

Land Use Change and its Impacts on Rural Development in Bomorenda Ward of Kisii County: *An Assessment for Planning Interventions*

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Abstract

Kisii County is one of the most densely populated and rapidly urbanising counties in Kenya. Despite increasing land use change in the peri-urban and rural areas of the county, limited empirical evidence exists to guide planning interventions at the ward level. This study was conducted in Bomorenda Ward, Kisii County, to examine land use change between 2003 and 2023, identify the factors influencing the change, assess the impacts of the change on rural development, and recommend policy and planning strategies for sustainable land management and governance. A survey research design involving 79 randomly sampled households, key informants, focus group discussions, and Landsat 7 and 8 satellite imagery was employed. Time-series, descriptive, and content analyses were undertaken. The findings revealed that, within the 20-year period, agricultural land had decreased by 26.82% from 62.50% to 35.68%, while built-up land had increased by 30.39% from 14.75% to 45.14%. The main factors driving land-use change were population growth, land fragmentation due to inheritance, and unplanned development. The negative impacts of land use change on rural development included food insecurity, land conflicts, landlessness, and loss of livelihood opportunities, while the positive impacts included improved access due to new infrastructure. The study recommends the formulation of guidelines on permissible agricultural land sizes, sustainable tenure arrangements, intensification of farming to increase productivity, and value addition for all enterprises to achieve optimal utilisation of land. Other recommendations include the formulation and implementation of a land use plan with clear agricultural zones and urban boundaries that will promote clustered high-density residential and commercial developments.

Keywords: Kisii County, Bomorenda Ward, land use change, rural development, land fragmentation, land use planning, rural land management, GIS

INTRODUCTION

Rapid urbanization has significantly influenced land use patterns globally. The diminishing of agricultural areas is attributed to land use changes and conversions (Naab, Dinye, & Kasanga, 2013). Conversion of agricultural land into residential and commercial developments jeopardizes productivity and threatens food security. Land use change is a major global driver of environmental degradation, ecosystem change, climate change, and human vulnerability, resulting in intensified land use, changing land cover, and land degradation (Kim, Le, Park, Tenhunen, & Koellner, 2014). Physical and land use planning guidelines consist of policies, laws, regulations, and standards established to direct the use of space.

Their overarching objective is to attain orderly spatial development and promote sustainable land use (Omollo, Hayombe, & Owino, 2018).

The urban bias has contributed significantly to rural underdevelopment, as most resources are invested within urban areas, which are relatively better planned than rural areas. In Kenya, 36.1% of the population lives below the poverty line, with 40.1% residing in rural areas compared to 29.4% in urban areas (Agayi & Karakayaci, 2022). Rural areas continue to experience limited access to education, food, water, healthcare, adequate housing, infrastructure, and employment

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opportunities. Consequently, poor accessibility, declining living standards, inadequate social facilities, and uncoordinated land use patterns remain common characteristics of many rural settlements.

Diminishing agricultural land is occasioned by population growth, land subdivision, and increasing land values that encourage further fragmentation (Meyer, 2014). Despite these challenges, limited efforts have been directed towards managing and optimizing rural land which remains a finite resource under increasing population pressure.

Although urban and rural land uses compete for space, urban expansion continues to dominate, gradually absorbing peri-urban and rural landscapes. Bomorenda Ward exhibits both rural and urban characteristics. The growth of Suneka Town, one of Kisii Municipality's satellite towns, together with the expansion of Kisii Town, has significantly influenced development within the Ward. Urban sprawl into the rural hinterland has resulted in land fragmentation, increased land values, encroachment on road and riparian reserves, and haphazard development. These challenges have largely been attributed to weak land governance, inadequate development control, lack of zoning plans, absence of rural development guidelines, and weak enforcement of existing planning legislation, particularly the Physical and Land Use Planning Act (PLUPA), 2019.

Although several studies have examined land use change and urban expansion, limited empirical evidence exists on how these changes affect rural development at the ward level and how planning interventions can address the emerging challenges. This knowledge gap limits evidence-based planning and policy formulation for rapidly urbanising rural areas. This study addresses that gap by examining land use change in Bomorenda Ward and proposing planning interventions for sustainable rural development.

Since the colonial period, planning has largely focused on urban areas. Apart from the Swynnerton Plan, which promoted intensive agriculture, limited planning attention has been directed towards the rural continuum. Although PLUPA (2019) provides for planning at all levels, implementation at the local level remains limited,

resulting in inadequate rural development plans and weak development control. Consequently, sprawling urban development continues to transform the rural landscape without corresponding planning interventions. This study contributes to planning knowledge by providing empirical evidence on land use change and its implications for rural development. It also offers practical planning and policy recommendations that can guide sustainable land management in Bomorenda Ward and other rapidly urbanising rural areas.

The study was guided by four research questions as indicated below: (i) What land use changes occurred in Bomorenda Ward between 2003 and 2023? (ii) What factors have influenced land use change in the Ward? (iii) What are the impacts of land use change on rural development? (iv) What planning interventions can promote sustainable land use and rural development in Bomorenda Ward? The remainder of this paper presents the literature review, research methodology, results, discussion, conclusions, and planning recommendations.

THEORY

Concept of Rural Development

Rural development refers to economic and social efforts aimed at promoting sustainable growth and improving living conditions in predominantly agricultural, non-urban areas. It seeks to enhance the livelihoods of rural populations through targeted interventions. In developing countries, a significant proportion of the population depends on agriculture, yet rural areas continue to face physical and non-physical challenges, including inadequate water supply, poor infrastructure, limited healthcare services, environmental degradation, restricted access to land, and weak engagement with government institutions.

A major challenge is strengthening communities' capacity to drive development and absorb development shocks while ensuring that development remains sustainable. Rural development therefore focuses on improving essential infrastructure and services such as, water supply, sanitation, electricity, healthcare, education, housing, transportation, and security. It also promotes investment, enterprise development, and community participation in identifying

local needs and priorities. Consequently, rural development encompasses three interrelated dimensions: economic, socio-cultural, and environmental development. (Atkinson, 2017).

Land Use Change

Land use change has transformed both urban and rural landscapes worldwide, largely through the conversion of agricultural and natural land into built-up areas. In Bandar Abbas, Iran, agricultural and barren land declined substantially between 1956 and 2012, while built-up areas expanded considerably because of rapid urban growth and limited land resources (Dadras et al., 2014). Although the study highlighted urban land transformation, it paid limited attention to the rural areas that remain closely linked to urban development.

Similarly, studies in Akure City, Nigeria, found that urban expansion significantly increased built-up areas while reducing forest cover through deforestation, agricultural expansion, land degradation, and human encroachment (Balogun et al., 2011). Although the study quantified land use changes and projected future trends, it did not propose planning interventions to manage the changing land use patterns, a gap addressed by this study.

In Kenya, research in Ruaka Town, Kiambu County, established that land use and land cover changes have reduced agricultural land and vegetation cover while substantially increasing built-up areas (Abuya et al., 2019). The resulting urban expansion has placed considerable pressure on infrastructure, including roads, water supply, wastewater management, and environmental conservation. However, the study primarily focused on urban infrastructure with limited attention to the implications of land use change for rural development.

Factors Influencing Land Use Change

Population growth, increasing land values, land inheritance, urban sprawl, and weak development control are among the major drivers of land use change. In Puerto Rico, unregulated development accelerated urban sprawl, resulting in the conversion of productive agricultural land to urban land use and increased pressure on watersheds and open spaces (Martinuzzi et al., 2007). However, the study focused mainly on land use planning

without providing practical development control measures.

Similarly, research in Kiminini Sub-County, Kenya, identified population growth, rising land values, inheritance practices, and weak enforcement of development control regulations as the major causes of agricultural land subdivision and conversion (Atieno & Alumasa, 2022). While the study examined the impacts of land subdivision on agriculture, it did not propose comprehensive planning guidelines for managing rural land use. Likewise, Abuya et al. (2019) found that increasing demand for residential and commercial land, coupled with weak planning enforcement, accelerated land fragmentation and urban sprawl in Ruaka Town.

Consequences of Land Use Change on Rural Development

Land use change has significant implications for rural development. In Kiminini Sub-County, continued land subdivision reduced farm sizes, increased land values, intensified land conflicts, contributed to deforestation, and reduced agricultural productivity (Atieno & Alumasa, 2022). Smaller land parcels also discouraged long-term investments such as tree planting and sustainable farming practices.

Similarly, in Ruaka Town, land use and land cover changes reduced vegetation cover, degraded riparian areas, increased traffic congestion, and contributed to water pollution through inadequate wastewater management (Abuya et al., 2019). These findings demonstrate that unmanaged land use change affects not only agricultural production but also environmental quality, infrastructure provision, and the overall sustainability of rural and peri-urban development.

Planning and Policy Interventions

Balanced rural growth requires decentralised planning and administrative structures that transfer planning functions and resources from the national government to devolved units. This enhances decision-making and enables local development priorities to be identified and implemented more effectively (Agayi & Karakayaci, 2022). Although the study advocated decentralised planning and optimal land use, it did not explain how these interventions could be implemented at the ward level or provide

practical land development measures. These gaps are addressed in this study.

Rural development further depends on effective governance, community participation, strategic planning, agricultural development, improved urban-rural linkages, access to essential services, and efficient utilization of local resources (Meyer, 2014). Strategic spatial planning is fundamental to guiding development and managing land use. However, despite advocating for economic growth and employment creation, Meyer did not adequately address industrial development or the preparation of zoning plans and development guidelines for rural areas.

Integrated spatial planning can promote coordinated development across the rural-urban continuum. A rural land use plan should identify development zones, transition areas, and conservation zones to protect agricultural land and natural resources from uncontrolled conversion. This should be complemented by national and urban land use plans and development management plans that provide zoning regulations, development controls, and capital investment strategies to guide sustainable land development (Berke et al., 2006).

Past Efforts to Manage Rural Development in Kenya

Kenya has implemented several initiatives to promote balanced rural development through the provision of services, infrastructure, transportation, and growth centres. The Development of Service Centres Policy sought to improve access to healthcare, education, water, sanitation, electricity, markets, and administrative services by establishing a hierarchy of local, market, rural, and urban centres. These centres were intended to reduce travel distances, improve accessibility, stimulate commerce, and promote equitable service distribution across rural areas.

The Development of Growth Centres Policy aimed to encourage industrial and commercial investment in small towns to support regional development and manage urbanization. However, implementation was constrained by inadequate financial resources despite the strategic location and economic potential of many growth centres.

The Integrated Transportation and Communication

System was designed to strengthen rural-urban linkages through a hierarchical of road networks connecting urban centres, rural centres, market centres, and local centres. Improved connectivity was expected to facilitate service delivery, agricultural production, trade, employment creation, and rural industrialisation, recognising the interdependence between rural and urban economies.

The policy on Appropriate Infrastructure Standards sought to promote equitable infrastructure provision by establishing minimum development standards across rural and urban areas. It also encouraged low-cost housing through the use of locally available materials and labour. Despite these initiatives, many rural areas continue to experience land fragmentation, poor accessibility, inadequate infrastructure, weak development control, and uncoordinated land use patterns, demonstrating the need for stronger planning interventions.

International Experiences in Rural Land Use Planning

Vietnam

Vietnam has made significant progress in rural development through strategic investments in agriculture, infrastructure, and land use planning. In 2020, about 60 percent of its population lived in rural areas, with agriculture contributing approximately 15–20 percent of the national GDP (Association of Rural Planning, 2022). Despite limited agricultural land holdings and challenges such as low farmer training levels and land scarcity, Vietnam has strengthened the rural economy through investments in transport and irrigation infrastructure. The country aims to transform rural agriculture by 2030 by promoting ecological, modern, and smart farming that integrates climate change adaptation, infrastructure development, innovation, sustainable agricultural practices, regional planning, and stronger rural-rural linkages. These interventions demonstrate the importance of integrated planning, infrastructure investment, and effective governance in achieving sustainable rural development.

Tanzania

Tanzania has similarly adopted structured approaches to rural land management through the Tanzania Village Land Act of 1999, which

classifies land into village, reserved, and general land (World Bank, 2021). Village land use planning is undertaken before land subdivision, while integrated land use plans, strengthened land administration, public participation, and enforcement of land use by-laws guide rural development. The country also emphasizes training planning personnel, establishing land information systems, creating zonal offices, and allocating district budgets to support land use planning and development (United Republic of Tanzania, 2017).

The experiences of Vietnam and Tanzania provide important lessons for Kenya and Bomorenda Ward. Their emphasis on integrated land use planning, infrastructure development, effective governance, public participation, budget allocation and enforcement of planning regulations demonstrates practical approaches for managing land use change. Adapting these strategies could help reduce uncontrolled land conversion, strengthen rural land governance, protect agricultural land, and promote sustainable rural development within Bomorenda Ward.

Theoretical Underpinnings

The study is anchored on five complementary theories that explain the relationship between urban growth, land use change, and rural development. These theories provide the analytical lens for understanding the drivers of land use change and the planning interventions required to promote sustainable rural development.

Growth Pole Theory

The Growth Pole Theory, developed by François Perroux in the 1950s, argues that economic development is accelerated by concentrating investment in strategic sectors or geographic areas. These growth poles stimulate development in surrounding areas through infrastructure development and economic linkages.

Kisii Municipality functions as a growth pole, stimulating the growth of Suneka, one of the principal urban centres within Bomorenda Ward. Commercial activities and the upgrading of the Kisii–Migori–Isebania Highway have accelerated development within the peri-urban and rural areas, resulting in increasing land values and land use change. However, the theory pays limited attention to the long-term sustainability

of expanding settlements. This study applies the theory to assess the influence of Suneka on the surrounding rural hinterland.

Agglomeration Economies and the Location of Industry Theory

Agglomeration theory explains how industries and economic activities cluster in particular locations because of shared infrastructure, labour availability, market accessibility, and lower transport costs.

Suneka has attracted commercial development, leading to urban expansion into the surrounding peri-urban and rural areas. The Kisii–Migori–Isebania Highway has further strengthened this concentration of activities, resulting in encroachment onto road and riparian reserves and increasingly unclear land use patterns. Limited accessibility and the absence of local industries continue to constrain agricultural production and market linkages within the rural areas of Bomorenda Ward.

Gunnar Myrdal's Theory of Cumulative Causation

Gunnar Myrdal's Theory of Cumulative Causation explains development as a self-reinforcing process in which regions with initial advantages continue to grow through spread effects, while disadvantaged areas experience backwash effects that constrain development (Berger, 2009; Fujita, 2004).

In Bomorenda Ward, uncontrolled land conversion, fragmented land use, and encroachment on road and riparian reserves may undermine long-term development. Conversely, orderly land use planning and sustainable development can strengthen agriculture, commerce, and industry while improving livelihoods and supporting economic growth within Kisii County. The theory therefore helps explain how the growth of Suneka can generate positive spill-over effects without disadvantaging the surrounding rural areas.

Concentric Zone Model

The Concentric Zone Model, developed by Ernest Burgess (1925), explains urban growth as a series of expanding concentric zones radiating from the central business district. As urban areas expand, development gradually extends into adjacent zones.

The model illustrates how the expansion of Suneka has spread into the Bomorenda Ward hinterland, resulting in land use conversion, haphazard development, and environmental degradation associated with rapid urbanisation.

The Concentric Zone Model provides a useful perspective for understanding the spatial expansion of urban development into the surrounding rural landscape. **Figure 1** presents the Concentric Zone Model, illustrating the outward expansion of urban development into surrounding zones.

Theory of Sub-urbanisation

The Theory of Sub-urbanisation explains the movement of population and economic activities from urban centres to peripheral areas, resulting in the expansion of residential, commercial, and industrial development (Adefioye, 2016). This process is influenced by housing demand, transportation, zoning, and land use change.

The theory explains the transformation of Bomorenda Ward due to its proximity to Kisii Municipality. Urban sprawl and linear development along the Kisii–Isebania Highway have accelerated unplanned growth across the urban, peri-urban,

and rural landscape. The study therefore emphasises the need for integrated land use planning, zoning, environmental conservation, public participation, and infrastructure development to promote sustainable rural development amid continuing sub-urbanisation.

Conceptual Framework

Figure 2 illustrates the conceptual framework showing the relationship between land use changes, the planning system, and rural development outcomes in the study.

Figure 2 presents the conceptual framework underpinning this study. Land use changes constitute the independent variable, rural development the dependent variable, while the planning system serves as the intervening variable. Land use changes are reflected in diminishing farmland, expanding built-up areas, and declining vegetation cover. Land fragmentation, driven by inheritance practices, population growth, and urban sprawl, reduces agricultural productivity, weakens rural livelihoods, and contributes to food insecurity. Declining vegetation cover, resulting from deforestation and increasing demand for land, lowers land productivity and water

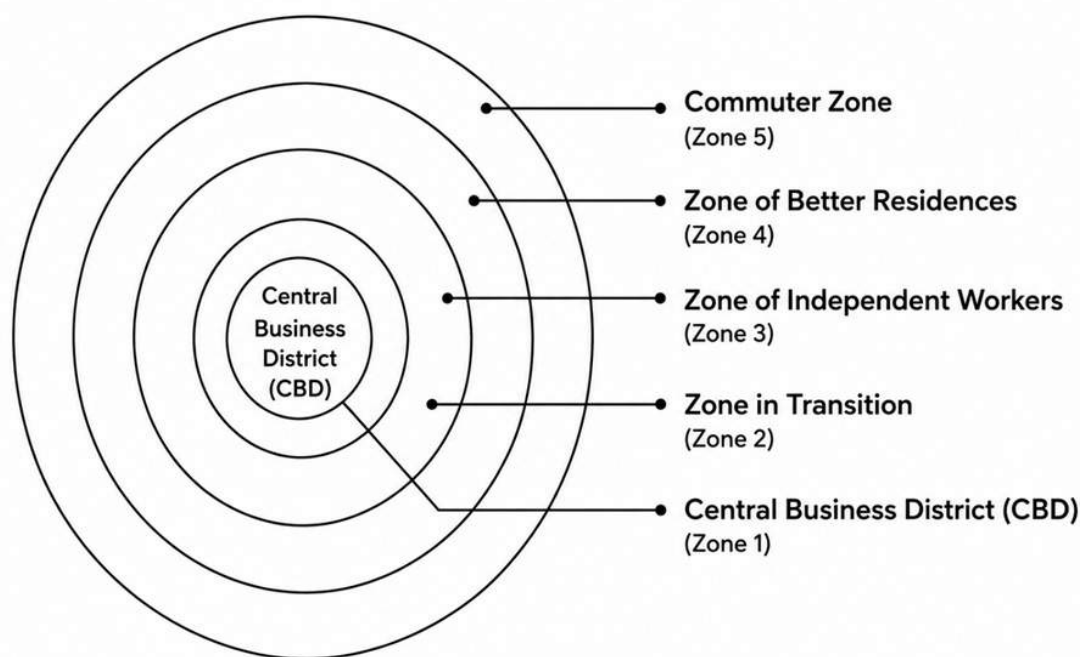


FIGURE 1

Concentric urban expansion influences surrounding peri-urban and rural land use

Source: Adapted from Burgess (1925)

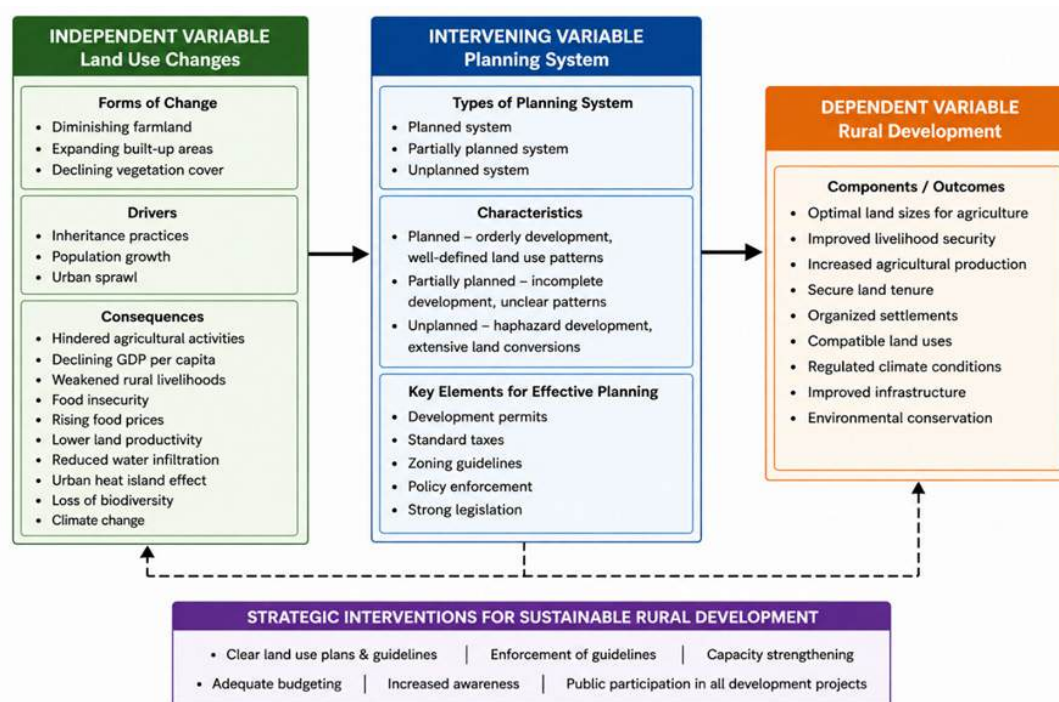


FIGURE 2
Conceptual framework linking land use and rural development
Source: Author's conceptualisation, 2026

infiltration while contributing to biodiversity loss, urban heat island effects, and climate change.

The planning system influences how these land use changes affect rural development. It may be planned, partially planned, or unplanned. Unplanned development results in haphazard growth and extensive land use conversions, while partially planned systems are characterised by incomplete development and unclear land use patterns. Planned systems promote orderly development through zoning, development control, policy enforcement, and compliance with planning regulations. Effective planning also requires development permits, appropriate taxation, and clear development guidelines.

These planning interventions ultimately influence rural development outcomes, including optimal agricultural land sizes, improved livelihood security, increased agricultural production, secure land tenure, organised settlements, compatible land uses, improved infrastructure, environmental conservation, and regulated climate conditions. Achieving sustainable rural development therefore requires the preparation and enforcement of rural land use plans, strengthened institutional capacity,

adequate resource allocation, public awareness, and meaningful stakeholder participation in the planning process.

RESEARCH METHODS

Study Design

The study adopted a survey research design, in which primary data were collected at a single point in time from a selected sample of the population. Both primary and secondary data were collected to examine land use change, factors influencing the change, the impacts of the change on rural development within the Ward, and possible planning interventions.

Study Area

Bomorenda Ward is situated in Kisii South Sub-County, Kisii County. Kisii County borders Nyamira County to the east, Narok County to the south, Homa Bay County to the northwest, and Migori County to the west. The county is also part of the Lake Region Economic Bloc (LREB), comprising 14 counties: Migori, Nyamira, Siaya, Vihiga, Bomet, Bungoma, Busia, Homa Bay, Kakamega, Kisumu, Nandi, Trans Nzoia, and Kericho. Kisii South Sub-County consists of three

other wards that include Riana, Mobariba, and Bogiakimu.

A proportion of Bomorenda Ward lies within Kisii Municipality and comprises four sub-locations: Bomakombi, Bomwancha, Bonyanchaire, and Bonyaoro (KNBS, 2019). The Ward lies at latitude 0°4'43.4" S and longitude 34°4'27.7" E, covers an area of 26.68 km², and is situated approximately 7 km from Kisii Town. The two main structuring elements that define the Ward are Suneka Town and the Kisii–Migori–Isebania Highway, which traverses the area.

Bomorenda Ward has a population of approximately 28,116 people, comprising 13,647 men and 14,969 women, distributed across 7,052 households, with a population density of 1,565 persons per square kilometre (KNBS, 2019). The population is projected to increase to 35,658 by 2031 at an annual growth rate of 2 percent (KNBS, 2019).

Figure 3 illustrates the location of the study area within the national and county context.

Target Population and Sampling

The target population consisted of three categories. The first comprised all 7,052 households within the four sub-locations of the Ward. The second consisted of key informants from relevant sectors, including the Ward Administrator, the Chief and Assistant Chiefs from the four sub-locations, and the Sub-County Agriculture, Physical Planning, Environment, and Lands Officers. The third category comprised focus group discussion participants.

The four sub-locations were considered as clusters, while household lists formed the sampling frame. Field findings identified two additional sub-locations, namely Bomaina and Bokeira, which had not been officially gazetted. Sampling was therefore limited to the four sub-locations captured in the KNBS (2019) Census.

A sample size of 79 households was determined at a 95 percent confidence level and an 11 percent margin of error using Cochran's sample size formula available through Survey Monkey. Households were selected proportionately using simple random sampling, while key informants and focus group discussion participants were

selected purposively.

Table 1 presents the distribution of the sampled households across the four sub-locations.

The sample size was estimated using Cochran's sample size formula.

Figure 4 presents the formula adopted in determining the study sample.

Data Collection and Analysis

Secondary data were gathered from scholarly articles, journals, government documents, and books. Primary data were collected from households through face-to-face interviews using a semi-structured household questionnaire. A tape measure was used to measure land areas, while a camera and an observational checklist were used to record landscape features. Data from key informants and focus group discussions were collected using interview schedules and Focus Group Discussion guides.

Landsat imagery covering the period 2003–2023 (20 years) was obtained from the Regional Centre for Mapping and Resource Development (RCMRD). The study examined land use changes before and after devolution following the promulgation of the Constitution of Kenya 2010, a period considered adequate to detect change.

Quantitative and qualitative data were analysed using descriptive statistics and content analysis, respectively. Microsoft Excel and SPSS were the main tools used to analyse quantitative data. Landsat 7 and Landsat 8 images were analysed through time-series analysis using the ArcGIS Desktop 10.8 Iso-Cluster tool. Both unsupervised Iso-Cluster and supervised classification techniques were used to classify vegetation cover, agricultural land, and built-up areas. Interpretations and inferences were based on the spatial-temporal analysis of Landsat imagery together with the quantitative and qualitative findings.

RESULTS

Land Use Change

The findings show that Bomorenda Ward has experienced substantial land use change over the 20-year period. Remotely sensed data from

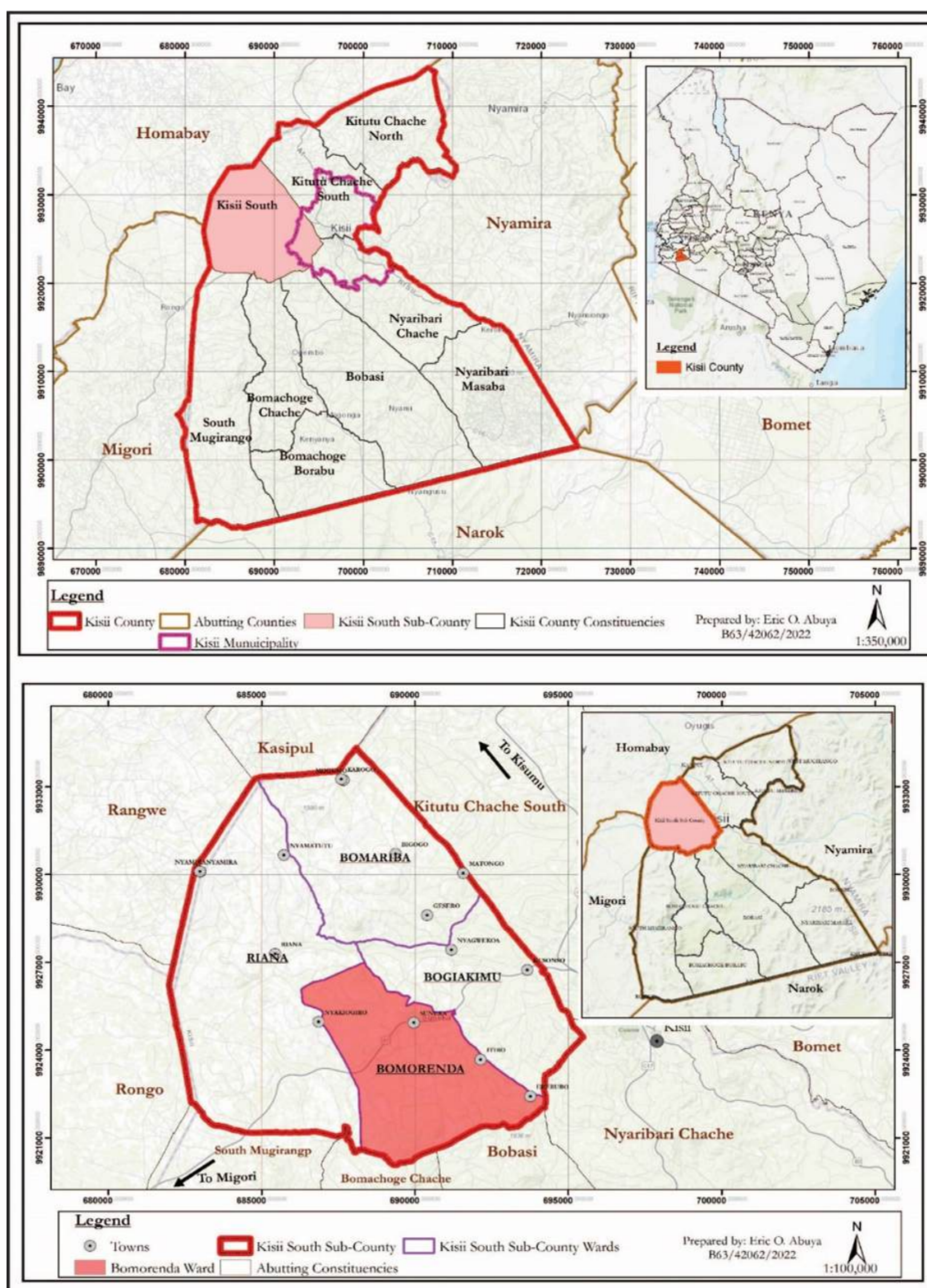


FIGURE 3
Study area in national and county context
Source: Field survey, 2026

TABLE 1
Distribution of sampled households across the four sub-locations

No.	Sub-Location	Total Households	Sample Size*
(i)	Bomakombi	1,979	22
(ii)	Bomwancha	916	11
(iii)	Bonyanchaire	2,410	26
(iv)	Bonyaoro	1,747	20
	Total	7,052	79

Source: KNBS (2019) and SurveyMonkey sample size estimation

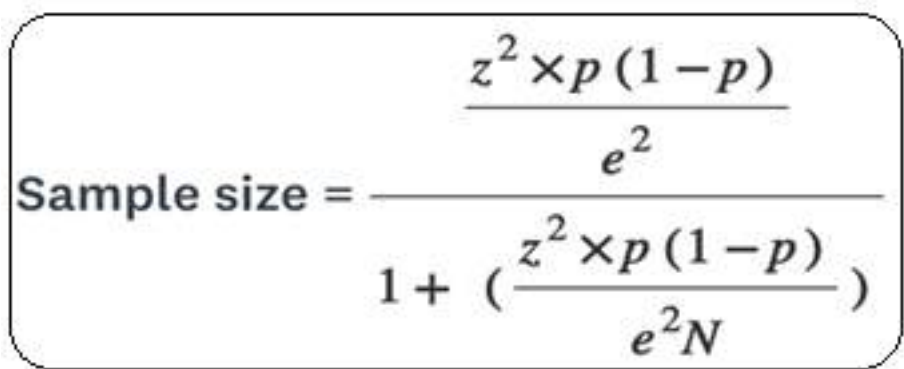

$$\text{Sample size} = \frac{\frac{z^2 \times p(1-p)}{e^2}}{1 + \left(\frac{z^2 \times p(1-p)}{e^2 N} \right)}$$

FIGURE 4
Cochran sample size formula for household sample estimation

Source: Adopted from <https://www.surveymonkey.com/mp/sample-size-calculator/>

Landsat 7 and Landsat 8 imagery supported the spatial-temporal analysis presented in **Table 2**. The land use and land cover (LULC) classification comprised three categories: vegetation cover, agricultural land, and built-up areas. Vegetation cover included forested areas with indigenous and exotic trees on both public and private land. Agricultural land comprised crop farming, livestock keeping, and uncultivated farmland. Since the Ward experiences two planting seasons annually, some land appeared bare during image acquisition due to temporary non-cultivation. Built-up areas comprised human settlements, transportation networks, and associated infrastructure.

Table 2 presents the characteristics of the remotely sensed data used in the study.

Spatial analysis, complemented by field findings, established that Bomorenda Ward underwent significant land use transformation between 2003 and 2023. Agricultural land decreased

by 26.82%, while built-up areas increased by 30.39%. Vegetation cover declined by 3.56% over the same period. Built-up areas, comprising human settlements and transport infrastructure, formed the principal structuring elements of development. Linear settlement patterns were predominantly observed along major transport corridors, particularly the Kisii–Migori–Isebania Highway. Settlement density was highest within the Suneka urban node, which continues to expand into the peri-urban and rural hinterlands. Vegetation cover increased by 7.03% between 2003 and 2013, largely reflecting afforestation and reforestation efforts. However, between 2013 and 2023, it declined sharply by 10.59%.

Table 3 summarises the land use and land cover changes recorded during the study period.

The temporal trend in land use and land cover change is illustrated in **Figure 5**, while **Figure 6** compares the proportions of the three land use categories across the study period.

TABLE 2

Characteristics of remotely sensed data used for LULC analysis

No.	Data	Sensor	Band	Resolution	Projection	Zone	Datum	Year
1	Landsat-7	ETM+	1, 2, 3, 4, 5, 61, 62, 7, 8	30m	UTM	36S	WGS 1984	2003
2	Landsat-8	OLI	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	30m	UTM	36	WGS 1984	2013
3	Landsat-8	OLI/TIRS	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	30m	UTM	36	WGS 1984	2023

Source: Regional Centre for Mapping Resources for Development, 2026

TABLE 3

Land use and land cover changes, 2003–2023

LULC / Year	2003		2013		2023	
	Area (Ha)	Area (%)	Area (Ha)	Area (%)	Area (Ha)	Area (%)
Vegetation	652.59	22.75	854.1	29.78	550.26	19.19
Agriculture	1792.44	62.50	1128.06	39.33	1023.21	35.68
Built-Up Areas	422.91	14.75	885.78	30.89	1294.47	45.14
Total Area	2867.94	100	2867.94	100	2867.94	100

Source: Author's Landsat image analysis, 2026

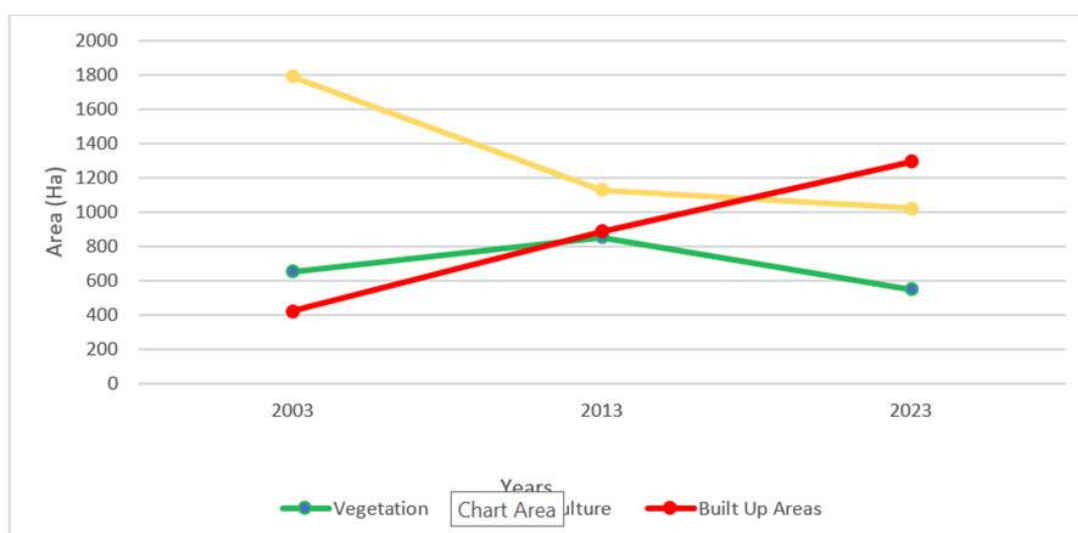
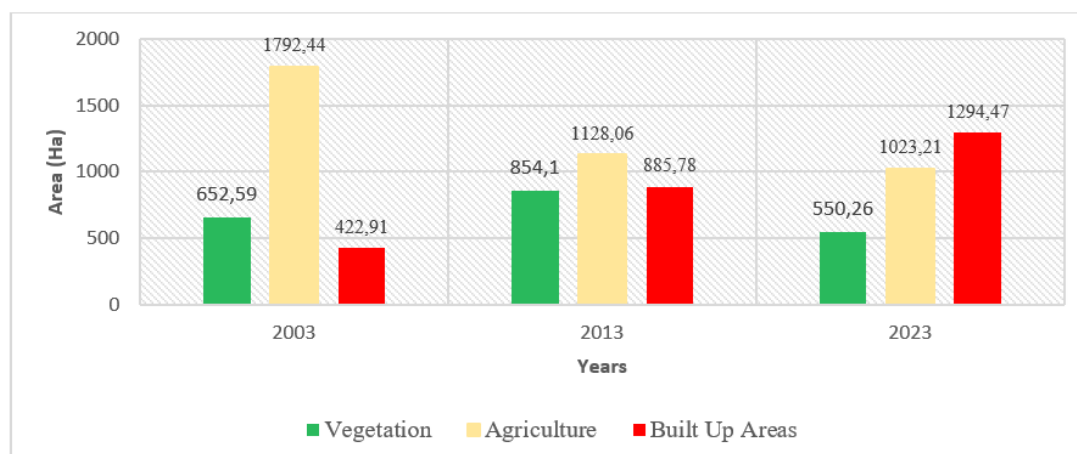


FIGURE 5

Trend of land use and land cover changes

Source: Author's Landsat image analysis, 2026

**FIGURE 6**

Comparison of land use and land cover categories

Source: Author's Landsat image analysis, 2026

The spatial distribution of land use and land cover in 2003, 2013, and 2023 is presented in **Figures 7, 8, and 9, respectively.**

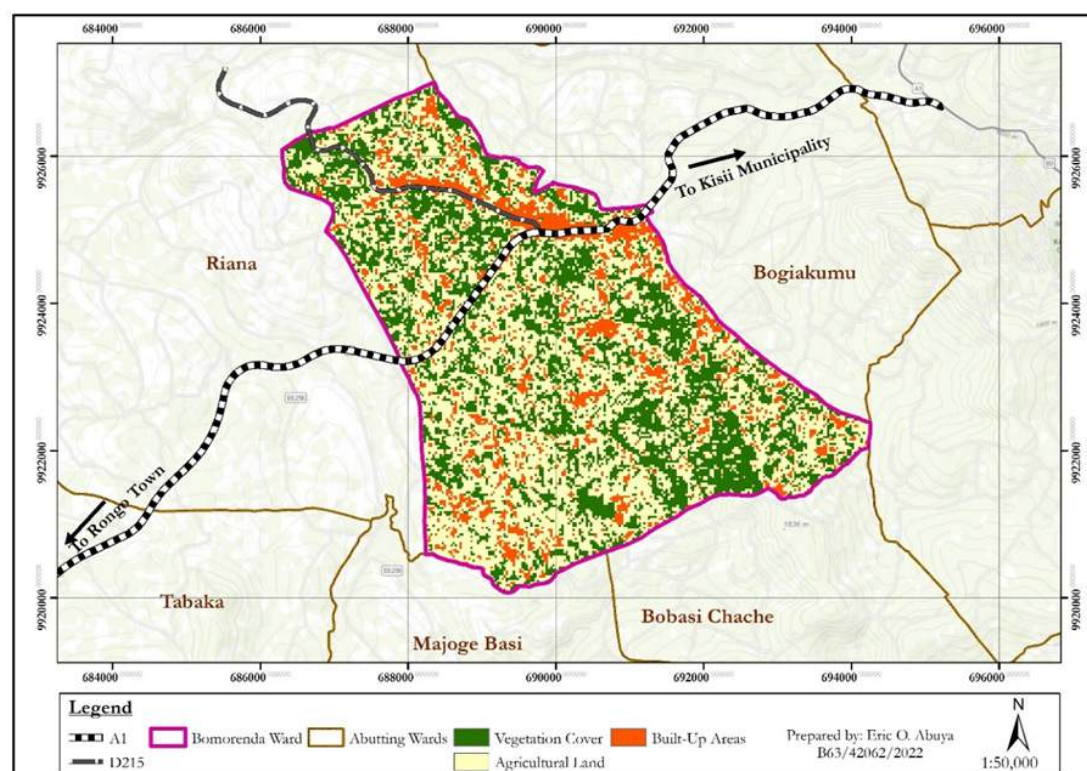
Key Factors Influencing Land Use Change

The findings established that land use change in Bomorenda Ward is mainly influenced by weak development control and prevailing land

tenure systems. These factors have accelerated land subdivision, unplanned developments, and conversion of agricultural land.

Lack of a Development Framework

The Ward's land use plan is obsolete and no longer effectively guides development. It also lacks development control guidelines required to

**FIGURE 7**

Land use and land cover distribution, 2003

Source: Author's Landsat image analysis, 2026

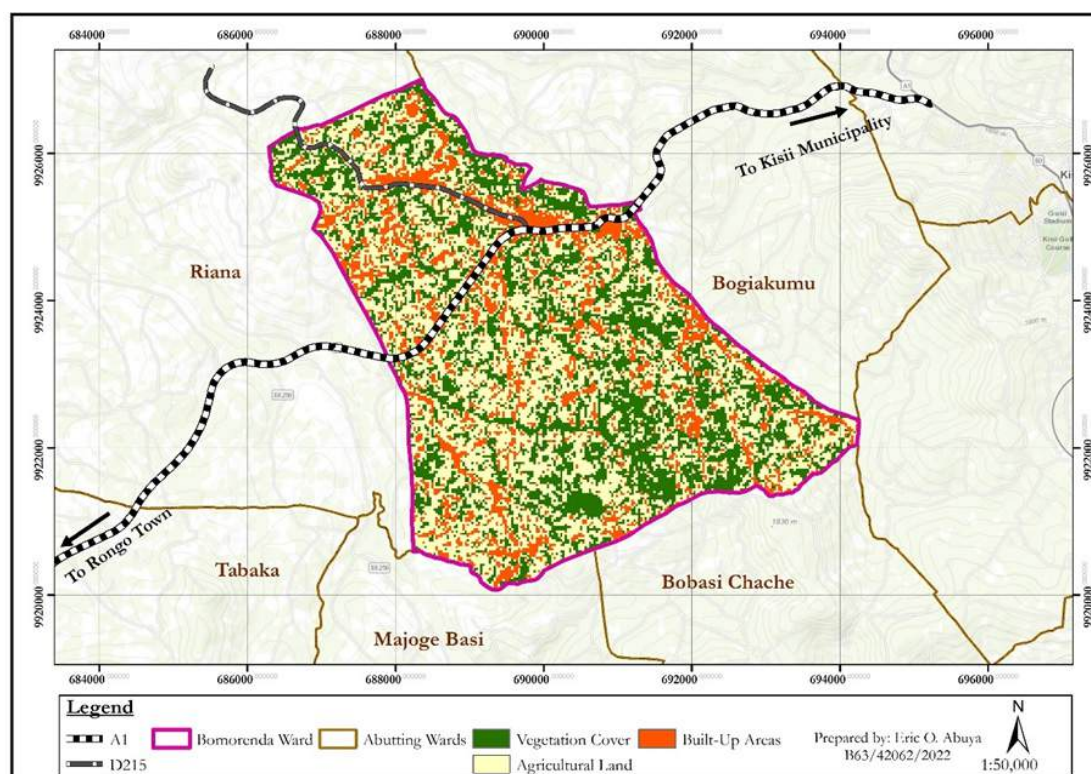


FIGURE 8

Land use and land cover distribution, 2013

Source: Author's Landsat image analysis, 2026

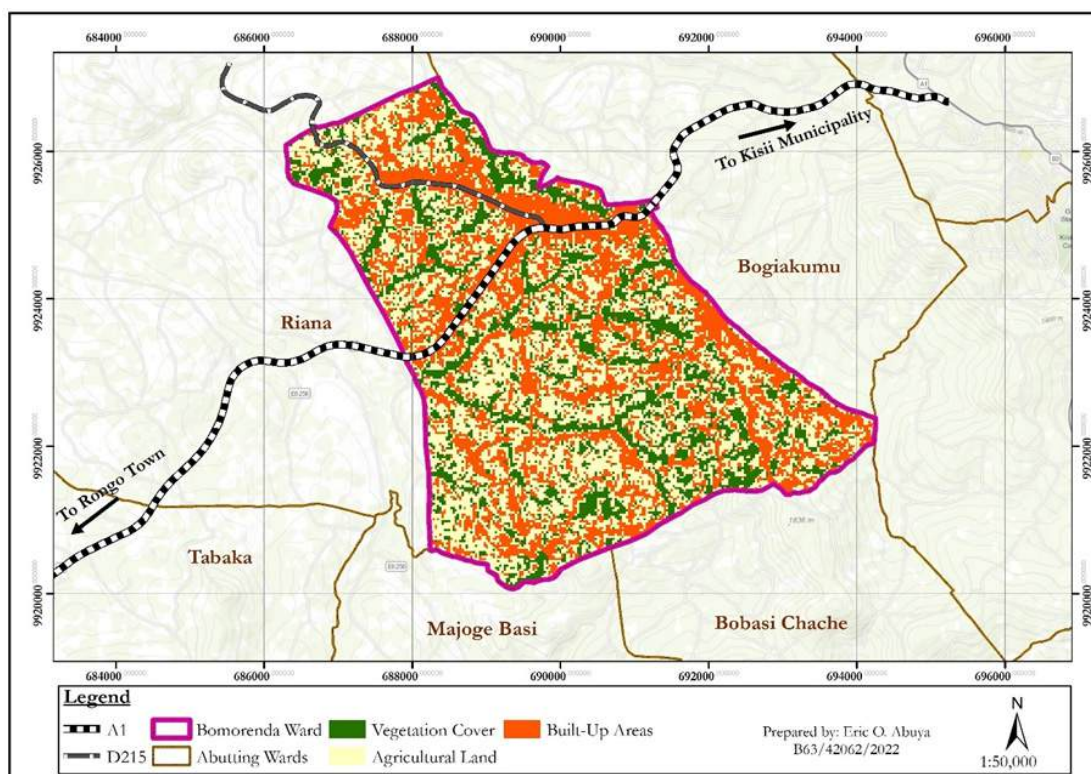


FIGURE 9

Land use and land cover distribution, 2023

Source: Author's Landsat image analysis, 2026

regulate developments. Although the Physical and Land Use Planning Act (PLUPA, 2019) requires developers to obtain development permission before construction, household findings showed that 59% of respondents had not sought approvals, while 41% had complied. Failure to seek approvals was attributed to lack of awareness (46.67%), high approval fees (37.72%), lengthy approval processes (13.33%), and weak enforcement (2.28%).

Most respondents were unfamiliar with the legal requirements and approval procedures, while others cited professional and approval costs as unaffordable. Inadequate planning personnel and lengthy approval procedures also encouraged commencement of developments without formal permission. **Figure 10** presents the main challenges experienced in obtaining development approvals.

Random inspections by the enforcement department occasionally resulted in regularisation of completed developments, mainly within commercial areas. Common applications included change of user, extension of use, and building plan approvals. Development applications were verified by the County Planner before circulation to relevant technical departments for comments and eventual approval. However, these procedures were frequently bypassed, while illegal land subdivisions and amalgamations further contributed to haphazard land use change.

Land Tenure Systems

Urbanisation, population growth, and existing land tenure systems have also influenced land use change within the Ward. Suneka Town continues

to expand into the surrounding peri-urban and rural areas, increasing competition for the limited land resource. The Ward comprises approximately 95% private land and 5% public land.

Among surveyed households, 78% owned land under freehold tenure, 4% under leasehold, while 14% reported not owning any land. Cultural inheritance practices, whereby parents subdivide land among their children, have accelerated land fragmentation. Respondents also reported frequent succession and subdivision disputes handled by the Chief's office, indicating persistent land governance challenges. **Table 4** summarises the land tenure characteristics, while **Figure 11** illustrates the land acquisition categories.

Impacts of Land Use Change

Land Fragmentation

Land fragmentation emerged as the most significant impact of land use change. Uneconomical land holdings dominated the Ward, with 25.3% of households owning one acre, 19.0% owning 0.5 acres, and 16.5% owning less than 0.5 acres. Only 2.5% owned more than two acres. **Figure 12** presents the distribution of plot sizes.

Other impacts included unplanned developments, increasing land values along the Kisii–Migori–Isebania Highway, pressure on existing infrastructure, and encroachment into road reserves and riparian zones. Land fragmentation also contributed to landlessness, territorial disputes, and informal land transactions. Parents traditionally allocate land to their children

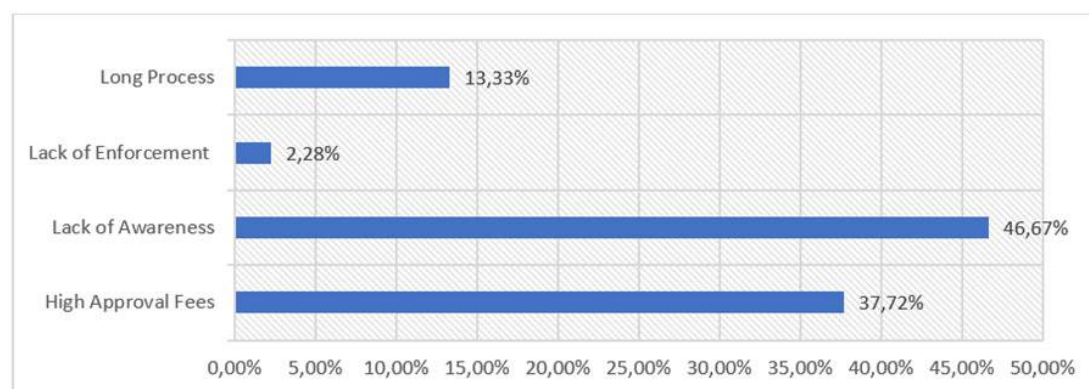


FIGURE 10

Challenges to obtaining development approvals

Source: Field survey, 2026

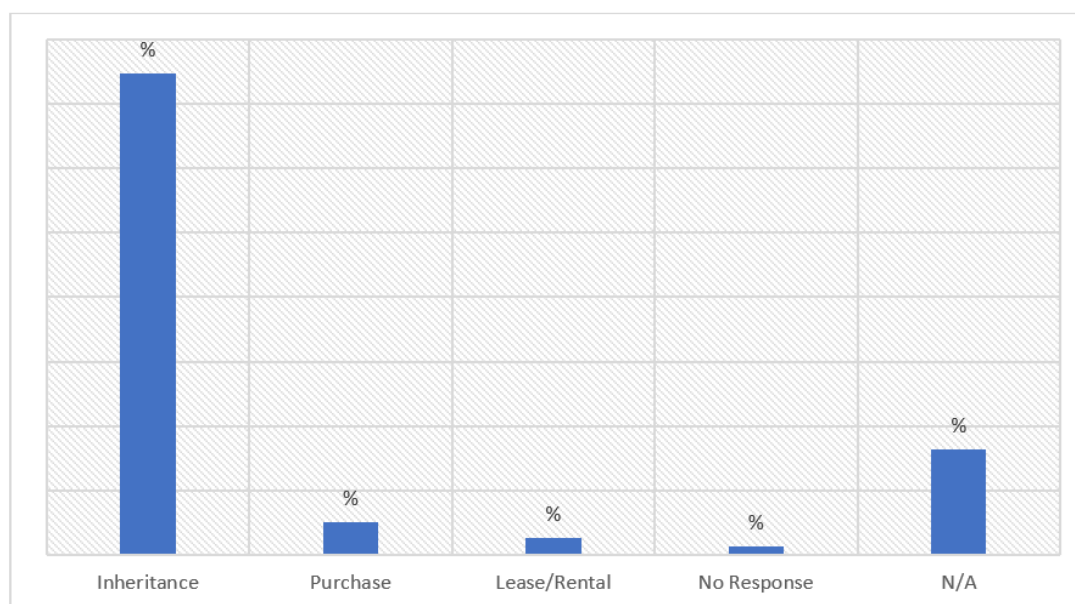


FIGURE 11
Land acquisition categories
Source: Field survey, 2026

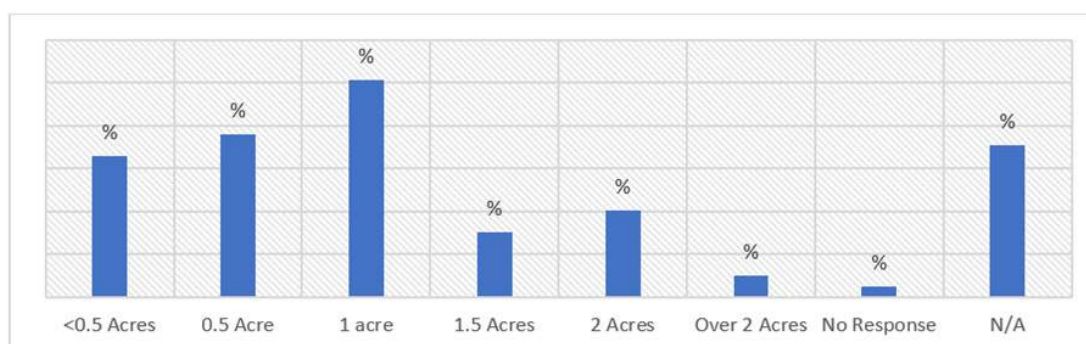


FIGURE 12
Distribution of plot sizes
Source: Field survey, 2026

for settlement, often resulting in scattered developments across the Ward. **Figure 13** summarises the major effects of land use change.

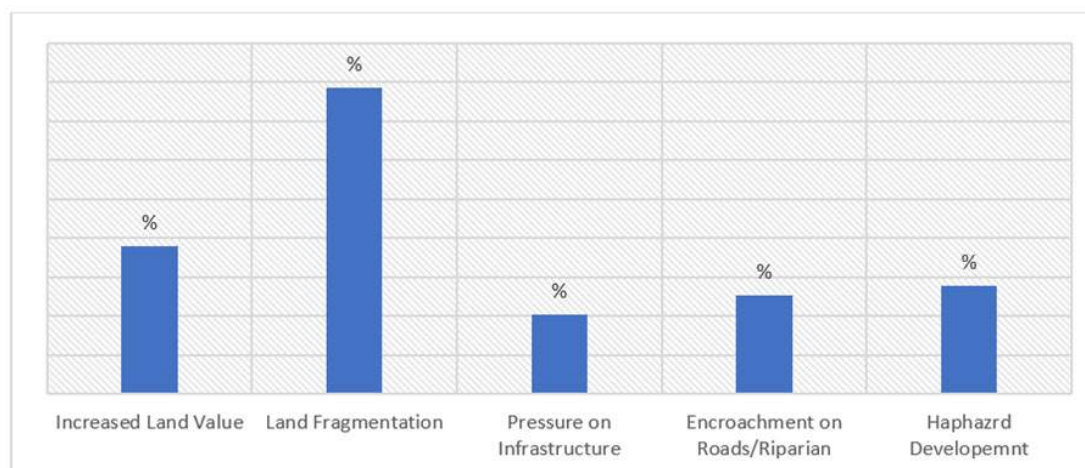
Low Productivity

Land fragmentation was associated with over-cultivation and mixed cropping to maximise production from the available land. Household farming practices varied, with 38.0% practicing crop farming, 30.4% mixed farming, 12.7% livestock keeping only, and 6.0% dairy farming only. Mixed farming included crop farming, poultry keeping (6.3%), and dairy farming (1.3%). About 8.9% of respondents did not practice farming, while 3.8% gave no response.

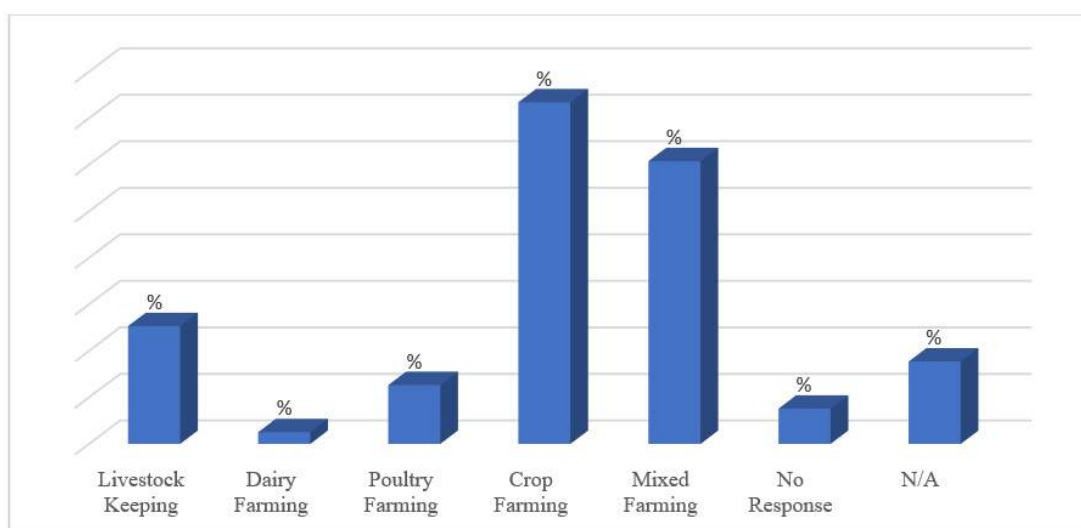
Respondents reported that the current production was insufficient for both subsistence and commercial purposes, particularly among larger households. **Figure 14** presents the distribution of agricultural practices.

Increased and Haphazard Built-Up Areas

The field survey established that linear, dispersed, and clustered settlement patterns exist within the Ward. Dispersed settlements dominate the rural hinterlands, linear developments occur along major transport corridors, while clustered developments are concentrated within the Suneka urban node. The predominant house typologies included bungalows in the rural hinterlands,

**FIGURE 13**

Major effects of land use change

Source: Field survey, 2026**FIGURE 14**

Agricultural practices among surveyed households

Source: Field survey, 2026

maisonettes in peri-urban areas, and a mixture of flats, bungalows, and maisonettes within Suneka.

The survey further established haphazard developments, encroachment onto road and riparian reserves, and increasing built-up areas along transport corridors and commercial nodes. Access roads within the hinterlands ranged between 6 m and 8 m wide. **Figure 15** illustrates the settlement patterns observed in the Ward.

Inadequacies in Waste Management

The findings established that both solid and liquid waste management remain inadequate within the Ward. Although waste management is undertaken

by NEMA in collaboration with the County Department of Physical Planning, the Ward lacks a designated solid waste disposal site. Sewer reticulation mainly serves the Suneka urban node and its immediate surroundings, while the rural hinterlands largely depend on pit latrines. The field survey further established limited enforcement of existing waste management regulations by the responsible agencies.

Positive Development Impacts

Enhanced Accessibility and Connectivity

Household respondents reported that the expansion of the Kisii–Migori–Isebania Highway

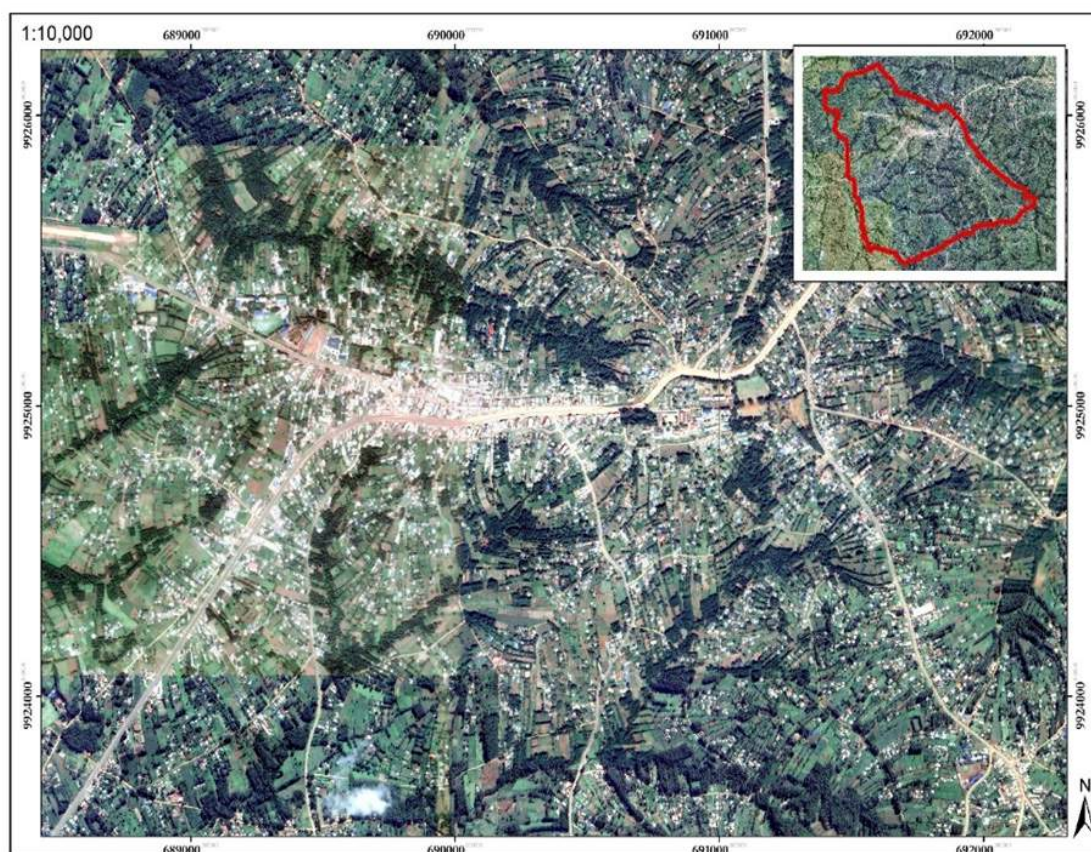


FIGURE 15
Settlement patterns within Bomorenda Ward
Source: Author and Google Earth, 2024

improved accessibility, particularly in Suneka, a satellite town within the County. The grading of access roads in the rural hinterlands also improved the movement of people and goods. Respondents further indicated that the improved road network enhanced transportation of farm produce to markets.

Enhanced Safety

Respondents reported that the installation of streetlights along major transport corridors improved safety for both motorists and pedestrians. The streetlights also supported commercial activities during the night.

Access to Healthcare

The findings established that Riotanchi Health Centre and Masongo Dispensary provide healthcare services to residents, particularly for minor illnesses and first aid before referral to higher-level health facilities. Respondents further reported that the graded and tarmacked roads improved access to emergency health services.

Employment Opportunities

The field survey established that the expansion (dualisation) of the Kisii–Migori–Isebania Highway provided temporary employment opportunities for youth and middle-aged residents. Respondents also identified the presence of primary and secondary schools as important public facilities within the Ward.

DISCUSSION

Interventions to Identified Challenges

Households, key informants, and FGD participants proposed several measures to address the development challenges identified in Bomorenda Ward. These findings are generally consistent with previous studies that advocate for integrated land use planning, stronger development control, and sustainable rural land management.

Management of Land Fragmentation

Respondents considered one acre as the minimum economically viable land size for sustainable

agriculture. Households with less than one acre reported difficulties in sustaining agricultural production. Similar concerns regarding shrinking farm sizes and declining agricultural productivity have been reported by Atieno and Alumasa (2022). Respondents therefore emphasized regulating land subdivisions and consolidating fragmented land to enhance agricultural production and support infrastructure development (Table 4).

Land Governance and Conveyance

Household respondents and key informants emphasized the need for stronger collaboration between the community and government during planning and implementation. Such collaboration was considered important in improving accessibility, controlling illegal developments, and reducing informal land subdivisions. These findings support Meyer (2014), who emphasized stakeholder participation and coordinated governance in achieving sustainable rural development. Respondents further noted that physical planning, survey, and lands departments should work together to strengthen development control, while built environment professionals should enhance public awareness and promote compliance with planning standards.

Environmental Issues

Respondents proposed afforestation and reforestation, particularly through planting indigenous and fruit trees, to restore environmental quality. The government initiative of planting

two trees for every tree cut was also supported. Restoration of riparian reserves, environmental awareness, and adoption of renewable energy sources such as biogas for cooking and lighting and also solar energy were viewed as practical measures for reducing deforestation and mitigating climate change. These findings are consistent with studies highlighting environmental conservation as a key component of sustainable rural development.

Further measures included undertaking Environmental Impact Assessments (EIAs) and Environmental Audits, constructing water pans for irrigation and erosion control, and improving solid waste management through recycling and waste segregation, particularly within Suneka urban centre.

Rural Land Use Measures

Respondents proposed preparation of comprehensive zoning plans to guide residential, commercial, and agricultural development and manage the expansion of Suneka town into the surrounding rural areas. Similar recommendations have been advanced by Berke et al. (2006), who advocates for integrated spatial planning to protect agricultural land and manage urban expansion. Respondents also proposed establishment of urban growth boundaries and green belts, integrating recreational land uses, promoting compact development, and encouraging densification in areas with uneconomical land sizes.

TABLE 4

Proposed minimum land sizes for economically viable agriculture

Proposed Land Sizes	Frequency	Percent	Valid Percent
1 Acre	22	27.8	28.9
2 Acres	15	19.0	19.7
3 Acres	11	13.9	14.5
4 Acres	7	8.9	9.2
5 Acres	3	3.8	3.9
No Response	4	5.1	5.3
N/A	14	17.7	18.4
Total	76	96.2	100.0
Missing	3	3.8	
Overall Total	79	100.0	

Source: Field Survey, 2026

Infrastructure upgrading, including roads, walkways, water supply, electricity, sewerage, solid waste facilities and non-motorised transport facilities, was identified as necessary to support compact development. Regular development inspections, enforcement of planning regulations, and penalties for non-compliant developments were also recommended.

Finally, respondents emphasized the need for preparation and periodic review of comprehensive rural land use plans in accordance with the Physical and Land Use Planning Act (PLUPA, 2019). They further recommended strengthening stakeholder participation throughout the planning process to enhance inclusivity, reduce land use conflicts, and promote sustainable rural development.

CONCLUSION

The study established that agricultural land declined significantly by 26.82%, falling from 62.50% to 35.68%, while built-up areas expanded by 30.39%, increasing from 14.75% to 45.14% between 2003 and 2023. The main factors influencing land use change in the Ward were population growth, the sprawl of Kisii Municipality, unplanned development, and land fragmentation. The impacts of land use change on rural development include food insecurity, land conflicts, landlessness (14%), and loss of livelihoods, leading to increasing poverty.

The findings further show that rural land in the Ward is increasingly being converted to competing urban land uses. The expansion of Kisii Municipality continues to influence the growth of Suneka Town, an urban node within Bomorenda Ward, thereby shaping development across the Ward. There is therefore a need for a comprehensive land use plan to balance urban growth and rural development while promoting agricultural productivity, infrastructure development, commercial activities, and sustainable livelihoods.

The study concludes that sustainable management of land use change requires the preparation and implementation of a comprehensive land use plan, supported by clear development guidelines, strengthened institutional, personnel and financial capacity, and effective enforcement of planning regulations. These measures are expected to promote orderly development and sustainable

rural development.

RECOMMENDATIONS

The study recommends the following:

Determine a minimum economically viable agricultural land size for Bomorenda Ward through wider stakeholder consultation. While 27.8% of respondents proposed one acre, 19% proposed two acres, and 13.9% proposed three acres, 8.9% proposed 4 acres and 3.8% proposed five acres, giving a median of 2.0 acres. This study recommends 2.0 acres as the minimum economically viable size for agriculture in the Ward. This would accommodate one acre of cash crops (coffee, tea, bananas, avocado, maize, and vegetables), 0.5 acre for dairy farming (Napier grass), 0.25 acre for subsistence food production, 0.125 acre for the homestead, and 0.125 acre for tree planting to support climate mitigation.

Create an agricultural intensification fund to enhance agricultural productivity to optimal levels for all farmers.

Regulate land subdivision: Establish the minimum agricultural land size through legislation and prohibit informal land subdivisions to preserve agricultural land, enhance food security, and sustain rural livelihoods.

Prepare and implement a comprehensive land use plan that recognises the rural character of Bomorenda Ward while promoting compact mixed-use development in appropriate urban centres to optimise the use of the available land. The Plan should establish urban boundaries and designate residential and agricultural zones to avoid urban sprawling and preserve agricultural land.

Develop decent housing in the urban centres of the Ward and promote planned rural-urban migration into designated urban centres within the Ward.

Strengthen trade and non-farm economic activities through provision of business enhancement funds to reduce pressure on agricultural land.

Promote value-addition agro-cottage-industries for major agricultural enterprises, including milk cooling and processing plants (pasteurised milk,

yoghurt, mala, cheese, ghee, butter) tea and coffee factories, maize milling, and banana and avocado processing, to enhance household incomes and strengthen the local economy.

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