assessment of the Unsupervised Land Use Classification by Using Proprietary GIS and Open-Source Software
- Mulugojam, W., Suneetha, P., & Krishna, T.V. (2019). Urban Growth and Land Use Land Cover Change of Bahir Dar City, Department of Geography, Andhra University, Visakhapatnam
- Munabi, C., Kansime, F., Amel, A. (2009). Variation of water quality in Kakira catchment area Jinja – Uganda, Phys. Chem. Earth
- Mundia, C. N. & Aniya, M. (2015). Analysis of land use/cover changes and urban expansion of Nairobi District using remote sensing and GIS, International Journal of Remote Sensing. Vol 26, No.13.
- Njiru, M. & Ojuok, J. (2006). Dominance of introduced Nile tilapia, *Oreochromis niloticus* (L.) in Lake Victoria: A case of changing biology and ecosystem, Ministry of Water and Irrigation, Nairobi (Kenya). pp. 255- 262

- Nyonges, S.K., Maghenda, M., & Siljander, M. (2022). Assessment of Urban Sprawl, Land Use and Land Cover Changes in Voi Town, Kenya Using Remote Sensing and Landscape Metrics Journal of Geography, Environment and Earth Science International, vol. 26, no. 4 , pp. 50-61 .
- Ransford, A., Agyeman, S., & Mohammed, F., (2021). Quantifying the spatio-temporal patterns of settlement growth in a metropolitan region of Ghana.
- Sridhar, M.B. (2020). Urban Sprawl Analysis Using Remote Sensing Data and Its Impact on Surface Water Bodies: Case Study of Surat, India
- Sturm, R. (2004). Suburban Sprawl and physical and Mental Health, Canada
- United Nations Development Program (2016) Sustainable Urbanization strategy.
- United Nations Economic Commission for Africa Contribution to the (2014) United Nations Economic and Social Council (ECOSOC) Integration Segment
- United Nations, World Urbanization Prospects 1990 (New York: United Nations, 1991)
- Upton, N., Igga, Y., & Nasasir, P. (2022). Interrogating the Impact of Land Use/Land Cover Dynamics in Mbarara Districtin South western Uganda, Mbarara University of science and technology
- Waibi, M. (2019). Sugarcane Growing and Household Food Security
- Yannis, M., Ioannides & Esteban, R. (2005). Urban Growth; Department of Economics Working Paper, Tufts University
- Zhicha, H. G., Minmin, N., & Peng G., (2022). Urban Land Expansion from Scratch to Urban Agglomeration in the Federal District of Brazil in the Past 60 Years; Department of Geography, University of Brasilia, Brasilia 70910-900, Brazil

APPENDICES

Appendix 1: Questionnaire

ENUMERATOR ADMINISTERED QUESTIONNAIRE FOR MULTIPLE INCOME EARNERS AND URBAN SMALLHOLDER FARMER RESPONDENTS

Introduction:

I am Wandiyaka Richard, a final year student of Kyambogo University pursuing Masters of Arts in Geography of Kyambogo University conducting research on ‘**ASSESSMENT OF THE EFFECT OF LAND USE/COVER CHANGE ON THE LIVELIHOODS OF SMALLHOLDER FARMERS IN JINJA DISTRICT**’

I am conducting this survey with 276 respondents in Jinja City. You have been selected to contribute to this study by answering a few questions that are in this questionnaire. All the responses given will be kept confidential and used for academic purposes only. I would therefore like to get your permission to ask you some questions about your experience with in the City.

Interview No:Date:Enumerator:

Division: Parish: ward:

SECTION A: SOCIO-DEMOGRAPHIC INFORMATION:

Please, tick in the box provided and fill in the blank spaces as required by the questionnaire.

1. Gender of the respondent

a) Female ☐ b) Male ☐

2. Age group ☐

18-28 ☐

29-39 ☐

40-50

51-59

☐

above

☐

3. Marriage status

a) Single ☐ b) married ☐ c) divorced ☐ d) widow/ widower ☐

4. Respondents level of Education;

a) University ☐ b) Other tertiary ☐ c) Secondary ☐ d) Primary ☐ e) None ☐

5. Employment status

a) Formal Employment ☐
b) None-formal employment ☐
C) Unemployed ☐

6. Source of household income

Farming ☐
Self employed ☐
Business man/woman ☐
Public servant ☐
Daily manual labour ☐
Others ☐

7. Household size

- 1-4 Members ☐
- 5-8 Members ☐
- 9-12 Members ☐
- 12-Members and above ☐

SECTION B: ASSESSMENT OF THE EFFECT OF LAND USE/COVER CHANGE ON THE LIVELIHOODS OF SMALLHOLDER FARMERS IN JINJA DISTRICT”

1. Have you noticed urban growth Land use changes in this area/City?

- a) Yes ☐ b) No ☐

2. Which one is the most witnessed form of urban growth/land use change in the City?

i. Transportation routes ☐

ii. Residential areas ☐

iii. Industrial centers ☐

iv. Others Specify ☐

3. What is the major driver of urban growth/land use changes in the City?

i. Demand for more living space ☐

ii. Ineffective land use control ☐

iii. Increase in population ☐

iv. Efficient transport systems ☐

v. Employment opportunities ☐

3. What motivated you to relocate into this community as a resident?

i. Access to land ☐

ii. Preference for serene environment ☐

iii. Housing affordability ☐

iv. Improved security ☐

v. Cheap prices for land ☐

vi. Others, Specify ☐

4. Is urban growth affecting agricultural production and livelihoods in the City?

a) Yes ☐

b) No ☐

5. If yes, how has urban growth affected household food crop production in the City?

Decline in arable land for agriculture ☐

Decline in a variety of crops grown ☐

Decline in agricultural output and income levels ☐

iv. High food prices, utilities, and general social services ☐

v. Others, specify ☐

6. If yes, how has urban growth affected agricultural production and ecology in the city?

Clearance of vegetation for residential purposes e.g. cutting down trees which act as wind breakers ☐

ii. Loss of indigenous medicinal plants and rare species are lost ☐

iii. Increased land pollution due to waste disposal ☐

iv. Increased heat and emission of fumes from cars ☐

v. Increased encroachment of wetlands and thus loss of wetlands ☐

vi. Others, specify ☐

7. If yes, how has urban growth affected household livelihood sustainability?

Reduction in agricultural output/income ☐

Increased cost of living ☐

Increasing uncontrolled housing development ☐

Hygiene and nutritional deficiencies ☐

Loss of farmlands ☐

Increasing land disputes ☐

Unequal access to social amenities ☐

Traffic congestion ☐

Others, specify ☐

8. Has urban growth brought opportunities to the people in the city?

a).Agree ☐ b) disagree ☐ c) not sure ☐

9. According to you which one is the most pronounced opportunity that urban growth has brought in the area?

a).Creation and access to urban market ☐

b).Increase in land value ☐

c). Employment opportunities (off-farm jobs) ☐

d). Access to social services (health, water, education and nutritional) ☐

c). Any other ☐

SECTION C: THE COPING MECHNANISMS OF SMALLHOLDER FARMERS TO THE EFFECTS OF LAND USE/COVER CHANGE AND IT'S OUT COMES.

1. Do you agree there farm and no-farm coping strategies in the area?

a) Agree ☐ b) disagree ☐ c) not sure ☐

2. How are you managing to cope up with the effects of urban growth in this area?

a) Agriculture diversification ☐

b) Multiple livelihood portfolios ☐

c) Access to credit facilities ☐

d) Seeking for foreign aid from government and non-government agencies ☐

e) Reducing on the number of meals per day ☐

3. Which of the following coping strategies do you under take to reduce the effects caused by urban growth on agricultural livelihood?

a) Getting jobs outside agriculture ☐

b) Rearing improved breeds of animals ☐

c) Growing improved crop varieties ☐

d) Compound back yard farming and rearing animals ☐

e) Others ☐

4. In your household which one is most witnessed livelihood outcome?

a). Increased income ☐

b). Increased well being ☐

c). Food security Improved ☐

d). Reduced vulnerability ☐

3. Is there anything else you would like to tell me concerning urban growth and Agricultural livelihood?

.....
.....
.....

*******Thanks for participating*******

Appendix 2: Self-Administered questionnaire for urban planners and agricultural extension workers.

Introduction:

I am Wandya Richard, a final year student of Kyambogo University pursuing Masters of Arts in Geography of Kyambogo University conducting research on **“ASSESSMENT OF THE EFFECT OF LAND USE/COVER CHANGE ON THE LIVELIHOODS OF SMALLHOLDER FARMERS IN JINJA DISTRICT”**

I am conducting this survey with 276 respondents in Jinja District. You have been selected to contribute to this study by answering a few questions that are in this questionnaire. All the responses given will be kept confidential and used for academic purposes only. I would therefore like to get your permission to ask you some questions about your experience with in the District.

Interview No:Date:Enumerator:

Division: Parish: ward:

SECTION A: SOCIO-DEMOGRAPHIC INFORMATION:

Please, tick in the box provided and fill in the blank spaces as required by the questionnaire.

1. Gender of the respondent

a) Female ☐ b) Male ☐

2. Age group

18-28	☐
29-39	☐
40-50	☐
51-59	☐
Above	☐

3. Marriage status

a) Single ☐ b) married ☐ c) divorced ☐ d) widow/ widower ☐

4. Respondents level of Education;

a) University ☐ b) Other tertiary ☐ c) Secondary ☐ d) Primary ☐ e) None ☐

5. Employment status

a) Formal Employment ☐
b) None-formal employment ☐
C) Unemployed ☐

6. Source of household income

Farming ☐
Self employed ☐
Business man/woman ☐
Public servant ☐
Daily manual labour ☐
Others ☐

7. Household size

1-4 Members ☐
5-8 Members ☐
9-12 Members ☐
12-Members and above ☐

SECTION B: THE EFFECT OF LAND USE/COVER CHANGE ON LIVELIHOOD OF THE SMALLHOLDER FARMERS.

1. Have you noticed urban growth Land use changes in this area/District?

a) Yes ☐ b) No ☐

2. Which one is the most witnessed form of urban growth/land use change in the District?

i. Transportation routes ☐

ii. Residential areas ☐

iii. Industrial centers ☐

Iv. Others Specify ☐

3. What is the major driver of urban growth/land use changes in the District?

i. Demand for more living space ☐

ii. Ineffective land use control ☐

iii. Increase in population ☐

iv. Efficient transport systems ☐

v. Employment opportunities ☐

3. What motivated you to relocate into this community as a resident?

i. Access to land ☐

ii. Preference for serene environment ☐

iii. Housing affordability ☐

iv. Improved security ☐

v. Cheap prices for land ☐

vi. Others, Specify ☐

4. Is urban growth affecting agricultural production and livelihoods in the District?

a) Yes ☐

b) No ☐

5. If yes, how has urban growth affected household food crop production in the District?

Decline in arable land for agriculture ☐

Decline in a variety of crops grown ☐

Decline in agricultural output and income levels ☐

iv. High food prices, utilities, and general social services ☐

v. Others, specify ☐

6. If yes, how has urban growth affected agricultural production and ecology in the District?

Clearance of vegetation for residential purposes e.g. cutting down trees which act as wind breakers ☐

ii. Loss of indigenous medicinal plants and rare species are lost ☐

iii. Increased land pollution due to waste disposal ☐

iv. Increased heat and emission of fumes from cars ☐

v. Increased encroachment of wetlands and thus loss of wetlands ☐

vi. Others, specify ☐

7. If yes, how has urban growth affected household livelihood sustainability?

Reduction in agricultural output/income ☐

Increased cost of living ☐

Increasing uncontrolled housing development ☐

Hygiene and nutritional deficiencies ☐

Loss of farmlands ☐

Increasing land disputes ☐

Unequal access to social amenities ☐

Traffic congestion ☐

Others, specify ☐

8. Has urban growth brought opportunities to the people in the district?

a). Agree ☐

b) disagree ☐

c) not sure ☐

9. According to you which one is the most pronounced opportunity that urban growth has brought in the area?

- a).Creation and access to urban market ☐
- b).Increase in land value☐
- c). Employment opportunities (off-farm jobs) ☐
- d). Access to social services (health, water, education and nutritional) ☐
- c). Any other ☐

SECTION C: THE COPING MECHNANISMS OF SMALLHOLDER FARMERS TO THE EFFECTS OF URBAN GROWTH AND OUT COMES.

1. Do you agree there are farm and no-farm coping strategies in the area?

- a) Agree ☐ b) disagree ☐ c) not sure☐

2. How are you managing to cope up with the effects of urban growth in this area?

- a) Agriculture diversification ☐
- b) Multiple livelihood portfolios ☐
- c) Access to credit facilities ☐
- d) Seeking for foreign aid from government and non-government agencies ☐
- e) Reducing on the number of meals per day ☐

3. Which of the following coping strategies do you under take to reduce the effects caused by urban growth on agricultural livelihood?

- a) Getting jobs outside agriculture ☐
- ☐

b) Rearing improved breeds of animals

c) Growing improved crop varieties

☐

d) Compound back yard farming and rearing animals

☐

e) Others ☐

4. In your household which one is most witnessed livelihood outcome?

a). Increased income ☐

b). Increased well being ☐

c). Food security Improved ☐

d). Reduced vulnerability ☐

********Thanks for participating********