

**EXPLORING PERI-URBAN LAND USE CHANGE FROM COFFEE FARMING TO
REAL ESTATE DEVELOPMENT: A CASE STUDY OF NYERI, KENYA**

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the document contains no material previously published or written by another person except where due reference is made in the research concept itself.

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Approval

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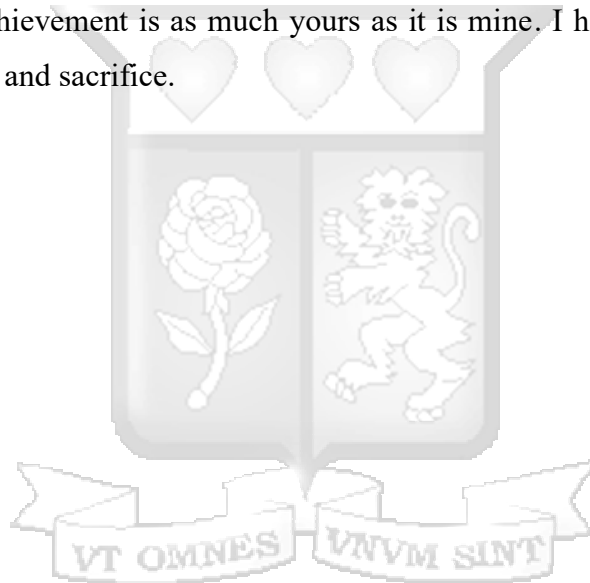
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DEDICATION

This dissertation is dedicated to my father, whose unwavering support, wisdom, and encouragement have been the bedrock of my journey at Strathmore Business School. His belief in me, even in moments of doubt, has been a guiding light, shaping not only my academic path but also the person I am today. For his sacrifices, relentless motivation, and the invaluable lessons he has imparted, I am eternally grateful.

I also dedicate this work to my life partner, whose selflessness and unwavering support have been my strength through this journey. From the words of encouragement that pushed me forward to the quiet understanding and comfort during the challenging moments, your love and patience have been my anchor. This achievement is as much yours as it is mine. I hope you now share in the rewards of your devotion and sacrifice.



ABSTRACT

Trade-offs between ecosystem preservation, poverty alleviation, and urban development are critical considerations in peri-urban areas undergoing a transition from agriculture to urban growth. This study explores the factors driving land-use change from coffee farming to real estate development in Nyeri, Kenya, its socio-economic consequences, and the role of government interventions in ensuring a sustainable balance. The study is anchored on the Theory of Urban Expansion and the Urban Growth Machine Theory, providing a framework to understand the economic and political drivers of land-use transformation.

A mixed-methods approach was adopted, utilizing a concurrent triangulation design that combined quantitative surveys with qualitative interviews. A judgmental sample of 377 coffee farmers participated in the quantitative survey, while 25 key informants—including real estate developers, land use planners, land brokers, and community members—were engaged in semi-structured interviews. Data was analyzed using descriptive statistics, inferential statistics, and thematic analysis, with NVIVO software applied for qualitative coding.

Findings indicate that economic incentives, particularly the higher profitability of real estate compared to coffee farming, are the primary drivers of land-use change. As coffee incomes decline, farmers are increasingly motivated to sell land for real estate ventures. This shift is further influenced by land fertility perceptions, urban expansion pressures, and market demand for housing and commercial spaces. Despite existing government policies aimed at supporting coffee farmers, their impact remains limited due to weak enforcement, inadequate financial incentives, and fragmented policy implementation.

The socio-economic consequences of this transition include reduced food security, environmental degradation, loss of agricultural heritage, and weakened community ties. Additionally, haphazard real estate development, poor urban planning, and unregulated land sales have further exacerbated socio-economic disparities and spatial instability in peri-urban Nyeri.

The study recommends strengthening zoning regulations, providing targeted financial incentives for coffee farmers, and enhancing participatory urban planning to ensure a sustainable balance between urban growth and agricultural preservation. Furthermore, government policies should

focus on research-driven interventions and collaborative stakeholder engagement to mitigate the negative impacts of rapid peri-urban land conversion.



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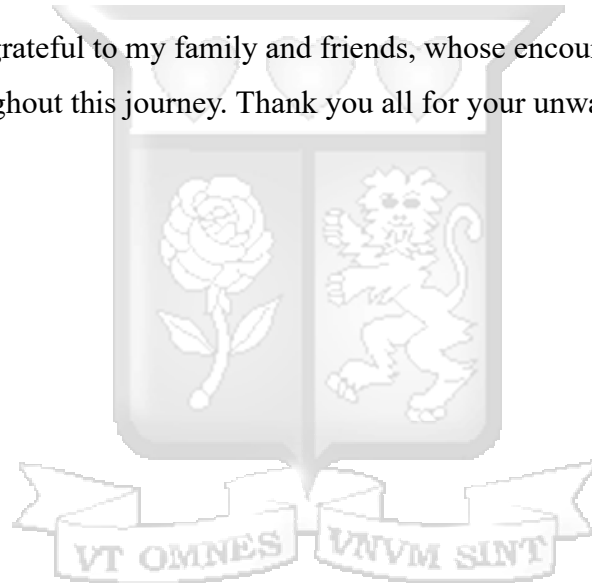


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ABBREVIATIONS AND ACRONYMS

CCARF	The Coffee Cherry Advance Revolving Fund
FAO	Food and Agriculture Organization
NACOSTI	National Commission for Science, Technology and Innovation
SDGs	Sustainable Development Goals
EMCA	Environmental Management and Coordination Act



DEFINITION OF KEY TERMS

Socio-economic consequences

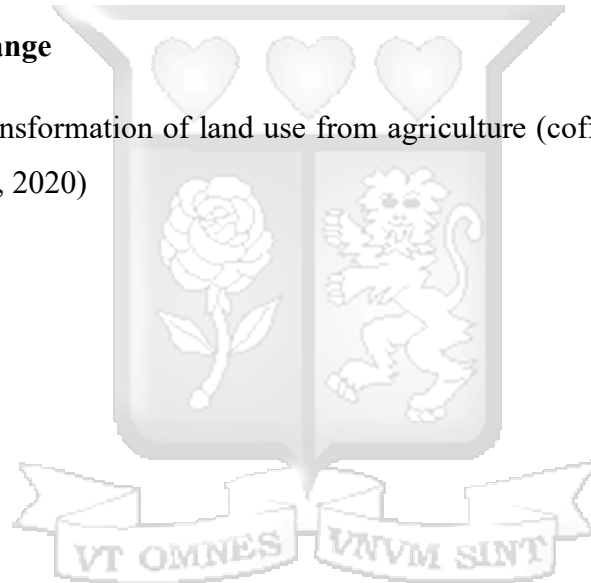
These are the effects of land use transformation from agriculture to real estate development. These shifts bring up important issues of sustainable urbanization, the preservation of agricultural history, and the community's long-term effects (Sylla et al., 2020)

Driving Factors

These are defined as factors that motivate the transformation in land use in peri-urban landscapes (Baye et al., 2020)

Peri-urban land use change

This is defined as the transformation of land use from agriculture (coffee farming) to real estate development (Baye et al., 2020)



CHAPTER ONE

INTRODUCTION TO THE STUDY

1.1 Background to the Study

As cities in developing nations continue to urbanize, large tracts of rural land are increasingly forming part of the urban perimeter (Brown et al., 2018). This peri-urbanization process often entails the conversion of rural agricultural land to various urban land uses, such as commercial zones, industrial areas, city-oriented agricultural production spaces, transport routes, and housing developments (Busck & Kristensen, 2014). However, peri-urbanization often disadvantages peripheral areas, leading to a strain on rural resources, environmental degradation, and loss of agricultural livelihoods (Ewing & Hamidi, 2017). As a result, there is a need for a balanced and sustainable approach to peri-urbanization that ensures a harmonious coexistence between urban expansion and agricultural preservation.

One of the most common land-use changes in peri-urban settings is the transition from farming to real estate development (Baye et al., 2020). This shift is primarily driven by economic factors, where investors purchase agricultural land for conversion into commercial and residential developments (Olson & Lyson, 2019). Globally, agricultural land hectarage has been shrinking significantly due to urban expansion and population growth (FAO, 2023). According to the Food and Agriculture Organization (FAO, 2023), global cropland per capita declined from 0.21 hectares in 1961 to 0.15 hectares in 2016, despite a rising demand for food. The largest decreases in cropland have been recorded in China, the United States, Australia, Brazil, and India, where rapid urbanization has contributed to significant agricultural land loss (FAO, 2023).

A similar trend is occurring in Kenya, where prime agricultural land is increasingly being converted into real estate developments (Mwazighe, 2023). Large sections of farmland in the South and North Rift regions, including Eldoret and Kericho, are now occupied by retail outlets, business hubs, hospitals, and high-rise apartments (Wakarima, 2023). Likewise, in Central Kenya (Nyandarua, Murang'a, Nyeri, and Nanyuki), both cash crops (such as coffee) and food crops are being replaced by small-scale residential plots (AFA Coffee Directorate, 2022). Even in remote counties like Taita Taveta, agricultural land is increasingly being converted for commercial real estate projects, indicating that this trend is widespread across the country (Ndegeah, 2015).

The younger generation of landowners—who often inherit agricultural land—are more inclined to convert it for real estate development due to higher financial returns compared to farming (Mwazighe, 2023). This shift, while economically beneficial for some, raises concerns about long-term food security, environmental sustainability, and the economic viability of agriculture (Baye et al., 2020). Considering the controversial nature of agricultural land-use conversion, there is a growing need to understand its underlying drivers and consequences to inform effective land-use policies (Sang et al., 2022).

This study examines peri-urban land use change in Nyeri, focusing on the factors driving the transition from coffee farming to real estate development, the socio-economic consequences of this shift, and the role of government interventions in ensuring a sustainable balance between urbanization and agricultural preservation.

1.1.1 Case Study Description – Nyeri, Kenya

Nyeri County is one of Kenya's leading coffee-producing regions and has played a critical role in shaping the socioeconomic landscape of the area. The coffee industry has long been a pillar of the local economy, providing employment to thousands of farmers and supporting various value chain actors, including cooperatives, millers, extension agents, and marketing firms (AFA Coffee Directorate, 2022). In 2019, an estimated 14,138 hectares of land in Nyeri were under coffee production, yielding approximately 5,318 metric tons of coffee beans. This output accounted for 12% of Kenya's total coffee production, second only to Kiambu County, which contributed 22% (AFA Coffee Directorate, 2022). Nyeri has an estimated 3,800 coffee farmers, alongside key industry stakeholders such as government agencies, research institutions, and private-sector players, all working together to enhance productivity and address sector challenges. The industry is regulated by the Coffee Directorate, which oversees policies, pricing structures, and quality standards to ensure sustainable coffee farming practices.

The rationale for selecting Nyeri County as the focus of this study is based on its significant coffee output compared to other counties. Despite its high yields and relatively better returns, an increasing number of farmers are shifting away from coffee farming to real estate development, raising questions about the underlying drivers of this transition (AFA Coffee Directorate, 2022). Notably, Nyeri ranks second in cherry rates, with farmers receiving KES 95.18 per kilogram, a

price considerably higher than Murang'a County, where farmers earn KES 78 per kilogram. Furthermore, Nyeri consistently outperforms Murang'a and Kiambu in total coffee production, factory payout rates, and net proceeds. However, despite these advantages, the total acreage under coffee in Nyeri has been shrinking. During the 2019/2020 coffee season, Nyeri had 13,517 hectares under coffee cultivation, but by the 2020/2021 season, this figure had dropped to 9,829 hectares, representing a 27% decline in coffee acreage. This decline is significantly higher than the 12% reduction recorded in Kiambu County during the same period (AFA Coffee Directorate, 2022).

Given this trend, this study seeks to explore the key drivers and socio-economic consequences of this land-use transition from coffee farming to real estate development. Additionally, it examines the role of government interventions in ensuring that this shift is managed sustainably, balancing urban expansion with agricultural preservation.

1.2 Statement of the Problem

Kenya's coffee industry has faced a gradual decline in production, attributed to fluctuating global prices, diminishing profitability, and land-use transformations (AFA Coffee Directorate, 2022). This trend is particularly evident in Nyeri County, where an increasing number of farmers are selling their coffee farms to real estate developers due to higher financial returns from land sales compared to farming (Ndegeah, 2015). While real estate development contributes to economic growth and urban expansion, it also raises critical concerns regarding food security, environmental sustainability, and the loss of agricultural heritage (Erasu & Lika, 2022). Furthermore, poor urban planning and unregulated land conversions have led to haphazard real estate developments, undermining both agricultural stability and sustainable urban growth (Wakarima, 2023).

Despite the presence of government interventions such as financial incentives and land-use policies, the effectiveness of these measures remains questionable due to weak enforcement mechanisms and regulatory challenges (AFA Coffee Directorate, 2023). The lack of coordinated urban planning has further exacerbated land-use conflicts, particularly in peri-urban regions where agricultural land is rapidly disappearing. This study, therefore, seeks to examine the key factors driving land-use change in Nyeri, its socio-economic impacts, and the effectiveness of government interventions in ensuring sustainable land transitions.

Land-use change has been widely studied in various global contexts. In the United States, Sealey et al. (2018) conducted a secondary data analysis to examine the role of financial credit in land-use change, measured through increases in housing developments. Their findings highlighted financial debt, infrastructure expansion (such as highways), rising income levels, shifts in financing laws, and a preference for suburban housing as major contributors to the reduction of agricultural land. Similarly, in Argentina, Piquer-Rodríguez et al. (2018) conducted a panel data study and established that profit-driven motivations, particularly declining returns in agriculture, were the primary triggers of agricultural land conversion. In Asia, Prabhakar (2021) employed a mixed-methods approach, incorporating secondary data analysis and literature reviews, to demonstrate that population growth is the dominant driver of land-use change in the region.

At the regional level, several studies have identified diverse land-use transformation drivers. A systematic review by Azadi et al. (2018) found that in Tanzania, drought and climate variability were significant triggers of agricultural land conversion, with substantial socioeconomic and ecological consequences. In Ethiopia, Erasu and Lika (2022) conducted a cross-sectional survey and identified urban expansion as a key factor leading to a decline in agricultural productivity. In Ghana, Appiah et al. (2014) employed a mixed-methods research design, integrating quantitative and qualitative data, to investigate land-use change in peri-urban areas. Their study found that the rising demand for commercial, recreational (hotels and guest houses), and residential properties was displacing agricultural land uses at an increasing rate.

In the Kenyan context, Sang et al. (2022) utilized secondary data from Geographic Information Systems (GIS) to analyze land-use transformations along the Standard Gauge Railway Corridor. Their findings attributed these changes to urbanization, population growth, economic expansion, and agro-ecological shifts. Konyango et al. (2021) investigated spatial stability in peri-urban areas of Siaya Township between 1987 and 2017 using remote sensing and GIS mapping. Complementing their analysis with qualitative interviews, they identified significant land-use shifts characterized by an increase in built-up areas and a reduction in bare land.

Although agricultural land conversion has been extensively studied, existing research varies in terms of conceptualization, methodology, and study context. Different scholars have defined land-use change using distinct measures, such as housing development (Sealey et al., 2018), changes in agricultural land proportions (Piquer-Rodríguez et al., 2018), and spatial stability (Konyango et

al., 2021). Additionally, the methodologies used in past studies differ significantly, including secondary data analysis (Sang et al., 2022), systematic reviews (Azadi et al., 2018), cross-sectional surveys (Erasu & Lika, 2022), and mixed-methods approaches (Appiah et al., 2014). Furthermore, existing studies have been conducted in different regional and global contexts, making it difficult to generalize their findings to the Nyeri case study.

To address these conceptual, methodological, and contextual gaps, this study explores land-use change in Nyeri with a specific focus on the factors driving the transition from coffee farming to real estate development. Additionally, the study examines the socio-economic consequences of this transition and assesses the role of government in ensuring a balanced and sustainable land-use transformation.

1.3 Overall Objective of the Study

The general objective of this study is to explore the nature of land-use change from coffee farming to real estate development in Nyeri County.

1.3.1 Specific Objectives of the Study

The specific objective of this study are as follows:

1. To identify the key factors driving the shift from coffee farming to real estate development in Nyeri, Kenya.
2. To assess the socio-economic consequences of the transition from coffee farming to real estate development in Nyeri, Kenya.
3. To evaluate the effectiveness of government policies in promoting sustainable land-use practices in Nyeri, Kenya.

1.4 Research Questions

1. What are the primary drivers of land-use change from coffee farming to real estate development in Nyeri?
2. What are the socio-economic impacts of the shift from coffee farming to real estate development on farmers and local communities?

3. How effective are government policies and interventions in managing urban growth while ensuring agricultural sustainability?

1.5 Scope of the Study

This study investigates peri-urban land-use change as the dependent variable, examining the driving factors, socio-economic impacts, and government interventions as independent variables. A concurrent triangulation research design was employed, integrating both quantitative surveys and qualitative interviews to provide a comprehensive analysis of the research problem.

The study involved a sample of 360 coffee farmers who participated in the quantitative survey, while 25 key informants took part in qualitative interviews. These key informants included coffee farmers, real estate developers, land-use planners, land brokers, and community members, offering diverse perspectives on the land-use transformation in Nyeri County, Kenya.

Data collection and analysis were conducted between May and June 2024. The mixed-methods approach facilitated cross-validation of findings, enhancing the reliability and depth of insights into the transition from coffee farming to real estate development.

1.6 Significance of the Study

1.6.1 Policymakers and Regulators

By studying the intricate interactions between coffee growing, real estate development, and government initiatives, the study provides a model for achieving balanced, sustainable development in Nyeri. This research provided useful insights that can guide the formulation of policies to balance coffee farming and real estate development in Nyeri.

1.6.2 Practice

Stakeholders, including government authorities, coffee farmers, real estate developers, agricultural and environmental organizations, also stand to benefit from the insights gained from this study. This study provided practical recommendations that stakeholders can adopt to ensure there is a balance between sustainable urban development and agricultural growth.

1.6.3 Theory

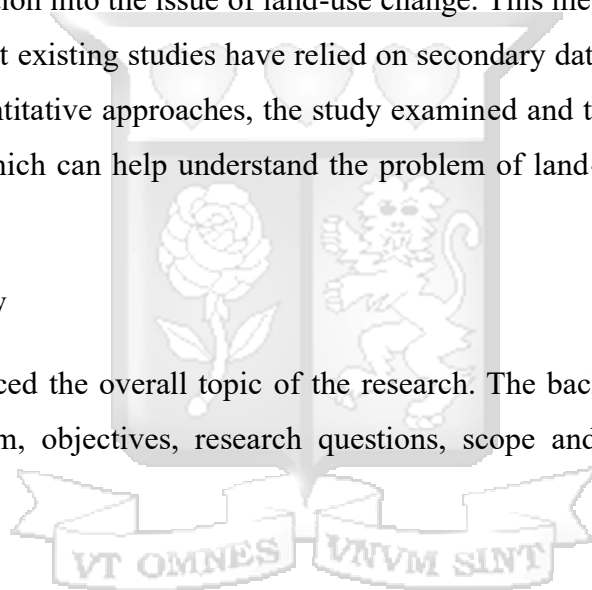
Academically, this study adds to the debate of the coexistence of agriculture and urbanization in peri-urban areas. It adds to the body of knowledge already available on the topic by providing a case study along with useful suggestions. It might also be a resource for academics and researchers researching related topics. The study also forms the basis for further research on the topics of peri-urbanization and sustainable urban development.

1.6.4 Methodology

This study will use a mixed methods approach – concurrent triangulation design – to conduct a comprehensive investigation into the issue of land-use change. This methodology provided novel findings considering most existing studies have relied on secondary data analysis. By integrating both qualitative and quantitative approaches, the study examined and triangulated findings from multiple perspectives, which can help understand the problem of land-use change from various viewpoints.

1.7 Chapter Summary

This chapter has introduced the overall topic of the research. The background to the study, the statement of the problem, objectives, research questions, scope and significance have been discussed in this chapter.



CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of the existing theoretical and empirical literature on the topic of peri-urban land use changes. This chapter is organized as follows: Section 2.2 discusses the theories that inform the study, section 2.3 reviews existing empirical studies related to the objectives, section 2.4 shows the research gap, and section 2.5 shows the conceptual framework.

2.1.1 Peri-urban Land-use Change

Peri-urban land-use change is broadly defined as the transformation of peri-urban land for various urban functions, including commercial and industrial zones, transport infrastructure, housing developments, city-oriented agriculture, and recreational spaces. This process is often driven by population growth, economic development, and shifting land-use priorities, leading to a reduction in agricultural land (Busck & Kristensen, 2014; Ewing & Hamidi, 2017). Calder (2017) describes peri-urban land-use change as the gradual expansion or merging of cities into rural areas, resulting in the absorption of farmlands into urban spaces. Similarly, Du et al. (2014) explain that peri-urban expansion is a dynamic process of urban sprawl, characterized by low-density residential housing, increased automobile dependence, and single-use zoning.

For the purposes of this study, peri-urban land-use change is defined as the transformation of peri-urban agricultural land into urban developments, with a specific focus on housing projects (Halefom et al., 2018). This definition aligns with the research objective of examining the transition from coffee farming to real estate development in Nyeri.

The measurement of peri-urban land-use change varies across different geographical contexts. Naikoo (2023), in India, examined peri-urban expansion by analyzing increases in the proportion of built-up areas using geospatial data. In Ethiopia, Baye et al. (2020) assessed peri-urban land-use change by tracking the growth of informal settlements, emphasizing unregulated urban expansion as a key indicator. Salem et al. (2019), in a study on peri-urban land transformation in Egypt, utilized land cover mapping techniques and Geographic Information System (GIS) software to quantify spatial changes over time. Similarly, in Ghana, Appiah et al. (2014) measured peri-

urban land-use change by evaluating expansions in commercial, residential, and industrial land use, as well as shifts in subsistence agriculture.

For this study, peri-urban land-use change in Nyeri will be assessed through key indicators, including the sale and conversion of peri-urban agricultural land into residential real estate, commercial developments, transport corridors, and recreational spaces (Halefom et al., 2018). This approach ensures that both quantitative and qualitative aspects of land-use transformation are effectively captured, providing a comprehensive understanding of how agricultural land is being repurposed to meet urban development needs.

2.1.2 Peri-Urban Land-Use Change Factors

Numerous factors associated with peri-urban land-use change have been explored in the existing literature, including determinants, consequences (economic, social, community, environmental, demographic, and agricultural), land-use management, and government interventions (Halefom et al., 2018; Hoggart, 2016; Lambin et al., 2014). The aspects that this study explores include the factors driving peri-urban land-use change, the socio-economic consequences of peri-urban land-use change, and the role played by the government in ensuring a sustainable and balanced peri-urban land-use transformation.

2.1.2.1 Driving Factors of Peri-urban Land-use Change

The factors driving peri-urban land-use change are the motivations or reasons behind the transformation of peri-urban land into urban uses (Baye et al., 2020). These driving factors are multifaceted, incorporating economic, social, and land-related drivers, as well as individual influences that shape land-use decisions. Economic drivers include rising land prices, demand for housing, and infrastructure development. The increasing economic value of land near urban centers often pushes farmers to sell their land for more profitable urban development opportunities (Alonso, 1970). Studies such as that of Konyango et al. (2021) have highlighted that rising land values and urban expansion contribute significantly to the conversion of agricultural land into residential and commercial properties, particularly in peri-urban areas.

Social factors, including population growth and migration, also play a critical role in peri-urban land-use change. In developing countries, rapid urbanization due to rural-to-urban migration leads

to higher demand for housing and infrastructure, further incentivizing land-use changes (Hoggart, 2016). Furthermore, individual drivers such as lifestyle changes, access to credit, and shifts in the interests of younger generations towards urban-based professions, away from agriculture, influence decisions to sell or convert agricultural land (Calder, 2017).

Land-related drivers encompass factors such as land tenure insecurity, informal land transactions, and the fragmentation of land into smaller parcels. According to Baye et al. (2020), land tenure insecurity can often drive landowners to sell land in anticipation of losing it due to unclear ownership, exacerbating land-use changes. Similarly, the conversion of large tracts of agricultural land into smaller parcels for residential development is commonly seen in peri-urban areas (Melesse et al., 2020).

2.1.2.2 Socio-economic Consequences of Peri-urban Land-use Change

Socio-economic consequences are defined as the effects of peri-urban land-use change on societal and human well-being. These consequences often manifest as urban sprawl, demographic changes, social conflicts, and changes in the quality of life for local communities. According to Ndegeah (2015), socio-economic consequences can be an antecedent to land-use change because landowners, as well as community members, may choose to sell their agricultural land after witnessing changes in their environment, such as deteriorating soil quality due to urban sprawl. The land-use transformation process itself leads to several direct and indirect consequences for society.

Urban sprawl is one of the primary socio-economic outcomes of peri-urban land-use change. It is characterized by the unplanned spread of urban development into surrounding rural areas, often resulting in spatial instability, loss of agricultural land, and increased pressure on infrastructure (Wakarima, 2023). Haphazard development, often seen in peri-urban areas, leads to a lack of basic amenities such as clean water, sanitation, and transport, thereby exacerbating social inequalities (Lambin et al., 2014). Furthermore, these rapid and unregulated developments contribute to demographic shifts, leading to overcrowding, poor housing conditions, and changes in the local population's social dynamics, which in turn create conflicts among residents (Satterthwaite, 2017).

A significant socio-economic impact is the decline in agricultural activities. As land is converted from agricultural use to residential or commercial purposes, farming communities experience a loss of livelihoods, and food production may suffer (Konyango et al., 2021). This, in turn, affects local economies and exacerbates poverty in peri-urban areas, especially when alternative employment opportunities are limited (Baye et al., 2020).

2.1.2.3 The Role of the Government in Managing Peri-urban Land-use Change

The role of the government in peri-urban land-use change is critical in promoting and incentivizing sustainable and balanced land-use practices. Governments can enact policies that regulate land use, promote sustainable development, and protect agricultural lands from unplanned urban expansion. According to Satterthwaite (2017), effective land-use planning and policies are essential in mitigating the negative impacts of peri-urban land-use change.

Regulatory support is one of the primary ways governments can influence land-use change. This includes the establishment and enforcement of zoning laws, land-use regulations, and building codes that guide urban expansion. However, weak enforcement of these regulations, as highlighted by Wakarima (2023), can lead to uncoordinated urbanization and the uncontrolled expansion of urban areas into agricultural zones. Financial incentives, such as subsidies for sustainable farming practices or tax incentives for urban developers who follow green building principles, can also play a role in guiding land-use change toward more sustainable outcomes (Melesse et al., 2020).

In addition, government efforts in extension and research services are crucial for educating landowners and farmers about sustainable land-use practices and providing alternatives to agricultural land conversion. For example, by supporting land tenure reforms and promoting community-based land management strategies, governments can ensure that farmers have secure rights to land, reducing the pressure to sell land for urban development (Hoggart, 2016). Furthermore, policies related to sustainable agriculture, such as promoting agroforestry or organic farming, can help protect peri-urban agricultural lands while still supporting the local economy (Lambin et al., 2014)

2.2 Theoretical Review

The theories selected for this study—the Theory of Urban Expansion and the Urban Growth Machine Theory—were deliberately chosen because they offer a comprehensive framework for understanding the complex drivers of peri-urban land-use change. These theories provide both economic and political perspectives, which are crucial for addressing the main drivers of land-use change, the socio-economic impacts on farmers and local communities, and the role of government policies in balancing urban growth with agricultural sustainability, as outlined in the research objectives from Chapter One.

2.2.1 Theory of Urban Expansion

The Theory of Urban Expansion, developed by Fujita (1991), explains urbanization as a complex phenomenon driven by the increasing economic value of land. The central premise of this theory is that as urban centers grow, the perceived economic value of surrounding peri-urban land rises, incentivizing land-use conversion from agriculture to urban development (Hoggart, 2016). Consequently, as cities expand outward, agricultural land near urban areas is more likely to be subdivided and converted into commercial, residential, and industrial properties. This process disincentivizes farming, particularly in high-demand locations, as farmers often sell land for more profitable urban uses.

A key proposition of this theory is that proximity to an urban area significantly impacts land-use decisions. The closer a piece of land is to the city, the higher its perceived value, making real estate development more attractive than agriculture. This concept aligns with studies that have documented urban expansion-induced land-use transformations. For instance, Konyango et al. (2021) found that peri-urban land-use change in Kenya is heavily influenced by rising land values, prompting farmers to sell land rather than continue farming. Similarly, Brown et al. (2018) demonstrated that in regions experiencing rapid urban growth, farmland is systematically replaced by residential and commercial developments due to increasing demand for housing.

Beyond economic motivations, this theory also highlights the negative consequences of uncontrolled urban expansion. When land-use change is unregulated, it can lead to haphazard mixed developments, spatial instability, and poor infrastructure planning (Hoggart, 2016). This

underscores the importance of controlled development policies to ensure spatial balance and sustainable urban expansion.

A strength of the Theory of Urban Expansion is that it has been extensively validated through research, confirming that economic land value is a primary driver of land-use change (Konyango et al., 2021). Additionally, it effectively explains how urban encroachment can transform rural land-use patterns (Brown et al., 2018). However, a notable limitation of the theory is that it does not account for other significant drivers of land-use change, such as generational shifts leading to declining interest in farming, social influences, and government regulations (Calder, 2017). This limitation is particularly relevant in Nyeri County, where land-use change is influenced not only by proximity to urban areas but also by factors such as weak enforcement of land policies and intergenerational land transfers. The Theory of Urban Expansion, developed by Fujita (1991), explains urbanization as a dynamic process driven by the increasing economic value of land surrounding expanding urban centers. As cities grow, the demand for land increases, making peri-urban areas more valuable and prompting land-use conversions from agriculture to urban development (Fujita, 1991; Hoggart, 2016). This process is often facilitated by the higher economic returns offered by real estate development as compared to agriculture, particularly in locations near urban centers.

A central aspect of this theory is the economic transformation of land, which incentivizes landowners, especially farmers, to sell their land for development, given the higher financial returns from real estate investments. This aligns with Konyango et al. (2021), who found that the expansion of urban areas around Nairobi has significantly increased the demand for land in peri-urban regions, prompting farmers to sell agricultural land for residential or commercial purposes. Similarly, Brown et al. (2018) noted that urban growth often results in the conversion of agricultural land into housing and commercial spaces, as rising land values drive farmers to abandon agriculture for more profitable land uses. This theory underscores that proximity to urban areas plays a pivotal role in the decision-making process regarding land-use changes.

However, the Theory of Urban Expansion also highlights the negative implications of rapid, unregulated urban sprawl, including the loss of agricultural land, environmental degradation, and poor infrastructure development (Hoggart, 2016). These challenges illustrate the need for comprehensive land-use policies that manage urban growth while balancing the need for

agricultural sustainability. Gakenia (2020) similarly highlighted that in peri-urban areas of Kenya, unchecked urban expansion leads to agricultural land being increasingly marginalized, which affects food security and local livelihoods.

While the economic motivations behind land-use conversions are central to the theory, it has been critiqued for not fully considering other social, political, and cultural factors. For instance, Calder (2017) argued that generational shifts in farming practices, changing land ownership dynamics, and weak enforcement of land policies also play significant roles in land-use decisions, which are particularly evident in Nyeri County, where the process of land transfer between generations often leads to the abandonment of agricultural activities. Eckert (2019) also pointed out that the decline in farming interest among younger generations, coupled with weak government enforcement of land-use regulations, contributes to accelerated land conversions, making it harder to sustain agricultural practices in peri-urban areas.

Thus, the Theory of Urban Expansion offers a foundational lens for examining the economic drivers behind peri-urban land-use change in Nyeri, especially in the context of coffee farming and the rise of real estate development. It helps explain how land values and urban proximity drive farmers to abandon agriculture in favor of urban development, while also drawing attention to the consequences of unchecked urban sprawl.

2.2.2 Urban Growth Machine Theory

The Urban Growth Machine Theory, developed by Molotch (1976), posits that urban growth is a deliberate process driven by elites—such as real estate developers, landowners, and policymakers—who seek to maximize land value through strategic urban expansion. According to this theory, the growth of cities is not merely a result of market forces but is heavily influenced by the political and economic interests of powerful land-based elites who manipulate land-use policies and development strategies to their advantage (Molotch, 1976; Rosen & Alvarez León, 2022).

This theory is particularly pertinent for understanding peri-urban land-use change, as it emphasizes the role of governance, policy manipulation, and elite networks in driving land-use conversions. Unlike the Theory of Urban Expansion, which focuses on economic drivers, the Urban Growth Machine Theory highlights how political and institutional factors also shape land-use decisions. It suggests that real estate developers, business investors, and policymakers collaborate to push

urbanization forward, often disregarding the needs of local communities and the environment (Farahani, 2017). McNeill (2020) supported this argument by showing how powerful urban elites manipulate zoning laws and government policies in cities across the Global South to increase land values and facilitate real estate development.

Empirical research has corroborated this theory's applicability in various urban contexts. For example, Farahani (2017) found that real estate developers and local governments in rapidly urbanizing regions of Iran work together to bypass zoning laws and push agricultural land into commercial and residential development, despite the adverse effects on the environment and local communities. Similarly, Rosen & Alvarez León (2022) noted that in Latin American cities, elite groups drive urban expansion through coordinated efforts to influence land-use policies, zoning laws, and infrastructure investments to maximize profits.

In Kenya, Wakarima (2023) identified how powerful political and business elites have been instrumental in transforming peri-urban coffee farms into real estate developments, often circumventing regulatory frameworks. The weak enforcement of land-use policies has allowed land-based elites to capitalize on the rising demand for housing, leading to rapid land conversions in regions like Nyeri, where coffee farming has traditionally been a primary livelihood activity.

While the Urban Growth Machine Theory offers valuable insights into the political and economic dynamics of urban expansion, it has its limitations. One critique is that it overemphasizes the role of elites and political elites, neglecting other factors such as cultural, social, and environmental considerations that also influence land-use decisions (Farahani, 2017). Moreover, it tends to focus on local governance and property markets, often overlooking the broader impact of national policies or global economic trends that can also influence urbanization (Rosen & Alvarez León, 2022). Gakenia (2020) observed that national government policies on urban development and land management, such as incentives for industrialization, can often shift land-use patterns in peri-urban areas, overshadowing the influence of local elites.

In the context of this study, the Urban Growth Machine Theory provides a critical framework for examining the role of political and economic elites in shaping peri-urban land-use change in Nyeri. It allows for an exploration of how local policymakers, developers, and landowners manipulate land-use policies and zoning laws to facilitate real estate development. Additionally, it informs the

study's analysis of government interventions and the role of national and local policies in managing the trade-off between urban growth and agricultural preservation.

By integrating both the Theory of Urban Expansion and the Urban Growth Machine Theory, this study offers a nuanced framework that captures the interplay between economic and political forces in shaping peri-urban land-use changes. The combined approach allows for a comprehensive understanding of how rising land values, government policies, and elite interests drive the transformation of coffee farms into real estate developments, while also shedding light on the socio-economic consequences of these changes for local communities.

2.3 Empirical Review

This section presents a review of existing empirical literature on land use change, guided by the objectives of this proposed research.

2.3.1 Factors Driving Land-Use Change

Peri-urban land-use change is influenced by multiple factors, including economic incentives, geographical advantages, environmental conditions, infrastructure expansion, and demographic shifts (Baye et al., 2020). In the context of this study, these factors are examined in relation to the decisions made by coffee farmers in Nyeri to transition from coffee farming to real estate development or sell their land to developers. The Theory of Urban Expansion provides a critical framework for understanding how rising land values, urban encroachment, and declining agricultural profitability drive this transformation.

Economic incentives are one of the most significant drivers of peri-urban land-use change. The expansion of cities increases the perceived market value of peri-urban land, making it financially more attractive to convert farmland into urban uses such as residential developments, commercial properties, and transport infrastructure. Hoggart (2016) argues that as urban areas expand outward, landowners in peri-urban areas are incentivized to shift from low-value agricultural activities to high-value urban land uses, particularly real estate.

Several empirical studies confirm this process. Konyango et al. (2021) found that in Kenya, rising land values in peri-urban areas led to increased farmland sales, as landowners sought higher financial returns from real estate compared to farming. Similarly, Brown et al. (2018) analyzed

peri-urban expansion in developing countries, demonstrating that agricultural land is often converted into residential and commercial properties due to increasing urban demand for housing, retail spaces, and industrial zones.

Nickerson et al. (2012) examined the relationship between farmland values and macroeconomic factors in the United States, using trend and correlation analysis. Their findings showed that as land prices increased due to urban expansion, agricultural landowners opted to sell their land rather than continue farming, reinforcing the economic premise of the Theory of Urban Expansion. A similar trend was observed in Denmark, where Busck and Kristensen (2014) surveyed landowners in Roskilde Municipality and found that financial returns from real estate sales outweighed the benefits of continued agricultural use. Increased land prices and market demand were the primary drivers of land-use change in these regions.

Beyond economic incentives, shifts in farmland viability also contribute to peri-urban land-use transformation. Thurston et al. (2013) found that the fluctuating profitability of agriculture influenced farmers' decisions to convert land to real estate. As land values in metropolitan or peri-urban regions appreciate faster than agricultural land, landowners see real estate as a more stable and lucrative investment. Ndegeah (2015) emphasized that landowners often evaluate long-term financial security, making real estate development a more attractive alternative to farming.

Environmental conditions also play a significant role in land-use change decisions. As peri-urban areas experience soil degradation, declining agricultural productivity, and changing climate conditions, farmers are increasingly disincentivized from maintaining agricultural activities. Borgogno-Mondino et al. (2015) examined the relationship between soil quality and peri-urban expansion in Torino, Italy, using GIS-based spatial analysis. The findings revealed that a decline in soil quality led to a decrease in agricultural yields, which incentivized farmers to sell land for urban development. This supports the Theory of Urban Expansion, which argues that external pressures such as declining soil fertility accelerate land-use conversion from agriculture to real estate (Hoggart, 2016).

Demographic changes also contribute to peri-urban land-use transformation. Naikoo et al. (2023) examined the drivers of land-use change in peri-urban New Delhi using Landsat datasets and spatial regression models. The findings showed that the proportion of built-up area increased from

1.67% to 7.12%, primarily due to migration and rising employment opportunities in urban areas. As people move closer to cities in search of work, demand for housing increases, leading to the conversion of agricultural land into residential developments.

Similar trends are observed in Africa. Appiah et al. (2014) conducted a mixed-methods study in Ghana, revealing that the demand for commercial, recreational, and residential properties in peri-urban areas displaced agricultural activities. In Ethiopia, Baye et al. (2020) found that urban expansion and population pressures significantly contributed to the rise in urban land lease prices and increased demand for rental housing, leading farmers to convert their land into rental and commercial properties.

The availability of infrastructure and transport connectivity further accelerates peri-urban land-use change. Salem et al. (2019) analyzed peri-urban expansion in Cairo, Egypt, between 2007 and 2017, using Landsat imagery and GIS-based models. The study identified proximity to major roads and transport corridors as one of the strongest predictors of land conversion. Similarly, in Kenya, Sang et al. (2022) examined land-use transformation along the Standard Gauge Railway Corridor, demonstrating that urbanization, population growth, and infrastructure expansion were major drivers of land-use change from agriculture to urban development.

The transition from coffee farming to real estate development in Nyeri aligns with these global and regional patterns. As land values rise, farmers are motivated by higher financial returns from real estate compared to coffee farming. Additionally, declining soil fertility, changes in farming viability, and increasing urban migration contribute to the shift toward real estate development. The Theory of Urban Expansion explains how these factors work together—economic land valuation, urban encroachment, and reduced agricultural profitability drive land-use change in peri-urban areas.

This study applies the Theory of Urban Expansion to analyse the transformation occurring in Nyeri, focusing on how economic, environmental, and demographic pressures influence the decision of coffee farmers to convert agricultural land into real estate projects. By integrating insights from global and regional case studies, this research provides a comprehensive understanding of the drivers of peri-urban land-use change and their impact on Nyeri's evolving urban landscape.

2.3.2 Socio-economic Consequences of Land Use Change

Socio-economic consequences are defined as the effects of peri-urban land-use change on societal and human well-being. The transition from agricultural land to real estate development has far-reaching implications, affecting community structures, economic stability, food security, environmental sustainability, and urban planning (Erasu & Lika, 2022). These changes present critical challenges regarding sustainable urbanization, the preservation of agricultural heritage, and the long-term economic well-being of affected communities (Baye et al., 2020).

One of the primary socio-economic consequences of peri-urban land-use change is urban sprawl, which is characterized by low-density development, automobile dependence, fragmented land-use planning, increased traffic congestion, and environmental degradation (Ewing & Hamidi, 2017). As urban areas expand into agricultural zones, they often develop in an uncoordinated manner, leading to disorganized settlement patterns and inadequate infrastructure planning. Ndegeah (2015) argues that land-use change can be influenced by observational behavior, where individual landowners sell or convert their agricultural land based on broader urbanization trends in their vicinity. This phenomenon highlights how land-use change is not only a result of direct economic incentives but also a response to urbanization pressures.

Global studies have identified significant socio-economic consequences associated with peri-urban expansion. Emadodin et al. (2016) conducted a study in Iran analysing the impact of urban sprawl on land degradation and climate variability. Using Landsat images and climate data from 1975-2015, the study revealed that rapid urban expansion significantly increased land degradation, which, in turn, altered local climate patterns by accelerating evaporation rates. These findings demonstrate that land-use change has broader environmental and socio-economic consequences beyond its immediate impact on agriculture.

Bucała-Hrabia (2017) examined the relationship between socio-economic conditions and land-use change in Poland, utilizing census reports, aerial photos, and spatial analysis of maps. The study found that population density and employment shifts in agriculture were critical factors influencing land-use transitions. As agricultural employment declined, more landowners opted to sell farmland for urban development, leading to a loss of agricultural identity and increased dependency on urban economies.

The loss of spatial stability due to peri-urban expansion has also been documented in Southeast Asia. Cahya et al. (2018) studied land-use change in Ciawi Urban Areas, Malaysia, from 2013-2015 using field surveys and GIS-based spatial analysis. Their findings revealed that agricultural land declined by 4%, while urban built-up areas expanded significantly. However, this transition did not comply with local government land-use plans, highlighting the risk of unregulated and haphazard peri-urban expansion. The study emphasized the need for stronger spatial planning frameworks to ensure sustainable land-use transformation.

Sarkodie et al. (2020) conducted a global study covering 206 countries to assess the environmental consequences of peri-urban expansion. Using data from the World Bank and panel estimation techniques, the study found that peri-urban expansion is closely linked to increased energy consumption due to an energy-intensive urban economy. The authors argued that rapid urbanization, if left unchecked, could lead to overexploitation of natural resources and environmental pollution, necessitating a shift toward sustainable and decarbonized land-use policies.

Regionally, the socio-economic consequences of land-use change have been observed across multiple African contexts. Baye et al. (2020) examined peri-urban expansion in Woldia, Ethiopia, and found that uncontrolled urbanization led to the proliferation of informal settlements. The study noted that many peri-urban areas lacked adequate regulatory oversight, resulting in illegal construction, uncoordinated urban sprawl, and socio-economic disparities between landowners and lower-income residents. The findings in Woldia align with the Urban Growth Machine Theory's argument that urban expansion is often driven by speculative real estate interests rather than sustainable urban planning, leading to widening socio-economic inequalities (Molotch, 1976; Rosen & Alvarez León, 2022).

Toh et al. (2018) explored the impact of land-use change on socio-economic conditions in Mount Bambuoto Caldera, Cameroon, between 1980-2016. Using satellite imagery, field interviews, and key informant discussions, the study found that land-use change led to declining soil fertility, reduced crop yields, and seasonal food shortages. The study concluded that these factors exacerbated rural poverty, as many farmers struggled to sustain agricultural livelihoods in the face of expanding urban development.

In Nigeria, Njoku et al. (2021) evaluated the socio-economic consequences of peri-urban expansion from 1987-2002 using remote sensing and GIS technology. The study found that built-up areas increased significantly while vegetation cover declined, leading to disruptions in local economic activities. This shift was primarily driven by rural-urban migration, as people moved closer to cities in search of employment, triggering increased demand for housing and commercial spaces. However, this rapid urbanization failed to keep pace with infrastructure development, leading to increased socio-economic inequality and informal housing settlements. This pattern aligns with the Urban Growth Machine Theory's argument that urban expansion disproportionately benefits politically connected developers and investors while marginalizing lower-income groups (Farahani, 2017).

In Kenya, similar socio-economic consequences have been observed in peri-urban regions. Ondiek et al. (2020) studied land-use change in Anyiko Wetland, where agricultural land was converted to settlements to boost food security. Using color photographs, high-resolution images from 1966-2018, and household surveys, the study found that land conversion was influenced more by household socio-economic conditions than perceptions of its agricultural value. Farmers from low-income households were more likely to sell land for immediate financial gains, reinforcing the link between socio-economic vulnerabilities and land-use transformation.

Konyango et al. (2021) investigated spatial stability in Siaya Township, Kenya, between 1987-2017 using GIS mapping and key informant interviews. The study found that built-up areas increased at the expense of bare land and agricultural zones, leading to spatial instability and uncoordinated urban expansion. The researchers noted that this shift resulted in haphazard and incompatible developments, reducing land-use efficiency and increasing conflicts between agricultural landowners and developers. These findings align with the Urban Growth Machine Theory's assertion that real estate-driven expansion is often prioritized over sustainable spatial planning, leading to uncontrolled development and land-use conflicts.

The socio-economic consequences of peri-urban land-use change in Nyeri align with these global, regional, and local findings. As land-use shifts from coffee farming to real estate development, Nyeri faces rising urban sprawl, increased socio-economic disparities, and disruptions to traditional community structures. The Theory of Urban Expansion explains how economic pressures, environmental factors, and demographic shifts contribute to this transformation, while

the Urban Growth Machine Theory provides insights into how speculative real estate development and elite-driven land policies exacerbate socio-economic inequalities.

This study will examine the extent to which socio-economic consequences in Nyeri mirror trends observed in other peri-urban areas worldwide. By integrating insights from global, regional, and local studies, the research will assess how urban sprawl, land fragmentation, loss of agricultural identity, and economic inequality impact the long-term viability of peri-urban land-use changes in Nyeri.

2.3.3 Government Initiatives and Land Use Change

Government initiatives play a critical role in shaping peri-urban land-use change by establishing policies and regulations that aim to balance urban expansion with agricultural sustainability. Governments introduce zoning laws, land tenure policies, infrastructure investments, and financial incentives to guide land-use transitions in a manner that is economically beneficial while maintaining environmental sustainability. However, the effectiveness of these initiatives is often constrained by economic pressures, weak enforcement mechanisms, and political interference. The Theory of Urban Expansion and the Urban Growth Machine Theory provide complementary insights into the ways in which government interventions shape, regulate, or fail to control urban growth.

The Theory of Urban Expansion, as developed by Fujita (1991), explains that as cities expand, land in peri-urban areas gains economic value, creating incentives for its conversion from agricultural use to real estate development. Governments intervene by implementing zoning laws, land tenure reforms, and policies designed to regulate land-use transitions. However, in many cases, these regulatory frameworks struggle to keep pace with the increasing economic attractiveness of peri-urban land. Infrastructure projects such as roads, public transport systems, and utility expansions further accelerate this transition by improving access to urban areas, making land conversion even more appealing. Empirical studies have demonstrated that government interventions often fail to prevent uncontrolled urban sprawl because the rising economic value of peri-urban land consistently outweighs agricultural incentives.

A case study by Dolley et al. (2020) in Wuhan, China, highlights the difficulties governments face when trying to balance food security with economic expansion. In Wuhan, policies were

introduced to protect farmland from conversion, yet pressure from developers and industrial investors led to large-scale rezoning for commercial and residential use. The experience in Wuhan demonstrates how economic pressures continuously push peri-urban land toward urbanization, despite government efforts to preserve agricultural sustainability. Similarly, in Kenya, Sang et al. (2022) examined land-use transformation along the Standard Gauge Railway Corridor, showing that government infrastructure projects often accelerate urban expansion rather than containing it. The construction of new transport routes increases the value of adjacent land, attracting speculative real estate investments and displacing agricultural activities.

While the Theory of Urban Expansion explains the economic forces that governments attempt to regulate, the Urban Growth Machine Theory, formulated by Molotch (1976), provides deeper insight into why many government land-use policies ultimately favour speculative real estate development over sustainable planning. This theory argues that urban growth is largely driven by coalitions of economic and political elites who seek to maximize property values. These elites—including real estate developers, business leaders, and policymakers—form influential networks that shape government policies in ways that promote urban expansion, often at the expense of long-term sustainability.

Lambin et al. (2014) emphasize that effective governance requires balancing the interests of multiple stakeholders, including urban planners, agricultural authorities, business groups, and local communities. However, in many cases, urban growth coalitions exert disproportionate influence over policy decisions, leading to land-use changes that primarily serve economic interests. Spyra et al. (2020) highlight how governments frequently prioritize short-term real estate profits over ecosystem conservation, resulting in unregulated expansion, loss of biodiversity, and increased environmental degradation. In Wroclaw, Poland, Sylla et al. (2020) analysed government zoning policies and found that despite regulatory measures aimed at protecting agricultural land, speculative real estate investments led to widespread land conversion. These findings align with the Urban Growth Machine Theory's argument that government land-use policies are often manipulated by private interests seeking financial gain rather than being guided by principles of sustainable development.

The conflict between economic interests and environmental sustainability is further illustrated in Ghana, where Kleemann et al. (2017) assessed the effectiveness of land-use planning instruments.

Their study found that government initiatives in peri-urban areas were largely ineffective due to poor enforcement, lack of public participation, and strong political interference. These findings reinforce the argument that elite-driven land-use decisions often override sustainable development objectives, leading to urban sprawl and disorganized settlement patterns.

In Kenya, governance challenges related to peri-urban land-use regulation are well-documented. Land-use regulations are frequently undermined by political lobbying, weak enforcement mechanisms, and speculative real estate development. Despite formal policies designed to promote sustainable land-use transitions, many peri-urban developments occur informally, leading to fragmented land-use patterns and infrastructure deficits. The Urban Growth Machine Theory provides a useful framework for understanding why government interventions often fail in this context. Political elites and real estate investors frequently influence zoning decisions and land-use policies, ensuring that regulations favour urban expansion rather than conservation. This is evident in areas like Nyeri, where the increasing value of peri-urban land has incentivized coffee farmers to convert agricultural land into real estate developments.

Government policies in Kenya have sought to regulate this transition through land tenure reforms, financial incentives for sustainable agriculture, and strategic urban planning. However, empirical studies indicate that these measures are often poorly enforced and inconsistently applied, allowing speculative developers to bypass regulations. A study by Konyango et al. (2021) on spatial stability in Siaya Township between 1987 and 2017 found that elite-controlled land policies led to fragmented and haphazard developments, undermining coordinated land-use planning efforts. This aligns with the Urban Growth Machine Theory's assertion that real estate-driven expansion is often prioritized over sustainable planning, exacerbating socio-economic disparities and environmental degradation.

The challenges faced in peri-urban governance are further highlighted in research by Plieninger et al. (2016), who argue that traditional rigid zoning laws are often ineffective in rapidly urbanizing areas. They advocate for more adaptive governance models that incorporate performance-based planning approaches, participatory decision-making, and context-specific policy adjustments. However, as observed in case studies from China, Ghana, and Kenya, such approaches are frequently manipulated by political and economic elites, leading to unregulated expansion rather than balanced urban growth.

In addition to regulatory challenges, financial incentives and land tenure reforms have played a significant role in shaping peri-urban land transitions. In many countries, governments have introduced subsidies and tax incentives to encourage sustainable agricultural practices and discourage unregulated urban expansion. However, these measures have often been undermined by speculative land markets, where developers purchase agricultural land at low costs and later convert it into high-value real estate properties. In Ethiopia, Baye et al. (2020) examined how urban expansion has affected smallholder farmers, finding that peri-urban land values have risen dramatically, making it financially difficult for farmers to continue agricultural production. Despite government efforts to control land speculation, market forces and elite interests have driven land-use changes at a pace that outstrips regulatory mechanisms.

The evidence from global, regional, and local case studies suggests that government policies aimed at regulating peri-urban land-use change frequently fall short due to economic pressures, weak enforcement, and elite-driven land speculation. The Theory of Urban Expansion explains why peri-urban land becomes increasingly valuable as cities grow, making real estate conversion more attractive than continued agricultural use. Meanwhile, the Urban Growth Machine Theory highlights why government policies often fail to protect agricultural land, as political and business elites manipulate regulations to maximize real estate profits.

This study will assess whether government land-use policies in Nyeri align with sustainable governance models or whether they reflect patterns of elite-driven urban expansion, as seen in other peri-urban areas worldwide. By analysing regulatory effectiveness, stakeholder influence, and governance structures, this research will provide insights into how government interventions shape peri-urban land-use transitions and whether existing policies effectively balance urban expansion with agricultural sustainability. The findings will contribute to a broader understanding of how economic, environmental, and governance factors influence the transition from coffee farming to real estate development in Nyeri.

2.4 Research Gaps

Peri-urban land-use change has been extensively studied in various global and regional contexts. However, significant conceptual, contextual, and methodological gaps persist in the existing literature, particularly in relation to the Kenyan setting and, more specifically, Nyeri County. The

existing studies do not fully capture the unique economic, environmental, and governance factors influencing the transition from coffee farming to real estate development in this region.

In terms of contextual gaps, limited studies have explored peri-urban land-use change in Kenya, particularly in Nyeri. While existing research has analysed urban expansion in general, the specific transition from coffee farming to real estate development remains largely unexplored. Peri-urban land-use changes are heterogeneous and dynamic, varying across geographical, economic, and social contexts. Findings from previous studies conducted in Ethiopia, Ghana, China, and Poland may not fully apply to the Kenyan setting, where smallholder farmers face distinct economic pressures, governance challenges, and elite-driven land speculation. This suggests the presence of conceptual gaps in the literature, as the underlying factors driving peri-urban land-use change in Nyeri have not been comprehensively examined.

A further conceptual gap exists in how peri-urban land-use change is framed in existing studies. Much of the literature conceptualizes land-use change in terms of housing expansion, industrial growth, or informal settlements, but fewer studies focus on the conversion of cash crop farms into urban developments. This study will address this gap by specifically examining the transition from coffee farming to real estate in Nyeri and identifying the socio-economic consequences of this transformation.

From a theoretical perspective, previous studies have not sufficiently integrated both the Theory of Urban Expansion and the Urban Growth Machine Theory when analyzing peri-urban land-use change. While research has demonstrated how economic pressures and elite interests shape land-use transitions, few studies have applied both theories to assess how government policies interact with market-driven land dynamics in peri-urban areas. This study will fill this gap by examining whether government interventions effectively regulate land-use transitions or if they primarily serve speculative real estate interests.

Methodological gaps also exist in the literature. Many studies on peri-urban land-use change rely on secondary data sources, such as geographic information systems (GIS) and Landsat imagery, to track changes in land cover. While these approaches provide valuable spatial data, they do not capture the lived experiences, motivations, and decision-making processes of those directly affected by land-use transitions. There is a need for primary data collection methods that

incorporate perspectives from farmers, real estate developers, land brokers, policymakers, and local communities. This study will address this gap by adopting a mixed-methods approach, combining survey data, in-depth interviews, and spatial analysis to provide a more comprehensive understanding of land-use change in Nyeri.

Additionally, few studies have analysed the effectiveness of government interventions in regulating peri-urban land-use change. While some research has examined zoning policies and land tenure reforms, little attention has been given to whether these policies are successfully enforced or if they are manipulated by political and economic elites to facilitate urban expansion. This study will fill this gap by evaluating the role of governance structures, institutional capacity, and policy enforcement in shaping land-use outcomes in Nyeri.

By addressing these conceptual, contextual, and methodological gaps, this study will provide a more nuanced understanding of peri-urban land-use change in Kenya, contributing to both academic literature and policy discussions on sustainable urban expansion. Table 2.1 presents a summary of the research gaps identified in the existing literature.

Table 2.1: Summary of Identified Research Gaps

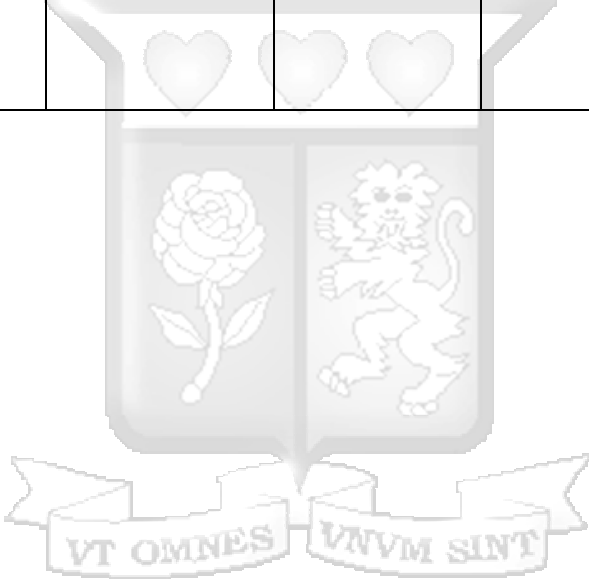
Author	Title	Methodology	Finding	Research Gaps	Focus of the Current Study
Konyango et al. (2021)	Land Use Changes in Peri-urban Areas of Siaya Township Ward from 1987 to 2017	Mixed methods – secondary data using remote sensing and geographic information systems and primary data using interviews	Significant land use changes were observed during the study period, which led to spatial instability	Contextual (study conducted in Siaya) and conceptual (only examined land use patterns)	Current study will focus on drivers and consequences of changes in land use, and the government’s role in ensuring that the transition is sustainable
Cahya et al. (2018)	Urbanization and Land Use Changes in Peri-Urban Area using Spatial	Mixed methods – primary data from a field survey and secondary data	Significant land use changes occurred during the study period,	Contextual (study conducted in Indonesia) and conceptual (only	Current study will focus on drivers and consequences of changes in land use as

	Analysis Methods (Case Study: Ciawi Urban Areas, Bogor Regency)	from maps and a geographic information system	which led to spatial instability	examined land use patterns)	well as the role of the government policy in ensuring the land use change is sustainable
Busck and Kristensen (2014)	From agriculture to nature – a study of drivers of land use change in a peri-urban landscape	Quantitative – questionnaire survey	Peri-urban land use change was primarily driven by economic reasons	Contextual gap – study conducted in Denmark Methodological – the study used quantitative method only	Current study will focus on the Kenyan context using Nyeri as a case study, and will employ mixed methods research
Naikoo et al. (2023)	Analysis of peri-urban land use/land cover change and its drivers using geospatial techniques and geographically weighted regression	Secondary data	Land use was primarily driven by migration and an increase in employment rate in the region	Contextual – study was conducted in India. Methodological – only secondary data used	Current study will focus on the Kenyan context using Nyeri as a case study, and will use mixed methods research
Baye et al. (2020)	Drivers of informal settlements at the peri-urban areas of Woldia: Assessment on the demographic and socio-economic trigger factors	Mixed methods – quantitative survey and interviews with key informants	Peri-urban land use change was driven by the increase in the lease price of urban land, little compensation offered to peri-urban farmers when their lands are	Contextual – the study was conducted in Ethiopia Conceptual – study focused only on drivers of peri-urban land use change	Current study will focus on the Kenyan context using Nyeri as a case study, and will also explore the drivers, socio-economic consequences and government initiatives

			expropriated, increased demand for rental houses, and inefficient land provision		associated with peri-urban land use change
Borgogno-Mondino et al. (2015)	Soil quality and landscape metrics as driving factors in a multi-criteria GIS procedure for peri-urban land use planning	Secondary data from a geographic information system	Soil quality was a driving factor for peri-urban expansion in Italy	Contextual – the study was conducted in Italy Methodological – only secondary data used Conceptual – study only focused on soil quality and land metrics as drivers	Current study will focus on the Kenyan context using Nyeri as a case study. Other drivers besides soil quality and landscape metrics will be examined. Current study will use mixed methods
(Emadodin et al., 2016)	Effects of urban sprawl on local climate: A case study, north central Iran	Secondary data	Peri-urban expansion adversely affected the local climate	Contextual – the study was conducted in Iran. Methodological – only secondary data used	Current study will focus on the Kenyan context using Nyeri as a case study. Current study will use mixed methods and will examine driving factors, socio-economic consequences and the influence of government initiatives in ensuring the sustainability

					of the land use change
(Nickerson, et al., 2012)	Trends in U.S. Farmland Values and Ownership	Secondary data (USDA's National Agricultural Statistics Service (NASS) and data from NASS' June Area Survey-Trend and correlation analyses	Strong farm earnings have helped farmland markets withstand the significant downturn in the residential housing market	Contextual – the study was conducted in U.S.A. Methodological – only secondary data used Conceptual – study only focused on economic driving factors	Current study will focus on the Kenyan context using Nyeri as a case study. Current study will use mixed methods and explore other factors besides economic driving factors

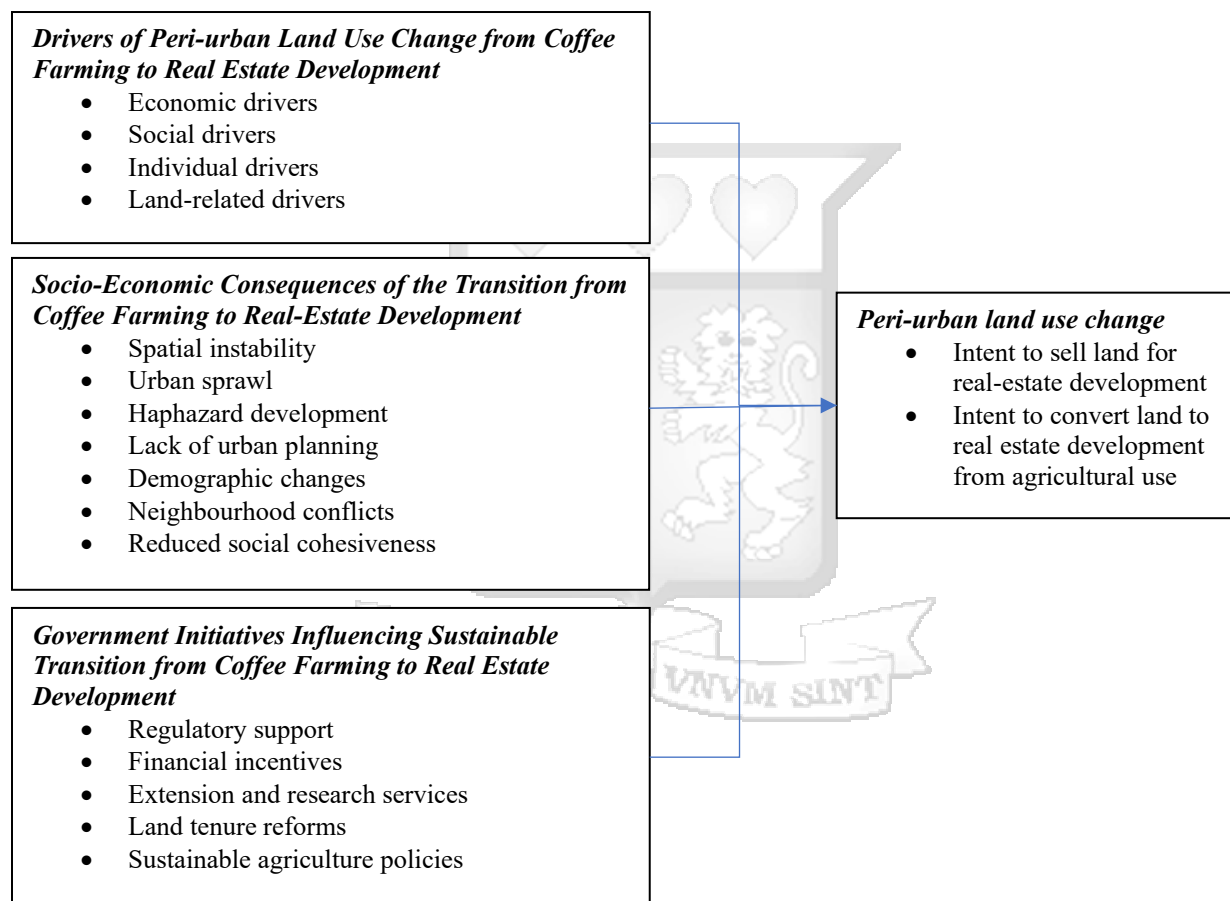
Source: Author (2023)



2.5 Conceptual Framework

The conceptual framework for the proposed study is illustrated in Figure 2.1. The dependent variable is peri-urban land use change while the independent variables are driving factors, socio-economic consequences and government initiatives in balancing sustainable agriculture and urban development. Table 2.2 shows the operationalization of the study variables.

Figure 2.1: Conceptual Framework



Source: Author (2024)

The conceptual framework illustrates the relationship between the independent variables, drivers of peri-urban land use change, socio-economic consequences, and government initiatives, and the dependent variable, peri-urban land use change. This framework is underpinned by two key theories: Urban Expansion Theory and the Urban Growth Machine Theory.

Urban Expansion Theory explains the processes driving peri-urban land use change, particularly the first two independent variables: drivers of land use change and socio-economic consequences.

The theory highlights how urban areas expand outward due to economic, social, and individual motivations, leading to the conversion of agricultural land into urban development. As land transitions from coffee farming to real estate, consequences such as urban sprawl, spatial instability, and demographic shifts emerge, reflecting the unplanned and rapid nature of urban expansion.

On the other hand, the Urban Growth Machine Theory underpins the role of government initiatives in shaping land use change. This theory posits that urban growth is actively driven by stakeholders—including government agencies, policymakers, and developers—who influence land use decisions to maximise economic returns. Regulatory frameworks, financial incentives, land tenure reforms, and sustainable agriculture policies represent mechanisms through which the government attempts to manage and direct land use change towards sustainable urban development.

By integrating these two theories, the conceptual framework provides a comprehensive understanding of peri-urban land use change in Nyeri, demonstrating how economic and social forces drive land conversion while government policies influence the trajectory of urban growth.

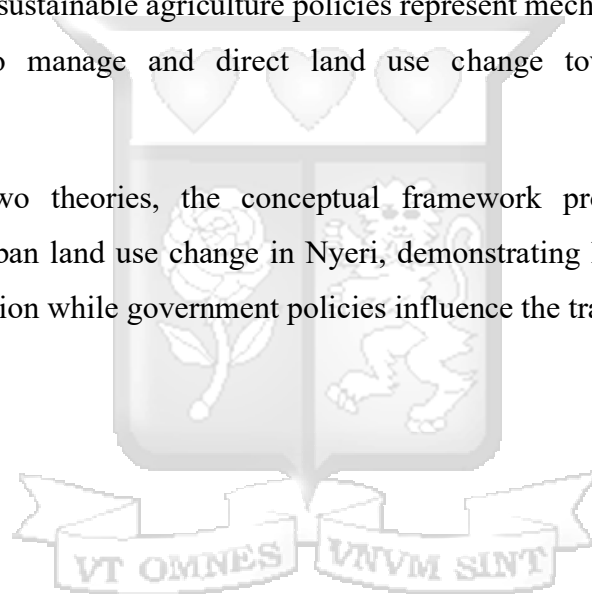


Table 2.2: Operationalization of Variables

Variable	Variable Definition	Variable Indicator	Scale of Measurement	Supporting Literature	Supporting Theories
Independent Variables					
Driving factors – both qualitative and quantitative	Factors that motivate people to convert their land use from agricultural to real estate development	Economic drivers, social drivers, individual drivers, and land-related drivers	Ordinal – five-point Likert scale (1 = Strongly Disagree, 2 – Disagree, 3 – Neither agree nor disagree, 4 – Agree, 5 – Strongly Agree)	(Baye et al., 2020)	Urban Land Market Theory
Socio-economic consequences – both qualitative and quantitative	Socio-economic consequences are defined as the effects of peri-urban land use change on societal and human wellbeing	Urban sprawl, spatial instability, haphazard development, lack of urban planning, demographic changes, neighbourhood conflicts, and reduced social cohesiveness	Ordinal – five-point Likert scale (1 = Strongly Disagree, 2 – Disagree, 3 – Neither agree nor disagree, 4 – Agree, 5 – Strongly Agree)	(Baye et al., 2020; Sarkodie et al., 2020)	Theory of Urban Expansion
Government initiatives – both qualitative and quantitative	Policies for promoting and incentivizing sustainable and balanced land-use change.	Regulatory support, financial incentives, extension and research services, land tenure reforms, and policies on sustainable agriculture	Ordinal – five-point Likert scale (1 = Strongly Disagree, 2 – Disagree, 3 – Neither agree nor disagree, 4 – Agree, 5 – Strongly Agree)	(Naikoo et al., 2023)	Theory of Urban Expansion
Dependent Variable					
Peri-urban land use change – quantitative	Transition in the use of land from agricultural towards real estate development	Intent to sell land for real-estate development, and the Intent to convert land to real estate development from agricultural use	Ordinal – five-point Likert scale (1 = Strongly Disagree, 2 – Disagree, 3 – Neither agree nor disagree, 4 – Agree, 5 – Strongly Agree)	(Naikoo et al., 2023)	Theory of Urban Expansion

Source: Author (2024)

2.6 Chapter Summary

This chapter examined the body of knowledge regarding the research topic, both theoretically and empirically. The literature's methodological and contextual research gaps have been outlined and the conceptual framework for the suggested investigation is presented.



CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the methodology adopted to collect and analyse the data needed to answer the research questions. The justifications for methodological choices are also discussed. The structure of this chapter is as follows: research philosophy, research design, data collection, data analysis, research quality, and research ethics.

3.2 Research Philosophy

Research philosophy comprises of the beliefs and assumptions that a researcher holds concerning what knowledge is considered valid and how this knowledge should be created (Creswell, 2014). The choice of the research methodology underpins the entire research process. For this study, the selected philosophy was positivism. This philosophy assumes that reality can be observed objectively; hence, the research studies are supposed to be objective and valid. Positivism also focuses on examining cause and effect relationships, and commences with theory, after which data is collected and analysed to either validate or refute the theory (Bell et al., 2022). Positivism assumes that valid knowledge is that which is objective and developed using the scientific method to predict and explain a phenomenon (Bell et al., 2022). By using the positivism philosophy, valid and generalizable results were produced to better understand peri-urban land use change in Nyeri. Positivism philosophy has been used in similar studies on land use change (Cahya et al., 2018; Emadodin et al., 2016).

3.3 Research Design

The research design represents the framework that guides the techniques and methods used to conduct the study and answer the research questions. This study utilized mixed methods. The rationale for choosing the mixed methods approach is to conduct a more comprehensive investigation into the research topic (Hennink et al., 2020). It is crucial to clarify the limitations of relying solely on quantitative inquiry, as it may overlook the nuanced socio-economic dynamics and stakeholder perspectives essential for understanding peri-urban land use changes comprehensively. Quantitative methods alone may fail to capture qualitative aspects such as

community perceptions, cultural influences, and individual motivations driving land use decisions. By blending quantitative and qualitative inquiry, a more holistic understanding of the complex interactions shaping peri-urban land use changes was developed, enhancing the validity and depth of the study findings. The research design used in this study was the concurrent triangulation design, wherein both quantitative and qualitative data is collected at the same time to accurately define the relationships between the variables. In this design, both qualitative and quantitative phases of the study have the same status and are integrated at the analysis phase. The use of the concurrent triangulation design helps to validate the findings produced by each method using evidence gathered by the other to establish if the findings from both methods are convergent and add to the scope and depth of the findings (Schindler, 2022). For this study, a quantitative survey and qualitative interviews were concurrently administered to address each of the research questions.

To understand the factors driving land-use change quantitative methods such as regression analysis was used to identify statistically significant factors driving land-use change, including variables such as population growth, market demand for real estate, land prices, and government policies. Qualitative interviews and focus groups with stakeholders including farmers, real estate developers, government officials, and community members gave insights into the underlying reasons and motivations for the shift from coffee farming to real estate development.

To further understand the socio-economic consequences, quantitative analysis using economic indicators such as income levels, employment rates, and property values will be utilized to assess the socio-economic impacts of land-use change on local communities. Qualitative methods including interviews, surveys, and case studies will be used to explore the social implications such as changes in community dynamics, cultural practices, and livelihoods resulting from the transition from agriculture to real estate. Longitudinal studies will also be used to track changes over time and assess the sustainability of socio-economic outcomes associated with land-use change.

Analysis of Government Initiatives will be done through Review of policy documents, laws, and regulations related to land use and development in Nyeri County to understand the government's role and initiatives. Interviews and surveys with government officials and policymakers will guide the assessment of existing initiatives in promoting sustainable land-use change. Comparative

analysis of case studies and best practices from other regions or countries will provide insights into potential policy interventions and strategies for promoting sustainable land use in Nyeri.

3.4 Population of the Study

The population of the proposed study consisted of coffee farmers in Nyeri County. The rationale for choosing Nyeri County for this study is because of the high production of output compared to other counties. As a result, considering that returns from coffee farming are still high in Nyeri, it is puzzling that farmers are converting their land to real estate (AFA Coffee Directorate, 2023). This county has approximately 3800 coffee farmers cultivating an estimated 561 ^{Ha} of land and produce about 461,000 kilograms of green coffee every year (AFA Coffee Directorate, 2023).

3.5 Sample Design and Technique

Judgmental sampling was employed to select respondents for both the quantitative and qualitative arms of the study. This non-probability sampling technique involves selecting participants who meet predefined criteria relevant to addressing the research questions (Saunders et al., 2015). For this study, the eligibility criteria required active involvement in coffee farming or real estate development in Nyeri, while individuals not directly engaged in these activities were excluded. Coffee farmers participated in the quantitative survey, whereas other stakeholders—including real estate developers, land use planners, land brokers, and community members—were selected for qualitative interviews. This approach ensured that respondents possessed the necessary knowledge and experience regarding peri-urban land use change. Moreover, judgmental sampling was cost-effective and facilitated the identification of a large enough sample for the quantitative survey.

However, a key limitation of judgmental sampling is the potential for selection bias, as the researcher's discretion in choosing respondents may inadvertently exclude relevant perspectives. The reliance on predefined eligibility criteria may also limit the diversity of viewpoints, potentially affecting the generalizability of the findings. To mitigate this limitation, careful attention was paid to ensuring that respondents represented a diverse cross-section of coffee farmers and stakeholders involved in real estate development and land use planning.

For the quantitative survey, the sample size was determined using Yamane's formula:

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

where N represents the estimated population of coffee farmers (3,800), and e denotes the desired margin of error (5%). Applying this formula, the required sample size was calculated as follows:

$$N = \frac{3800}{1 + 3800(0.5)^2} = 361$$

Thus, the target sample size for the quantitative survey was 361 respondents.

For the qualitative component, data saturation served as the guiding principle in determining the sample size. Data saturation occurs when additional data collection ceases to yield new themes, indicating that further sampling is unnecessary. Various scholars provide different recommendations for achieving data saturation. Bougie and Sekaran (2019) suggested a sample size of 25 respondents, while Raju and Prabhu (2019) proposed a minimum of 12 respondents, provided they possess relevant expertise in the phenomenon being studied. Schindler (2022) observed that saturation typically emerges between 9 and 17 interviews. Based on these recommendations, this study adopted a minimum threshold of 25 respondents for the qualitative phase, with sampling continuing until data saturation was attained.

3.6 Data Collection Methods

Primary data was collected for this study. For the quantitative arm of the proposed study, structured questionnaires were used, which consisted of closed-ended questions. Questionnaires offer numerous benefits, including providing standardized data, easy to administer, and efficient for collecting data from a large sample (Bougie & Sekaran, 2019). The questionnaire consisted of three sections. Section A collected information on respondent's demographic profile. Section B collected information on driving factors, consequences and government initiatives. Section C collected information on land use change. The questionnaire was administered using a fill-and-wait strategy. Trained research assistants were used to increase the response rate.

For the qualitative phase, data was collected using semi-structured interviews. These interviews are an effective tool for collecting rich information regarding respondents' experiences (Schindler, 2022). An interview guide will be used, which collected information regarding driving factors,

consequences, and government initiatives as well as land use change. Semi-structured interviews were conducted with respondents at a location of their choosing that they deem convenient. These interviews were expected to take about 30 minutes. The interviews were recorded and later transcribed verbatim to facilitate thematic analysis. Interviews were conducted with key informants including real estate developers, land use planners, land brokers, and community members.

3.7 Research Quality

This section discusses the steps that were taken to enhance the quality of the research in terms of reliability and validity. Reliability is the extent to which similar findings can be obtained repeatedly if the same methodological procedures are executed (Schindler, 2022). Validity refers to the accuracy of the findings of the research, which can be attained by making sure that the data collection tools measure what they are intended to measure (Creswell, 2014).

3.7.1 Reliability

For the questionnaire, an internal consistency coefficient will be calculated and reported. A value of 0.7 is deemed satisfactory reliability (Creswell, 2014). Additionally, the reliability of the questionnaire will be improved by using a simple language. The reliability of qualitative data was improved using member checks, which entails giving participants an opportunity to provide feedback on the findings as well as comment on whether or not the results reflect their views.

3.7.2 Validity

To enhance the validity of the study, a pilot survey was conducted in Tetu, targeting 30 coffee farmers who met specific selection criteria. The respondents were required to produce at least 500 kilograms of coffee cherry per year, own the land they cultivated, be active members of a coffee cooperative society, and consider coffee farming as their primary economic activity. These criteria ensured that the selected farmers had sufficient experience and direct involvement in coffee production, making them suitable participants for assessing the questionnaire's effectiveness.

The pilot study was instrumental in evaluating the clarity, relevance, and effectiveness of the questionnaire in capturing key variables related to peri-urban land use change. Feedback from the respondents revealed the need for certain refinements, including rewording ambiguous questions

to enhance clarity, adjusting response categories to ensure more precise data collection, and incorporating additional variables related to government incentives and land tenure security. These modifications improved the overall structure and comprehensibility of the questionnaire, ensuring that it would effectively gather the intended data in the main study.

Beyond respondent feedback, the data collection tools, including questionnaires and interview guides, were reviewed by experts in land use planning. Their input helped to confirm that the instruments were well-structured and aligned with the research objectives and theoretical framework. This expert validation strengthened the study's credibility by ensuring that the data collection tools accurately captured the constructs being examined.

3.8 Data Analysis

Qualitative data from semi-structured interviews was analysed using thematic analysis, which provides a systematic approach to identifying and interpreting patterns within qualitative data. This method was chosen because it allows for flexibility in capturing emerging themes while ensuring a structured process in organising and analysing the data. The analysis followed Braun and Clarke's six-phase framework, which involves familiarisation with the data, generating initial codes, identifying themes, reviewing themes, defining and naming themes, and producing the final analysis.

The first stage of the analysis involved transcribing the interviews verbatim to ensure an accurate representation of participant responses. The transcripts were then uploaded into NVIVO software, where an initial open coding process was conducted. During this phase, meaningful statements were assigned descriptive labels, allowing for the identification of key ideas across the dataset. The coded data was systematically reviewed and grouped into broader categories based on similarities and recurring patterns. These categories were then refined to form overarching themes that captured the key aspects of peri-urban land use change in Nyeri.

The development of themes was guided by two main criteria: frequency of mention and relevance to the research objectives. Thematic saturation was considered to determine the point at which no new themes emerged, indicating that further coding would not add significant new insights. To ensure reliability, an inter-coder reliability check was conducted by having a second researcher

independently code a subset of the transcripts. Discrepancies were discussed, and coding definitions were refined to enhance consistency in theme identification.

A thematic framework was developed to structure the analysis, ensuring that identified themes were directly linked to the study’s objectives. The final themes were validated through iterative reviews and cross-checking against the research questions to confirm their relevance. A sample of the thematic framework is presented in Table 3.1, outlining how themes were identified and classified.

Table 3.1: Thematic Coding Framework

Phase of Thematic Analysis	Process Description
Data Familiarisation	Transcription of interviews and repeated reading of transcripts to gain an in-depth understanding of the responses.
Initial Coding	Assigning descriptive labels to relevant statements in NVIVO, capturing key ideas and patterns in the data.
Theme Identification	Grouping related codes into broader categories based on patterns observed across multiple interviews.
Theme Review and Refinement	Evaluating emerging themes for consistency, ensuring alignment with the research objectives, and eliminating redundant codes.
Validation and Reliability Checks	Conducting inter-coder reliability tests to compare coding consistency and resolve discrepancies.
Finalisation of Themes	Naming and defining themes to ensure clarity and coherence in data interpretation.

The structured approach to thematic analysis ensured that qualitative data was analysed systematically and rigorously, allowing for an accurate representation of the participants’ perspectives. The findings from this analysis will be presented in detail in Chapter 4.

Data collected from questionnaires was analysed using both descriptive and inferential statistics to summarise variables and establish relationships between independent and dependent variables. Descriptive statistics, including frequencies, percentages, and means, were used to summarise key characteristics of the data. Inferential analysis was conducted to test relationships and answer the research questions, with multiple linear regression employed to assess the impact of independent variables on peri-urban land use change. Data analysis was conducted using Statistical Package for Social Sciences (SPSS) software.

Before performing multiple linear regression, the dataset was tested to ensure it met the assumptions of regression analysis. These assumptions included linearity, which requires a linear relationship between the independent and dependent variables; normality, ensuring that variables are normally distributed; independence of observations, confirming that each participant represents a single independent observation; and homoscedasticity, which assumes equal variance of error terms across all independent variables (Bell et al., 2022). In cases where these assumptions were violated, appropriate remedies were applied. If normality or linearity assumptions were not met, non-linear transformations were performed. If independence of observations was violated, lags were added to the data, and in cases where homoscedasticity was not satisfied, log transformations were used to stabilise variance (Bell et al., 2022).

The following multiple linear regression model was used to examine the relationship between peri-urban land use change and its independent variables:

$$PLUC = \beta_0 + \beta_1 Dr + \beta_2 Cons + \beta_3 GI + \epsilon$$

Where:

PLUC (Peri-Urban Land Use Change) is the dependent variable, measured in hectares of agricultural land converted into real estate development.

Dr (Drivers of Land Use Change) represents economic, social, individual, and land-related factors, measured using a Likert scale assessing perceived importance of each driver.

Cons (Socio-Economic Consequences) captures the impact of land use change, including urban sprawl, loss of agricultural land, and demographic shifts, measured using a composite index of reported consequences.

GI (Government Interventions) refers to regulatory frameworks, financial incentives, and land tenure reforms, measured using policy effectiveness ratings.

β_0 is the intercept, β_1 , β_2 , and β_3 are the regression coefficients for the independent variables, and ϵ is the error term.

This regression model allowed for an assessment of how economic, social, and policy-related factors influence peri-urban land use change. The findings from the regression analysis will be

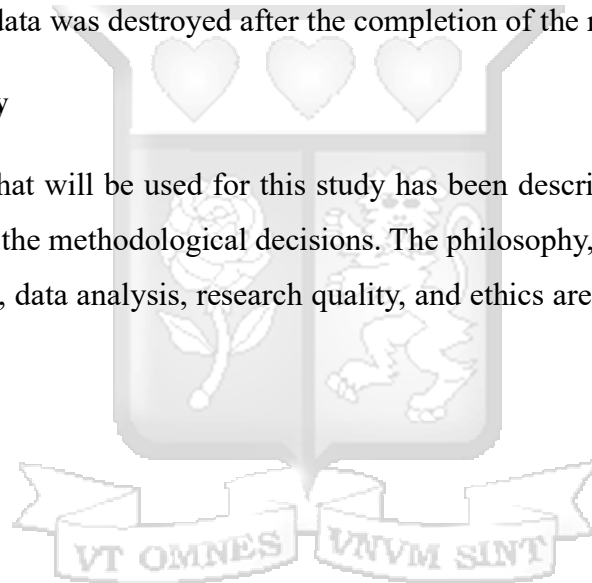
presented in Chapter 4, where the significance and predictive strength of the model will be discussed in detail.

3.9 Ethical Considerations

Prior to data collection, approval was sought from the Ethical Review Board at Strathmore University. Next, approval from the National Commission for Science, Technology, and Innovation (NACOSTI) was also be obtained. Another ethical consideration for this study was voluntary participation. Before administering the data collection tool, a letter of introduction was given to participants to obtain their informed consent. The confidentiality and privacy of participants was also maintained. Potentially identifying data, like names and addresses, were be collected. The collected data was destroyed after the completion of the research project.

3.10 Chapter Summary

The research technique that will be used for this study has been described in this chapter, along with the rationale behind the methodological decisions. The philosophy, study design, population, sampling, data collection, data analysis, research quality, and ethics are the topics covered in this chapter.



CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION OF RESULTS

4.1 Introduction

The aim of this study was to explore the nature of land-use change from coffee farming to real estate development in Nyeri County. The specific objectives included exploring the factors driving the land-use change from coffee farming to real estate development, assess the socio-economic consequences of the transition from coffee farming to real estate development, and evaluating government's initiatives in promoting sustainable land-use change from coffee farming to real estate development. This chapter presents the results of this study, which includes the respondents' demographic information descriptive and inferential analysis and thematic analysis.

4.2 Response Rate

The target sample size for this study was 361 respondents. However, 377 coffee farmers participated in the survey, translating to a response rate of 104%. A response rate of at least 60 percent is enough for proceeding with quantitative analysis. Table 4.1 shows the response rate

Table 4.1: Response Rate

Category	Frequency	Percentage
Target sample size	361	100%
Respondents	377	104%

Source: Researcher (2024)

4.3 Respondents' Demographic Information

The survey data on coffee farmers shows that most produce between 1,000 and 2,000 kilograms of coffee cherries annually (38%), with smaller proportions producing 500–1,000 kg (31%) and less than 500 kg (14%). Regarding experience, 23% have been farming for 16–20 years, followed closely by those with 6–10 years (21%) and more than 20 years (21%). A majority of the farmers are male (65%), while 35% are female. Most farmers are between 56–65 years old (30%) and 46–55 years old (25%), with no respondents under 25. Additionally, 69% of the farmers are married, 14% are single, and smaller percentages are widowed, divorced, separated, or in domestic partnerships. Table 4.2 presents a detailed summary of the demographic characteristics of the respondents.

Table 4.2: Respondents' Demographic Information

		Frequency	Percent
Annual coffee production	Less than 500 kilograms of coffee cherries	51	14%
	500 - 1,000 kilograms of coffee cherries	115	31%
	1,000 - 2,000 kilograms of coffee cherries	142	38%
	2,000 - 3,000 kilograms of coffee cherries	33	9%
	More than 3,000 kilograms of coffee cherries	33	9%
	Prefer not to say	3	1%
	Total	377	100%
Number of years you have practiced coffee farming	Less than 1 year	11	3%
	1-5 years	57	15%
	6-10 years	80	21%
	11-15 years	64	17%
	16-20 years	85	23%
	More than 20 years	79	21%
	Total	376	100%
Gender	Male	242	65%
	Female	131	35%
	Prefer not to say	4	1%
	Total	377	100%
Age Category	18-25	0	0%
	26-35	33	9%
	36-45	65	17%
	46-55	93	25%
	56-65	111	30%
	Above 65	75	20%
	Total	377	100%
Marital Status	Single	54	14%
	Married	262	69%
	Divorced	9	2%
	Widowed	39	10%
	Separated	3	1%
	In a domestic partnership	10	3%
	Prefer not to say	0	0%
	Total	377	100%

Source: Researcher (2024)

4.4 Descriptive Analysis

This section presents the descriptive statistics for the variables in this study, which included driving factors, socio-economic consequences and government initiatives in balancing sustainable agriculture and urban development, and peri-urban land use change.

4.4.1 Descriptive Statistics for Driving Factors for Land-use Change from Coffee farming to Real Estate Development in Nyeri, Kenya

The first objective of this study was to explore factors driving the land-use change from coffee farming to real estate development in Nyeri, Kenya. The factors examined were Economic drivers, social drivers, individual drivers, and land-related drivers. The survey data indicates that a significant portion of respondents (45% agree and 12% strongly agree) believe the quality of soil is reducing, making coffee farming less profitable, while 36% disagree or strongly disagree with this statement. When comparing income from real estate to coffee farming, 62% of respondents believe real estate is more profitable. A majority (83%) also agree that the income from coffee farming is declining. Furthermore, 91% agree or strongly agree that the value of land in Nyeri is increasing, and 56% believe there's a growing demand for land for industrial uses, while 90% agree there's rising demand for residential land, and 69% see growing demand for commercial land. However, only 31% agree or strongly agree that they can sell off land to sustain agricultural operations, with 54% disagreeing. Most respondents (73%) think younger generations are less interested in coffee farming. Additionally, 75% disagree that they sold land because neighbouring farmers were doing so, and 58% believe the land is still fertile for coffee farming, while 36% agree that fertility is declining. These findings are presented in Table 4.3

Table 4.3: Driving Factors – Frequency Distribution

		Frequency	Percent
The quality of soil is reducing which is making coffee farming less profitable	Strongly Disagree	39	10%
	Disagree	99	26%
	Neither agree nor disagree	23	6%
	Agree	169	45%
	Strongly Agree	47	12%
	Total	377	100%
The income from real estate is better compared to coffee farming	Strongly Disagree	15	4%
	Disagree	84	22%
	Neither agree nor disagree	46	12%

	Agree	146	39%
	Strongly Agree	86	23%
	Total	377	100%
The income from coffee farming is reducing	Strongly Disagree	11	3%
	Disagree	40	11%
	Neither agree nor disagree	13	3%
	Agree	237	63%
	Strongly Agree	76	20%
	Total	377	100%
The value of land in Nyeri is increasing	Strongly Disagree	5	1%
	Disagree	15	4%
	Neither agree nor disagree	13	3%
	Agree	201	53%
	Strongly Agree	143	38%
	Total	377	100%
There is a growing demand for land for industrial uses	Strongly Disagree	19	5%
	Disagree	105	28%
	Neither agree nor disagree	45	12%
	Agree	142	38%
	Strongly Agree	66	18%
	Total	377	100%
There is a growing demand of land for residential uses	Strongly Disagree	10	3%
	Disagree	12	3%
	Neither agree nor disagree	17	5%
	Agree	230	61%
	Strongly Agree	108	29%
	Total	377	100%
There is a growing demand for land for commercial uses	Strongly Disagree	14	4%
	Disagree	67	18%
	Neither agree nor disagree	35	9%
	Agree	193	51%
	Strongly Agree	68	18%
	Total	377	100%
I can sell off some land to sustain my agricultural operations	Strongly Disagree	109	29%
	Disagree	93	25%
	Neither agree nor disagree	55	15%
	Agree	81	21%
	Strongly Agree	39	10%
	Total	377	100%
The younger generations are less interested in coffee farming	Strongly Disagree	6	2%
	Disagree	21	6%
	Neither agree nor disagree	75	20%
	Agree	156	41%
	Strongly Agree	119	32%
	Total	377	100%

I sold my land because farmers around were also doing it	Strongly Disagree	187	50%
	Disagree	94	25%
	Neither agree nor disagree	20	5%
	Agree	41	11%
	Strongly Agree	35	9%
	Total	377	100%
The land is no longer fertile to sustain coffee farming	Strongly Disagree	61	16%
	Disagree	157	42%
	Neither agree nor disagree	26	7%
	Agree	89	24%
	Strongly Agree	44	12%
	Total	377	100%

Source: (Researcher, 2024).

The descriptive statistics show that respondents generally agree that the value of land in Nyeri is increasing (mean = 4.23) and that there is a growing demand for residential land (mean = 4.10). There is also moderate agreement that younger generations are less interested in coffee farming (mean = 3.96) and that the income from coffee farming is decreasing (mean = 3.87). While respondents lean toward agreeing that income from real estate is better than coffee farming (mean = 3.54), they are more neutral about whether the quality of soil is reducing profitability (mean = 3.23). Perceptions of demand for land for commercial (mean = 3.62) and industrial (mean = 3.35) uses are also moderately positive. There is disagreement with the idea of selling land to sustain agricultural operations (mean = 2.60) or selling land because others are doing so (mean = 2.05). Overall, the mean score for all factors is 3.39, suggesting that respondents slightly agree with most of the issues related to coffee farming and land use, with some variability in individual opinions. Table 4.4 shows these findings.

Table 4.4: Driving Factors – Descriptive Statistics

	N	Mean	Std. Deviation
The quality of soil is reducing which is making coffee farming less profitable	377	3.23	1.255
The income from real estate is better compared to coffee farming	377	3.54	1.180
The income from coffee farming is reducing	377	3.87	.953
The value of land in Nyeri is increasing	377	4.23	.802
There is a growing demand for land for industrial uses	377	3.35	1.200
There is a growing demand of land for residential uses	377	4.10	.831
There is a growing demand for land for commercial uses	377	3.62	1.085

I can sell off some land to sustain my agricultural operations	377	2.60	1.369
The younger generations are less interested in coffee farming	377	3.96	.939
I sold my land because farmers around were also doing it	377	2.05	1.350
The land is no longer fertile to sustain coffee farming	377	2.73	1.303
Overall Mean Score for Driving Factors	377	3.3878	.66987
Valid N (listwise)	377		

Source: Researcher (2024)

4.4.2 Descriptive Statistics for Socio-economic Consequences of the Transition from Coffee Farming to Real Estate Development in Nyeri, Kenya

The second objective of this research was to assess the socio-economic consequences of the transition from coffee farming to real estate development in Nyeri. The indicators that were used to measure socio-economic consequences included spatial stability, urban sprawl, haphazard development, lack of urban planning, demographic changes, neighbourhood conflicts, and reduced social cohesiveness. The survey data reveals significant concerns about real estate development in Nyeri. A large proportion of respondents (54%) agree or strongly agree that there is uncontrolled and haphazard development, and 63% feel that unplanned development in the town is increasing. Many respondents (56%) believe that this real estate growth is negatively affecting the environment, and 58% feel that it is reducing the sense of community. Additionally, 56% agree or strongly agree that urban planning is ineffective at regulating development, and 60% report that neighbourhood conflicts over land have increased. A vast majority (84%) perceive that Nyeri's population is changing due to urbanization, and 63% no longer feel they are in a rural environment. Overall, the data indicates growing concerns about the rapid pace of urbanization and its social and environmental impacts. Table 4.5 depicts these findings.

Table 4.5: Socio-economic Consequences – Frequency Distribution

		Frequency	Percent
There is uncontrolled and haphazard real estate development in Nyeri	Strongly Disagree	15	4%
	Disagree	99	26%
	Neither agree nor disagree	57	15%
	Agree	167	44%
	Strongly Agree	39	10%
	Total	377	100%
	Strongly Disagree	7	2%

Unplanned development of Nyeri town is increasing	Disagree	81	21%
	Neither agree nor disagree	53	14%
	Agree	177	47%
	Strongly Agree	59	16%
	Total	377	100%
The increase in real estate is negatively affecting the environment	Strongly Disagree	7	2%
	Disagree	100	27%
	Neither agree nor disagree	61	16%
	Agree	158	42%
	Strongly Agree	51	14%
Total	377	100%	
The increased real estate development is reducing the sense of community	Strongly Disagree	13	3%
	Disagree	98	26%
	Neither agree nor disagree	49	13%
	Agree	149	40%
	Strongly Agree	68	18%
Total	377	100%	
The urban planning is not effective regulating real estate development in Nyeri	Strongly Disagree	11	3%
	Disagree	87	23%
	Neither agree nor disagree	68	18%
	Agree	159	42%
	Strongly Agree	52	14%
Total	377	100%	
Because of real estate developments, neighborhood conflicts over land issues have increased	Strongly Disagree	29	8%
	Disagree	88	23%
	Neither agree nor disagree	34	9%
	Agree	131	35%
	Strongly Agree	95	25%
Total	377	100%	
The population of Nyeri is changing due to the increasing urbanization	Strongly Disagree	7	2%
	Disagree	43	11%
	Neither agree nor disagree	12	3%
	Agree	217	58%
	Strongly Agree	98	26%
Total	377	100%	
I no longer feel I am in rural country environment	Strongly Disagree	13	3%
	Disagree	86	23%
	Neither agree nor disagree	39	10%
	Agree	171	45%
	Strongly Agree	68	18%
Total	377	100%	

Source: (Researcher, 2024)

The survey results indicate moderate concern among respondents about the socio-economic consequences of real estate development in Nyeri. With a mean score of 3.31, respondents somewhat agree that there is uncontrolled and haphazard real estate development, and a higher mean of 3.53 suggests stronger agreement that unplanned development in Nyeri town is increasing. Respondents also feel that real estate growth is negatively impacting the environment (mean = 3.39) and reducing the sense of community (mean = 3.43). Urban planning is seen as ineffective in regulating this development (mean = 3.41), and neighbourhood conflicts over land have reportedly increased (mean = 3.46). The highest concern is expressed over the changing population dynamics due to urbanization (mean = 3.94), with many respondents also indicating that Nyeri no longer feels like a rural environment (mean = 3.52). The overall mean score of 3.50 reflects moderate agreement on the socio-economic impacts of urbanization in Nyeri, showing that respondents are concerned about the broader implications of rapid urbanization, environmental effects, and social changes. Table 4.6 presents these descriptive statistics.

Table 4.6: Socio-economic Consequences – Descriptive Statistics

	N	Mean	Std. Deviation
There is uncontrolled and haphazard real estate development in Nyeri	377	3.31	1.089
Unplanned development of Nyeri town is increasing	377	3.53	1.052
The increase in real estate is negatively affecting the environment	377	3.39	1.074
The increased real estate development is reducing the sense of community	377	3.43	1.156
The urban planning is not effective regulating real estate development in Nyeri	377	3.41	1.076
Because of real estate developments, neighborhood conflicts over land issues has increased	377	3.46	1.298
The population of Nyeri is changing due to the increasing urbanization	377	3.94	.956
I no longer feel I am in rural country environment	377	3.52	1.130
Overall Mean score for Socio-economic consequences	377	3.4983	.75456
Valid N (listwise)	377		

4.4.3 Descriptive Statistics for Government Initiatives in Promoting Sustainable Land-use Change from Coffee Farming to Real Estate Development

The third objective of this study was to evaluate the government’s initiatives in promoting sustainable land-use change from coffee farming to real estate development in Nyeri, Kenya. The indicators used to measure government initiatives included regulatory support, financial incentives, extension and research services, land tenure reforms, and sustainable agriculture policies. The survey findings indicate that respondents largely disagree with the effectiveness of land use planning and government support for coffee farming in Nyeri. A significant majority (65%) disagree or strongly disagree that land use planning policies are developed through stakeholder participation, and 53% feel that these policies are not flexible enough to reflect stakeholders' changing needs. Similarly, 56% do not believe that local government regulations effectively guide the sale of land for real estate, and 66% disagree or strongly disagree that the government provides adequate research and extension services to coffee farmers. Regarding land tenure reforms, 63% of respondents disagree that effective measures are in place to regulate real estate development, while 76% feel that the government does not offer sufficient financial support or incentives for coffee farmers to continue their operations. Overall, these results reflect a perception of limited government involvement in both land management and support for traditional farming. These findings are presented in Table 4.7.

Table 4.7: Government Initiatives – Frequency Distribution

		Count	Percent
Land use planning and policies in Nyeri are developed through stakeholder participation	Strongly Disagree	74	20%
	Disagree	170	45%
	Neither agree nor disagree	56	15%
	Agree	70	19%
	Strongly Agree	7	2%
	Total	377	100%
Land use planning and policies in Nyeri are flexible and can be adapted to reflect the changing needs of stakeholders	Strongly Disagree	59	16%
	Disagree	141	37%
	Neither agree nor disagree	53	14%
	Agree	113	30%
	Strongly Agree	11	3%
	Total	377	100%
The local government has implemented regulations to guide the sale of land in Nyeri for real estate projects	Strongly Disagree	75	20%
	Disagree	136	36%
	Neither agree nor disagree	59	16%

	Agree	97	26%
	Strongly Agree	10	3%
	Total	377	100%
The government is providing research and extension services to coffee farmers who still want to continue farming	Strongly Disagree	94	25%
	Disagree	156	41%
	Neither agree nor disagree	33	9%
	Agree	83	22%
	Strongly Agree	11	3%
	Total	377	100%
The government has implemented reforms on land tenure and ownership to regulate the development of real estate projects	Strongly Disagree	95	25%
	Disagree	145	38%
	Neither agree nor disagree	71	19%
	Agree	59	16%
	Strongly Agree	7	2%
	Total	377	100%
The government provides financial incentives and support to those who still wish to continue with coffee farming	Strongly Disagree	156	41%
	Disagree	131	35%
	Neither agree nor disagree	27	7%
	Agree	48	13%
	Strongly Agree	15	4%
	Total	377	100%

Source: (Researcher, 2024)

The descriptive statistics reveal a generally low level of agreement among respondents regarding the effectiveness of government initiatives in Nyeri, particularly concerning land use planning, real estate regulations, and support for coffee farmers. The overall mean score of 2.38 indicates a prevalent perception of inadequacy. Specifically, respondents scored low on stakeholder participation in land use planning (mean = 2.38) and flexibility of policies (mean = 2.67). Similarly, the implementation of regulations to guide land sales (mean = 2.55) and research services for coffee farmers (mean = 2.37) were perceived as insufficient. The lowest score was on the government's financial incentives for coffee farming (mean = 2.03), reflecting widespread dissatisfaction. The standard deviations show moderate variability in responses, but the overall perception of government support is relatively poor across all areas. These findings are detailed in Table 4.8.

Table 4.8: Government Initiatives – Descriptive Statistics

Descriptive Statistics			
	N	Mean	Std. Deviation
Land use planning and policies in Nyeri are developed through stakeholder participation	377	2.38	1.055
Land use planning and policies in Nyeri are flexible and can be adapted to reflect the changing needs of stakeholders	377	2.67	1.145
The local government has implemented regulations to guide the sale of land in Nyeri for real estate projects	377	2.55	1.150
The government is providing research and extension services to coffee farmers who still want to continue farming	377	2.37	1.162
The government has implemented reforms on land tenure and ownership to regulate the development of real estate projects	377	2.31	1.069
The government provides financial incentives and support to those who still wish to continue with coffee farming	377	2.03	1.164
Overall Score for Government Initiatives	377	2.384	.8744
Valid N (listwise)	377		

Source: (Researcher, 2024)

4.4.3.1 Review of Government Policies, Laws, and Regulations Related to Land Use and Agriculture in Nyeri County

This section evaluates key government policies, regulations, and initiatives relevant to land use and agriculture in Nyeri County, focusing on their role in influencing the transition from coffee farming to real estate development. The analysis covers the Nyeri County Spatial Plan, national land use policies, environmental regulations, and the Coffee Cherry Advance Revolving Fund, assessing their contributions to or mitigation of land-use changes.

4.4.3.1.1 Nyeri County Spatial Plan

The Nyeri County Spatial Plan aims to foster sustainable land-use practices and manage competing demands for agricultural, residential, and industrial uses. The plan seeks to protect agricultural land and mitigate urban sprawl through zoning regulations that designate areas for coffee farming, real estate development, and conservation. However, weak enforcement of these zoning laws has inadvertently supported the transition to urban development. Study respondents noted that

unregulated conversions of agricultural land for real estate purposes often occur, contributing to haphazard development. Furthermore, low public awareness of the spatial plan undermines its effectiveness, allowing landowners to prioritize short-term economic gains over long-term sustainability. Strengthening enforcement mechanisms and improving community engagement could better align the plan's objectives with sustainable land use practices, potentially reducing the rate of land conversion.

4.4.3.1.2 National Land Policies and the Physical and Land Use Planning Act, 2019

The Ministry of Lands has introduced policies like the National Land Policy (Sessional Paper No. 3 of 2009) and the Physical and Land Use Planning Act, 2019, which emphasize integrated planning and the protection of prime agricultural land. Despite these provisions, their weak implementation in Nyeri County has indirectly facilitated the transition from coffee farming to real estate development. The disconnect between national policies and local enforcement has left agricultural zones vulnerable to urban expansion, as local authorities struggle to align regulations with overarching national objectives. This gap has enabled developers to acquire and convert coffee farming land with minimal oversight, accelerating the shift in land use. Closing this implementation gap through stronger county-level regulations and oversight is vital to preserving agricultural land and managing urban growth.

4.4.3.1.3 Environmental Management and Coordination Act (EMCA) of 1999

The Environmental Management and Coordination Act (EMCA) of 1999 and its amendments provide a legal framework for safeguarding the environment during land-use changes. The act requires environmental impact assessments (EIAs) for development projects to mitigate soil degradation, water pollution, and biodiversity loss. In Nyeri, compliance with these regulations varies. While large-scale real estate projects often meet EIA requirements, smaller developments frequently bypass these processes, leading to environmental degradation. This concern was echoed by study respondents who highlighted pollution and disrupted water systems caused by unregulated urban growth. Strengthening enforcement under EMCA, including regular monitoring of both small and large developments, is essential for minimizing the environmental impact of urbanization.

4.4.3.1.4 Coffee Cherry Advance Revolving Fund

The Coffee Cherry Advance Revolving Fund is a national initiative aimed at supporting coffee farmers by providing affordable credit facilities. Established under the Crops Act, 2013, the fund offers pre-harvest financing to farmers at an annual interest rate of 3%. The primary objective is to reduce farmers' reliance on costly informal loans, thereby increasing the profitability of coffee farming and enhancing its sustainability. Despite its potential, the fund faces challenges in Nyeri County. Study participants reported limited awareness of the fund and difficulties in accessing it due to bureaucratic hurdles and inadequate outreach. This has left many farmers reliant on less favorable financing options, further exacerbating their financial instability and contributing to the shift toward real estate development. Enhancing access to the Coffee Cherry Advance Revolving Fund through simplified application processes, targeted awareness campaigns, and local financial education initiatives could significantly improve coffee farming profitability and reduce the pressure to sell land for real estate.

4.4.4 Descriptive Statistics for Peri-urban Land Use Change

The survey results indicate that a significant portion of respondents view real estate development as a more attractive option than continuing with coffee farming. A majority (68%) agree or strongly agree that selling land for real estate development is a better idea compared to coffee farming. Similarly, 60% of respondents express a willingness to consider quitting coffee farming in favour of real estate development. When it comes to the direct sale of land to developers, 50% are open to the idea, while 34% disagree with it. These findings suggest that real estate development is increasingly viewed as a more lucrative and viable option than traditional coffee farming among the respondents. These findings are presented in Table 4.9.

Table 4.9: Peri-urban Land Use Change – Frequency Distribution

		Count	Percent
Selling land for real estate development seems like a better idea compared to continuing coffee farming	Strongly Disagree	61	16%
	Disagree	32	8%
	Neither agree nor disagree	30	8%
	Agree	150	40%
	Strongly Agree	104	28%
	Total	377	100%
I might consider quitting coffee farming in favor of real estate development	Strongly Disagree	62	16%
	Disagree	37	10%
	Neither agree nor disagree	52	14%
	Agree	140	37%
	Strongly Agree	86	23%
	Total	377	100%
I may consider selling my land to real estate developers	Strongly Disagree	87	23%
	Disagree	40	11%
	Neither agree nor disagree	62	16%
	Agree	105	28%
	Strongly Agree	83	22%
	Total	377	100%

Source: Researcher (2024)

The descriptive statistics indicate a moderate level of agreement among respondents regarding the attractiveness and willingness to substitute coffee farming for real estate development. With a mean score of 3.54, respondents generally view selling land for real estate development as a better option than sticking with coffee farming. This sentiment is further reflected in the mean score of 3.40 for considering quitting coffee farming in favour of real estate development. Additionally, the mean score of 3.15 for considering selling land to real estate developers suggests a moderate openness to this idea. The overall mean score of 3.36 for peri-urban land use change reinforces the view that real estate development is increasingly perceived as a viable alternative to coffee farming, though there is some variability in responses, as indicated by the relatively high standard deviations. These findings are presented in Table 4.10.

Table 4.10: Peri-urban Land Use Change – Descriptive Statistics

Descriptive Statistics			
	N	Mean	Std. Deviation
Selling land for real estate development seems like a better idea compared to continuing coffee farming	377	3.54	1.395
I might consider quitting coffee farming in favor of real estate development	377	3.40	1.373
I may consider selling my land to real estate developers	377	3.15	1.474
Overall Score for peri-urban land use change	377	3.3643	1.28039
Valid N (listwise)	377		

4.5 Inferential Analysis

This section presents the results of inferential analysis, which includes correlations, diagnostic tests for regression analysis, and multiple linear regression analysis.

4.5.1 Correlation Analysis Results

Pearson’s correlation is used to analyze the direction, strength and significance of the relationship between variables. The following subsection shows the correlations between the independent and dependent variables.

4.5.1.1 Correlations between Driving Factors and Peri-urban Land Use Change

Table 4.11 reveals significant correlations between peri-urban land use change and various driving factors, particularly those related to coffee farming and real estate development. These correlations are supported by thematic insights from interviews, which highlight the motivations, challenges, and perspectives of local stakeholders.

Economic Motivations: Economic factors emerged as the most significant drivers of peri-urban land use change. The correlation between the perception that "the income from real estate is better compared to coffee farming" and land use change ($r = 0.544$, $p < 0.001$) underscores the strong economic appeal of real estate. This finding is consistently echoed in the interviews, with participants frequently citing the higher and more stable income from real estate as a key motivator. One farmer stated, *“The income from coffee farming has been decreasing, while real estate offers*

better earnings” (Interview 1). Another respondent noted, *“Real estate provides steady monthly income from rentals, unlike coffee farming, which is unpredictable and unstable”* (Interview 15).

Dissatisfaction with coffee farming further compounds this economic motivation. Many participants expressed frustration over delayed payments, low coffee prices, and poor management of cooperatives. As one respondent remarked, *“The poor performance of the coffee industry, characterized by mismanagement and low payments, motivates people to sell their land or convert it to real estate”* (Interview 7). Another noted, *“Coffee income is delayed, and when you have urgent financial needs, selling land becomes the only option”* (Interview 2). This dissatisfaction with the coffee industry is reflected in the correlation between the perception of "declining agricultural productivity" and land use change ($r = 0.362, p < 0.001$), highlighting how financial instability in farming pushes landowners toward more profitable alternatives like real estate.

Declining Agricultural Productivity: Environmental challenges, such as declining soil fertility and reduced productivity, further contribute to land use change. The correlation between "the land is no longer fertile to sustain coffee farming" and land use change ($r = 0.362, p < 0.001$) highlights the role of environmental degradation. Participants frequently cited issues such as soil depletion and rising costs of farming inputs as critical barriers to continuing coffee farming. As one respondent explained, *“The quality of soil is reducing, and with the cost of fertilizers and chemicals, coffee farming is no longer viable”* (Interview 11).

The perception of declining productivity is supported by thematic analysis, where farmers described the increasing difficulty of maintaining profitability in agriculture. One respondent remarked, *“Coffee farming is becoming a menace due to poor coffee prices and the cost of production”* (Interview 13). Such challenges are compounded by external pressures, including real estate developments that disrupt water channels and increase pollution (Interview 5).

Growing Demand for Land: The belief that "the value of land in Nyeri is increasing" is positively correlated with peri-urban land use change ($r = 0.219, p < 0.001$). Rising land values make real estate development an attractive option for farmers compared to maintaining agricultural activities. Interview respondents emphasized the financial allure of selling land, with one farmer stating, *“Land prices have skyrocketed, and even a small piece can fetch a lot of money compared to the income from coffee farming”* (Interview 9). Another respondent highlighted the speculative nature

of the market, noting that *“Real estate is changing the value of land in Nyeri. With land prices going up, selling becomes a much more attractive option”* (Interview 18).

Market pressures driven by increasing demand for industrial, commercial, and residential land are also significant contributors, as evidenced by the correlations ($r = 0.253$, $r = 0.216$, and $r = 0.130$, respectively; $p < 0.05$). These demands are reshaping Nyeri’s peri-urban areas, with participants noting that developers are actively seeking agricultural land for real estate projects, creating competitive market conditions.

Social and Cultural Shifts: Social and cultural factors, such as generational shifts and peer influence, also play a role in peri-urban land use change. The correlation between the perception that "younger generations are less interested in coffee farming" and land use change ($r = 0.254$, $p < 0.001$) reflects a growing disinterest in farming among the youth. This sentiment was echoed in interviews, with one participant stating, *“The youth are not taking up farming like their parents; they find it more worthwhile to sell the land”* (Interview 16). Another respondent highlighted how peer influence accelerates this trend, noting, *“I sold my land because others around me were doing it, and it seemed like the only way to secure my financial stability”* (Interview 7).

Additionally, the ability to sell land as a coping mechanism for financial stability correlates positively with land use change ($r = 0.372$, $p < 0.001$). This dynamic reflects the pressure faced by many farmers who view land sales as their only viable option to address immediate economic challenges.

Financial Pressures and Land Sales: The correlation between the ability to sell land to sustain agricultural operations ($r = 0.372$, $p < 0.001$) reflects the financial struggles faced by many farmers. Participants frequently cited financial instability as a key motivation for selling land. One respondent noted, *“Coffee income is delayed, and when you have fees to pay or other needs, selling land becomes the only option”* (Interview 2). Another added, *“The high costs of chemicals, fertilizers, and labor make it impossible to sustain coffee farming, so I sold part of my land to survive”* (Interview 6).

Value of Land in Nyeri: The belief that "the value of land in Nyeri is increasing" is positively correlated with peri-urban land use change ($r = 0.219$, $p < 0.001$). This indicates that rising land values act as a significant incentive for farmers to convert agricultural land into real estate.

Thematic analysis corroborates this finding, with multiple participants emphasizing the financial allure of selling land due to its escalating worth. One respondent noted, *“The price of land has skyrocketed, and even a small piece can fetch a lot of money compared to the income from coffee farming”* (Interview 9). Another echoed this sentiment, stating, *“Real estate is changing the value of land in Nyeri. With land prices going up, selling becomes a much more attractive option”* (Interview 18). This economic pressure compels many farmers to prioritize short-term financial gains over long-term agricultural sustainability. Moreover, participants highlighted how land value appreciation often leads to speculative sales, further accelerating the transition from coffee farming to urban development.

Integration of Findings

The findings from the correlation and thematic analyses strongly align with the Theory of Urban Expansion, which highlights how economic, demographic, and infrastructural factors drive the outward growth of cities. Economic motivations, particularly the higher profitability of real estate compared to coffee farming, serve as a key catalyst for land use change. The correlation between land use transition and the perception that real estate provides more stable income reflects a broader shift in land utility—moving away from agricultural production toward urban and residential development.

The increasing demand for land, driven by population growth and urban spillover effects, further accelerates this expansion. The rising land values in Nyeri create strong market pressures that incentivize land conversion, aligning with the theory’s assertion that urban expansion is propelled by economic returns on land. Social and cultural changes, including generational disinterest in farming and peer influence, reinforce this shift, as younger populations opt for urban-oriented livelihoods rather than traditional agriculture. Additionally, declining agricultural productivity due to environmental constraints, such as soil degradation and high farming costs, further justifies the transition to urban land uses.

The thematic insights provide a nuanced understanding of how these structural forces shape local decision-making. Farmers and landowners, responding to economic pressures and changing urban dynamics, are key agents in this expansion process. This supports the theoretical perspective that urban growth is an organic and inevitable outcome of economic incentives and market forces.

Managing this expansion effectively will require policies that guide sustainable urban development while addressing the socio-economic vulnerabilities of displaced agricultural communities.



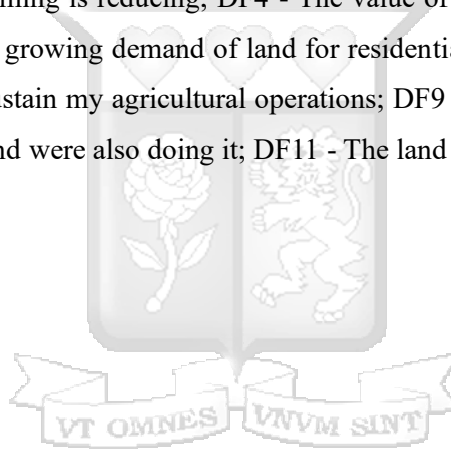
Table 4.11: Correlation – Driving Factors vs. Land Use Change

		DF1	DF2	DF3	DF4	DF5	DF6	DF7	DF8	DF9	DF10	DF11	Overall Score for peri-urban land use change
The quality of soil is reducing which is making coffee farming less profitable	<i>r</i>	1											
	<i>p</i>		.000										
The income from real estate is better compared to coffee farming	<i>r</i>	.365**	1										
	<i>p</i>	.000											
The income from coffee farming is reducing	<i>r</i>	.221**	.473**	1									
	<i>p</i>	.000	.000										
The value of land in Nyeri is increasing	<i>r</i>	.144**	.391**	.412**	1								
	<i>p</i>	.005	.000	.000									
There is a growing demand for land for industrial uses	<i>r</i>	.217**	.316**	.375**	.327**	1							
	<i>p</i>	.000	.000	.000	.000								
There is a growing demand of land for residential uses	<i>r</i>	.042	.231**	.369**	.446**	.411**	1						
	<i>p</i>	.413	.000	.000	.000	.000							
There is a growing demand for land for commercial uses	<i>r</i>	.251**	.352**	.162**	.267**	.655**	.345**	1					
	<i>p</i>	.000	.000	.002	.000	.000	.000						
I can sell off some land to sustain my agricultural operations	<i>r</i>	.154**	.384**	.277**	.146**	.408**	.201**	.341**	1				
	<i>p</i>	.003	.000	.000	.005	.000	.000	.000					
The younger generations are less interested in coffee farming	<i>r</i>	.182**	.371**	.142**	.158**	.117*	.138**	.203**	.202**	1			
	<i>p</i>	.000	.000	.006	.002	.023	.007	.000	.000				
	<i>r</i>	.247**	.306**	.167**	.114*	.251**	.133**	.261**	.593**	.199**	1		

I sold my land because farmers around were also doing it	<i>p</i>	.000	.000	.001	.027	.000	.010	.000	.000	.000			
The land is no longer fertile to sustain coffee farming	<i>r</i>	.443**	.388**	.162**	.140**	.346**	.140**	.409**	.407**	.302**	.474**	1	.
	<i>p</i>	.000	.000	.002	.006	.000	.006	.000	.000	.000	.000		.
Overall Score for peri-urban land use change	<i>r</i>	.237**	.544**	.207**	.219**	.253**	.130*	.216**	.372**	.254**	.297**	.362**	1
	<i>p</i>	.000	.000	.000	.000	.000	.012	.000	.000	.000	.000	.000	

Legend: DF1 - The quality of soil is reducing which is making coffee farming less profitable; DF2 - The income from real estate is better compared to coffee farming; DF3 - The income from coffee farming is reducing; DF4 - The value of land in Nyeri is increasing; DF5 - There is a growing demand for land for industrial uses; DF6 - There is a growing demand of land for residential uses; DF7 - There is a growing demand for land for commercial uses; DF8 - I can sell off some land to sustain my agricultural operations; DF9 - The younger generations are less interested in coffee farming; DF10 - I sold my land because farmers around were also doing it; DF11 - The land is no longer fertile to sustain coffee farming

Source: Researcher (2024)



4.5.1.2 Correlations between Socioeconomic Consequences and Peri-urban Land Use Change

Table 4.12 shows the correlations between socio-economic consequences and peri-urban land use change. The correlation analysis highlights significant relationships between socioeconomic consequences and peri-urban land use change in Nyeri County. These findings are complemented by thematic insights from interviews, which provide nuanced perspectives on the perceptions, challenges, and impacts associated with real estate development and urbanization.

Unplanned and Haphazard Urban Development: The strongest correlation is the perception that "unplanned development of Nyeri town is increasing" ($r = 0.491, p < 0.001$), suggesting that unregulated and uncoordinated urban expansion is a key driver of agricultural land conversion to real estate. Similarly, the perception of "uncontrolled and haphazard real estate development" ($r = 0.388, p < 0.001$) reflects concerns about the disorderly growth of real estate projects. These correlations align with thematic findings from interviews, where participants expressed frustration over the lack of planning. One respondent observed, *"Real estate growth in Nyeri is unplanned, with no proper zoning or regulations. This contributes to chaotic development"* (Interview 8). Another emphasized, *"Unplanned development is destroying the environment and affecting our ability to farm effectively"* (Interview 3).

Environmental Impacts of Real Estate Development: The belief that "the increase in real estate is negatively affecting the environment" ($r = 0.349, p < 0.001$) highlights the perceived environmental consequences of land-use transitions. Thematic analysis reinforces this finding, with participants citing pollution, soil erosion, and water channel disruptions as major concerns. One respondent explained, *"Real estate development increases pollution and changes water channels, which negatively impacts agriculture"* (Interview 1). Another added, *"The environment is being spoiled by unregulated real estate projects, leading to the loss of green spaces"* (Interview 5). These environmental challenges are further exacerbated by shrinking agricultural land, as one participant lamented, *"Smaller shambas (farms) make it harder for agriculture to thrive"* (Interview 12).

Ineffectiveness of Urban Planning: The perception that "urban planning is not effective in regulating real estate development in Nyeri" ($r = 0.342, p < 0.001$) underscores the role of weak

governance and inadequate regulatory frameworks in driving peri-urban land use change. Many participants criticized the lack of enforcement of urban planning policies. One respondent noted, *“There’s no effective planning to balance real estate and agricultural development. This is why land is being sold off without any control”* (Interview 7). These governance challenges allow unregulated real estate development to flourish, further accelerating the transition away from farming.

Loss of Rural Identity and Community Ties: The correlation between the perception that "I no longer feel I am in a rural country environment" and peri-urban land use change ($r = 0.379$, $p < 0.001$) reflects the erosion of rural identity as urbanization expands. This sentiment is echoed in the belief that "increased real estate development is reducing the sense of community" ($r = 0.359$, $p < 0.001$). Interview participants expressed concern about the social consequences of urban growth. One respondent remarked, *“The influx of strangers due to real estate development weakens traditional community ties and creates security concerns”* (Interview 5). Another highlighted the cultural shift, stating, *“Younger generations are not stepping in to replace their parents in farming; they see more value in selling land”* (Interview 16). This loss of rural identity and community cohesion is further driven by the economic opportunities provided by real estate, which often outweigh the benefits of farming.

Neighborhood Conflicts and Social Tension: The belief that "real estate developments have increased neighbourhood conflicts over land issues" shows a weaker but significant correlation ($r = 0.124$, $p < 0.05$). This reflects the growing tensions surrounding land-use changes. Interview participants described disputes over land boundaries and access, with one noting, *“Real estate developments have led to more conflicts in neighbourhoods, as people argue over land use and ownership”* (Interview 11). These conflicts often arise from unplanned development and the influx of new residents, which disrupts existing social structures.

The findings indicate that perceptions of unregulated development, ineffective urban planning, environmental degradation, and social disruptions are significantly associated with peri-urban land use change in Nyeri. Strong correlations with unplanned urban growth and the loss of rural identity suggest that the rapid expansion of real estate is perceived as a dominant force in driving land transitions. These results underscore the need for more effective urban planning, environmental

protections, and community-focused policies to manage the socio-environmental impacts of urbanization.

4.5.1.2.1 Integration of Findings

The integration of correlation and thematic analyses reveals the intertwined economic, social, and environmental consequences of peri-urban land use change in Nyeri County. This transformation aligns with both Urban Growth Machine Theory and the Theory of Urban Expansion, each offering a distinct but complementary lens on the patterns of change.

From the perspective of the Urban Growth Machine Theory, land is increasingly viewed as a commodity, with real estate developers, investors, and local stakeholders capitalizing on rising land values. This has led to haphazard urban expansion, where market-driven forces—rather than strategic planning—dictate land use transitions. The prioritization of real estate over agriculture reflects the economic incentives of growth coalitions, which shape urbanization based on profitability rather than long-term sustainability.

At the same time, the Theory of Urban Expansion explains how weak planning controls and market forces facilitate rapid outward growth, leading to sprawling, fragmented urbanization. Unregulated development has resulted in environmental degradation, the displacement of agricultural land, and a shift in socio-spatial dynamics. Thematic insights further highlight the social tensions and disruptions caused by these transitions, as communities struggle with the erosion of rural identity and the challenges of adapting to an increasingly urbanized environment.

Addressing these challenges requires a balanced approach that integrates economic opportunities with sustainable urban planning and environmental protections. Without stronger regulatory frameworks and policy interventions, Nyeri's peri-urban expansion risks deepening socio-economic inequalities and undermining its agricultural and ecological heritage.

Table 4.12: Correlation – Socioeconomic Consequences vs. Land Use Change

		SEC1	SEC2	SEC3	SEC4	SEC5	SEC6	SEC7	SEC8	Overall Score for peri-urban land use change
There is uncontrolled and haphazard real estate development in Nyeri	<i>r</i>	1	.609**	.605**	.540**	.303**	.403**	.308**	.421**	.388**
	<i>p</i>		.000	.000	.000	.000	.000	.000	.000	.000
Unplanned development of Nyeri town is increasing	<i>r</i>	.609**	1	.501**	.417**	.429**	.357**	.297**	.458**	.491**
	<i>p</i>	.000		.000	.000	.000	.000	.000	.000	.000
The increase in real estate is negatively affecting the environment	<i>r</i>	.605**	.501**	1	.591**	.342**	.435**	.283**	.293**	.349**
	<i>p</i>	.000	.000		.000	.000	.000	.000	.000	.000
The increased real estate development is reducing the sense of community	<i>r</i>	.540**	.417**	.591**	1	.353**	.401**	.322**	.429**	.359**
	<i>p</i>	.000	.000	.000		.000	.000	.000	.000	.000
The urban planning is not effective regulating real estate development in Nyeri	<i>r</i>	.303**	.429**	.342**	.353**	1	.325**	.273**	.377**	.342**
	<i>p</i>	.000	.000	.000	.000		.000	.000	.000	.000
Because of real estate developments, neighbourhood conflicts over land issues has increased	<i>r</i>	.403**	.357**	.435**	.401**	.325**	1	.149**	.307**	.124*
	<i>p</i>	.000	.000	.000	.000	.000		.004	.000	.016
The population of Nyeri is changing due to the increasing urbanization	<i>r</i>	.308**	.297**	.283**	.322**	.273**	.149**	1	.379**	.285**
	<i>p</i>	.000	.000	.000	.000	.000	.004		.000	.000
I no longer feel I am in rural country environment	<i>r</i>	.421**	.458**	.293**	.429**	.377**	.307**	.379**	1	.379**
	<i>p</i>	.000	.000	.000	.000	.000	.000	.000		.000
Overall Score for peri-urban land use change	<i>r</i>	.388**	.491**	.349**	.359**	.342**	.124*	.285**	.379**	1
	<i>p</i>	.000	.000	.000	.000	.000	.016	.000	.000	

Legend: SEC1 - There is uncontrolled and haphazard real estate development in Nyeri; SEC2 - Unplanned development of Nyeri town is increasing; SEC3 - The increase in real estate is negatively affecting the environment; SEC4 - The increased real estate development is reducing the sense of community' SEC5 - The urban planning is not effective regulating real estate development in Nyeri; SEC6 - Because of real estate developments, neighbourhood conflicts over land issues has increased; SEC7 - The population of Nyeri is changing due to the increasing urbanization; SEC8 - I no longer feel I am in rural country environment

Source: Researcher (2024)

4.5.1.3 Correlations between Government Initiatives and Peri-urban Land Use Change

Table 4.13 highlights the relationship between peri-urban land use change and various perceptions of government initiatives in Nyeri. The correlation analysis reveals significant negative relationships between peri-urban land use change and perceptions of various government initiatives, underscoring the critical role of governmental support in managing land-use transitions. These findings are enriched by thematic insights from interviews, which highlight stakeholders' views on the effectiveness – or lack thereof – of government efforts to regulate urban expansion and support agriculture.

Stakeholder Participation in Land Use Planning: The perception that "land use planning and policies in Nyeri are developed through stakeholder participation" is negatively correlated with peri-urban land use change ($r = -0.239$, $p < 0.001$). This suggests that participatory planning processes, which include farmers, conservationists, and other stakeholders, can help address the competing demands of urbanization and agriculture. Thematic analysis supports this finding, as respondents emphasized the importance of inclusive decision-making. One participant remarked, *"If farmers were included in land-use planning, they could help ensure that agricultural areas are preserved for farming instead of being sold off for real estate"* (Interview 7). Another respondent added, *"When all stakeholders have a say, the policies reflect the needs of the community better, and people are less likely to sell their land"* (Interview 3).

Flexibility of Land Use Policies: The correlation between "land use planning and policies in Nyeri are flexible and can be adapted to reflect the changing needs of stakeholders" and peri-urban land use change ($r = -0.373$, $p < 0.001$) highlights the value of adaptive policies. Flexible planning allows for balancing urban growth with the preservation of agricultural land. However, interview findings indicate that stakeholders often perceive these policies as rigid or poorly implemented. One participant noted, *"The government needs to create policies that adapt to both urban and agricultural needs, but right now, the policies are too weak to manage the pressure from urbanization"* (Interview 12). This lack of responsiveness exacerbates the challenges faced by farmers and accelerates the shift toward real estate.

Regulations on Land Sales: The perception that "the local government has implemented regulations to guide the sale of land in Nyeri for real estate projects" is negatively correlated with

peri-urban land use change ($r = -0.348, p < 0.001$). This correlation underscores the importance of regulatory frameworks in curbing haphazard land sales and protecting agricultural zones. Thematic insights, however, reveal a gap between policy and enforcement. One respondent stated, “*There are no strict regulations guiding land sales, which is why farmers easily sell their land for real estate development*” (Interview 5). Another suggested, “*The government should impose high taxes on land sales in agricultural areas to discourage farmers from selling*” (Interview 9). These insights reflect a widespread perception that weak enforcement of regulations contributes to unchecked urbanization.

Research and Extension Services for Coffee Farmers: The strongest negative correlation is with the perception that “the government is providing research and extension services to coffee farmers who still want to continue farming” ($r = -0.447, p < 0.001$). This finding highlights the critical role of technical support in sustaining coffee farming and reducing the pressure to sell farmland. Thematic analysis reinforces this, with many respondents criticizing the lack of government support for coffee farmers. One participant explained, “*Farmers need more education on modern farming techniques and support to improve yields, but the government hasn’t done much in this area*” (Interview 6). Another added, “*If farmers were given better resources and advice, they would not feel the need to abandon farming for real estate*” (Interview 13).

Land Tenure and Ownership Reforms: The perception that “the government has implemented reforms on land tenure and ownership to regulate the development of real estate projects” is negatively correlated with peri-urban land use change ($r = -0.428, p < 0.001$). Secure land tenure and ownership rights are essential for deterring speculative land sales and encouraging agricultural investments. Interview participants expressed concerns about the lack of clear policies in this area. One respondent remarked, “*Farmers feel insecure about their land ownership, so they sell their land quickly to avoid potential disputes*” (Interview 11). Another suggested, “*The government should introduce stricter reforms to ensure that agricultural land is not easily converted into real estate*” (Interview 16).

Financial Incentives for Coffee Farmers: The perception that “the government provides financial incentives and support to those who still wish to continue with coffee farming” is also negatively correlated with peri-urban land use change ($r = -0.416, p < 0.001$). Direct financial support can make coffee farming economically viable, reducing the need for farmers to sell their

land. However, interview findings reveal widespread dissatisfaction with the lack of such incentives. One participant observed, *“The government has not done enough to support coffee farmers financially. That’s why we are forced to sell our land”* (Interview 1). Another emphasized, *“If the government provided guaranteed minimum returns for coffee farming, farmers would not turn to real estate as a more stable income source”* (Interview 8).

4.5.1.3.1 Integration of Findings

The correlation and thematic analyses underscore the pivotal role of government initiatives in managing peri-urban land use change in Nyeri County. However, when viewed through the lens of Urban Growth Machine Theory, it becomes evident that policy and regulatory frameworks often favour urban expansion and real estate interests over agricultural preservation. While participatory land-use planning, adaptive policies, and financial incentives are theoretically linked to reduced agricultural-to-real estate transitions, gaps in implementation expose the influence of powerful economic actors who benefit from land commodification.

Respondents frequently expressed frustration over government inaction and policy shortcomings, particularly in supporting coffee farming or regulating real estate growth. As one participant noted, *“The government has not done much. Since real estate offers better earnings for individuals, people are naturally drawn to it, leaving coffee farming under-supported”* (Interview 1). Another highlighted the lack of land-use zoning, stating, *“The government needs to implement policies that separate areas for agriculture and real estate to protect farming land”* (Interview 16). These sentiments reflect how urban growth coalitions including developers, land speculators, and political stakeholders shape policy environments to sustain land value appreciation rather than agricultural stability.

To address these imbalances, government interventions must counteract the market-driven forces prioritizing real estate growth over agricultural sustainability. Strengthening regulatory oversight, enforcing zoning laws, and increasing financial and technical support for farmers can help resist unchecked urban expansion while ensuring that land-use decisions serve broader social and economic interests rather than catering solely to growth coalitions.

Table 4.13: Correlation – Government Initiatives vs. Land Use Change

Correlations								
		GI1	GI2	GI3	GI4	GI5	GI6	Overall Score for peri-urban land use change
Land use planning and policies in Nyeri are developed through stakeholder participation	<i>r</i>	1	.618**	.542**	.357**	.460**	.365**	-.239**
	<i>p</i>		.000	.000	.000	.000	.000	.000
Land use planning and policies in Nyeri are flexible and can be adapted to reflect the changing needs of stakeholders	<i>r</i>	.618**	1	.564**	.514**	.480**	.413**	-.373**
	<i>p</i>	.000		.000	.000	.000	.000	.000
The local government has implemented regulations to guide the sale of land in Nyeri for real estate projects	<i>r</i>	.542**	.564**	1	.535**	.639**	.537**	-.348**
	<i>p</i>	.000	.000		.000	.000	.000	.000
The government is providing research and extension services to coffee farmers who still want to continue farming	<i>r</i>	.357**	.514**	.535**	1	.591**	.668**	-.447**
	<i>p</i>	.000	.000	.000		.000	.000	.000
The government has implemented reforms on land tenure and ownership to regulate the development of real estate projects	<i>r</i>	.460**	.480**	.639**	.591**	1	.588**	-.428**
	<i>p</i>	.000	.000	.000	.000		.000	.000
The government provides financial incentives and support to those who still wish to continue with coffee farming	<i>r</i>	.365**	.413**	.537**	.668**	.588**	1	-.416**
	<i>p</i>	.000	.000	.000	.000	.000		.000
Overall Score for peri-urban land use change	<i>r</i>	-.239**	-.373**	-.348**	-.447**	-.428**	-.416**	1
	<i>p</i>	.000	.000	.000	.000	.000	.000	

Legend: GI1 - Land use planning and policies in Nyeri are developed through stakeholder participation; GI2 Land use planning and policies in Nyeri are flexible and can be adapted to reflect the changing needs of stakeholders; GI3 - The local government has implemented regulations to guide the sale of land in Nyeri for real estate projects; GI4 - The government is providing research and extension services to coffee farmers who still want to continue farming; GI5 - The government has implemented reforms on land tenure and ownership to regulate the development of real estate projects; GI6 - The government provides financial incentives and support to those who still wish to continue with coffee farming

Source: Researcher (2024)

In the interviews, most respondents criticized the lack of adequate government intervention to support coffee farmers and regulate real estate development. One participant remarked, *“The government has not done much. Since real estate offers better earnings for individuals, people are naturally drawn to it, leaving coffee farming under-supported”* (Interview 1). Another interviewee pointed out, *“I don’t think the government has taken any significant action”* (Interview 5). There was a general feeling amongst respondents that the government had not done enough to address the financial challenges of coffee farming or to create policies that protect agricultural land. *“The government should implement land policies that separate areas for agriculture and real estate”* was a suggestion from one participant (Interview 16).

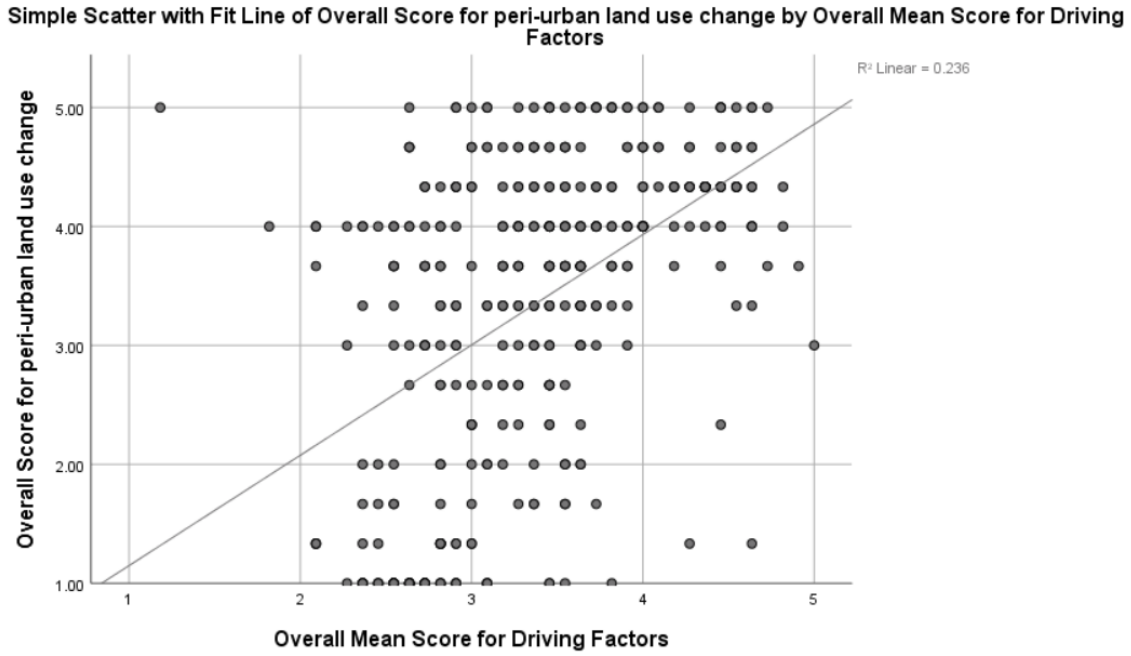
4.5.2 Regression Analysis

A multiple regression analysis was performed to assess the relationship between peri-urban land-use change as the dependent variable and driving factors, socio-economic consequences and government initiatives as the independent variables. Diagnostics were performed to determine if the data collected met the assumptions for multiple linear regression.

4.5.2.1 Diagnostic Tests

The first assumption that must be met for a multiple linear regression is linearity, which means that a linear relationship should exist between the dependent variable and each of the independent variables. Examining linearity entails a visual inspection of the scatter plots where the data points need to be close to the line of fit. The scatter plots in Figures 4.1, 4.2 and 4.3 confirm that the data met the assumption for linearity.

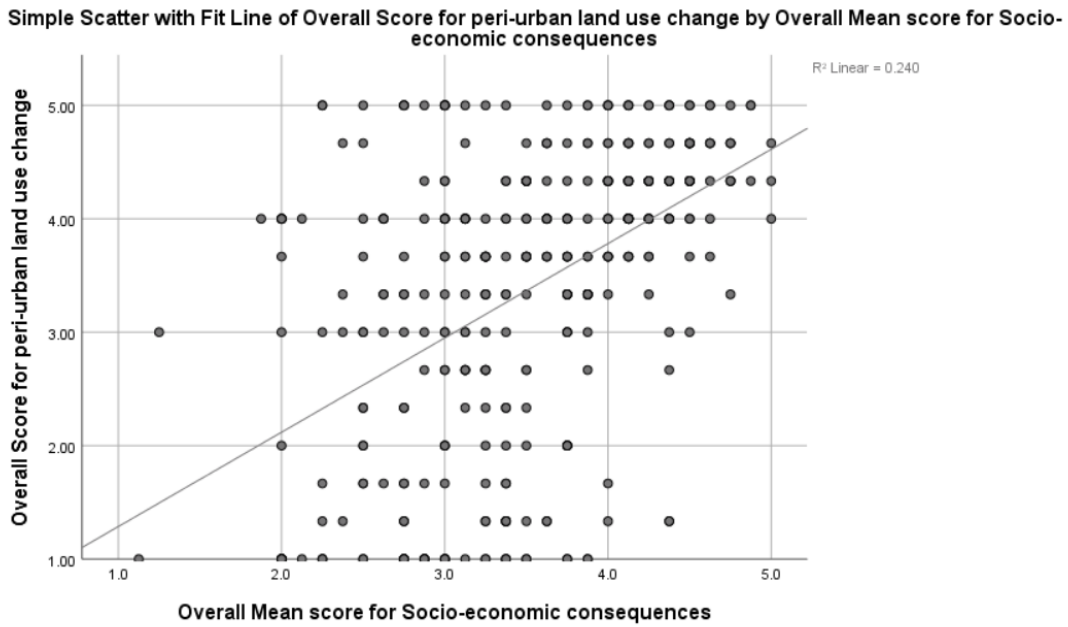
Figure 4.1: Scatter Plot – Land Use Change vs. Driving Factors



Source: Researcher (2024)

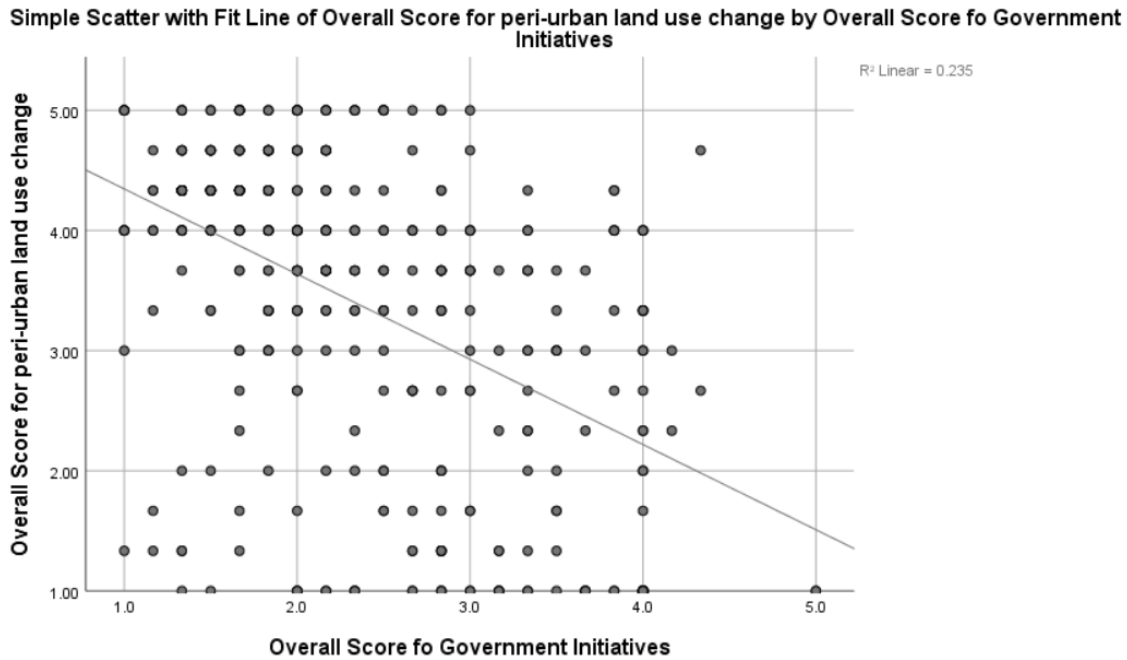


Figure 4.2: Scatter Plot – Land Use Change vs. Socio-economic Consequences



Source: Researcher (2024)

Figure 4.3: Scatter Plot – Land Use Change vs. Government Initiatives



Source: Researcher (2024)

Normality constitutes another key assumption that should be satisfied for a multiple linear regression. This assumption requires the variables to be normally distributed, which can be affirmed by the Shapiro-Wilk Test where a significance value of >0.05 shows that the data is normally distributed. The Tests of Normality table (Table 4.14) presents the results from the Kolmogorov-Smirnov and Shapiro-Wilk tests, which examine whether the data follows a normal distribution. For the Kolmogorov-Smirnov test, all four variables—Driving Factors, Socio-economic Consequences, Government Initiatives, and Peri-urban Land Use Change—have significance (Sig.) values of 0.276, 0.331, 0.287, and 0.425, respectively. Since these p-values are greater than 0.05, this suggests that the distributions of all four variables do not significantly deviate from normality according to this test. Similarly, the Shapiro-Wilk test results show Sig. values of 0.331, 0.389, 0.375, and 0.369 for the same variables. Since all these values are also above the 0.05 threshold, the test indicates that the data does not significantly deviate from a normal distribution. In summary, both the Kolmogorov-Smirnov and Shapiro-Wilk tests suggest that the data for all four variables—Driving Factors, Socio-economic Consequences, Government

Initiatives, and Peri-urban Land Use Change—are normally distributed, as the p-values are greater than 0.05, indicating no significant deviation from normality.

Table 4.14: Normality Test Results

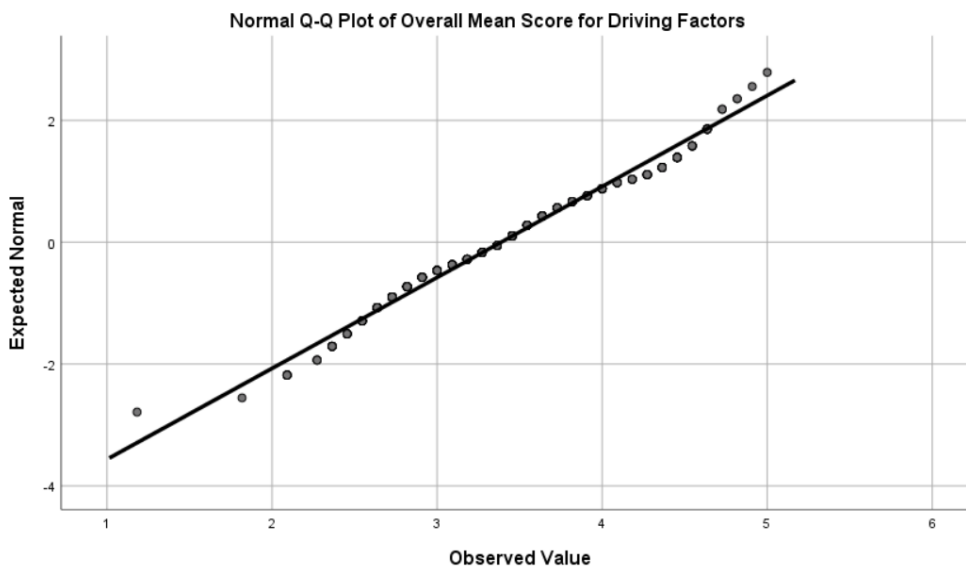
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Overall Mean Score for Driving Factors	.065	377	.276	.984	377	.331
Overall Mean score for Socio-economic consequences	.071	377	.331	.980	377	.389
Overall Score for Government Initiatives	.129	377	.287	.946	377	.375
Overall Score for peri-urban land use change	.174	377	.425	.889	377	.369

a. Lilliefors Significance Correction

Source: Researcher (2024)

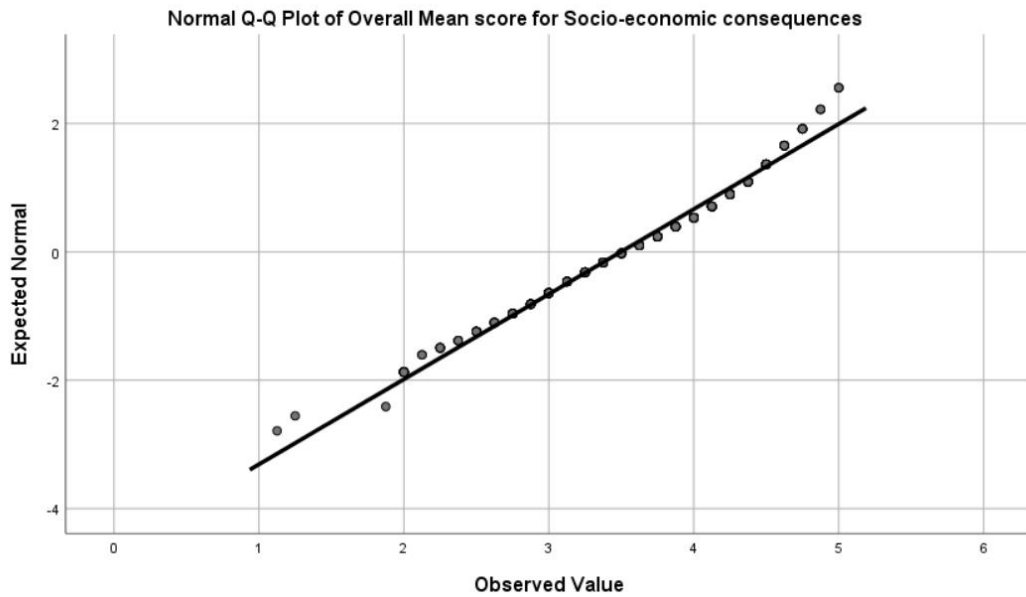
Moreover, normal Q-Q plots showing data points that are in proximity to the diagonal line shows that the data is normally distributed as indicated in Figures 4.4, 4.5, 4.6 and 4.7. Deviations from the diagonal line would indicate departures from normality. Since the points adhere closely to the diagonal line, there is no significant evidence of non-normality in the dataset. This aligns with the previous normality test results, further confirming that the data likely follows a normal distribution.

Figure 4.4: Normal Q-Q Plot – Driving Factors



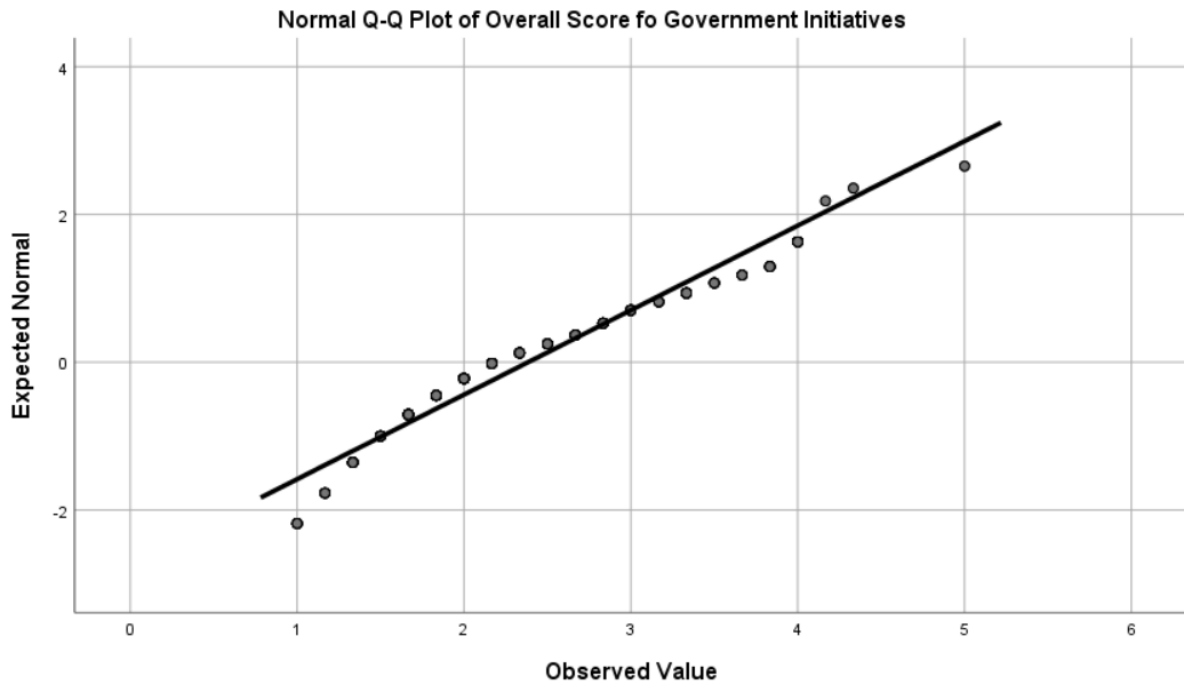
Source: Researcher (2024)

Figure 4.5: Normal Q-Q Plot – Socio-economic Consequences



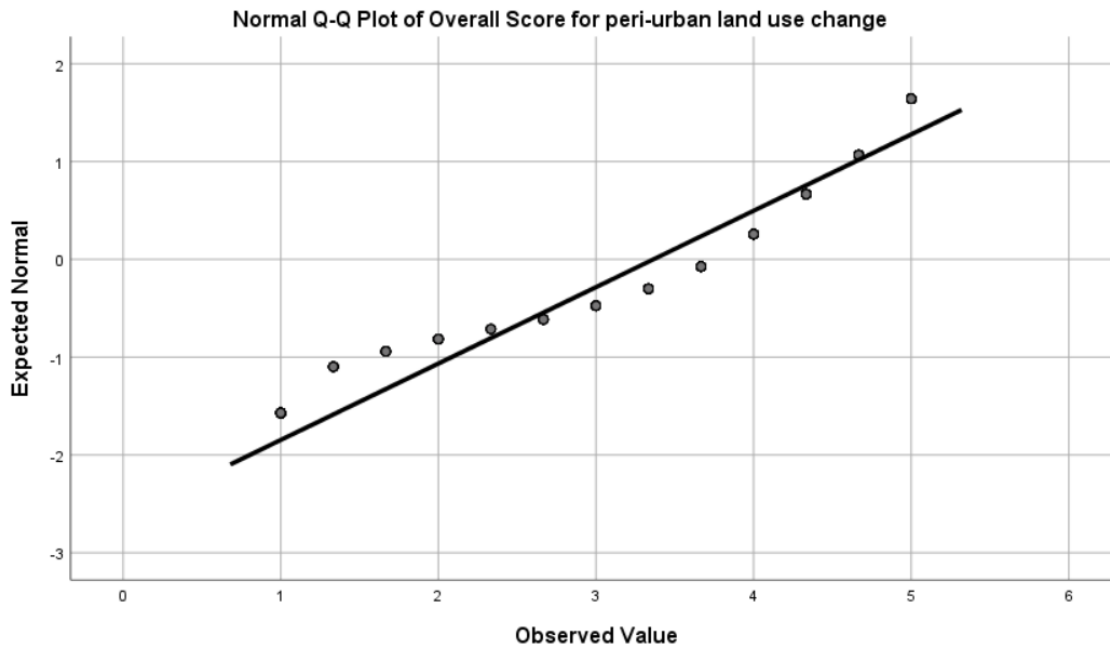
Source: Researcher (2024)

Figure 4.6: Normal Q-Q Plot – Government Initiatives



Source: Researcher (2024)

Figure 4.7: Normal Q-Q Plot – Peri-urban Land Use Change



Source: Researcher (2024)

4.5.2.2 Multiple Linear Regression Analysis

A multiple linear regression analysis was used to analyse the relationship between peri-urban land use change from coffee farming to real estate development in Nyeri as the dependent variable, and driving factors, socio-economic consequences and government initiatives as the independent variables. The multiple linear regression analysis reveals a strong relationship between peri-urban land use change from coffee farming to real estate development in Nyeri and the independent variables: driving factors, socio-economic consequences, and government initiatives. The correlation coefficient (R) of 0.889 indicates a strong positive association between the predictors and the dependent variable. The R-squared value of 0.790 suggests that the model explains 79% of the variation in land use change, while the adjusted R-squared value of 0.772 accounts for the number of predictors, confirming a strong fit for the model. Additionally, the standard error of the estimate (1.02743) indicates that the model's predictions deviate by approximately 1.03 units on average from the actual values. Overall, the analysis shows that the model is a good fit and explains a significant portion of the variance in land use change. These findings are presented in Table 4.15.

Table 4.15: Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.889 ^a	.790	.772	1.02743

a. Predictors: (Constant), Overall Score for Government Initiatives, Overall Mean Score for Driving Factors, Overall Mean score for Socio-economic consequences

Source: Researcher (2024)

The ANOVA table (Table 4.14) provides insight into the overall significance of the regression model used to predict peri-urban land use change from coffee farming to real estate development in Nyeri. The regression sum of squares (222.676) represents the variation explained by the independent variables, while the residual sum of squares (393.740) accounts for the unexplained variation. The total sum of squares (616.417) is the overall variation in the dependent variable. The F-statistic of 70.316, with 3 degrees of freedom for the regression and 373 degrees of freedom for the residuals, indicates that the model as a whole is statistically significant. The significance value (Sig. = .000) confirms that the model is highly significant, meaning there is a very low probability (less than 0.05) that the observed relationship occurred by chance. Thus, the independent variables—driving factors, socio-economic consequences, and government initiatives—together have a significant effect on peri-urban land use change.

Table 4.16: ANOVA Results

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	222.676	3	74.225	70.316	.000 ^b
	Residual	393.740	373	1.056		
	Total	616.417	376			

a. Dependent Variable: Overall Score for peri-urban land use change
b. Predictors: (Constant), Overall Score for Government Initiatives, Overall Mean Score for Driving Factors, Overall Mean score for Socio-economic consequences

Source: Researcher (2024)

The coefficients table (Table 4.15) presents the impact of each independent variable—driving factors, socio-economic consequences, and government initiatives—on the dependent variable, peri-urban land use change, while controlling for the other variables. The constant (B = 1.363, p = .004) represents the baseline value of peri-urban land use change when all other variables are held at zero. The unstandardized coefficient for driving factors (B = 0.533, p = .000) suggests that for

every one-unit increase in driving factors, the score for peri-urban land use change increases by 0.533 units, holding other factors constant. This variable is highly significant, as indicated by the p-value (.000), and has a standardized Beta value of .279, meaning it has a moderate positive effect on land use change. The finding indicates that for every one-unit increase in the composite score of driving factors, there is an associated 0.533-unit increase in the score for peri-urban land use change, assuming all other variables are held constant. A "one-unit increase" represents an incremental improvement or strengthening in the combined influence of driving factors, such as economic pressures, urban proximity, or perceived profitability of real estate development. This variable is highly significant ($p = .000$) and has a standardized Beta value of 0.279, suggesting a moderate positive impact on peri-urban land use change relative to other variables in the model.

For socio-economic consequences, the unstandardized coefficient ($B = 0.327$, $p = .000$) shows that a one-unit increase in socio-economic consequences leads to a 0.327 increase in the dependent variable. The standardized Beta value (.193) indicates a smaller but still significant positive impact. The unstandardized coefficient for socio-economic consequences indicates that a one-unit increase in the score for socio-economic consequences leads to a 0.327-unit increase in the dependent variable. This reflects the role of challenges such as reduced agricultural viability, community disruptions, and environmental degradation in driving land use change. The standardized Beta value shows that socio-economic consequences have a smaller, albeit significant, positive impact compared to driving factors.

In contrast, government initiatives have a negative unstandardized coefficient ($B = -0.398$, $p = .000$), meaning that a one-unit increase in government initiatives results in a 0.398 decrease in peri-urban land use change. This indicates that stronger government initiatives, as represented in this study, are associated with a reduction in peri-urban land use change. The standardized Beta value (-.271) reflects a significant negative influence on the dependent variable. The variance inflation factor (VIF) values for all predictors are below 2, indicating that multicollinearity is not a concern, as these values are well below the threshold of 10. This suggests the independent variables are not highly correlated with each other, maintaining the integrity of the model. From these findings, the new regression model is:

$$PLUC = 1.363 + 0.533Dr + 0.327Cons - \beta_3 0.398$$

PLUC – peri-urban land use change

Dr – Driving Factors

Cons – Socioeconomic Consequences

GI – Government initiatives

Table 4.17: Regression Coefficients

Coefficients								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.363	.467		2.920	.004		
	Driving Factors	.533	.094	.279	5.659	.000	.705	1.418
	Socio-economic consequences	.327	.092	.193	3.538	.000	.577	1.732
	Government Initiatives	-.398	.073	-.271	-5.436	.000	.687	1.457

a. Dependent Variable: Overall Score for peri-urban land use change

Source: Researcher (2024)

4.6 Thematic Analysis Using NVIVO Coding

The thematic analysis conducted using NVIVO provided critical insights into the transition from coffee farming to real estate development in Nyeri, Kenya. The coding structure identified key themes such as economic motivations, the declining viability of coffee farming, environmental sustainability concerns, policy gaps, and socio-economic implications. These themes align with the broader theoretical frameworks of the Theory of Urban Expansion and the Urban Growth Machine Theory, which help explain the driving forces behind peri-urban land-use changes. The following discussion integrates the NVIVO findings with these theoretical perspectives and empirical literature. The findings are presented in Table 4.18.

Table 4.18: NVIVO Coding Framework – Peri-urban Land Use Change

Parent Code (Theme)	Child Code (Sub-Theme)	Example Quotes (Supporting Evidence)
1. Economic Motivations	1.1 Financial Stability	<i>“The main motivation for selling my land is the potential for better income. The income from coffee farming has been decreasing while real estate offers better earnings.”</i> (Interview 1)
	1.2 Unreliable Coffee Income	<i>“Selling land to build a house can be motivated by inconsistent coffee income and educational expenses.”</i> (Interview 2)
	1.3 Secure Investment in Real Estate	<i>“Real estate offers a more permanent and secure investment compared to coffee, which is unstable due to fluctuating prices.”</i> (Interview 15)
2. Declining Coffee Industry	2.1 Low Payments & Delayed Income	<i>“People are frustrated with coffee farming. They are often promised a lot but receive very little in return.”</i> (Interview 3)
	2.2 Mismanagement of Cooperatives	<i>“The poor performance of the coffee industry, characterized by low payments due to mismanagement of cooperatives, motivates people to sell their land or convert it to real estate.”</i> (Interview 7)
	2.3 High Farming Costs & Low Yields	<i>“Coffee farming is expensive, and with decreasing yields, many farmers are looking for alternative land uses.”</i>
3. Impact on Land Values	3.1 Rising Land Prices Due to Real Estate	<i>“Yes, land values have increased because of real estate development.”</i> (Interview 1)
	3.2 Increased Competition for Land	<i>“As competition for land grows, sellers hike the prices. This increase can make it difficult for sellers to accommodate their families.”</i> (Interview 5)
	3.3 Profitability of Real Estate Over Coffee	<i>“The value of land has increased significantly due to real estate. Real estate is more profitable than coffee farming.”</i> (Interview 17)

4. Environmental and Agricultural Impacts	4.1 Environmental Degradation	<i>“Real estate development disrupts the environment by increasing pollution and changing water channels.” (Interview 1)</i>
	4.2 Reduced Agricultural Land	<i>“Real estate development is leading to smaller shambas (farms), making it difficult for agriculture to thrive.” (Interview 12)</i>
	4.3 Risk to Food Security	<i>“We are gradually destroying our main agricultural base... If we continue to prioritize real estate over farming, we will eventually face food shortages.” (Interview 16)</i>
5. Lack of Government Support	5.1 Absence of Coffee Farming Support	<i>“The government has not done much. Since real estate offers better earnings for individuals, people are naturally drawn to it, leaving coffee farming under-supported.” (Interview 1)</i>
	5.2 Lack of Action on Land Use Policies	<i>“I don’t think the government has taken any significant action.” (Interview 5)</i>
	5.3 Need for Land Use Regulation	<i>“The government should implement land policies that separate areas for agriculture and real estate.” (Interview 16)</i>
6. Social and Livelihood Changes	6.1 Loss of Community & Security Concerns	<i>“Selling land to strangers can lead to negative consequences. Once the money is spent, people may face poverty again, and the security of the area can be compromised.” (Interview 5)</i>
	6.2 Generational Shift in Farming	<i>“The younger generation is not stepping in to replace their parents in coffee farming, and they see more value in selling the land rather than continuing with farming.” (Interview 16)</i>
	6.3 Economic Empowerment Through Real Estate	<i>“Real estate is empowering people economically and bringing more stability to livelihoods.” (Interview 15)</i>

A key finding from the NVIVO analysis is the economic motivation behind land-use change. Many respondents indicated that selling land for real estate is significantly more profitable than coffee farming. The NVIVO coding structure identified frequent references to land appreciation, high returns from real estate, and financial instability in coffee farming as primary economic drivers.

This finding is consistent with the Urban Growth Machine Theory (Molotch, 1976), which argues that urban expansion is primarily driven by economic interests, where landowners, developers, and local governments seek to maximize land value through real estate development. In Nyeri, this phenomenon is evident as landowners prioritize financial gains over agricultural sustainability, aligning with previous studies (Gichimu & Njeru, 2014). The local government's role in facilitating real estate growth through infrastructure development and zoning policies further supports this theory, as observed in similar peri-urban transitions in Kenya (Kamau, 2015).

The NVIVO coding also highlighted the declining viability of coffee farming as a major reason for land-use change. Farmers reported low coffee prices, high input costs, climate variability, and lack of government support as significant challenges. These responses align with the Theory of Urban Expansion (Fujita, 1989), which suggests that cities expand outward due to declining rural economic opportunities and increasing urban demand for land.

Angel's (2012) theory explains that urbanization inevitably extends into adjacent agricultural areas as cities grow and economic activities shift. In Nyeri, this is evident in the increasing conversion of coffee farms into residential and commercial developments, reflecting trends observed in other peri-urban areas in Kenya (Mubea & Menz, 2012). This expansion is not only demand-driven but also a response to the diminishing profitability of traditional agriculture, further reinforcing the shift toward real estate investment.

Another theme emerging from the NVIVO analysis is concern over environmental degradation and loss of agricultural land. Respondents frequently mentioned deforestation, urban sprawl, and reduced agricultural productivity as consequences of real estate expansion. While some landowners benefit economically, others worry about the long-term effects on food security, water availability, and soil fertility.

These concerns align with the Theory of Urban Expansion, which highlights that unregulated urban growth often leads to environmental stress and loss of farmland (Fujita, 1989). Research by Wario, Ouma, and Onyango (2022) supports this, showing that peri-urban areas in Kenya face increased exposure to natural hazards due to unplanned land conversion. The NVIVO thematic findings reinforce these arguments, as respondents expressed fears about unsustainable land development and lack of urban planning regulations to mitigate these challenges.

The NVIVO data also revealed that government policies play a crucial role in land-use change. Many respondents mentioned that poor enforcement of land-use regulations, weak agricultural policies, and lack of government support for coffee farmers have accelerated the shift towards real estate. The coding structure frequently referenced government inaction, weak land policies, and inefficient coffee sector management as contributing factors.

From an Urban Growth Machine Theory perspective, this reflects the idea that local governments and policymakers often favour urban expansion over agricultural preservation (Molotch, 1976). In many cases, regulatory frameworks are either weak or deliberately structured to promote real estate growth, benefiting developers and municipal authorities while marginalizing small-scale farmers. This is evident in other peri-urban regions in Kenya, where inadequate zoning laws have facilitated rapid land-use transformation (Kamau, 2015).

The NVIVO coding chart also identified significant social implications of land-use change. Many respondents highlighted that selling their land meant losing generational family farms and traditional livelihoods. The data showed concerns over displacement of farming communities, changing social dynamics, and uncertain economic futures for those transitioning away from agriculture.

This aligns with both the Urban Growth Machine Theory and the Theory of Urban Expansion, which suggest that land-use changes disrupt existing social structures and create new economic hierarchies (Fujita, 1989; Molotch, 1976). In Nyeri, the transformation from coffee farming to real estate has led to new opportunities in construction and rental businesses, but it has also forced some former farmers to seek alternative livelihoods, often with mixed success (Kamau, 2015). The NVIVO analysis supports this by showing a divergence in outcomes and while some landowners reinvest profits successfully, others struggle to adapt.

The NVIVO thematic analysis confirms that the transition from coffee farming to real estate development in Nyeri is driven by economic, environmental, policy, and social factors, all of which align with the Theory of Urban Expansion and the Urban Growth Machine Theory. The economic appeal of real estate, declining coffee profitability, weak land-use policies, and urban pressures collectively fuel this shift. These findings reinforce previous research and highlight the need for comprehensive urban planning, stronger agricultural support systems, and policies that balance

economic growth with sustainability. Addressing these issues requires a collaborative approach involving farmers, policymakers, and urban developers to ensure a more sustainable and inclusive peri-urban transition.



4.7 Chapter Summary

This chapter has presented the results from the survey and interviews, illustrating the complex interplay of economic, social, and policy-related factors driving peri-urban land use change in Nyeri County. The findings align with both the Theory of Urban Expansion and the Urban Growth Machine Theory, highlighting the dual forces shaping this transformation.

The regression analysis reveals that 79% of the variation in peri-urban land use change can be explained by driving factors, socio-economic consequences, and government initiatives. Economic drivers and socio-economic consequences positively influence the shift, while stronger government interventions mitigate it. The thematic analysis reinforces this by showcasing how real estate development provides more stable and immediate financial returns compared to coffee farming, which is hindered by low profitability and delayed payments.

From an Urban Growth Machine perspective, rising land values and speculative real estate investments accelerate the shift, often at the expense of agriculture. This has led to land commodification, environmental degradation, and social disruptions, reshaping traditional agricultural and communal structures. Meanwhile, the Theory of Urban Expansion explains how urban sprawl, infrastructure development, and market pressures are expanding the urban frontier into peri-urban zones, intensifying the conversion of farmland into real estate.

Respondents expressed frustration with inadequate government support for agriculture, emphasizing that policy gaps and weak enforcement mechanisms further fuel this transition. The findings suggest an urgent need for balanced policies that support sustainable development, regulate unchecked urban growth, and provide incentives for coffee farming, ensuring that economic prosperity does not come at the cost of agricultural and environmental sustainability.

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This study examined the transition of land use from coffee farming to real estate development in Nyeri County. The research aimed to (i) explore the key factors driving this land-use change, (ii) assess the socio-economic consequences of the shift, and (iii) evaluate the effectiveness of government initiatives in managing this transformation sustainably.

This chapter provides a comprehensive discussion of the findings, linking them to theoretical frameworks and existing literature. It critically examines how the study's results align with or contradict previous research, highlighting alternative perspectives and potential gaps. Furthermore, the chapter presents recommendations for policymakers, industry stakeholders, and theoretical contributions. Lastly, it outlines the study's limitations and offers directions for future research.

5.2 Summary of Main Results

This study explored the factors driving the shift from coffee farming to real estate development in Nyeri, Kenya, with a focus on economic motivations, socio-economic consequences, and government initiatives. The regression analysis assessed the influence of these factors on peri-urban land use change.

The first objective examined the primary factors influencing land-use change, particularly the economic incentives behind the shift from coffee farming to real estate. The findings align with Fujita's Theory of Urban Expansion (1989), which explains how rising land values, economic forces, and the transition from agricultural to urban land uses drive urban growth. The study found that the significantly higher and more stable income from real estate strongly influences farmers' decisions to sell their land. Additionally, factors such as declining coffee prices, generational disinterest in farming, peer influence, and increasing demand for residential and commercial land further accelerate this transition. These results support the argument that peri-urban expansion in Nyeri is predominantly driven by financial considerations rather than agricultural sustainability.

The second objective explored the socio-economic consequences of this transition through the lens of Fujita's Theory of Urban Expansion and Urban Growth Machine Theory (Logan & Molotch, 1987). The study found a significant correlation between unplanned urban expansion, loss of rural identity, and socio-economic disruptions. Many farmers transition to real estate due to the economic unsustainability of coffee farming, caused by factors such as low farm-gate prices, delayed payments, and increased production costs.

From Fujita's perspective, this transition reflects broader economic and social shifts, including the loss of agricultural land and the emergence of new urban employment opportunities. On the other hand, Urban Growth Machine Theory explains how political and economic actors—including developers, investors, and local authorities—drive urbanization for financial gain. The study found that urban elites and real estate developers have a growing influence on local governance, often prioritizing economic interests over community-centered development. This dynamic has led to environmental degradation, loss of farmland, and weakened rural economies, reinforcing the need for stricter urban planning regulations.

The third objective assessed the role of government interventions in managing peri-urban land-use change. The study found that government initiatives—such as participatory land-use planning, financial incentives for coffee farmers, land tenure reforms, and agricultural support programs—were negatively correlated with rapid urban expansion, suggesting that stronger intervention could help sustain coffee farming. These findings align with Urban Growth Machine Theory, which suggests that urban expansion is often shaped by elite coalitions—including government officials, real estate developers, and businesses—who manipulate land policies to promote economic growth (Logan & Molotch, 1987).

However, qualitative interviews revealed widespread dissatisfaction with government policies. Respondents highlighted issues such as weak enforcement of land-use regulations, inadequate financial support for coffee farmers, and limited efforts to curb speculative real estate development. This aligns with studies from Kleemann et al. (2017), who found that ineffective land-use planning in peri-urban Ghana resulted from a lack of public participation and weak policy implementation. Similar concerns were raised in Spyra et al. (2020), who emphasized the need for governance mechanisms that balance urban growth with agricultural sustainability. Without effective

interventions, Nyeri risks experiencing further environmental degradation and the permanent loss of its agricultural heritage.

The study found that economic pressures—particularly the higher profitability of real estate compared to coffee farming—are the primary drivers of land-use change. This is well explained by Fujita’s Theory of Urban Expansion (1989), which emphasizes the role of economic forces in land-use transitions. The socio-economic consequences of this transition reflect both urban expansion dynamics and the role of economic elites, as outlined in Urban Growth Machine Theory (Logan & Molotch, 1987). Finally, government initiatives play a crucial role in shaping urban growth, but weak enforcement and policy gaps allow speculative real estate development to dominate.

While this study aligns with established theories, alternative perspectives suggest that land-use change is not solely driven by economic forces. Some studies emphasize community-driven land management, technological advancements in agriculture, and alternative land-use policies as potential solutions. Future research should explore how sustainable agriculture practices, improved farmer incentives, and stricter urban regulations could help balance economic growth with environmental conservation in peri-urban Kenya..

5.3 Discussion of Findings

5.3.1 Factors Driving the Land-use Change from Coffee Farming to Real Estate Development in Nyeri

The findings from this study align with existing literature on land-use change in peri-urban areas, particularly concerning economic, social, and cultural factors. The study revealed that land-use transformation in Nyeri is primarily driven by economic incentives, including the higher profitability of real estate development compared to coffee farming, declining agricultural productivity, and the volatility of coffee prices. Social and cultural dynamics, such as generational disinterest in farming and peer influence, also play a significant role in shaping land-use decisions. These findings are consistent with the Theory of Urban Expansion, which argues that as urban areas grow, the increasing economic value of land incentivizes its conversion from agriculture to more profitable uses (Hoggart, 2016). Participants frequently cited economic motivations as the primary reason for transitioning from coffee farming to real estate, reflecting the theory’s assertion

that urban expansion disincentivizes agricultural land use due to rising land values (Fujita, 1991; Konyango et al., 2021).

This study's findings are consistent with global trends in peri-urban transformation. For instance, Appiah et al. (2014) found that in Ghana, increasing demand for residential and commercial land was the primary driver of agricultural land conversion. Similarly, Baye et al. (2020) highlighted how rising urban land lease prices in Ethiopia pressured peri-urban farmers to sell their land for real estate development. These studies reinforce the argument that economic pressures make agricultural land increasingly unviable in expanding urban regions, a pattern also observed in Nyeri. Further empirical studies demonstrate that real estate investment offers greater financial stability compared to coffee farming, which is subject to price volatility, delayed payments, and productivity challenges (Ndegeah, 2015; Thurston et al., 2013).

A key aspect of this research was examining how landowners in Nyeri perceive and respond to these economic changes. Interview responses indicated that shifting economic landscapes strongly influence land-use decisions, particularly assessments of profitability, long-term financial security, and investment returns. The study also found that declining agricultural productivity, partly due to soil degradation, was another critical driver of land-use change. This finding aligns with Borgogno-Mondino et al. (2015) in Italy and Busck and Kristensen (2014) in Denmark, where economic struggles in farming led to land-use transitions.

While economic drivers were dominant, this study also found that generational shifts and evolving family dynamics significantly contribute to land-use change. Several respondents noted that younger generations are less interested in coffee farming and more inclined toward real estate development, seeking urban lifestyles that offer perceived higher social status and economic security. This observation aligns with Calder (2017), who critiques the Theory of Urban Expansion for overlooking social and generational influences as critical factors in land-use transitions. In Nyeri, younger landowners appear to be actively disengaging from farming, accelerating the shift toward real estate.

Although economic incentives drive land conversion, alternative perspectives in the literature suggest that land-use change is not always inevitable in peri-urban areas. Angel et al. (2011) argue that structured urban planning and zoning regulations can manage urban expansion while

preserving agricultural land. Turok & McGranahan (2013) provide evidence from Asian cities where proactive policies have balanced urban growth with agricultural sustainability. Furthermore, studies on agricultural cooperatives and rural development programs suggest that sustainable farming models can enhance agricultural viability. Pretty et al. (2011) highlight cooperative farming and financial incentives as mechanisms that can reduce the economic pressures driving farmers to sell land. Similarly, Kiptot & Franzel (2014) show how farmer-to-farmer extension programs can increase agricultural productivity and slow migration to urban areas.

From a governance perspective, research indicates that land tenure reforms and policy interventions can slow down the rapid transition from agriculture to real estate. Deininger & Byerlee (2011) argue that secure land rights can reduce pressure on farmers to sell their land, and Mwangi (2007) demonstrates how cooperative land management in Kenya's Maasailand has reduced uncontrolled land fragmentation and urban sprawl. These perspectives contrast with the situation in Nyeri, where the absence of strong land-use regulations or agricultural incentives has left coffee farmers vulnerable to economic pressures favouring real estate development.

Another relevant theoretical framework is the Urban Growth Machine Theory (Molotch, 1976), which suggests that land-use change is driven by land-based elites and local business interests seeking to maximize land value. While this study did not explicitly identify elite-driven land speculation, the overwhelming economic pressure to convert agricultural land into profitable real estate projects aligns with the theory's central idea. Participants frequently cited the increasing profitability of real estate as a decisive factor, supporting the notion that urban expansion is largely shaped by economic forces rather than agricultural sustainability.

In summary, the transition from coffee farming to real estate development in Nyeri is primarily driven by economic incentives, aligning with both the Theory of Urban Expansion and the Urban Growth Machine Theory. However, the findings also highlight how weak land governance, a lack of agricultural support programs, and shifting generational preferences exacerbate land-use transformation. Studies on sustainable land-use planning (Angel et al., 2011; Turok & McGranahan, 2013), cooperative farming (Pretty et al., 2011), and land tenure reforms (Deininger & Byerlee, 2011; Mwangi, 2007) highlight potential strategies that could mitigate real estate-driven land conversion. The absence of such policies in Nyeri suggests that urban expansion here is largely unregulated, driven by financial motivations rather than structured planning. Future

research should explore how participatory governance and incentive-based agricultural policies can create a more balanced land-use framework that accommodates both urban growth and agricultural sustainability.

5.3.2 Socio-Economic Consequences of The Transition from Coffee Farming to Real Estate Development in Nyeri, Kenya

The findings of this study indicate that perceptions of unregulated development, ineffective urban planning, environmental degradation, and social disruptions are significantly associated with peri-urban land-use change in Nyeri. The strong correlation between unplanned urban growth and the loss of rural identity suggests that rapid real estate expansion is a dominant force driving land transitions. The regression analysis further demonstrates that socio-economic consequences have a statistically significant impact on land-use change, emphasizing that the challenges stemming from coffee farming's declining profitability—and the subsequent shift to real estate—have far-reaching socio-economic effects. This aligns with existing literature, which highlights the adverse effects of land-use change in peri-urban areas.

For instance, Baye et al. (2020) found that urban sprawl disrupts not only agricultural livelihoods but also spatial stability, leading to unregulated and haphazard development. Similar concerns emerged from respondents in Nyeri, who reported that the loss of agricultural land to real estate has diminished agricultural productivity and food security. The reduction in coffee farming has had ripple effects on the local economy, particularly among smallholder farmers who relied on it as their primary source of income. As observed by Thurston et al. (2013), declining agricultural productivity often forces farmers to seek alternative livelihoods, a pattern mirrored in Nyeri, where farmers are increasingly opting to sell their land rather than invest in struggling coffee farms.

From a theoretical standpoint, the Theory of Urban Expansion (Fujita, 1991) provides a useful framework for understanding these socio-economic consequences. The theory suggests that urban growth, driven by economic incentives, often leads to the displacement of agricultural activities in favor of higher-value land uses. This is evident in Nyeri, where real estate development has led to unplanned urban growth, weakened community ties, and a loss of social cohesion. Respondents expressed concerns about the erosion of traditional farming practices and rural lifestyles,

reinforcing Ewing and Hamidi's (2017) argument that urban sprawl contributes to a deteriorating sense of community and environmental harm.

The Urban Growth Machine Theory (Molotch, 1976) also supports these findings, particularly in explaining the role of land-based elites and real estate interests in driving socio-economic consequences. The theory posits that local business interests and influential stakeholders prioritize maximizing land value over sustainability, often leading to socio-economic instability. This is evident in Nyeri, where participants acknowledged the short-term profitability of real estate but also noted that this transition came at the expense of agricultural livelihoods and environmental health. Similar patterns have been observed elsewhere. For example, Sarkodie et al. (2020) found that peri-urban expansion in Ghana led to environmental degradation and declining living conditions for former agricultural communities. Participants in Nyeri expressed parallel concerns, particularly regarding the reduction of arable land and increased pollution from real estate development.

Beyond economic and environmental concerns, several respondents emphasized the long-term risks of land-use transition on local food security. The widespread conversion of fertile agricultural land to real estate has reduced Nyeri's capacity to produce food, exacerbating socio-economic challenges for those who previously depended on coffee farming. This finding is consistent with Toh et al. (2018), who observed that land-use change in Cameroon led to reduced crop production and seasonal food shortages, further entrenching poverty. In Nyeri, respondents highlighted a similar dilemma—while selling land to developers provides short-term financial relief, it often results in long-term economic instability, particularly for families who lack alternative income sources.

The issue of environmental degradation due to real estate development in Nyeri also echoes global trends. Emadodin et al. (2016) found that urban sprawl in Iran led to land degradation and negative impacts on local climates, including rising temperatures and water shortages. Similar concerns were raised by respondents in Nyeri, particularly regarding pollution, soil degradation, and the destruction of natural water channels due to unregulated real estate expansion. The absence of structured environmental management policies has further exacerbated these effects, underscoring the need for sustainable land-use policies that balance economic growth with environmental preservation.

Despite these concerns, alternative perspectives suggest that real estate expansion in Nyeri is not entirely detrimental. One key argument is that urbanization can stimulate local economies, create employment, and improve infrastructure. Glaeser (2011) posits that cities drive economic prosperity by fostering business growth, innovation, and investment. In Nyeri, the transition to real estate has generated new opportunities in construction, retail, hospitality, and service industries, leading to increased incomes for some residents. Additionally, some landowners who sold their coffee farms reported investing in small-scale businesses or rental properties, allowing them to diversify their income sources beyond agriculture.

Another perspective suggests that rather than being entirely displaced, agriculture in peri-urban areas can adapt and coexist with real estate development. Bryceson (2019) highlights cases where farmers diversified into high-value crops, greenhouse farming, and agribusiness, ensuring economic resilience despite land-use changes. In Ethiopia, integrated land-use policies have supported urban farming models that thrive alongside expanding cities (Gebre & Worku, 2021). In Nyeri, similar strategies could help mitigate the socio-economic consequences of land-use transitions while ensuring food security and agricultural sustainability.

Furthermore, some scholars argue that poor urban planning, rather than real estate development itself, is the core issue driving socio-economic instability. UN-Habitat (2016) suggests that regulated urban expansion can enhance living standards, improve infrastructure, and create a more inclusive economy if supported by appropriate zoning laws, environmental safeguards, and participatory governance. In Nyeri, implementing sustainable land-use planning strategies, such as agricultural preservation zones, mixed-use developments, and eco-friendly urbanization policies, could help balance economic growth with environmental and social stability.

Lastly, while some respondents expressed concerns about the loss of rural identity, others viewed urbanization as an opportunity for social and cultural transformation. Hall (2014) argues that urban expansion fosters greater social mobility, increased access to education, and improved quality of life. In Nyeri, the rise of real estate has facilitated the growth of modern schools, healthcare facilities, and commercial centers, making the region more attractive for businesses and migration. Instead of resisting change, adopting hybrid development models that integrate cultural heritage with modern infrastructure could help preserve social cohesion while embracing economic progress

Taken together, the socio-economic consequences of the transition from coffee farming to real estate development in Nyeri are complex and multifaceted. While challenges such as environmental degradation, food insecurity, and social disruption are significant, alternative perspectives highlight economic opportunities, adaptive agricultural strategies, and the role of policy in managing urban expansion. The findings align with the Theory of Urban Expansion and the Urban Growth Machine Theory, both of which emphasize the potential risks of unregulated urban growth. However, the discussion also suggests that well-planned real estate development, when supported by sustainable land-use policies and economic diversification strategies, can mitigate many of these negative consequences. As such, stronger government interventions, urban planning reforms, and stakeholder collaboration are crucial to ensuring that the transition from coffee farming to real estate contributes positively to Nyeri's long-term socio-economic stability.

5.3.3 Government Initiatives in Promoting Sustainable Land-use Change from Coffee Farming to Real Estate Development

The findings indicate that government initiatives—such as participatory land-use planning, adaptive policies, regulatory frameworks, agricultural support, land tenure reforms, and financial incentives—are linked to reduced peri-urban land-use change. Among these, research and extension services for coffee farmers, as well as financial incentives, showed the strongest negative correlations, highlighting their critical role in sustaining agriculture. Regression analysis demonstrated that government interventions had a significant negative impact on land-use change, suggesting that stronger policies could slow the rapid shift from agriculture to real estate. However, qualitative interviews revealed widespread dissatisfaction with existing government measures. Many participants expressed concerns over ineffective policies, insufficient support for coffee farmers, and the lack of regulations governing real estate development.

These findings align with global studies that emphasize the importance of effective governance in managing land-use changes. Lambin et al. (2014) argue that a multi-stakeholder approach, involving experts, community members, and policymakers, is essential for balancing trade-offs in peri-urban development. However, in Nyeri, the absence of meaningful public participation was evident, as respondents reported being excluded from key decision-making processes. This mirrors findings from Kleemann et al. (2017) in Ghana, where poor land-use planning was linked to a lack of public involvement and weak policy implementation.

The Urban Growth Machine Theory (Molotch, 1976) provides a useful framework for understanding how land-based elites influence government policies that prioritize real estate over agriculture. The theory suggests that local business interests manipulate urban expansion to maximize land value, often at the expense of sustainability. Respondents in Nyeri noted that real estate developers wield increasing influence over local governance, leading to land-use policies that favor urban expansion. This aligns with Farahani (2017), who found that local politics and land-based elites play a dominant role in peri-urban land transitions, often leading to socio-economic disparities.

The lack of strong government initiatives has also contributed to environmental trade-offs, with respondents highlighting concerns about land degradation and declining agricultural productivity. Spyra et al. (2020) emphasize the need for innovative governance mechanisms that balance urban development with ecosystem preservation. Similarly, Sylla et al. (2020) found that poor management of peri-urban ecosystems leads to long-term sustainability challenges. Participants in Nyeri echoed these concerns, noting that unchecked real estate growth has led to pollution, loss of natural water channels, and a decline in arable land.

While the findings highlight shortcomings in government interventions, alternative perspectives suggest that government action alone may not be the most effective solution. Some scholars argue that market-driven approaches and community-led initiatives can complement or even outperform state interventions.

For instance, public-private partnerships (PPPs) have been successfully implemented in other regions to integrate agriculture with urban expansion. Gondo (2019) discusses cases where governments, developers, and farmers collaborate to create planned, mixed-use developments that preserve farmland while accommodating real estate growth. In Ethiopia, peri-urban planning strategies have established protected agricultural zones, allowing cities to expand without displacing farmers (Gebre & Worku, 2021). Implementing a similar structured urban growth model in Nyeri could mitigate the negative effects of real estate expansion.

Another alternative is economic diversification rather than restrictive government policies. Porter (2015) argues that rural economies should not rely solely on agriculture but should integrate agribusiness, tourism, and service industries. In Nyeri, promoting agro-tourism and high-value

coffee production could provide farmers with higher incomes while preserving agricultural land. Latin American coffee producers, for example, have adapted to urbanization by offering farm tours, direct-to-consumer sales, and organic certifications (Daviron & Ponte, 2017). Instead of focusing solely on preventing land conversion, the government could incentivize farmers to adopt sustainable, high-profit agricultural practices that make farming more competitive against real estate.

Moreover, while the Urban Growth Machine Theory highlights the role of elites in shaping land-use policies, some scholars argue that landowners themselves actively participate in urban expansion rather than being victims of elite-driven policies. Scott & Storper (2018) suggest that land-use change is often driven by economic forces, infrastructure expansion, and evolving consumer preferences, rather than just elite manipulation. In some cases, farmers voluntarily sell land to capitalize on rising property values, seeking financial security rather than being forced out. This perspective shifts the focus from government failure to broader economic transformations, suggesting that the solution lies not only in policy reforms but also in strategic economic planning.

Government initiatives have the potential to play a crucial role in promoting sustainable land-use change in Nyeri. However, the current lack of effective policies, weak governance, and limited public participation have hindered progress. While state interventions are necessary, alternative approaches—such as public-private partnerships, economic diversification, and structured urban planning—could offer more practical and adaptive solutions. Instead of focusing solely on regulatory controls, a collaborative, market-driven, and community-led approach may provide a more sustainable balance between urban expansion and agricultural preservation. Without such reforms, Nyeri risks further environmental degradation and the permanent loss of its agricultural heritage.

5.3.4 Conclusion and Synthesis of Findings

This study sought to examine the transition from coffee farming to real estate development in Nyeri by addressing the following research questions: (1) What are the key drivers of land-use change from coffee farming to real estate development? (2) What are the socio-economic consequences of this transition? (3) How effective are government initiatives in regulating land-use change and promoting sustainable development?

Findings indicate that the shift from coffee farming to real estate development is primarily driven by declining coffee profitability, increased land value, and urban expansion pressures. Farmers facing economic uncertainty are incentivized to sell their land, a trend further reinforced by speculative real estate investments and limited government intervention. This aligns with the Urban Growth Machine Theory, which highlights how land-based elites and business interests shape urban expansion for financial gain.

The socio-economic consequences of this transition are significant. While real estate development offers short-term financial benefits to landowners, it also results in the loss of agricultural livelihoods, reduced food security, environmental degradation, and weakened community cohesion. The study findings resonate with the Theory of Urban Expansion, which posits that rapid urbanization can disrupt rural socio-economic structures and contribute to unplanned urban sprawl. Additionally, respondents in Nyeri expressed concerns about the long-term implications of selling farmland, including economic instability and reduced access to affordable food.

The third research question examined the effectiveness of government initiatives in promoting sustainable land use. Findings suggest that current policies are inadequate in regulating peri-urban development or supporting coffee farmers, leading to unchecked real estate expansion. While initiatives such as participatory land-use planning, agricultural support programs, and financial incentives have the potential to mitigate these challenges, weak enforcement and the influence of real estate interests have hindered their impact. Respondents highlighted the need for stronger governance, better land-use regulation, and increased farmer support to ensure a more balanced approach to land-use management.

Overall, the study demonstrates that the transition from coffee farming to real estate development in Nyeri is driven by economic pressures, results in profound socio-economic and environmental consequences, and is inadequately managed by existing government interventions. Addressing these challenges requires a multi-faceted policy approach that strengthens agricultural support, enforces sustainable land-use planning, and promotes inclusive decision-making. Without such reforms, Nyeri risks further environmental degradation, socio-economic instability, and the permanent loss of its agricultural heritage

5.4 Recommendations

5.4.1 Policy Recommendations

Based on the findings from the study, several policy recommendations can be made to help manage the transition from coffee farming to real estate development in Nyeri, Kenya, while promoting sustainable land-use practices.

First, the government should promote stakeholder participation in land use planning. The study highlights the positive correlation between stakeholder participation in land-use planning and reduced peri-urban land use change. To strengthen this, the government should ensure that all stakeholders—including farmers, real estate developers, local communities, and environmentalists—are actively involved in the planning process. Public consultations, community advisory boards, and collaborative decision-making processes should be institutionalized to ensure that land-use policies reflect the needs and priorities of all groups. This approach would ensure that policies reflect the needs and concerns of all stakeholders, as suggested by Lambin et al. (2014). It would also foster local ownership and compliance with land-use policies, ensuring that development proceeds sustainably.

Given the correlation between the implementation of regulations to guide land sales and reduced peri-urban land use change, the government should enhance the regulatory framework governing land transactions. This includes stricter enforcement of land sale regulations, ensuring that agricultural land is protected from speculative real estate development. A registry of agricultural land transactions could be established to track changes in land ownership and use, helping to prevent illegal or unsustainable land conversions.

The provision of research and extension services for coffee farmers has a strong negative correlation with peri-urban land use change. Therefore, the government should increase its support for coffee farming by expanding access to agricultural extension services, modern farming technologies, and capacity-building programs for farmers. This would enable coffee farmers to improve productivity and sustainability, reducing the economic pressures that drive them to sell land for real estate development. Furthermore, the Coffee Cherry Advance Revolving Fund should be made more accessible, with simplified procedures and targeted outreach to ensure wider adoption among farmers.

The study found that land tenure reforms are critical for reducing land-use change. The government should continue to implement reforms that provide farmers with secure land tenure, ensuring that landowners have legal protection and the right to manage their land without fear of unjust expropriation. Clear and enforceable land ownership laws, combined with title registration and protection against land grabbing, will give farmers greater confidence to invest in long-term agricultural production rather than selling their land for real estate development.

Given the findings on the ineffectiveness of urban planning and the growing demand for land in various sectors, the government should enhance urban planning strategies to ensure that real estate development does not encroach upon vital agricultural land. The urban planning process should include a clear zoning strategy that balances residential, commercial, industrial, and agricultural land uses. Effective enforcement mechanisms must be put in place to ensure that developments align with the spatial plan and do not encroach upon designated agricultural zones.

5.4.2 Managerial Recommendations

To address the factors driving the transition from coffee farming to real estate development, stakeholders should develop strategic partnerships between agricultural and real estate sectors. By fostering collaboration, these stakeholders can identify and leverage mutually beneficial opportunities, such as integrating agricultural spaces within real estate projects to enhance the economic viability of both sectors. For example, real estate developers could work with coffee farmers to create mixed-use developments that promote sustainable land use and maintain the agricultural landscape.

In response to the socio-economic consequences identified in the study, managers should prioritize community consultation and involvement in land-use planning processes. Engaging local communities in discussions about development projects can provide valuable insights into their needs and concerns, leading to more inclusive and effective land-use strategies. Establishing community advisory boards or holding public forums will foster transparency and build trust between developers and residents. Furthermore, agricultural managers should enhance farmer education and training programs to improve productivity and resilience. Workshops on modern farming techniques and diversification strategies will empower coffee farmers to adapt to market fluctuations and reduce their dependency on coffee, thereby mitigating the adverse socio-economic

impacts of land-use change. By promoting diversification, such as agro-tourism or value-added agricultural products, farmers can create additional revenue streams that lessen the temptation to sell their land for real estate development.

5.4.3 Theoretical Recommendations

To enhance the understanding of factors driving land-use change in Nyeri, it is recommended that future research further investigate the interplay between economic motivations and social influences using the Theory of Urban Expansion. This theory emphasizes the perceived economic value of urban land as a primary driver of land-use conversions. However, it could benefit from incorporating a broader range of factors, such as generational shifts and changing social dynamics, which also influence land-use decisions. This holistic approach will provide a more nuanced understanding of how economic pressures and social factors coalesce to influence land-use decisions.

Regarding the socio-economic consequences of land-use change, the study underscores the need for theories that account for the multi-dimensional impacts of urbanization on communities and agricultural practices. The Urban Growth Machine Theory provides a valuable lens through which to examine the influence of land-based elites and their role in shaping government policies. However, this theory could be expanded to include a broader consideration of community agency and the socio-cultural dimensions of land-use change.

The findings also suggest the necessity of developing a theoretical framework that emphasizes participatory governance in land-use planning. The existing literature, including Lambin et al. (2014), highlights the importance of including multiple stakeholders in decision-making processes to balance trade-offs between urban development and agricultural preservation. Future theories should incorporate elements of participatory governance that recognize the complexities of stakeholder interactions and the need for collaborative approaches in land-use policy formulation. This could involve the development of a model that integrates insights from diverse perspectives—government, community, and private sectors—fostering a more inclusive approach to land-use management.

Moreover, it is crucial to explore the trade-offs and synergies between urban development and ecosystem services in the context of peri-urban land-use changes. The existing frameworks could

be expanded to evaluate how land-use policies can be designed to enhance ecosystem services while supporting economic growth. Theories should consider the interconnectedness of ecological, social, and economic factors, promoting a more integrated understanding of land-use dynamics that reflects the realities of peri-urban environments.

5.5 Study Limitations and Suggestions for Further Research

While this study provides valuable insights into the factors driving land-use change from coffee farming to real estate development in Nyeri, Kenya, several limitations must be acknowledged. These limitations may affect the generalizability, depth, and validity of the findings.

First, sampling bias may have influenced the results. Although the study employed a robust sample size of 377 respondents, the participants primarily consisted of coffee farmers and real estate developers. This focus may have introduced a perspective bias, as other key stakeholders—such as local government officials, urban planners, environmental experts, and community members—were not extensively represented. The exclusion of these groups limits the study’s ability to capture a multi-stakeholder perspective on land-use transitions. Future research should incorporate a more diverse range of participants to enrich the analysis and provide a holistic understanding of the factors influencing land-use changes.

Second, the study employed a cross-sectional research design, collecting data at a single point in time. This methodological approach restricts the ability to draw causal inferences about the relationships between variables and their long-term impacts. Land-use change is a dynamic process that unfolds over years, influenced by shifting economic, social, and political conditions. A longitudinal study—tracking land-use changes over time—would offer deeper insights into evolving trends, the persistence of socio-economic consequences, and the effectiveness of government interventions. Future research should consider adopting a longitudinal approach to identify patterns that may not be evident in a one-time survey.

Another limitation is the potential for response bias, as participants may have overstated or understated certain aspects of land-use change due to personal interests, financial motivations, or perceived social desirability. For example, real estate developers may have downplayed concerns about environmental degradation, while farmers facing economic hardship may have emphasized financial struggles over other influencing factors. The study attempted to mitigate response bias

through anonymous surveys and triangulation with secondary data, but future research could benefit from mixed-method approaches, including ethnographic studies or focus group discussions, to validate findings.

Additionally, the study's scope was primarily economic and social, potentially overlooking cultural, historical, and environmental dimensions of land-use change. Traditional land tenure systems, historical patterns of land ownership, and ecological conditions play a crucial role in shaping land-use transitions but were not extensively examined in this research. Future studies should integrate cultural and environmental analyses to provide a more comprehensive understanding of land-use dynamics.

Finally, comparative studies across different regions in Kenya—or even internationally—could provide valuable insights into best practices for managing land-use transitions sustainably. Such research could highlight variations in stakeholder engagement, policy effectiveness, and socio-economic impacts, offering policy recommendations that are adaptable to different peri-urban contexts.

Despite these limitations, this study contributes to the ongoing discourse on peri-urban land-use change, emphasizing the need for stronger government interventions, stakeholder inclusion, and sustainable land management policies. Addressing these limitations in future research will help refine our understanding of land-use transitions and their long-term consequences.

5.6 Chapter Summary

This chapter has discussed the results obtained from this study. Additionally, recommendations for policy, managers and theory are presented as well as a limitations and suggestions for future research.

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APPENDICES

Appendix 1: Letter of Introduction for Questionnaire Survey

You are being invited to participate in a research study “Exploring Peri-Urban Land Use Change From Coffee Farming To Real Estate Development: A Case Study Of Nyeri, Kenya” Viraj Rajendra Padia, from Strathmore University (Email Address: viraj.padia @strathmore.edu, Phone Number: 0704499032) is conducting the research. The research aims to explore the drivers, consequences, and trade-offs of land use change from coffee farming towards real estate development in Nyeri. Your participation will help to better understand how balance can be achieved between urban development and preservation of agricultural land. If you choose to participate, you will complete a questionnaire for about 10 minutes. Any information that you provide will be treated with utmost confidentiality and privacy, and will be used only for academic purposes. Your choice to participate in this research is voluntary. If you have any questions, feel free to contact the research, Viraj Rajendra Padia.

Appendix 2: Letter of Introduction for Semi-structured Interviews

You are being invited to participate in a research study “Exploring Peri-Urban Land Use Change From Coffee Farming To Real Estate Development: A Case Study Of Nyeri, Kenya” Viraj Rajendra Padia, from Strathmore University (Email Address: viraj.padia @strathmore.edu, Phone Number: 0704499032) is conducting the research. The research aims to explore the drivers, consequences, and trade-offs of land use change from coffee farming towards real estate development in Nyeri. Your participation will help to better understand how balance can be achieved between urban development and preservation of agricultural land. If you choose to participate, you will participate in an interview that will last for about 30 minutes. Any information that you provide will be treated with utmost confidentiality and privacy, and will be used only for academic purposes. Your choice to participate in this research is voluntary. If you have any questions, feel free to contact the research, Viraj Rajendra Padia.

Appendix 3: Participant Information and Consent Form

Section 1: Information Sheet

Investigator: Viraj Rajendra Padia

Institutional Affiliation: Strathmore Business School (SBS)

Research Topic: **EXPLORING PERI-URBAN LAND USE CHANGE FROM COFFEE FARMING TO REAL ESTATE DEVELOPMENT: A CASE STUDY OF NYERI, KENYA**

Interview Location: The interviews will take place at convenient and comfortable locations for the participants, which may include community centers, local offices, or other agreed-upon venues within Nyeri County, Kenya.

Section 2: Information Sheet – The Study

2.1 Why is this study being carried out?

This study is being carried out to understand the drivers, consequences, and governmental responses to the transition of land use from coffee farming to real estate development in Nyeri, Kenya, aiming to inform sustainable land management practices and policy decisions.

2.2 Do I have to take part?

No. Taking part in this study is entirely optional and the decision rests only with you. If you decide to take part, you will be asked to complete a questionnaire to get information on Exploring Peri-Urban Land Use Change from Coffee Farming to Real Estate Development: A Case Study of Nyeri, Kenya. If you are not able to answer all the questions successfully the first time, you may be asked to sit through another informational session after which you may be asked to answer the questions a second time. You are free to decline to take part in the study at any time without giving any reasons.

2.3: Who is eligible to take part in this study?

Individuals involved in coffee farming or real estate development in Nyeri, Kenya, including farmers, landowners, developers, government officials, and community members, are eligible to participate in this study.

2.4: Who is not eligible to take part in this study?

Anyone below the age of 18 years

2.5: What will be taking part in this study involve for me?

You will be approached by the researcher and requested to take part in the study. If you are satisfied that you fully understand the objectives of the study, you will be asked to sign the informed consent form (this form) and then taken through a questionnaire to complete.

2.6: Are there any risks or dangers in taking part in this study?

There are no risks in taking part in this study. All the information you provide will be treated as confidential and will not be used in any other way without your express permission.

2.7: Are there any benefits of taking part in this study?

Yes, participants may benefit from gaining insights into the drivers and consequences of land-use change in Nyeri, Kenya, which could inform decision-making processes and contribute to more sustainable land-use practices in the region. Additionally, their perspectives and experiences shared during the study could contribute to broader knowledge and understanding of the issue.

2.8: What will happen to me if I refuse to take part in this study?

Participation in this study is entirely voluntary. Even if you decide to take part at first but later change your mind, you are free to withdraw at any time without any explanation.

2.9: Who will have access to my information during this research?

All research records will be stored securely and will be solely used for the purposes of supporting this study. Only the people who are closely concerned with this study will have access to your information. All your information will be kept confidential.

2.10: Who can I contact in case I have further questions?

You can contact me, Viraj Rajendra Padia, at SBS, or by e-mail viraj.padia@strathmore.edu, or by phone through 0704 499 032. You can also contact my supervisor, Dr. Bernadette Wanjala, at the Strathmore Business School, Nairobi, or by e-mail bwanjala@strathmore.edu

If you want to ask someone independent anything about this research, please contact:

The Secretary–Strathmore University Institutional Ethics Review Board, P. O. BOX 59857, 00200, Nairobi, email ethicsreview@strathmore.edu Tel number: +254 (0) 703 034418

I, _____, have had the study objectives explained to me. I have understood all that I have read and what has been explained to me. All my questions and clarifications have been answered satisfactorily. I understand that I can change my mind at any stage of study without any explanation.

Please tick the boxes that apply to you;

Participation in the research study

I AGREE to take part in this research

I DO NOT AGREE to take part in this research

Storage of information on the completed questionnaire

I AGREE to have my completed questionnaire stored for future data analysis

I DO NOT AGREE to have my completed questionnaire stored for future data analysis

Participants Signature:

Date:

Participants Name:

Date:

I, **Viraj Rajendra Padia** (Name of person taking consent), certify that I have followed the SOP for this study and have explained the study information to the study participant named above and that s/he has understood the nature and purpose of the study and consents to participation to the study. S/he has been given an opportunity to ask questions which have been answered satisfactorily.

Investigator's Signature:

Date:

Investigator's Name:

Date:



Appendix 4: Questionnaire

Section A: Respondent Profile

Please mark/tick your response in the corresponding box.

1. Please indicate your age category

18-25 26-35 36-45 46-55 56-65 Above 65

2. Please indicate your gender

Male Female

3. Please indicate the number of years you have practiced coffee farming.

0-5 6-10 11-15 16-20 21+

Section B: Driving Factors, Socio-economic consequences and government initiatives

Driving factors of land use change

To what extent do you agree with the following statements relating to what influenced or might influence you to convert your land from farming to real estate? Select the relevant box based on how much you agree with each of the following statements.

(1 = Strongly Disagree, 2 – Disagree, 3 – Neither agree nor disagree, 4 – Agree, 5 – Strongly Agree)

	1	2	3	4	5
The quality of soil is reducing which is making coffee farming less profitable					
The income from real estate is better compared to coffee farming					
The income from coffee farming is reducing					
The value of land in Nyeri is increasing					
There is a growing demand for land for industrial uses					
There is a growing demand of land for residential uses					
There is a growing demand for land for commercial uses					
I can sell off some land to sustain my agricultural operations					
The younger generations are less interested in coffee farming					
I sold my land because farmers around were also doing it					

The land is no longer fertile to sustain coffee farming					
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Socio-economic consequences of Land use Change

To what extent do you agree with the following statements relating to how the change from coffee farming to real estate development has affected or can affect you in the future? Select the relevant box based on how much you agree with each of the following statements.

(1 = Strongly Disagree, 2 – Disagree, 3 – Neither agree nor disagree, 4 – Agree, 5 – Strongly Agree)

	1	2	3	4	5
There is uncontrolled and haphazard real estate development in Nyeri					
Unplanned development of Nyeri town is increasing					
The increase in real estate is negatively affecting the environment					
The increased real estate development is reducing the sense of community					
The urban planning is not effective regulating real estate development in Nyeri					
Because of real estate developments, neighbourhood conflicts over land issues have increased					
The population of Nyeri is changing due to the increasing urbanization					
I no longer feel I am in rural country environment					



Government Initiatives to Balance Agriculture and Urban Development

To what extent do you agree with the following statements relating to how the government supported the change from coffee farming to real estate development? Select the relevant box based on how much you agree with each of the following statements.

(1 = Strongly Disagree, 2 – Disagree, 3 – Neither agree nor disagree, 4 – Agree, 5 – Strongly

	1	2	3	4	5
Land use planning and policies in Nyeri are developed through stakeholder participation					
Land use planning and policies in Nyeri are flexible and can be adapted to reflect the changing needs of stakeholders					
The local government has implemented regulations to guide the sale of land in Nyeri for real estate projects					
The government is providing research and extension services to coffee farmers who still want to continue farming					
The government has implemented reforms on land tenure and ownership to regulate the development of real estate projects					
The government provides financial incentives and support to those who still wish to continue with coffee farming					



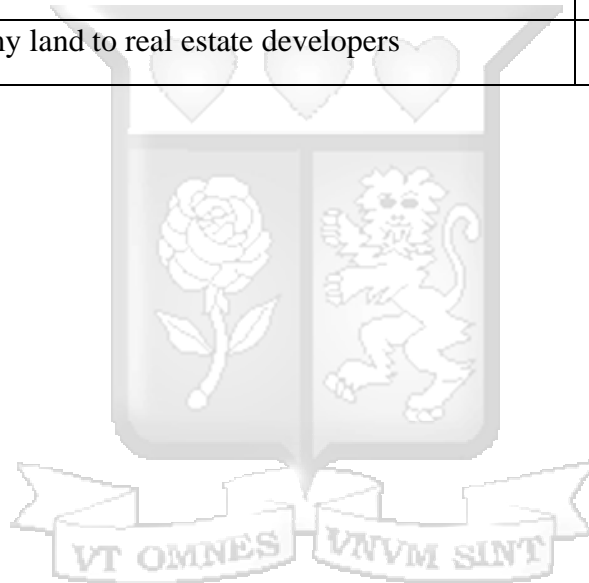
Section C: Land Use Change

Select the relevant box based on how much you agree with each of the following statements.

(1 = Strongly Disagree, 2 – Disagree, 3 – Neither agree nor disagree, 4 – Agree, 5 – Strongly Agree)

	1	2	3	4	5
Selling land for real estate development seems like a better idea compared to continuing coffee farming					
I might consider quitting coffee farming in favour of real estate development					
I may consider selling my land to real estate developers					

Thank you!



Appendix 5: Interview Guide

Introduction:

Thank you for participating in this study. Your perspectives are crucial in understanding the dynamics of coffee farming and real estate development in Nyeri, Kenya.

Questions:

1. What motivated or can motivate you to sell your land or convert part of your farmland for real estate development?
2. Why do you think people are selling their land or converting their land from coffee farming to real estate development?
3. How is the change from coffee farming to real estate development affecting people in Nyeri?
4. How do you perceive the impact of real estate development on your agricultural practices and livelihood?
5. Have you experienced any changes in land values and access to resources due to real estate development? Please elaborate.
6. What can be done to ensure there is urban development in Nyeri without diminishing the coffee farmlands?
7. What has the government done to ensure that there is a balance between coffee farming and real estate development?

Appendix 6: SBS Ethics Clearance Letter



16th May 2024

Mr Padia Viraj,
viraj.padia@strathmore.edu

Dear Mr Padia,

RE: Exploring Peri-Urban Land Use Change from Coffee Farming to Real Estate Development: A Case Study of Nyeri, Kenya

This is to inform you that SU-ISERC has reviewed and **approved** your above **SU-masters** proposal. Your application reference number is **SU-ISERC2280/24**. The approval period is from **16th May 2024 to 15th May 2025**.

This approval is subject to compliance with the following requirements:

- i. Only approved documents including (informed consents, study instruments, MTA) will be used.
- ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by SU-ISERC.
- iii. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to SU-ISERC within 72 hours of notification.
- iv. Any changes anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to SU-ISERC within 72 hours.
- v. Clearance for the export of biological specimens must be obtained from relevant institutions.
- vi. Submission of a request for renewal of approval at least 60 days prior to the expiry of the approval period. Attach a comprehensive progress report to support the renewal.
- vii. Submission of an executive summary report within 90 days of completion of the study to SU-ISERC.

Before commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology, and Innovation (NACOSTI) <https://research-portal.nacosti.go.ke/> and obtain other clearances needed.

Yours sincerely,

**Mr Ambrose Rachier,
Chairperson; SU-ISERC**

Appendix 7: NACOSTI Research License

REPUBLIC OF KENYA



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Ref No: 733387

Date of Issue: 04/June/2024

RESEARCH LICENSE



This is to Certify that Mr.. Viraj Rajendra Padia of Strathmore University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nyeri on the topic: **EXPLORING PERI-URBAN LAND USE CHANGE FROM COFFEE FARMING TO REAL ESTATE DEVELOPMENT: A CASE STUDY OF NYERI, KENYA** for the period ending : 04/June/2025.

License No: NACOSTI/P/24/36374

Applicant Identification Number: 733387

Director General
NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Verification QR Code



NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013 (Rev. 2014)
Legal Notice No. 108: The Science, Technology and Innovation (Research Licensing) Regulations, 2014

The National Commission for Science, Technology and Innovation, hereafter referred to as the Commission, was established under the Science, Technology and Innovation Act 2013 (Revised 2014) herein after referred to as the Act. The objective of the Commission shall be to regulate and assure quality in the science, technology and innovation sector and advise the Government in matters related thereto.

CONDITIONS OF THE RESEARCH LICENSE

1. The License is granted subject to provisions of the Constitution of Kenya, the Science, Technology and Innovation Act, and other relevant laws, policies and regulations. Accordingly, the licensee shall adhere to such procedures, standards, code of ethics and guidelines as may be prescribed by regulations made under the Act, or prescribed by provisions of International treaties of which Kenya is a signatory to
2. The research and its related activities as well as outcomes shall be beneficial to the country and shall not in any way;
 - i. Endanger national security
 - ii. Adversely affect the lives of Kenyans
 - iii. Be in contravention of Kenya's international obligations including Biological Weapons Convention (BWC), Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), Chemical, Biological, Radiological and Nuclear (CBRN).
 - iv. Result in exploitation of intellectual property rights of communities in Kenya
 - v. Adversely affect the environment
 - vi. Adversely affect the rights of communities
 - vii. Endanger public safety and national cohesion
 - viii. Plagiarize someone else's work
3. The License is valid for the proposed research, location and specified period.
4. The license any rights thereunder are non-transferable
5. The Commission reserves the right to cancel the research at any time during the research period if in the opinion of the Commission the research is not implemented in conformity with the provisions of the Act or any other written law.
6. The Licensee shall inform the relevant County Director of Education, County Commissioner and County Governor before commencement of the research.
7. Excavation, filming, movement, and collection of specimens are subject to further necessary clearance from relevant Government Agencies.
8. The License does not give authority to transfer research materials.
9. The Commission may monitor and evaluate the licensed research project for the purpose of assessing and evaluating compliance with the conditions of the License.
10. The Licensee shall submit one hard copy, and upload a soft copy of their final report (thesis) onto a platform designated by the Commission within one year of completion of the research.
11. The Commission reserves the right to modify the conditions of the License including cancellation without prior notice.
12. Research, findings and information regarding research systems shall be stored or disseminated, utilized or applied in such a manner as may be prescribed by the Commission from time to time.
13. The Licensee shall disclose to the Commission, the relevant Institutional Scientific and Ethical Review Committee, and the relevant national agencies any inventions and discoveries that are of National strategic importance.
14. The Commission shall have powers to acquire from any person the right in, or to, any scientific innovation, invention or patent of strategic importance to the country.
15. Relevant Institutional Scientific and Ethical Review Committee shall monitor and evaluate the research periodically, and make a report of its findings to the Commission for necessary action.

National Commission for Science, Technology and
Innovation(NACOSTI),
Off Waiyaki Way, Upper Kabete,
P. O. Box 30623 - 00100 Nairobi, KENYA
Telephone: 020 4007000, 0713788787, 0735404245
E-mail: dg@nacosti.go.ke
Website: www.nacosti.go.ke

Appendix 8: County Government of Nyeri Research Authorization

COUNTY GOVERNMENT OF NYERI



Town Hall – 2nd Floor
Along Kenyatta Road
P.O. Box 1112 – 10100
Telephone 061 2030700
NYERI

Email: nyericountysecretary@gmail.com

OFFICE OF THE COUNTY SECRETARY/HEAD OF COUNTY PUBLIC SERVICE

Our Ref: CGN/CS/ATT/II/100/39

10th June, 2024

Viraj Rajendra Padia
P.O. Box 1020-10100
NYERI

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on "**Exploring Peri-Urban Land Use Change from Coffee Farming to Real Estate Development**" in partial fulfillment of a Master's Degree programme.

I am pleased to inform you that you have been authorized to undertake the research in County Government of Nyeri valid until 4th June, 2025.

You will be required to **deposit** a copy of your final research findings with the Nyeri County Government.

I wish you all the best in the research.

A handwritten signature in black ink, appearing to read 'Benjamin W. Gachichio'.

Benjamin W. Gachichio
COUNTY SECRETARY/HEAD OF COUNTY PUBLIC SERVICE

Copy to:

- **County Commissioner**
NYERI COUNTY

- **County Executive Committee Member**
Trade, Cooperative, Culture & Tourism