

**LAND SIZE AND LAND USE FOR SUSTAINABLE LIVELIHOOD SECURITY IN  
COFFEE GROWING ZONES; THE CASE OF KIGANJO SUB-LOCATION,  
GATUNDU SOUTH SUB-COUNTY, KIAMBU COUNTY.**

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Award of The Master of Arts Degree in Planning.**

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**DECLARATION**

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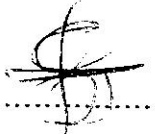
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## ABSTRACT

Subdivision of agricultural land is perceived to be a threat to food and livelihoods security in Kenya. It has been related to the decline of the coffee sector in Kenya, which has provoked discussion surrounding possible causes and solutions for a turn-around of the sector. This study examined the relationship between coffee production and the continuous subdivision of agricultural land in the coffee growing area of Kiganjo sub-location. The specific objectives of this study included examining four factors; inter-generational household land size change; current land uses and livelihood diversification strategies and their respective financial returns at household level, and; planning interventions that can ensure sustainable food and livelihood security in the coffee farming sector. Cross sectional research design method was used. The target population was coffee farmers in Kiganjo sub-location, and coffee sector key informants in the county. The existing ten villages in the sub-location were treated as a geographical cluster. Ten coffee farmers were sampled randomly from each cluster. Key informants were sampled purposively from the sector, and face to face interviews were conducted with 97 coffee farmers using a household questionnaire. Three focus group discussions with women, men and youth were held in the sub-location, and five key informant interviews conducted. The findings revealed that intergenerational household land size changed by 75% from 3.89 to 0.97 Ha from generation one to generation two. The same changed by 76% from 0.97 to 0.23 Ha from generation two to generation three. The change from generation one to three (grandfather to grandson) is 94% which is 3.89 Ha to 0.23 Ha. The current land uses were identified as coffee, dairy, avocado, macadamia nut, arrow root, banana, tree, poultry, maize and bean farming. Of these, coffee had the highest returns because of the relatively larger land size allocated to its production. The household livelihood diversification strategies included income from rental units, income from motorcycle taxi, employment, business enterprises, shop, pension funds, and financial remittances from relatives. Possible planning interventions from literature review and the field survey are as follows: i) formulating and enforcing a minimum household land size for coffee production of between 0.2 Ha and 0.5 Ha per household, ii) establishment of a land banking program where the government can lease or acquire idle land that can be used for coffee cultivation. Other measures include iii) adopting of long term (e.g. 25-50 years) land leasing for coffee cultivation as opposed to freehold land ownership, iv) promoting voluntary land pooling among brothers and neighbors guided by the minimum land size for coffee production, v) promoting mixed farming of cash crop, food crop and livestock for diversification. These measures can be complemented with vi) adoption of urban-based nucleated human settlement patterns instead of the current scattered rural settlements in order to release land for agriculture, and vii) encouraging co-operative based extension and marketing services to guarantee optimal productivity and reliable markets for farm produce. The study recommends further research to determine i) the economic viability of long-term leasing of land rather than freehold land ownership for coffee farmers, ii) the implementation of 2010 constitutional provision that give women and men equal rights to inheritance of family land; and finally iii) determination of (minimum) household land sizes for food, cash incomes and secure livelihoods in Kiganjo sub-location in consultation with the people.

## **DEDICATION**

This thesis is dedicated to:

My husband; for unwavering support and inspiration throughout the writing of this thesis.

My father; for encouragement to pursue Urban and Physical Planning.

My mother, siblings and nephew; for continual prayers and encouragement to finish.

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## **ABBREVIATIONS AND ACRONYMS**

ACZ	Agro-climatic Zone
AEZ	Agro-ecological Zone
AFA	Agriculture and Food Authority
CSA	County Statistical Abstract
DfID	Department for International Development
FAO	Food and Agricultural Organisation
GDP	Gross Domestic Product
GOK	Government of Kenya
ICO	International Coffee Organisation
IR	Inverse Relationship
KASLMP	Kenya Agricultural Productivity and Sustainable Land Management Project
CIDP	County Integrated Development Plan
KIHBS	Kenya Integrated Household Budget Survey
KNBS	Kenya National Bureau of Statistics
NCE	Nairobi Coffee Exchange
NLUP	National Land Use Policy
NR	New Ruralism
NSP	National Spatial Plan
PHC	Population and Housing Census
SDG	Sustainable Development Goal
SPSS	Statistical Packages for Social Sciences
WCED	World Commission on Environment and Development
WDI	World Development Indicators

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# 1 Chapter One: Introduction

Since the beginning of humankind, people have depended on agricultural activity for food security, and sustainable livelihoods through land-based economic activities.

The importance of land in the national economy was articulated in Sessional Paper No. 3 of 2009 on National Land Policy, stating thus:

- (a) Land is an economic resource that should be managed productively;
- (b) Land is a significant resource to which members of society should have equitable access for livelihood;
- (c) Land is a finite resource that should be utilized sustainably; and
- (d) Land is a cultural heritage which should be conserved for future generations.

Further, the Ministry of Lands and Physical Planning in its National Spatial Plan 2015-2045 found that “virtually the entire Kenyan territory is capable of supporting livelihoods”, subject to the capacity within which an area is located according to its Agro-Ecological Zone (AEZ) (Ministry of Lands and Physical Planning [MOLPP], 2015). An agro-ecological zone is ‘a land unit, carved out of a climatic zone, correlated with landforms, climate and the length of growing period, which refers to the number of days available for crop growth with suitable conditions’ (Balasubramanian, 2017). Naturally, there is a correlation between rich agricultural land and population size. In Kenya, the area demarcated as AEZ II, a high potential zone, and which covers an area of approximately 53,000 sq. km or 9.3% of total land mass also carries the highest population density of over 2,000 persons per sq. km (Infonet Biovision, 2018), a pointer to the interdependence of both populations and livelihoods on agricultural productivity.

According to the *Land Degradation Assessment in Kenya* (2016) report, Kenya's agriculture is predominantly small-scale farming and production is carried out on farms averaging 0.2–3 ha. Further, the farmer is characterised as one who produces a mix of cash and food crops with over 70% maize, 65% coffee, as is the case in the study area, whilst also growing a diverse range of food crops on the same holding for his or her own household consumption.

### **1.1 Background to the problem**

The Republic of Kenya covers an area of approximately 582,646 sq. km. comprising 97.8% land and 2.2% water surface. 20% of the said land is classified as medium to high potential and therefore suitable for agricultural development and productivity. According to the National Bureau of Statistics in their 2019 population and housing census, Kenya's population stood at 47,564,296; and of that population, 13.5%, (6,400,000) people practise agriculture. Sessional Paper No. 1 of 2017 on National Land Use Policy notes that

In the rural areas, the high to medium potential zones are dominated by millions of small farm holdings. In some cases, insecure land-tenure systems have led to low investment in land improvement and productivity. Many smallholder areas are suffering continuous fragmentation of holdings into uneconomic sizes, and farms are getting smaller in the high rainfall areas and in the drier zones as a result of lack of a law prescribing minimum and maximum land holdings for different land uses in Kenya.

Agriculture is important to Kenya; it contributes approximately 24.5% to the country's Gross Domestic Product (GDP) and provides a livelihood for over 80%, or about sixteen million smallholder farmers carrying out different agricultural activities.

The *Sector Plan for Land Reforms* identifies sustainable land use as a great challenge to national development. It further notes that population growth especially in high potential

areas has exerted a lot of pressure on land leading to continuous subdivision of agricultural land into uneconomical units, as well as the conversion of arable land to other commercial ventures. Formulation of appropriate policies and legislations to ensure agricultural land in high potential areas is not sub-divided further and the adoption of smart growth planning are some future solutions envisioned (Sector Plan for Land Reforms 2013-2017).

## **1.2 Problem Statement**

In its *Sector Plan for Agriculture Second Medium Term Plan 2013-2017*, the Ministry of Agriculture, Livestock and Fisheries acknowledged that among emerging issues the nation was facing included the conversion of agricultural land to other competing land uses. This effect has been felt among coffee farmers in Kiambu County, the subject of this study, as will be discussed in the section below.

Coffee is listed as an industrial crop grown by smallholder farmers in the country, the main variety being Arabica. However, there has been a steady decline in production and export of coffee. Statistics from the International Coffee Organisation show that in the year 2000 Kenya exported 1,328,000 (60kg) bags of coffee. By the year 2008 the number of bags had dropped to less than half, (608,000 bags), and in the coffee year 2017/2018 the number of exported (60kg) coffee bags was 740,000.

Locally among smallholder farmers, the area under coffee as well is steadily decreasing. A study by the Agriculture and Food Authority under the Ministry of Agriculture, Livestock, Fisheries and Corporatives, shows that between 2008 and 2015, the area under coffee declined from 122,040 Ha to 87,433 Ha, (28% drop), with production at 22,260 metric tonnes and 27,230 metric tonnes respectively.

A closer look at Kiambu County reveals that the average holding size of land is approximately 0.36 Ha on small scale. The small land holdings are mostly found in upper

parts of Gatundu North, Gatundu South, Kiambaa, Limuru and Kikuyu constituencies. However, fragmentation of land has made it uneconomical for agriculture and hence a majority of farmers are opting to convert their farms into residential plots to supplement the meagre income earned from the farming (Kiambu County Integrated Development Plan 2018-2022).

In Kiambu County, the area under coffee against the quantity of coffee produced has also been affected. In the coffee year 2015/2016 the area under coffee recorded by co-operatives was 10,830 Ha with a production of 12,793 metric tonnes. However, in the coffee year 2016/2017 the area under coffee was 10,520 Ha, producing 10,911 metric tonnes of coffee (Agriculture and Food Authority, 2016).

In their publication titled *Drivers of Agricultural Land Subdivision in Drylands of Kenya: A Case of Kajiado County*, Museleku, Kimani, Mwangi and Syagga (2018) found agricultural land inheritance practices to be the most significant driver of agricultural land subdivisions in their study area. Similar research findings include Mburu (2009) who found that the practise of land inheritance was a key driver of agricultural land subdivision in Gatundu District. Thuo (2013) also established land inheritance to be an important driver of agricultural land subdivision in Kiambu County. Similarly, the Kenya draft National Land Use Policy (NLUP) and National Spatial Plan (NSP) have both identified land inheritance to be an important driver of subdivision of agricultural land (Government of Kenya, 2016). The evidence therefore suggests that the cultural practise of inheritance is a significant factor in the issue of land subdivision. When sub-division of land is uncontrolled, it manifests a situation where land sizes are uneconomical to sustain livelihoods, and therein lies the problem. However, there is no study that has documented the exact land size change from one generation to the other through land inheritance within the coffee growing zone. In addition, there is no information that gives the exact size of land that can sustain a full-time coffee farmer in the

rural areas. While documenting the diminishing land size, the literature reviewed has not given options for sustaining a minimum land size. This study seeks to understand the dynamic relationship between land size and sustainable livelihoods among coffee farmers in Kiganjo Sub-Location of Gatundu South Sub-County, by observing the trend in land size change as a result of inheritance, implications of land subdivision on coffee production, and sustainability of livelihoods through diversification strategies.

### **1.3 Research Questions**

- i. How has household land size changed inter-generationally for coffee farmers in Kiganjo sub-location, Gatundu South sub-county?
- ii. What are the existing household land uses and their respective financial returns in the study area?
- iii. What are the current household livelihood diversification strategies and their respective financial returns in the study area?
- iv. What land-use planning interventions can ensure sustainable rural livelihoods in the study area?

### **1.4 Research Objectives**

- i. To determine the inter-generational household land size change in the study area.
- ii. To establish the existing rural land uses at household level and their respective financial returns in the study area.
- iii. To examine the current household livelihood diversification strategies and their respective financial returns in the study area.
- iv. To propose land use planning interventions that would ensure sustainable rural livelihoods in the study area.

## **1.5 Geographical and Theoretical Scope**

The geographical scope of this study covers Kiganjo Sub-Location in Gatundu South Sub-County, Kiambu County. The study area has a population of approximately 28,745 people, and covers an area of 56.8 sq. km (KNBS, 2019). The theoretical scope of this study covers household land size, household land use, sustainable livelihoods, livelihood diversification, and rural planning interventions in coffee growing areas.

## **1.6 Justification and Significance of the Study**

Since the introduction of coffee to Kenya in 1893, Kenya coffee has contributed significantly to global production, to foreign exchange earnings locally, as well as to the livelihood of the small-scale farmer. The factors that have contributed to good productivity include rich volcanic soils, favourable altitude ranges, conducive temperatures, as well as predictable rainfall patterns.

In terms of global production, in the year 2016 Kenya earned Kshs. 14.9 billion from sale of coffee at the Nairobi Coffee Exchange, and this rose to Kshs. 15.9 billion in the year 2017 (NCE: Coffee earnings, 2018).

According to coffee farmers in the study area, one acre of land can hold between five hundred (500), and five hundred and forty (540) coffee trees; each tree producing an average of five (5) kilogrammes of coffee beans. The buying price of one kilogramme of coffee beans in March 2019 was fifty Kenya shillings (Kshs. 50/=). A coffee farmer therefore will earn approximately Kenya shillings one hundred and twenty-five thousand (Kshs. 125,000/=) from each of the two harvesting seasons annually.

According to a report titled 'Assessing Coffee Farmer Household Income' by True Price, within the East Africa region, Kenya has the highest average yield of kilogram dried cherry per hectare (kg/ha) at 1.959, the highest average yield in kilogram of green coffee per hectare

(kg/ha) at 980, the highest average yield in kilogram of parchment per hectare (kg/ha) at 1.224, and the highest average total sales in United States dollars per farm, at 1.608 (Fobelets, Rusman, de Groot Ruiz, p.15)

The above situation is threatened by the continued fragmentation of land, which this study seeks to document, as well as propose interventions to address the same. The Government, in an effort to tame uncontrolled subdivision of land, discussed and tabled sessional paper No. 3 of 2009. Among its recommendations were that:

The Government shall ensure all sub-divisions of land are tied to land use sizes specified for different ecological zones. To facilitate the attainment of this objective, the Government shall:

- (a) Put in place a system to determine economically viable minimum land sizes for various zones; and
- (b) Promote conformity to land subdivisions with the set minimum economically viable land sizes.

To ensure that all land is utilized productively, the Government shall periodically commission field surveys on land holdings to determine levels of utilization with a view to ensuring that the use is economic and optimal.

To date the above objectives have not been met and minimum land sizes have not been recommended by government, despite the continued practise of land sub-division. The significance of this study therefore is that it will contribute to the body of knowledge on household land size for coffee farmers, and propose recommendations that support sustainable livelihoods for coffee farmers.



## **2 Chapter Two: Literature Review**

### **2.1 Introduction**

This chapter will present theories that address households, land size, land use, sustainable livelihoods, livelihood diversification, and rural planning. Case studies will be discussed, and policies and legislation highlighted, and finally the conceptual framework will provide an overview of the interaction of the mentioned ideas.

#### *2.1.1 Household*

According to KNBS population and housing census, 2009, a household is a person or group of persons who reside in the same homestead/compound but not necessarily in the same dwelling unit, have same cooking arrangement, and are answerable to the same household head.

#### *2.1.2 Agricultural Land*

The Crops Act No. 16 of 2003 defines agricultural land as “all land which is used for the purpose of agriculture, not being land which, under any law relating to town and country planning, is proposed for use for purposes other than agriculture”. According to the World Development Indicators (2014), Kenya’s agricultural land, as a percentage of total land area in 2009, was 48.23%, or approximately 281,010 sq. km. The permanent cropland as a percentage of land area was 1.14%, or approximately 6,642 sq. km.

## 2.2 Land Size

### 2.2.1 Minimum land size

In 2015, a debate arose in Kenya's national assembly in the form of the Minimum and Maximum Land Holding Acreage Bill, 2015. The Bill recommended a number of parameters to be used to determine minimum and maximum land sizes. Among them were;

- (a) Ecological zones;
- (b) Demographic factors;
- (c) Land use and physical planning standards;
- (d) Land tenure system and economic factors;
- (e) Cultural and customary practices;
- (f) Infrastructure, public health and public order;
- (g) Any other factor relevant to national strategic interests.

The ecological factors used to determine land size were agro-climatic zones (ACZ), and Kiambu was split into two agro-climatic zones, namely zone I-III; high rainfall areas which are medium to high potential productive areas, and Zone IV, which is semi-humid. The table below illustrates the minimum and maximum land size allocations for Kiambu as proposed in the Bill.

<b>Kiambu</b>	<b>ACZ</b>	<b>% of Land Mass Under This Zone</b>	<b>Minimum (Acres)</b>	<b>Maximum (Acres)</b>
	I-III	73	1	10
	IV	17	1.5	15

**Table 1: Proposed Minimum and Maximum Land Sizes; Minimum and Maximum Land Holding Acreage Bill, 2015**

In hectares, Zone I-III would have a minimum of 0.405 and maximum of 4.05Ha, and zone IV would have a minimum and maximum of 0.61 and 6.07 Ha respectively.

### *2.2.2 The Inverse farm size - productivity relationship (IR)*

The debate on farm size and productivity relationship intensified, when Sen (1962, 1966) observed inverse relationship between farm size and output per hectare in Indian agriculture, suggesting that small farms are more productive compared to large ones. This relationship is explained by the relative advantage of using more family labour by small farms that may reduce the monitoring and supervision costs of hired labour. These findings show that equity does matter for efficiency in the agricultural sector, and raise the question of redistributive land reform in most agrarian countries. Since then, a lot of empirical studies have re-examined the problem from different angles using various statistical techniques in order to test Sen's finding, and inverse relationship (IR) has been perceived as a "stylized fact" of rural development.

Several economists put their views that the IR remains valid for traditional agriculture. As a result, small farms in most developing countries were perceived as more efficient than large farms before the 1980s. On the other hand, rapid technological changes and the expansion of commercial farming have changed the perception of efficiency toward small farms, suggesting that the IR diminished when the agricultural sector moved towards modernisation through the adoption of more capital-intensive technology (Thapa, 2007).

## **2.3 Land use**

### *2.3.1 Definitions and Categories*

Land use refers to the activities to which land is subjected to and is often determined by; economic returns, socio-cultural practices, ecological zones and public policies. In the context of the national land policy, land use is defined as the economic and cultural activities practiced on the land (Sessional Paper No.1 of 2017).

The following table indicates the various land use categories in Kenya:

Estimated area under major land uses, 1995

Land-use category	Area ('000')	Percent of total
Crop (with intensive livestock) production	9,379.1	15.78
Livestock production	33,486.2	56.34
Forest and woodlands	3,082.7	5.19
National parks and reserves (protected areas)	4,389.9	7.31
Settlement and associated land uses	46.6	0.08
Others (water bodies, sparsely vegetated)	9,099.325	15.31
<b>Total</b>	<b>59,450.8</b>	<b>100</b>

Source: CBS Statistical Abstract, 1995

**Table 2: Estimated area under major land uses**

Land use can also be grouped into agro-ecological zones, each with its distinct characteristics based on soil, climate and land surface. The Food and Agriculture Organisation of the United Nations (FAO) defines its classification of zoning thus; ‘an agro-ecological zone is a land resource mapping unit, defined in terms of climate, landform and soils, and/or land cover, and having a specific range of potentials and constraints for land use’.

The table below indicates the seven agro-ecological zones each with its potential land use, for Kenya:

**Agro-ecological zones of Kenya**

Zone	Approximate Area (km <sup>2</sup> )	% Total
I. Agro-Alpine	800	0.1
II. High Potential	53,000	9.3
III. Medium Potential	53,000	9.3
IV. Semi-Arid	48,200	8.5
V. Arid	300,000	52.9
VI. Very arid	112,000	19.8
Rest (waters etc)	15,600	2.6

**Table 3: Agro-ecological zones of Kenya Source: Infonet Biovision (2018)**

The climatic conditions vis a vis agricultural production are as follows:

Zone I forms part of protected areas in Kenya as it is the source of rivers and streams, and is mainly mountainous, covering areas such as Mt. Kenya, and Mt. Elgon, consequently is not used for agricultural production. Zone II covers the highlands of Kenya and receives a minimum rainfall of 1000mm per year. Its altitude ranges between 1980 and 2700m above sea level, and is characterised by forest or open grassland. These areas include Meru, Embu, Kirinyaga, Nyeri, Kericho, Nyahururu, Kitale and Webuye, and their surrounding areas. These lands are rich for agricultural production. Zone III covers vast parts of Nyanza, Western, and Central areas, Central Rift Valley, as well as parts of the Coastal strip. The elevation ranges between 900-1800m above sea level, with rainfall between 950-1500mm. This area is the most significant for agricultural productivity, and is also the most densely populated by human settlements. Zone IV can be found at the same altitude as Zone III, however with less rainfall of between 500-1000mm per annum. It covers areas of Naivasha, Laikipia, Machakos, and parts of the central and southern Coast. Zone V is drier, receiving rainfall of between 300-600mm per annum, and is of lower elevations as well. It covers the areas of Baringo, Turkana, lower Makueni, and the North Eastern parts of Kenya. Zone VI is considered the driest part of Kenya, and is semi-desert. Its annual rainfall is between 200-400mm. The areas in this zone include Marsabit, Turkana, Mandera and Wajir. (Infonet Biovision, 2018).

### *2.3.2 Von Thunen's model of agricultural land use*

Von Thunen was a German who is credited with giving the world the widely known model on land use named after himself.

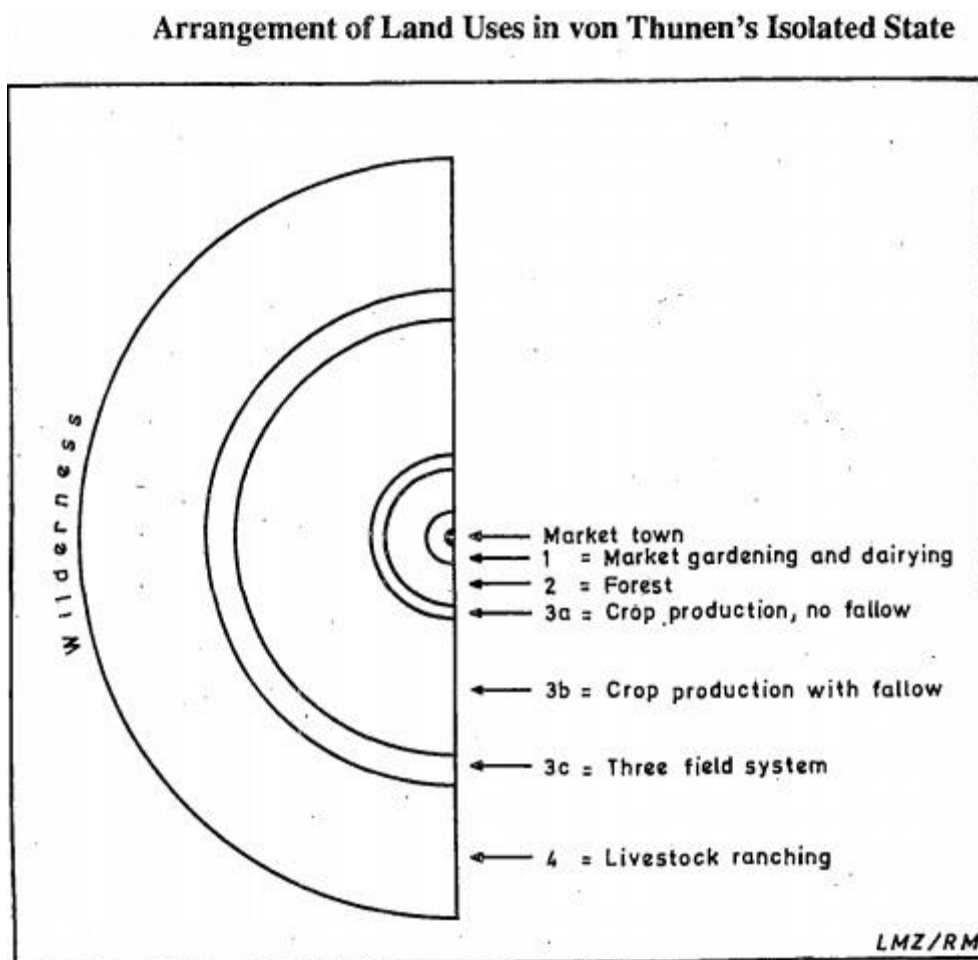
Zinyama (1989) records the history of Von Thunen:

Johann Heinrich von Thunen (1783-1850) was a wealthy German who farmed about 35 km from the market town of Rostock in Mecklenburg near the Baltic Sea on the north

German plain. Although not trained as a geographer, he showed remarkable ability in one of the essential geographical skills, namely the ability to observe and describe the spatial arrangement of phenomena. He bought his farm in 1810 and, for the next 40 years until his death in 1850, he meticulously recorded the costs and revenues and the patterns of land use on his estate. It was these records that provided the empirical basis of his land use theory.

Von Thunen saw land use as six concentric zones that represented distance from market, each concentric zone delineating a distance farther away from the market than the previous one.

The diagram below illustrates Von Thunen's concept.



**Figure 1: Von Thunen's model of agricultural land use**

The type of agriculture practiced in the first zone would be an agricultural activity that yielded high returns. The second zone marked as 'forest' was given priority close to market because in Von Thunen's time it was their source of energy, as well as a source of timber for building, which is now not the case what with technological advances in energy production and clean energy. The next three rings, 3a, 3b, and 3c conducted the same economic farming activity on a crop rotation basis, the main differences being intensity of land use, which decreased the farther one was from market, and the quota of land left fallow on any given year, with fallow land increasing as one moved outward. It was assumed in these three zones that the cash crop grown was rye, in his time. In Zone 4 the farmer economic activity revolved around animal products. Beyond this zone the wilderness was for future expansion.

#### **2.4 Sustainability theory**

In the Report of the World Commission on Environment and Development (1987, pg. 54), sustainable development is defined as

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two concepts: the concept of needs, in particular the essential needs of the world's poor, and the idea of limitations imposed by the state of technology and social organisation on the environment's ability to meet present and future needs.

The sustainability theory then provides an explanation for how human activity, in regard to natural resources, can be directed towards harnessing those resources around them to meet livelihood needs as well as improve one's standard of living, without the over exploitation of those resources to such an extent that they are depleted and rendered unproductive or unavailable for posterity.

The Department for International Development (DfID) describes the multifaceted approach to sustainability as having economic, environmental, social and institutional dimensions.

This is discussed below:

#### *2.4.1 Environmental Sustainability*

Environmental sustainability is achieved when the productivity of life-supporting natural resources is conserved or enhanced for future generations.

The Sustainable Development Goals (SDGs) address issues of environmental sustainability in at least seven goals, namely;

1. Goal 6: Clean water and sanitation. This goal aims to ensure universal access to safe and affordable drinking water for all, as well as protecting and restoring water-related ecosystems.
2. Goal 7: Affordable and clean energy. This goal encourages investment in solar, wind and thermal power, as well as improving energy productivity, expanding infrastructure and upgrading technology to provide clean and efficient energy.
3. Goal 11: Sustainable cities and communities. This goal aims to promote upgrading of slum settlements, as well as creating green public spaces within cities.
4. Responsible consumption and production. This goal seeks to improve efficiency in the disposal of toxic waste and pollutants, as well as encourage recycling and waste reduction.
5. Goal 13: Climate action. The aim of this goal is to invest in developing countries in the area of adaptation to climate change and low-carbon development.
6. Goal 14: Life below water. This goal aims to sustainably manage and protect marine and coastal ecosystems from pollution, and address impacts of ocean acidification.



7. Goal 15: Life on land. The aim of this goal is to conserve and restore terrestrial ecosystems, stop deforestation, and reduce the loss of natural habitats and biodiversity.

#### 2.4.2 *Economic Sustainability*

Economic sustainability is achieved when a given level of expenditure can be maintained over time. In the context of the livelihoods of the poor, economic sustainability is achieved if a baseline level of economic welfare can be achieved and sustained.

Within economic frameworks, sustainability is often thought to be achieved if the wellbeing of society is maintained over time (Arrow et al. 2004; Pezzey 1992; Solow 1993; Toman 1998). Wellbeing is made possible by economic production (income), it includes household and environmental services and other non-market outcomes, such as social connectedness. In this context — where wellbeing is at least maintained over time — sustainability can be attained by preserving the total stock of capital. The stock of capital is broadly defined as the ‘productive’ base that provides the opportunities from which wellbeing is ultimately derived. It includes all of society’s capital assets including those produced (such as roads, buildings, and machinery), natural ones (such as ecosystems, minerals, and fossil fuels), human capital (such as education, skills, knowledge, and health) and social capital (such as institutions and relationships that govern interactions between people). People value natural capital for the services it provides, including the benefit from knowing that certain natural capital exists (‘existence’ or ‘non-use’ value).

Interpreting sustainability as requiring that wellbeing be at least maintained over time embodies concerns about intergenerational equity. In this context, each generation must make a decision regarding the amount of capital to consume now (for the benefit of the current generation) and how much capital to accumulate or preserve, including conservation of

natural capital, for the benefit of future generations. Solow (1993) referred to this decision as a ‘trade with posterity’ — where the current generation consumes some natural capital, but in exchange they save and invest in produced and human capital so that future generations inherit an equivalent or larger total stock of capital.

#### *2.4.3 Social Sustainability*

Social sustainability is achieved when social exclusion is minimised and social equity maximised. Social sustainability is a process for creating sustainable successful places that promote wellbeing, by understanding what people need from the places in which they live and work.

Social sustainability combines design of the physical realm with design of the social world – infrastructure to support social and cultural life, social amenities, and systems for citizen engagement and space for people and places to evolve (Woodcraft, 2011).

#### *2.4.4 Institutional Sustainability*

Institutional sustainability is achieved when prevailing structures and processes have the capacity to continue to perform their functions over the long term (DfID, 1999).

### **2.5 Livelihoods theory**

The theory of livelihoods begins with an understanding of its elementary constituent parts. In 1992, Chambers and Conway brought into the development lexicon the now widely accepted definition described below.

A livelihood comprises the capabilities, assets (both material and social resources) and activities for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks maintain or enhance its capabilities and assets, while not undermining the natural resource base.

Otolo and Wakhungu, (2013) further describe livelihood as the sum of ways in which households obtain necessities for life, both in good years and in bad. Those necessities include food, water, shelter, clothing and health care, with education also often included. The household is taken as the unit of reference because it is by far the chief unit, through which population anywhere operates for production, sharing of income and consumption. They have observed that market access and agro-ecology are two factors that affect household diversification strategies.

### *2.5.1 Resilience*

The idea of resilience is central to the sustainable livelihoods theory. Resilience has been described as ‘the capacity of a system to deal with change and continue to develop’, and has three key features: persistence, adaptability, and transformability (Folke, Rockstrom, Osterblom and Walker, 2009).

## **2.6 New Ruralism Theory**

New Ruralism (NR) is a growth framework which grafts preserved farmland and sustainable agricultural principles into contemporary development/planning. Sibella Kraus defines NR as the preservation and enhancement of urban edge, rural, agricultural areas to create a comprehensive stage for efficient and sustainable agrarian-based growth. Credit is given to William Ellis who coined the term in *The Futurist*, focusing initially on adapting rural land uses to post-industrial technological change. Proponents of contemporary NR adjusted the term’s connotation, referring more to sustainable growth in rural areas within urbanizing influences. It intertwines ideas embedded within multiple contemporary trends: Smart Growth, Agricultural Urbanism and New Urbanism (See Table).

An important component to creating NR development is establishing an apparatus to permanently conserve farmland as both food sources for urban regions and frameworks to appropriately locate new development.

Two characteristics typify NR: First, any rural area under development must establish an identity rooted in the economic, ecological, and cultural systems of the surrounding agricultural environment; and second, the primary use of the land should be dedicated to farming in small-to medium-scaled agricultural plots. Development-based objectives to achieve these principles include increased density, mixed-land uses and public environments that are accessible to residents and visitors from all segments of society

NR concentrates on preserving lands in rural areas at risk from suburbanization, environmental degradation, and deindustrialization

**Table 1.** Comparison of the Concepts of New Ruralism, New Urbanism, Smart Growth, and Agricultural Urbanism.

Category	New Ruralism	New Urbanism	Smart Growth	Agricultural Urbanism
Definition	The preservation and enhancement of urban edge rural areas that as indispensable elements to the economic, environmental and cultural vitality of cities and metropolitan regions	A model for organizing development in cities, towns, and villages that are compact, walkable, mixed-use, and transit-friendly and contain a diverse range of housing	Development that serves the economy, the community, and the environment	A walkable urban form surrounded by large-scale food production
Etiology	The need for more sustainable development patterns at the metropolitan edge	changes in physical form are a necessary precondition for urban economic, social, and ecological change	Economic forces, consumer preferences, or misguided public policies	The need for more sustainable practices associated with local food production and better public health
Discipline Emphasis	Environmentalists	Architecture	Regionalists	Agrarianism
Goal	Sustaining rural areas	Sustaining urban areas	Sustaining regions	Sustaining regions
Environment	Agro-ecosystems	Cities	A range of neighborhoods	Urbanizing areas
Agricultural Typology	Small—medium size farms	Industrial agriculture	Mixed typologies	Large scale farm systems
Lifestyle	Rural lifestyle	Urban lifestyle	Urban or rural lifestyles	Urban lifestyle
Extension	Low density peripherals	High-density centers	Urbanizing regions	Urbanizing Regions
As Defined by Development	Increased density, suburban lots organized around agricultural preserves	Compact urban development supported by multi-modal transportation services	Large-scale planning mechanisms promoting clustered development and open space preservation	Large-scale planning emphasizing regional food systems and urban growth

**Table 4: Concepts of New Ruralism, New Urbanism, Smart Growth and Agricultural Urbanism (Newman, Saginor, 2016)**

## **2.7 Theory of the Anticommons**

A tragedy of the Anticommons can occur when too many individuals have rights of exclusion from a scarce resource. The tragedy is that rational individuals, acting separately, may collectively waste the resource by under consuming it compared with a social optimum (Heller, 1998).

The Anticommons explains land subdivision into smaller sizes since the resultant subplots may be too small to support economies of scale in agricultural production and/or occur in remote areas lacking basic infrastructure facilities and services to support alternative land uses. Consequently, the small pieces of agricultural land may remain vacant or underdeveloped and may not benefit the individual agricultural land owners or the rural community at large (Museleku, 2015).

## **2.8 Sustainable Livelihoods**

### *2.8.1 Livelihood diversification strategies*

The Department for International Development has characterised livelihood strategies as encompassing diversification, straddling and linkages.

#### *2.8.1.1 Diversification*

According to DfID, diversification is ‘a dynamic process whereby people combine activities to meet their various needs at different times’.

#### *2.8.1.2 Straddling*

Straddling has been used differently by various groups and individuals. Hebrinck and Ruben (1998) use it to indicate ‘the delicate combining of farm and non-farm activities in such a way that off-farm income (from self-employment, wage labour, or remittances) may be used for investments to improve the farming system’. Thanh, Anh, and Tacoli (2005) give straddling a spatial dimension seeing it as ‘a bridge between the rural-urban divide from a

spatial point of view (moving from town and countryside)', and DFID defines it as 'a manifestation whereby different members of the household live and work in different places, temporarily (e.g. seasonal migration), or permanently'. For this study, the Hebrinck and Ruben definition applies.

### 2.8.1.3 *Case Studies*

A case study on livelihood diversification comes from Nhat village in Vietnam, a village which primarily depended on farming to sustain livelihoods, but adopted a livelihood diversification strategy. Thanh, Anh and Tacoli (2005) report on households that traditionally farmed rice as the primary cash crop embraced a second cash crop, the cucumber, which became lucrative due to contract farming arrangement to produce for the Japan market. Other activities included rearing of pigs and poultry for sale, as well as cow breeding. Non-farm employment took the form of seasonal migration to nearby provinces to provide labour as masons, and carpenters, and wood carvers. Women took to weaving bamboo and rattan, and trading in the same. Their description of the following household captured the livelihood diversification strategy adopted by the villagers.

One household in Nhat simultaneously carries out various farm and non-farm activities including multi-crop farming with fish, rice, pigs, ducks, and fruit trees, small transport, motorized rice-separation services, tilling services, woodcarving, and migration. This household exemplifies a livelihood strategy that draws on the combination of agriculture intensification, non-farm activities, linkages with surrounding urban centres, and long –distance migration.

A similar case study on livelihood diversification in Nandi District, Kenya was conducted by Ruben and Hebinck (1998). They discovered three combinations of livelihood diversification

strategies employed by farmer households whose set of circumstances differed significantly.

They describe it thus:

For one group of households, the regulatory device for production and reproduction is maintaining and defending non-commodity relations. Protecting the means of consumption of the family by keeping the mobilisation of resources (inputs, labour, capital, food, etc.) via commodity relations at a minimum is an essential element of their calculus. They command few agricultural resources (land and cattle), and hence their involvement in off- and non-farm work as unskilled labourers or petty traders as well as the dependency on a small pension and/or on remittances from family members living elsewhere, is essential for their survival.

The second group of farm households can be characterised by accumulation of capital and expansion of means of production. Their calculus is founded upon an almost complete incorporation into the market (for permanent and casual wage labour, capital, and for implements and inputs) and upon the internalisation of the prescribed technology models introduced by development agencies. They are not only based on agricultural production but also straddle agriculture with other economic activities for the purpose of accumulation and expansion of their means of production, both in agriculture and other economic sectors.

The third group of farm households have their livelihood strategies dependent on the market for subsistence and on access to money for reproduction purposes. They live on the fruits of their own land and rely on the employment of their own labour. Here too, the phenomenon of straddling agriculture with other economic activities is observed, however the wealth accumulated by means of self-employed activities and petty trading is relatively small, and is used to increase and improve food consumption and to secure other needs of the family (Ruben et al 1998).

### 2.8.2 *Forward and Backward Linkages*

Rural-urban linkages are crucial for sustainability of the main production activities. Access to markets is one link that bridges the demand for agricultural produce spurred on by urbanisation.

Forwards linkages arise from labour supply into agricultural processing and trading activities that increase value addition, while backwards linkages arise from local maintenance shops and several types of technical assistance services (Ruben et al, 1998). An understanding of how rural-urban linkages operate in different contexts and how they are shaped by factors such as economic policies, political concerns, administrative measures and planning regulations is important, as this has an effect on the livelihoods of many people, but particularly the poorer and less powerful groups within society. Governments, the private sector, aid agencies and civil society can help shape the nature of such linkages and therefore indirectly affect the quality of life of a substantial proportion of households for whom these linkages represent sources of food, jobs, raw materials, as well as of human and social capital.

At certain times rural households may resort to having members simultaneously in the farm and the city as a way of maximising income: one or two members may temporarily be employed in the city outside the harvesting season (for example in construction work, or street hawking), while others will look after livestock and tend the fields. It is difficult to generalise across countries about the nature of rural-urban linkages as these are shaped by a number of factors, including the country's urbanisation pattern, the history and geography of the city and its region, and the city's role in the national and even the world economy. As rural-urban linkages intensify through movements of people, commodities, information and money, their importance as sources of livelihood grows. In sub-Saharan Africa, for example, many urban-based households try to retain ownership or control over village land as a supplementary source of income (Davila, 2002).



It is worth noting that livelihood diversification has a lot to do with choice, and choice of livelihood diversification is dependent on a number of factors, including access to different levels and combinations of assets. This is evident in farm or non-farm activities that require specific labour skills, financial or physical capital for production, or social access, which is access to a given group of people achievable only through existing social connections. This expansion of choice is important because it provides people with opportunities for self-determination, and the flexibility to adapt over time (DFID, 1999).

## **2.9 Land use planning interventions**

Land use planning has been described as ‘an iterative process based on the dialogue amongst all stakeholders aiming at the negotiation and decision for a sustainable form of land use in rural areas as well as initiating and monitoring its implementation (The Working Group Integrated Land Use Planning, 1999).

In his paper titled *Agricultural land protection: is government intervention warranted?*, Pasour Jr, (1983) outlined four land-use controls or incentives that were used in the United States of America to protect agricultural lands. They included ‘agricultural use-value taxation’ which allowed for property tax to be assessed on the basis of present use-value, rather than the market value, a measure meant to cushion the farmer from high property taxes and therefore preserve the use for agricultural purposes rather than conversion to other land uses. There was the ‘fee simple purchase, including public land banking’; in it ‘the farmer might retain title to the land while local and state government purchase only the rights to develop land for non-farm purposes. There was proposed the creating of ‘agricultural districts’; an indication by government that agriculture was the preferred land-use activity in the said district. It also was a measure to provide economic incentives to preserve farmland in that form of tax reliefs and discourage urbanisation through restrictions on eminent domain and local government ordinances that affected agriculture, and finally there was agricultural

zoning, which was to protect food supply as well as incompatible land uses. In this zone, agriculture and related farm buildings were the only land uses allowed.

In Kenya, the importance of land use planning in the economic and social activities of our society makes it imperative that land is accessible, its potential for productivity is enhanced and sustainability guaranteed (Sessional paper no. 1 of 2017).

The above mentioned sessional paper gave directive on sustainable rural land uses, and recommended the Government to:

- i. Identify, map and document all land uses in the country to be put in an inventory that is updated every 5 years for urban and 10 years for rural;
- ii. Establish a national spatial data infrastructure;
- iii. Facilitate inter-county land use planning and ensure regular updating of land use planning maps;
- iv. Develop a National land use/ land cover mapping system;
- v. Design and fund new strategies for collecting and managing data necessary for the National land use mapping system;
- vi. Modernize land use information management systems to allow for easier collection, collation, storage and dissemination of the same;
- vii. Invest in decentralized land use data centres which are easily accessible.

## **2.10 Land Reforms**

### *2.10.1 Policy*

Michal Ben-Gera as cited in the NORMAK –Project (2007) defines policy as “course of action or inaction chosen by the Government to address a given problem or interrelated set of problems, or the way in which the courses of action for achieving the appropriate goals are determined”. The term policy can also be defined as “deliberate action of Government that in some way alters or influences the society or economy outside the government. It includes, but it is not limited to, taxation, regulation, expenditures, information, statements, legal requirements, and legal prohibitions”. Programmes and projects constitute the output of the policy system and they are often embodied in legal acts (Ben-Gera as cited in NORMAK – Project, 2007).

#### *2.10.1.1 The National Land Policy*

Despite having various land laws addressing diverse matters, Kenya did not have a comprehensive land policy. In 2009 the national land policy was formulated to give direction to land use in a coherent, efficient and sustainable manner. Among the subjects it addresses include land tenure, land use management, and land administration.

Its specific objectives are to ensure the maintenance of a system of land administration and management that provides:

- (a) All citizens with the opportunity to access and beneficially occupy and use land;
- (b) Economically viable, socially equitable and environmentally sustainable allocation and use of land;
- (c) Efficient, effective and economical operation of land markets;
- (d) Efficient and effective utilisation of land and land-based resources; and
- (e) Efficient and transparent land dispute resolution mechanisms.

### 2.10.1.2 Kenya Vision 2030

This policy document was unveiled in 2008, and outlines strategic direction that the country should take to accelerate its transformation over the next twenty-two years to become a middle-income nation.

Key among the foundations of Kenya Vision 2030 are land reform and policy formulation to address land administration issues, computerisation of land registries, infrastructure for capturing spatial data, and legal frameworks that support land disputes.

It was envisioned that Kenya Vision 2030 would be supported by three pillars; economic, social and political.

The economic pillar specifically addresses matters concerning agriculture as detailed below.

Economic Pillar: Moving the Economy up the Value Chain

#### *Agriculture*

The Kenya Vision 2030 policy document states that Kenya aims to promote an innovative, commercially-oriented, and modern agricultural sector. This will be accomplished through:

- (i) transforming key institutions in agriculture and livestock to promote agricultural growth;
- (ii) increasing productivity of crops and livestock;
- (iii) introducing land use policies for better utilisation of high and medium potential lands;
- (iv) developing more irrigable areas in arid and semi-arid lands for both crops and livestock;
- (v) improving market access for smallholders through better supply chain management.

Kenya Vision 2030 aims at adding value to farm and livestock products before they reach local and international markets.

### *2.10.2 Legislation*

Following the promulgation of the constitution of Kenya 2010, the following statutes that have specific matters on land use, were enacted;

#### *2.10.2.1 County Government Act, 2012*

##### County spatial plans

In effect a spatial plan which shall set out objectives, strategies and policies regarding the desired spatial form of the county, desired patterns of land use, land management systems, as well as identifying programmes and projects for the development of land.

##### City or municipal plans

The city or municipal shall have the following plans; land use plans, building and zoning plans, urban area building and zoning plans, recreational areas and public facilities. Each of these plans shall provide for:

- (a) functions and principles of land use and building plans;
- (b) location of various types of infrastructure within the city or municipality;
- (c) development control in the city or municipality within the national housing and building code framework.

#### *2.10.2.2 Land Act, 2012*

This act applies to all public land, private land, and community land.

In the discharge of this act the following values and principles apply; equitable access to land along with elimination of gender discrimination related to property in land and the marginalised, security of land rights, sustainability of land resources, conservation and

protection of ecologically sensitive areas, local community initiatives to settle disputes as well as alternative dispute resolution mechanisms, participation, inclusiveness, accountability within communities.

This act also acknowledges the following land tenure systems; freehold, leasehold, partial interests such as easements, and customary land rights.

#### 2.10.2.3 Land Registration Act, 2012

The Land Registration Act, 2012 addresses issues of registration units, transfers, transfer of parts. The registration units' details are described specifically into sections and blocks and instructions drawn to specific offices and authorities. Transfers address land, leases and charges completed by filling the instrument and registration of the transferee as proprietor of the land, lease or charge. Transfer of part speaks to subdivision of land and the registration of each new subdivision.

#### 2.10.2.4 National Land Commission Act, 2012

The National Land Commission Act 2012 provides for the operationalisation of this office including its objectives and purpose, powers and responsibilities, personnel, and linkages.

Among the functions of the Commission include:

- (a) to manage public land on behalf of the national and county governments;
- (b) to recommend a national land policy to the national government;
- (c) to advise the national government on a comprehensive programme for the registration of title in land throughout Kenya;
- (d) to conduct research related to land and the use of natural resources, and make recommendations to appropriate authorities;
- (e) to initiate investigations, on its own initiative or on a complaint, into present or historical land injustices, and recommend appropriate redress;

- (f) to encourage the application of traditional dispute resolution mechanisms in land conflicts;
- (g) to assess tax on land and premiums on immovable property in any area designated by law;
- (h) to monitor and have oversight responsibilities over land use planning throughout the country.

#### 2.10.2.5 Community Land Act, 2015

This act acknowledges and upholds the right of individuals to acquire and own property of any description in any part of the country. It also acknowledges customary land rights as equal to freehold and leasehold rights.

#### 2.10.2.6 Crops Act No. 16 of 2013

The Crops Act of 2013 declares and identifies scheduled crops, which fall under two categories; crops with breeding programmes under compulsory certification, and crops with breeding programmes under voluntary certification. The Crops Act addresses issues of general and specific policies for scheduled crops, marketing and distribution, transportation, establishment of wholesale markets and agricultural collection centres, linkages with government and private research institutions, farmer training programmes, seed farms, enforcement of standards in grading, sampling and inspection, promotion of value addition, among other functions.

In addition, the Crops Act 2013 gives the power to develop rules for identifying agricultural land suitable for production of scheduled crops.

The following incentives and facilities to growers are also catered for:

- (a) credit assistance including provision of equipment for land preparation and other non-monetary assistance;

- (b) credit guarantee;
- (c) affordable farm-inputs including quality seeds, planting materials and market linkage;
- (d) technical support including research and extension services;
- (e) infrastructural support including physical infrastructure development, financial and market information;
- (f) fertilizer cost-reduction investment projects including private sector involvement in fertilizer importation and distribution;
- (g) pest and disease control;
- (h) post-harvest facilities and technologies including storage, processing, distribution and transport facilities;
- (i) tax exemptions including tax breaks and duty waivers on the import of farm inputs and farm machinery.

#### 2.10.2.7 Physical Planning Act, Cap. 286

This act defines the purpose and content of both regional and local physical development plans. It gives guidance on the appointment of public officers, as well as in the administration of physical planning. The act addresses control of development, including the control or prohibition of subdivision of land or existing plots into smaller areas. It discusses development permission, as well as application and approval of developments.

#### 2.10.2.8 Government Lands Act Cap. 286

This act addresses, among other issues, disposal of land within townships, disposal of agricultural land, disposal of land for special purposes, licenses for temporary occupation of land, general provisions relating to leases, licenses and agreements, and registration of transactions relating to government lands.



2.10.2.9 Land Control Act Cap. 302

This act provides for the establishment of land control areas and divisions, and land control boards. It instructs in the control of dealings in agricultural land, including transactions affecting agricultural land. The act also addresses granting of consent, provincial and central land control appeals boards, and provisions to boards.

**2.11 Conceptual Framework**

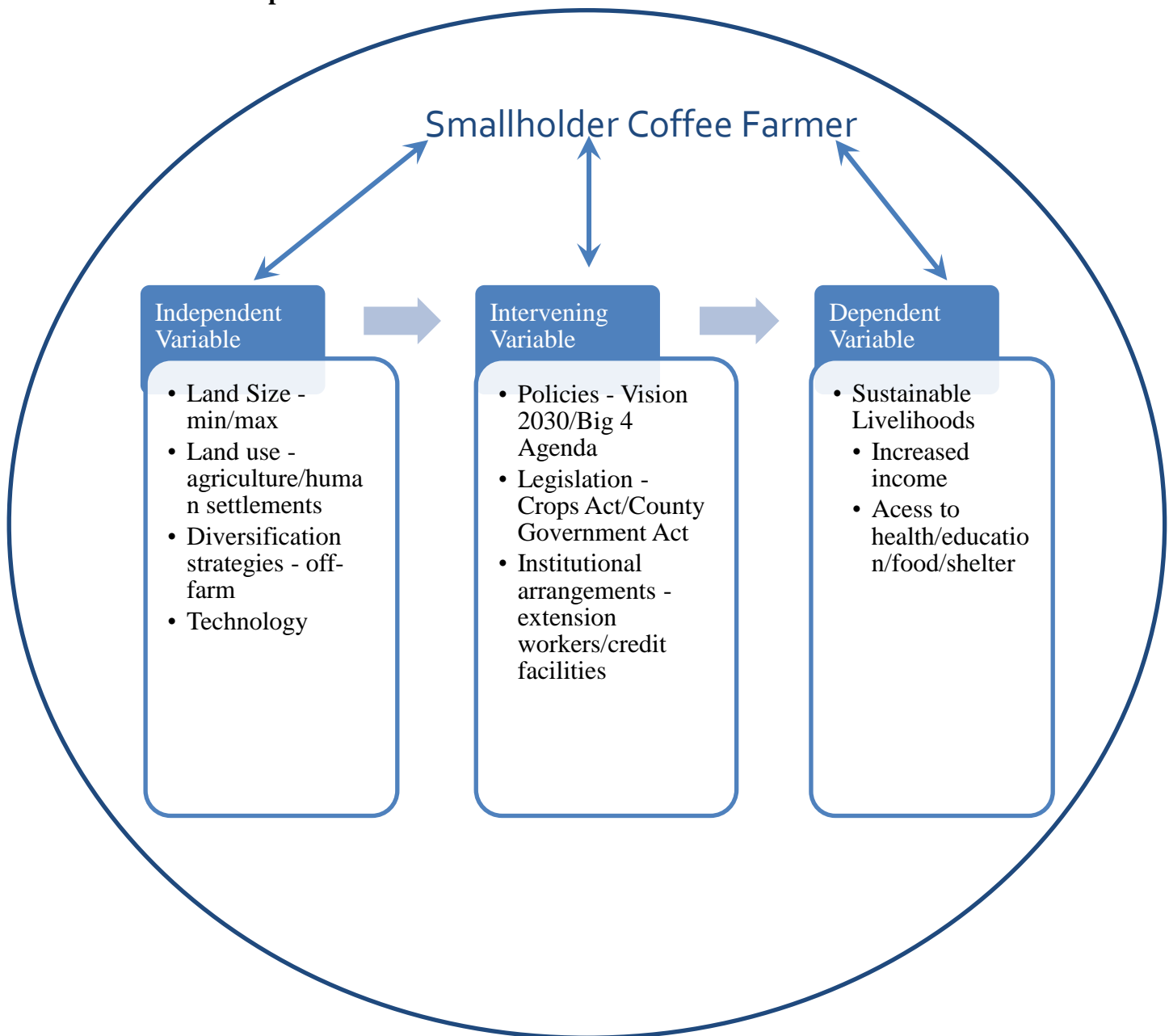


Figure 2: Conceptual Framework. (Source: Author, 2020)

### **3 Chapter Three: Research Methodology**

#### **3.1 Introduction**

This chapter explains the survey methods used by the researcher to conduct this study. It covers the research design, target population, sampling plan, and sample size. It also gives the detailed methods of data collection, data quality control, data analysis procedures and ethical considerations.

#### **3.2 Research Design**

Research design is ‘the arrangement of conditions for the collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure’ (Selltiz, Jahoda, Deutch, Cook, 1959).

For this study, the researcher used the survey, or cross sectional design.

The cross-sectional survey is a research approach where ‘a set of information is collected for a sample at one point in time’ (Community-Based Research: A Handbook for Native Americans, 1981).

#### **3.3 Target Population and sample size**

The target population in this study included all households that cultivate coffee, and that are located in Kiganjo Sub-Location, Gatundu South Sub-County, Kiambu County, Kenya.

The sampling error was  $\pm 5\%$ , with a confidence level of 95%. The researcher sampled a homogenous group of coffee farmers. To estimate the sample of the households that cultivate coffee, the study used population data obtained from the KNBS 2009 population and housing census. The total household population of Kiganjo sub-location was found to be 1,980, and the sample size was found to be 332 households. However, due to time and financial constraints, the researcher reduced the sample size to 97 households.

The formulae used to determine sample size is indicated below:

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

**Equation 1: Formulae determining sample size**

Where:

n = sample size

N = population size

e = is the level of precision

The study used simple random sampling technique to select households from the villages in Kiganjo sub-location, and purposive sampling for both key informant interviews and focus group discussions.

**3.4 Methods of Data Collection**

In this study, quantitative and qualitative methods were used to collect data. . The quantitative data was collected using a structured household survey instrument that was administered to a total of 97 households, and the qualitative data collected through observation. The survey instrument was pre-tested prior to data collection and adjusted for length and clarity of questions. The household survey was conducted in the randomly selected villages of Kiganjo sub-location, namely Njagu, Ikuma, Kahata, Kiganjo, Kياهو, Kiuu, Muboini, Kimiritia, Gitahi A, and Mundoro. Households involved in coffee farming were questioned regarding the scale and intensity of their on-farm and off-farm livelihood activities, coffee farming, diversification strategies, as well as possible planning interventions.

Key informant interviews and focus group discussion participants were selected using purposive sampling, and included opinion leaders in the area. Participants were selected for their knowledge of, and or participation in the coffee sub sector as their main livelihood activity. Area chiefs were enlisted to assist in identification of households as well as key informants, and participants for the focus group discussion. Village elders accompanied the leader researcher and research assistants into the villages and households as our guides, and translators.

### **3.5 Methods of Data Analysis**

The data collected from the field was collated, coded, entered, and analysed using the software known as Statistical Packages for Social Sciences (SPSS). SPSS has been described as beneficial to research in so far as ‘generating ideas and supporting theories by identifying patterns, describing relationships and explaining causes (Wang and vom Hofe, 2007).

### **3.6 Ethical Considerations**

This study sought the voluntary participation of all respondents, and guaranteed confidentiality of information provided.

In addition, the lead researcher sought authorisation and approvals from the University of Nairobi, the national government represented at the sub-county level, and the county government to carry out data collection in the study area.

## **4 Chapter Four: Study Area**

### **4.1 Introduction**

The study was conducted in Kiganjo Sub-Location of Gatundu South Sub-County, Kiambu County. The following discussion covers the position and size, administrative and political units, demographic features, topographic features, land use, crop production, and trade.

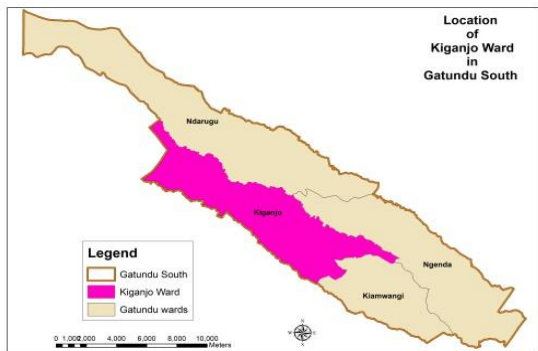
### **4.2 Position and size.**

Kiambu County is one of the forty-seven counties within the Republic of Kenya, and was carved out of the former Central Province. It is located between latitudes 00 25' and 10 20' South of the Equator, and Longitude 360 31' and 370 15' East. The total land surface area is 2,543.5km<sup>2</sup>. Kiambu County borders the following counties; to the north and north east, Muranga County, to the east Machakos County, to the South it borders two counties; Nairobi and Kajiado, to the west Nakuru County, and to the North West Nyandarua County ( Kiambu CIDP 2018-2022).

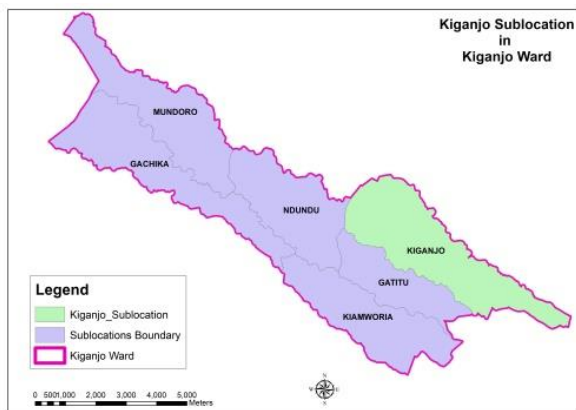
The maps below illustrate Kiambu County in the national context, along with two other context maps; Kiganjo Ward in Gatundu South Sub-County, and Kiganjo Sub-Location in Kiganjo Ward.



**Figure 3: Kiambu county context map (Source: Ambani, 2019)**



**Figure 4: Kiganjo Ward context map (Source: Ambani, 2019)**



**Figure 5: Kiganjo Sub-location context map (Source: Ambani, 2019)**

### 4.3 Administrative and Political Units

Kiambu County is subdivided into twelve sub counties, and sixty wards as illustrated in the Table below.

<b>Kiambu County Administrative and Political Units</b>			
<i>Sub County/ Constituency</i>	<i>Area sq.km</i>	<i>No. of Wards</i>	<i>Electoral Wards</i>
Gatundu South	192.4	4	Kiamwangi, Kiganjo, Ndarugo, Ngenda
Gatundu North	286.0	4	Gituamba, Githobokoni, Chania, Mangu
Juja	326.6	5	Murera, Theta, Juja, Witheithie, Kalimoni
Thika Town	217.5	5	Township, Kamenu, Hospital, Gatuanyaga
Ruiru	201.4	8	Gitothua, Biashara, Gatongora, Kahawa Sukari, Kahawa Wendani, Kiuu, Mwiki, Mvihoko
Githunguri	173.5	5	Githunguri, Githiga, Ikinu, Ngewa, Komothai
Kiambu	105.9	4	Tinganga, Ndumberi, Riabai, Township
Kiambaa	83.2	5	Cianda, Karuri, Ndenderu, Muchatha, Kihara
Limuru	281.7	5	Bibirioni, Limuru Central, Ndeiya, Limuru East, Ngecha, Tigoni
Kikuyu	175.8	5	Karai, Nachu, Sigona, Kikuyu, Kinoo
Kabete	60.3	5	Gitaru, Muguga, Nyathuna, Kabete, Uthiru
Lari	439.2	5	Kinale, Kijabe, Nyanduma, Kamburu, Lari/Kirenga

**Table 5: Kiambu County Administrative and Political Units (Source: CIDP, 2018-2022)**

#### 4.4 Demographic Features

According to the 2019 Kenya Population and Housing Census (KPHC), Kiambu County has a population of 2,417,735 consisting of 1,187,146 men, and 1,230,454 women. The total number of households was documented to be 795,241 and the population density noted as 952 persons per sq. km.

The Table below gives demographic data for Gatundu South sub-county, as well as Kiganjo Sub-Location.

<b>Distribution of Population by Sex, Number of Households, Land Area, Population Density and Sub-Locations</b>							
	<b>Sex</b>			<b>Households</b>		<b>Land Area</b>	<b>Density</b>
	<b>Total</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>	<b>Conventional</b>	<b>Sq. Km</b>	<b>Persons per Sq. Km</b>
<b>Gatundu South</b>	122,103	60,384	61,714	35,609	35,577	193.6	631
<b>Kiganjo</b>	28,745	14,262	14,482	8,376	8,369	56.8	506
<b>Kiamworia</b>	7,380	3,637	3,743	2,155	2,155	12.8	578
<b>Gachika</b>	2,069	1,040	1,029	664	664	4.0	520
<b>Gitare</b>	2,032	969	1,063	568	568	3.3	612
<b>Kiamworia</b>	3,279	1,628	1,651	923	923	5.5	601
<b>Kiganjo</b>	10,136	5,042	5,093	2,862	2,862	19.2	529
<b>Gatitu</b>	2,620	1,311	1,309	714	714	5.4	489
<b>Kiawandiga</b>	2,553	1,271	1,281	691	691	6.0	423



<b>Kiganjo</b>	4,963	2,460	2,503	1,457	1,457	7.8	640
<b>Mundoro</b>	11,229	5,583	5,646	3,359	3,352	24.8	452
<b>Gathiru</b>	2,384	1,171	1,213	717	717	6.8	351
<b>Kabuteti</b>	1,990	1,014	976	544	544	4.2	477
<b>Mundoro</b>	3,338	1,656	1,682	1,091	1,087	5.5	603
<b>Ndundu</b>	3,517	1,742	1,775	1,007	1,004	8.3	422

**Table 6: Demographic Data Gatundu South Sub-County (Source: CIDP, 2018-2022)**

#### **4.5 Age Structure**

The age structure in Kiambu County reveals a youth bulge and a declining aging population. The 2009 KPHC indicated that the population of children under 1 year old was 44,175, or 2.72% of the total population, the population of children under 5 years of age was 203,835, or 12.6% of the total population. Children of pre-primary school age, between 3-5 years of age accounted for 5.01% of the total population, or 81,265 children, children of primary school age, between 6-13 year of age, accounted for 15.44% of the total population, or 250,058 children, while children of secondary school age, between 14-17 years of age, accounted for 7.4% of the total population, or 119,301 children.

The youth age, which is the population between the ages of 15-29 years, accounted for 29.1% of total population, or 472,745 persons. The labour force, which is the population between the ages of 15-64 years, accounted for 59.2% or 961,261 persons. The aged population, which is between the age of 65 years and above accounted for 3.64% of total population, or 59,057 persons.

A summary of Kiambu County demographic dividend potential is provided by the National Council for Population and Development, Central Region as shown below:

<b>Category</b>	<b>2009</b>	<b>2014</b>	<b>2017</b>	<b>2022</b>	<b>2030</b>
<b>Population Size</b>	1,785,885	1,923,914	2,004,248	2,130,880	2,301,324
<b>Population below 15 (%)</b>	34.9	32.9	31.4	28.4	24.8
<b>Population aged 15-64 (%)</b>	61.4	63.6	65.2	68.2	70.4
<b>Population aged 65+ (%)</b>	3.8	3.4	3.4	3.5	4.8
<b>Dependency ratio</b>	63	57.1	53.3	46.7	42
<b>Fertility rate</b>	3.4	2.7	2.5	2.2	2.1

**Table 7: Kiambu County Demographic Dividend (Source: CIDP 2018-2022)**

#### **4.6 Topographic Features**

Broadly speaking, Kiambu County is divided into four topographic zones, namely the Upper Highland, the Lower Highland, the Upper Midland, and the Lower Midland zone.

#### 4.6.1 Surface Area by Category

Category	Km <sup>2</sup>
Total Area	2,543.5
Forest cover	476.3
Arable Area	1,878.4
Non-Arable Land	649.7
Water Mass	15.5
Urban Area	...

**Table 8: Kiambu County Surface Area by Category (Source: CIDP 2018-2022)**

#### 4.6.2 Kiambu Topography

Type of Geography	Units	
Altitude: Highest point	metres a.s.l	2,550
Altitude: Lowest point	metres a.s.l	1,200
Latitudes	degrees N/S	34.0
Longitudes	degrees E/W	7.1

**Table 9: Kiambu County Topography (Source: CIDP 2018-2022)**

#### 4.6.3 Annual Average Rainfall and Temperature

Type of Climate	Unit	Amount
Rainfall (Annual Average)	mm	1,200
Long rains (Average)	mm	2,000
Short rains (Average)	mm	600
Temperature (Annual Average Lowest)	°C	7
Temperature (Annual Average Highest)	°C	34
Temperature (Annual Average)	°C	26

**Table 10 : Kiambu County Annual Average Rainfall and Temperature (Source: CIDP 2018-2022)**

#### 4.6.4 Gatundu South Topography

The following maps illustrate the topography of Gatundu South including its agro-ecological zones, land form, lithology, soil depth, and soil drainage.

##### *Agro-ecological Zone*

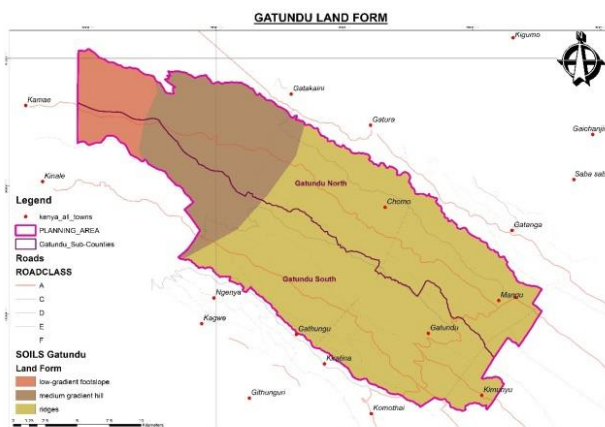
The study area is situated in the lower highland zone, which lies between 1,500-1,800metres above sea level (Kiambu CIDP 2018-2022). The map below illustrates this.



**Figure 6: Gatundu South Sub-County Agro-ecological zones (Source: Wakaba, 2019)**

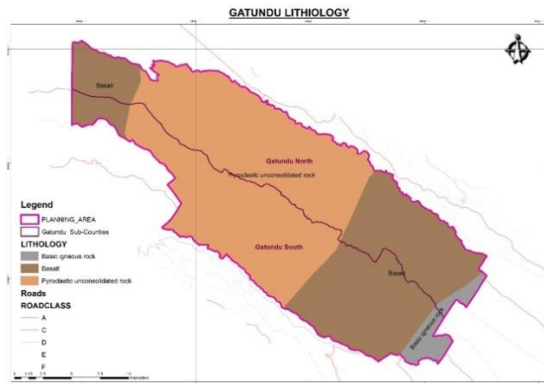
##### *Land Form*

The study area features undulating and hilly terrain with a series of ridges and valleys with streams (Kamwangi Town Integrated Strategic Urban Development Plan 2020-2030).



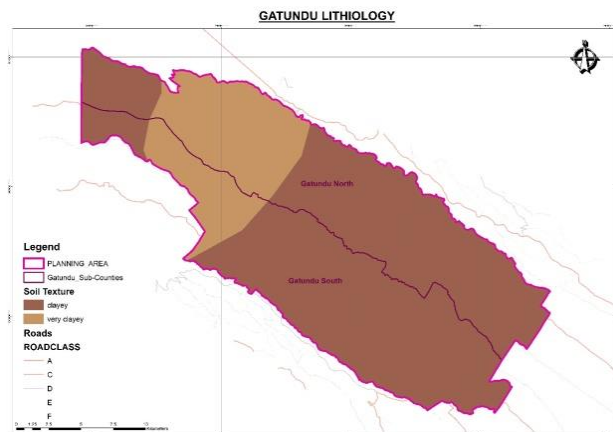
**Figure 7 : Gatundu South Sub-County Land Form (Source: Wakaba, 2019)**

The study area is composed of pyroclastic rocks with minor intercalations of basalts (Kamwangi Town Integrated Strategic Urban Development Plan 2020-2030). See map below.



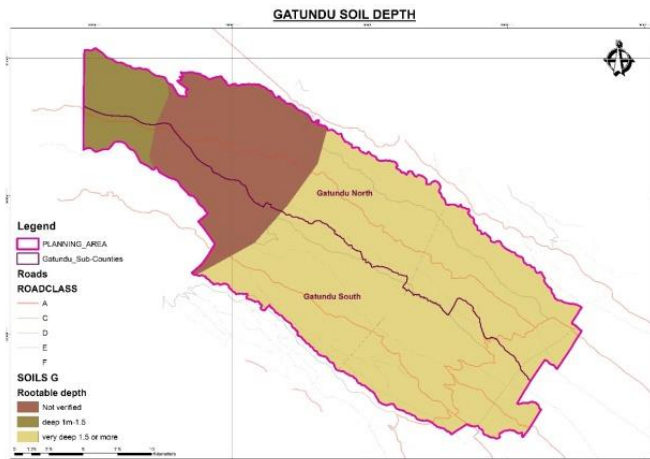
**Figure 8: Gatundu South Sub-Location Lithology (Source: Wakaba, 2019)**

The study area, as shown below, has three broad categories of soils: high level upland soils, plateau soil and volcanic footbridges soil all of varying fertility. The high level upland soils are very fertile (Kiambu CIDP, 2018-2022).



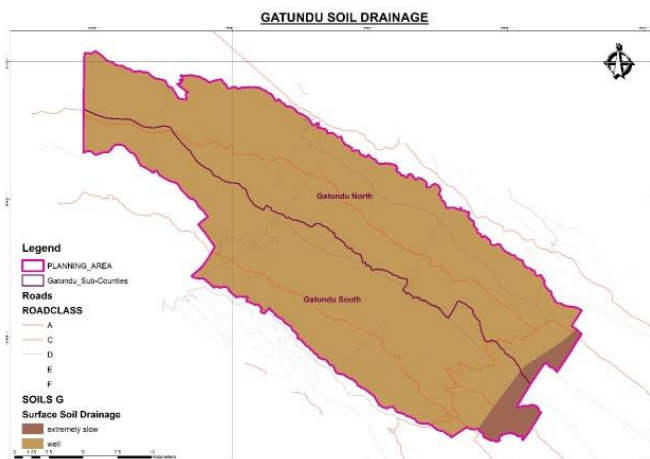
**Figure 9: Gatundu South Sub-Location Lithology II (Source: Wakaba, 2019)**

The study area supports coffee farming, with its soils which are red to dark brown friable clays, and have drainage to a depth of between 1.5m to 3m in drier areas (Infonet Biovision) (Kiambu CIDP 2018-2022). See map below.



**Figure 10: Gatundu South Sub-County Soil Depth (Source: Wakaba, 2019)**

The study area has soils that are airy and well drained, ideal for coffee farming, as shown below (Infonet Biovision).



**Figure 11: Gatundu South Sub-County Soil Drainage (Source: Wakaba, 2019)**

## 4.7 Land Use

Land has long been known to be a factor of production; therefore, any discussion on land use would benefit from understanding the characteristics of land.

In their book, *Urban Land Economics and Public Policy*, Balchin, Bull and Kieve (1995) highlight six characteristics that are relevant to our discussion.

- i) Land as fixed in supply; it is the least flexible factor of production. In observing land use to increase one type of land use would always be at the expense of another.
- ii) Land is at no cost to creation. Humankind found land already in existence and in that sense, is a free resource.
- iii) Land is heterogeneous. This is to mean that to the user of land each site and building is different. In addition, land can be classified into various economic categories such as sub-marginal land with no remunerative use, break-even marginal land, and profit or surplus-yielding intra-marginal land.
- iv) Land is subject to the Law of Diminishing Returns. This law states that after successive application of labour and capital to a given area of land, first the marginal output is high, then the average output begins to fall, and eventually the total output diminishes.
- v) The absence of a market for 'land'. It is observed that in practise land deals are transactions not in land itself but in interests or rights in, on, under and over land. Since land has traditionally been owned by the State, various forms of tenure are bestowed on individuals, firms, or institutions enabling them to use land subject to various conditions.
- vi) Agricultural rents. In the book the authors note that the payment for the use of land is known as commercial rent which has two constituents; transfer earnings and economic rent. Transfer earnings are the minimum sums paid to retain land for its

current economic purpose, and economic rent is a payment reflecting the scarcity value of land, in excess of transfer earnings (Balchin, Bull & Kieve, (1995).

In light of this, Kiambu County has diverse land uses which include industrial, agricultural, commercial, wetland forest, and public land.

According to the CIDP 2018-2022 Kiambu County has three categories of land; namely public land at 5%, community land at 0.01%, and private land at approximately 94.99%, with 85% of land registered and land owners in possession of title deeds to their land. Average mean holding size of land is approximately 0.045hectares for small scale farmers, and 69.5 hectares on large scale farms.

#### 4.8 Crop Production

Kiambu County produces crops in three categories. Food crop production, horticultural crop production, and industrial crop production.

##### 4.8.1 Food Crop Production

Food crop production is mainly for subsistence agriculture. Crops traditionally farmed in this category include maize, beans, Irish potatoes, bananas and vegetables. The following table is a representation of food crop production in Kiambu County.

**Table 11: Kiambu County Food Crop Production Trend (Source: CIDP 2018-2022)**

Food crop	2013		2014		2015		2016	
	HA	Production (tons)	HA	Production (tons)	HA	Production (Tons)	HA	Production (tons)
Irish Potatoes	19,057	57,015	18,162	181,620	18,504	166,536	9,198	101,178
Maize	32,330	58,956	34,453	62,015	β8,128	68,630	45,982	82,768
Beans	22,233	43,947	26,401	29,041	26,793	29,472	17,428	19,171
Bananas	4,317	92,041	4,279	149,765	3,457	120,995	3,515	123,025



#### 4.8.2 Horticultural Crop Production

Horticultural crop production in Kiambu County is both for local consumption as well as for the export market. The horticultural crops produced include vegetables, fruits, and flowers including, but not limited to French beans, snow peas, garden peas, kale, cabbage, tomatoes, spinach, carrot, dhania, basil, mint, rosemary, parsley, pineapples, mangoes, and avocado.

The table below gives a glance at the trends in horticultural crop production.

**Table 12: Kiambu County Horticultural Crop Production Trend (Source: CIDP 2018-2022)**

**Horticulture Crop Production trend**

Horticulture crop	2013		2014		2015		2016	
	HA	Production	HA	Production	HA	Production	HA	Production
		(Tons)		(Tons)		(Tons)		(Tons)
<b>Cabbages</b>	2,285.70	42,203.00	2,287.88	53,874.00	1,682.00	17,154.10	1,097.20	23,735.70
<b>Carrots</b>	766.40	12,092.00	897.30	15,331.50	813.80	15,335.00	509.70	11,349.50
<b>Kales</b>	5,699.00	158,955.00	3,803.05	111,397.70	3,668.20	113,638.50	2,240.70	66,941.20
<b>Spinach</b>	1,634.50	34,599.00	1,208.30	26,078.65	856.90	22,419.70	1,481.00	14,167.50

#### 4.8.3 Industrial Crop Production

Industrial crops are also commonly referred to as cash crops. Kiambu County has two mainstay cash crops, namely coffee and tea, with macadamia nut upcoming, and pyrethrum at a low scale production at industrial level. The chart below is indicative of the current position of industrial crop production within Kiambu County.

**Table 13: Kiambu County Industrial Crop Production Trend (Source: CIDP 2018-2022)**

**Industrial crops production trend**

Industrial crops	2013		2014		2015		2016	
	Area (HA)	Quantity	HA	Quantity	HA	Quantity	HA	Quantity
		(Tons)		(Tons)		(Tons)		(Tons)
Coffee	2,286	42,203	10,800	9,658	10,288	9,332	9,800	12,623
Tea	766	12,092	16,795	442,226	16,940	217,477	17,840	229,031
Pyrethrum	5,699	158,955	5	1	4	1	3	1
Macadamia	1,635	34,599	811	5,677	818	5,726	809	5,663

#### **4.9 Trade and Markets**

The CIDP 2018-2022 notes the presence of 118 designated markets spread across the county “for the sale of marketable commodities” (Kiambu County Trade and Markets Bill, 2015).

The main markets being Gatundu Modern Market in Gatundu South, Kamwangi market in Gatundu North, Juja Market in Juja Sub-County, Jamhuri and Madaraka markets in Thika, Githurai and Ruiru in Ruiru Sub-County, Githunguri Market in Githunguri Sub-County, Wangigi Main Market and Wangigi egg shed in Kabete Sub-County, Kangangi Market in Kiambu Sub-County, Dagoretti and Kikuyu Markets in Kikuyu Sub-County, and Kimende Market in Lari Sub-County.

Below is an indicator chart of retail market prices for selected commodities for the period of January to December 2014.

**Table 14: Kiambu County retail market prices January-December 2014 (Source: CIDP 2018-2022)**

Commodity	Selling Unit	Average Price											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Dry Maize		...	...	...	...	...	...	...	...	...	...	...	...
Green Maize	1 Cob	30	35	30	30	30	25	20	20	25	25	20	20
Finger millet		...	...	...	...	...	...	...	...	...	...	...	...
Sorghum		...	...	...	...	...	...	...	...	...	...	...	...
Rose oooo	1Kg	120	75	115	120	115	115	120	125	120	120	120	115
Mwitmania	1Kg	115	115	110	110	115	120	140	140	125	135	135	135
Dolicos-njahi	1Kg	125	125	125	120	125	125	125	120	125	135	135	145
Green grams	1Kg	115	130	120	120	130	130	130	130	130	150	150	150
Cowpeas		...	...	...	...	...	...	...	...	...	...	...	...
Fresh peas		...	...	...	...	...	...	...	...	...	...	...	...
Ground nuts		...	...	...	...	...	...	...	...	...	...	...	...
Irish/Potatoes	1Kg	45	45	45	50	65	45	45	45	45	55	55	55
Cassava fresh		...	...	...	...	...	...	...	...	...	...	...	...
Sweet potatoes	1Kg	65	65	65	50	65	65	65	65	85	65	65	65
Cabbage	1Kg	100	100	150	150	100	100	100	100	120	100	100	100
Cooking bananas	1Kg	45	45	45	40	45	45	45	45	45	45	40	40
Rice bananas	1Kg	129	129	129	129	129	129	129	129	129	129	139	139
Carrots	1Kg	70	70	70	70	55	55	60	60	60	50	50	50
Tomatoes	1Kg	50	65	60	85	70	60	60	60	90	80	70	70
Onions	1Kg	95	95	95	100	95	95	95	95	95	70	70	80
Spring onions		...	...	...	...	...	...	...	...	...	...	...	...
Chillies		...	...	...	...	...	...	...	...	...	...	...	...
Cucumber		...	...	...	...	...	...	...	...	...	...	...	...
Capsicum	1Kg	65	95	95	110	95	95	95	95	110	95	110	110
Brinjals		...	...	...	...	...	...	...	...	...	...	...	...
Cauliflower		...	...	...	...	...	...	...	...	...	...	...	...
Lettuce		...	...	...	...	...	...	...	...	...	...	...	...
Passion fruit	1Kg	145	145	169	169	169	129	...	139	139	139	110	120
Oranges	1Kg	260	260	260	260	260	260	260	260	260	220	220	220
Lemons	1Kg	110	105	109	115	105	105	89	89	105	105	105	105
Mangoes-Local		...	...	...	...	...	...	...	...	...	...	...	...
Mangoes-Ngowe	1Kg	145	145	109	109	109	139	79	79	79	129	129	129
Limes		...	...	...	...	...	...	...	...	...	...	...	...
Pineapple	1Kg	65	65	89	89	89	79	89	89	89	89	89	89
Pawpaw	1Kg	129	129	129	129	139	129	129	129	129	129	129	129
Avocado	1Kg	20	20	20	20	20	20	20	27	27	25	46	46
Kales	350gm	24	24	22	22	22	20	25	25	26	24	24	23

Agriculture is the predominant economic activity, and is the leading sub-sector in terms of employment, food security, income earnings, and overall contribution to the social-economic wellbeing of the people. Coffee and tea are the main cash crops. The main food crops include; maize, beans, pineapples, and Irish potatoes. Zero grazing is also practiced given the

limited farm sizes in the county. Animals reared include cattle, sheep, goats, poultry, and pigs (County Statistical Abstract, 2015).

## 5 Chapter 5: Research Findings

### 5.1 Introduction

The research findings presented in this chapter are the results of a household survey conducted in the study area of Kiganjo Sub-Location, Gatundu South Sub-County, Kiambu County. The findings answer the four questions that the study sought to address. They include information on intergenerational household land size change, existing household land uses and their respective financial returns, household livelihood diversification strategies and their respective financial returns, and land use interventions that would ensure sustainable rural livelihoods.

### 5.2 General Demographics

The general demographics of the respondents from the survey reveals their age, gender, marital status, education level, migration patterns, average household size, average household land size, ownership of land, and livelihood activities.

#### 5.2.1 Age of respondents

The average age of respondents was found to be 58.55 years. The median and modal ages were 58 and 45 respectively. The lowest age of the respondents interviewed was 21 years, and the highest age was 90 years.

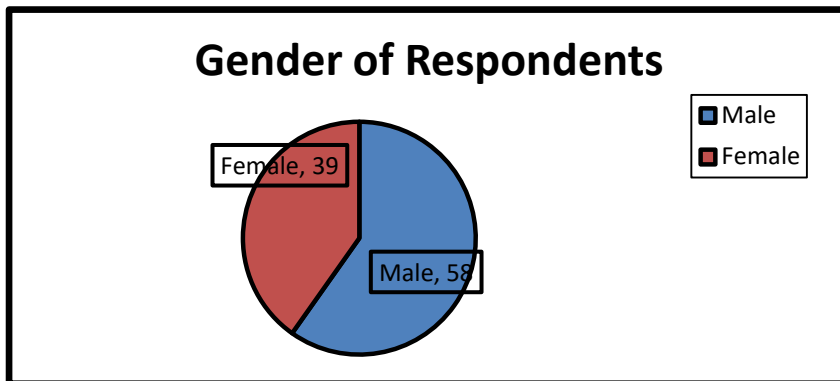
Age of Respondent

N	Valid	97
Mean		58.55
Median		58.00
Mode		45
Std. Deviation		15.102
Minimum		21
Maximum		90

Source: Field Survey, 2019

### 5.2.2 Gender of respondents

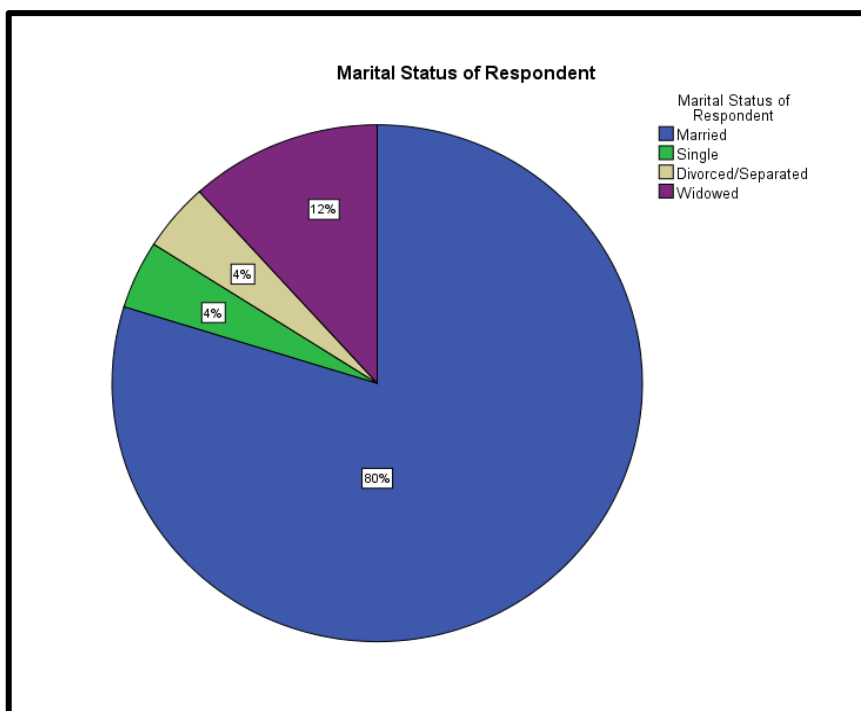
The survey recorded a higher number of male respondents compared to female respondents. The frequency value for male respondents was 58, and the frequency value for female respondents was 39.



Source: Field Survey, 2019

### 5.2.3 Marital status of respondents

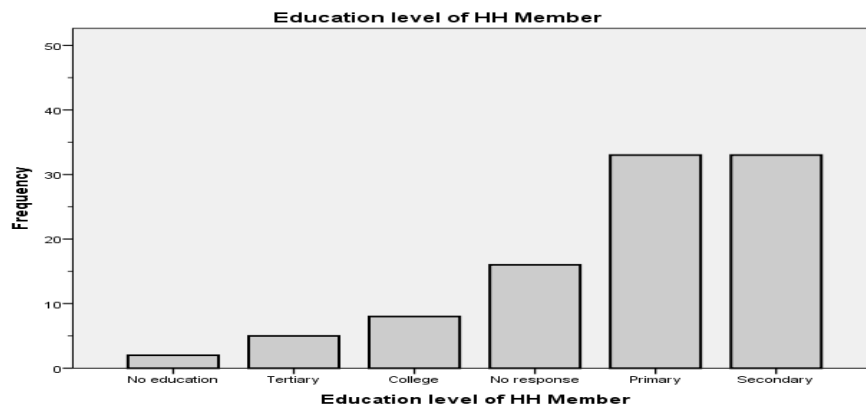
A majority of respondents in the study were married comprising 80 per cent of the sample size. Respondents who were single were 4 per cent of the sample, divorced or separated comprised 4 per cent, while those who were widowed comprised 12 per cent of the sample.



Source: Field Survey, 2019

#### 5.2.4 Education level of head of household

The education level with the highest frequency value was shared between secondary and primary education, followed by primary education, college education, tertiary education, and no education, respectively. Studies conducted by the World Bank indicate that incomes of rural households increase as level of education increases, and the same applies to level of agricultural productivity which increases as level of education increases (Psacharopoulos, Woodhall, (1985). The implication for coffee farmers in Kiganjo sub-location is that in order to secure their livelihoods there is need for expanded access to all levels of education.



Source: Field Survey, 2019

#### 5.2.5 Migration patterns

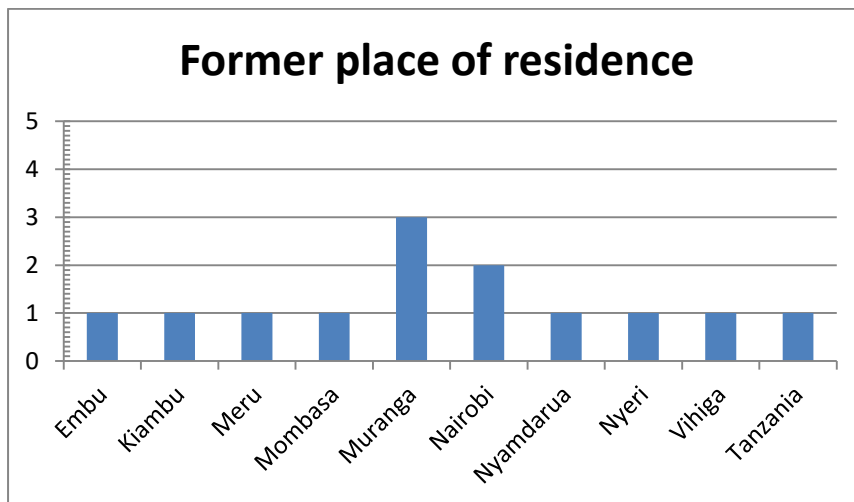
Survey respondents indicated whether they had lived in Gatundu South sub-county since birth, where they had lived before moving to Gatundu South, and the reason for moving to Gatundu South.

##### 5.2.5.1 Lived in Gatundu South since birth

Of the total survey respondents, a majority, 83, representing 86 per cent said they had lived in Gatundu South since birth, while the remaining 14 respondents, representing 14 per cent, had moved into Gatundu South from another location.

### 5.2.5.2 Place of residence before moving to Gatundu South

The former place of residence for respondents who had moved to Gatundu South included Embu, Kiambu, Meru, Mombasa, Murang'a, Nairobi, Nyandarua, Nyeri, Tanzania, and Vihiga. The data suggests that though outmigration occurred, a majority of respondents moved within the central region of Kenya, however, one case was identified as coming from the larger East Africa region, namely Tanzania.

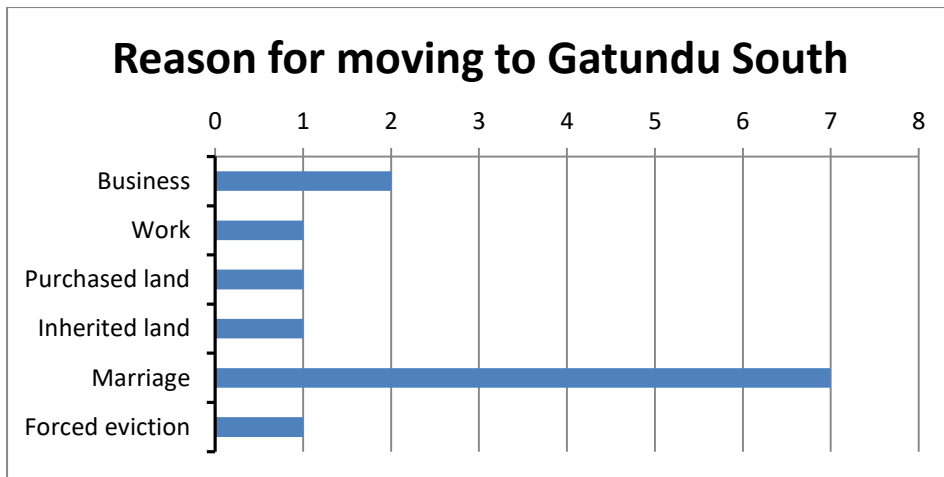


Source: Field Survey, 2019

### 5.2.5.3 Reason for moving to Gatundu South

The reasons for moving to Gatundu South included work, purchase of land, land inheritance, business, marriage, and forced eviction. Marriage carried the most weight as the foremost reason why people had moved to Gatundu South.

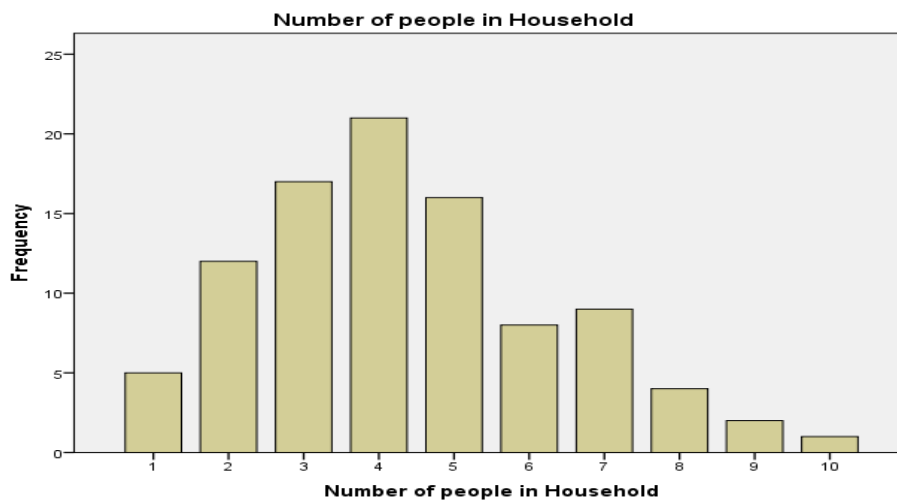




Source: Field Survey, 2019

#### 5.2.6 Household size

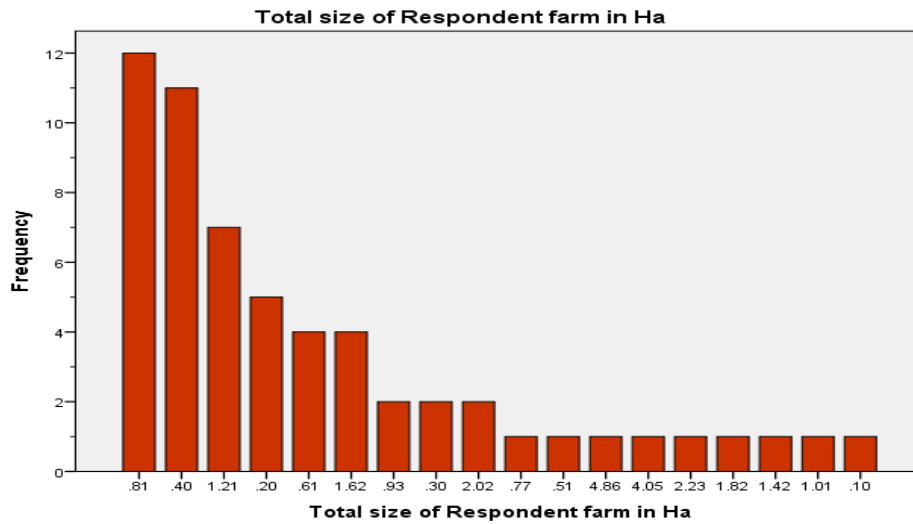
The household size was found to be as follows. Mean household size was 6.09; mode and median household sizes were both found to be 4. The minimum household size was found to be 1, and the maximum household size was 10. The bar chart below illustrates household size distribution.



Source: Field Survey, 2019

### 5.2.7 Household land size

The data from the household survey revealed that the minimum household land size was 0.10 Ha, and the maximum household land size was 4.86 Ha. The mode and median land sizes were both 0.81 Ha. The mean household land size was found to be 3.44 Ha.



Source: Field Survey, 2019

### 5.2.8 Ownership of land

92 of the 97 respondents owned the land on which they farmed coffee; five respondents indicated that they did not own the land on which they farmed coffee.



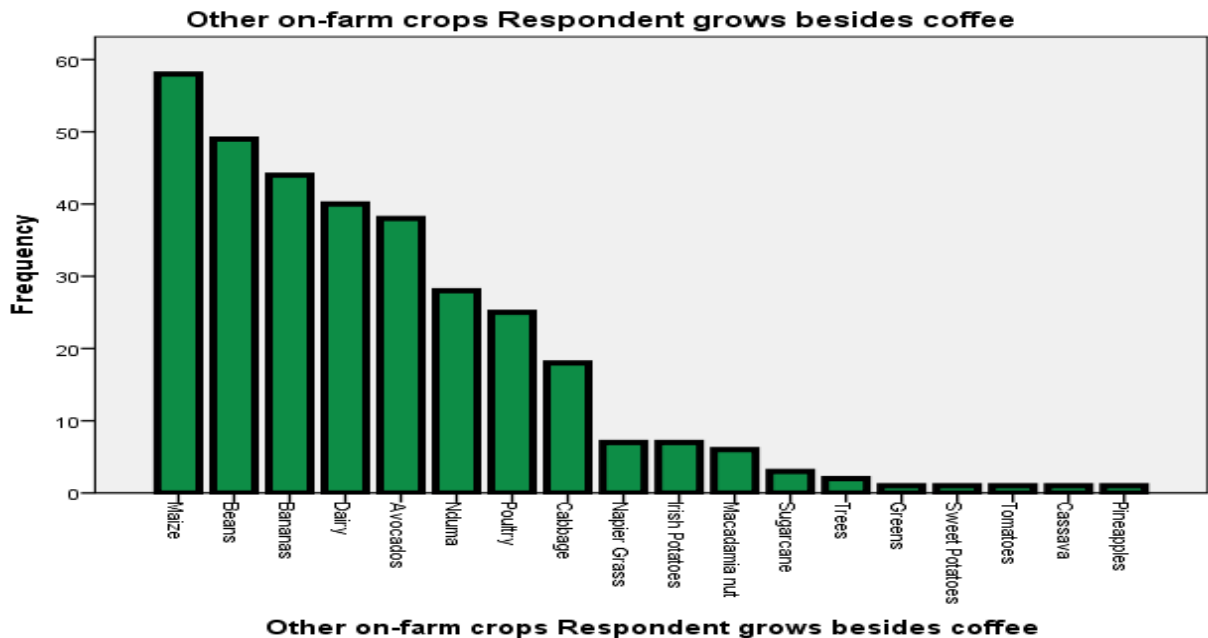
Source: Field Survey

### 5.2.9 Livelihood Activities

The survey data identified the diverse farm and non-farm activities that the respondents undertook to support their livelihoods.

#### 5.2.9.1 On Farm activities

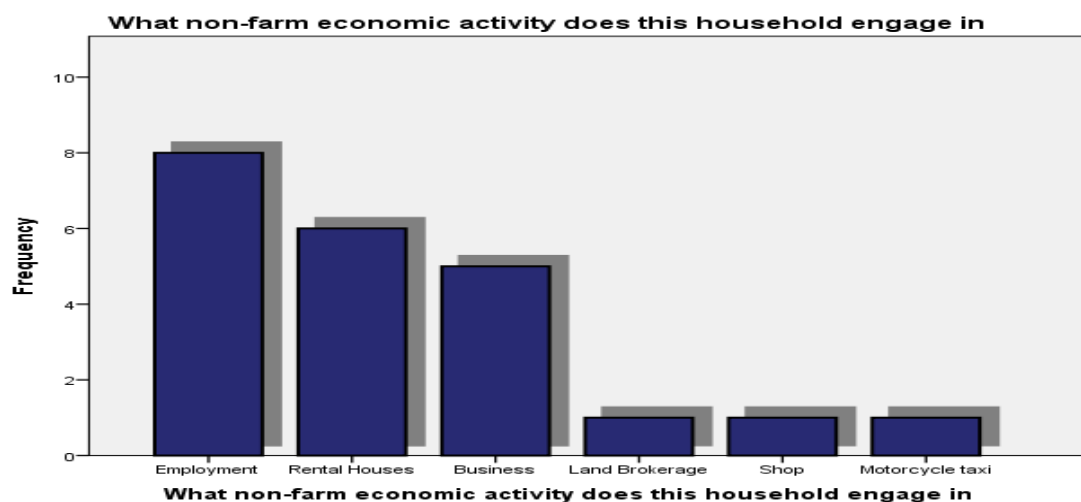
The study found that the respondents grow a diverse range of crops besides coffee to supplement their household dietary needs, as well as generate income. These include cassava, tomatoes, Irish potatoes, maize, beans, bananas, and others. Other on farm activities include dairy and poultry farming.



Source: Field Survey, 2019

#### 5.2.9.2 Off Farm Activities

Respondents also participate in an array of off –farm activities to supplement their livelihood needs, these include; rental property, operation of motorcycle taxi, running a shop, employment, financial remittances from relatives, running a business, and pension funds.



Source: Field Survey, 2019

### 5.3 Objective One

This objective sought to document how household land size has changed inter-generationally in Kiganjo sub location. To do this, the study asked questions regarding size of land families owned, and how family land had been allocated to different members of families in different generations beginning with land that was owned by grandparents. The data comprised acreages of land belonging to generation one (grandparents), generation two (respondents), and generation three (grandchildren), comparing increase or decrease in land holding size between the generations. The table below illustrates this.

	Ha of land. Generation 1	Ha of land. Generation 2	Ha of land. Generation 3
N Valid	84	85	82
Missing	13	12	15
Mean	3.9236	0.9786	0.2358
Median	2.3269	0.8093	.0000
Mode	1.2141	0.8093	.0000
Minimum	0.053	.000	.000
Maximum	40.4686	6.0703	2.0234

Source: Field Survey, 2019

The findings reveal that household land size has changed across the generations. There is a slight reduction of land sizes from generation one to generation three. In generation one the average household acreage was 3.92 Ha, which reduced to 0.98 Ha in generation two and 0.24 Ha in generation three.

In generation one, the study found that the largest inherited land size was 40.5 Ha, and the least size of land inherited was 0.05 Ha. In generation two, the largest inherited land size was 6.07 Ha among sons, and 3.24 Ha among daughters, while the least size of land inherited was 0.202 Ha among both sons and daughters. In generation three, the largest land size to be inherited among sons and daughters will be 2.02 Ha and 0.81 Ha respectively. The minimum land size to be inherited will be 0.012 Ha among sons and 0.80 Ha among daughters.

The study revealed that intergenerational household land size changed by 75 per cent from 3.92 to 0.98Ha from generation one to two. The same changed by 76 per cent from 0.98 to 0.235 Ha from generation two to three. The change from generation one to three (grandfather to grandson) is 94 per cent which is 3.92 to 0.235 Ha. Assuming proportional change in average quantity of produced coffee, this translates to a reduction of about 94 per cent because of the reduced land size.

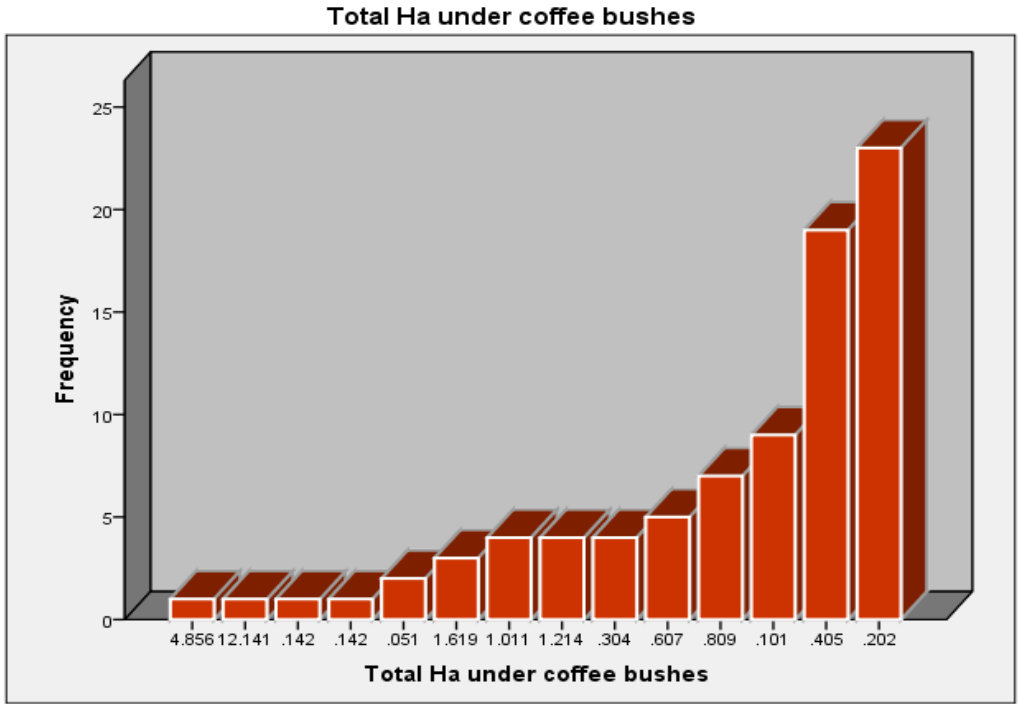
The constitution of Kenya gives ‘men and women ...the right to equal treatment, including the right to equal opportunities in political, economic, cultural, and social spheres’. In order to protect the constitutional rights of men and women, the issue of diminishing land sizes in the study area needs to be addressed in earnest.

In regard to sustainability of livelihoods, this phenomenon of diminishing land size poses a threat to sustainability as defined by the DfID. The environmental effect has been that soils in the study area have become weak as reported by respondents in the study area. This has led to increased use of pesticides and chemicals in coffee farming, further threatening

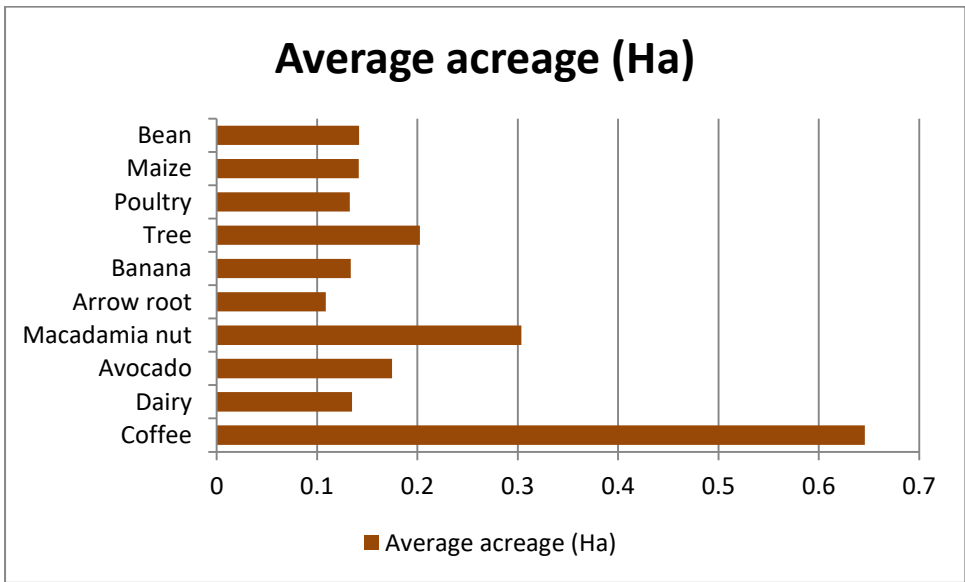
environmental sustainability. In terms of social sustainability, the data suggests that future generations will have to purchase alternative land away from their ancestral home, as there will no longer be sufficient land for heirs to inherit. Institutional sustainability can only be achieved once minimum land sizes have been determined based on ecological and land use carrying capacities as envisioned in the National Land Use Policy. In terms of economic sustainability, the respondents in the study area fall within the safeguards of rural household income as defined by the Kenya Integrated Household Budget Survey (KIHBS). Monthly average household income for a rural household is pegged at Kshs 10,633.00, translating to annual average income of Kshs 127,596.00. The findings on page 64 of this report indicate average annual income of a coffee farmer in the study area at Kshs 140,435.00. Further, a study conducted by Kenya Coffee Platform titled ‘Coffee Economic Viability Study’ found that the break-even point for smallholder coffee farmers was 1.28kgs of coffee per bush. The study further found that a smallholder farmer should harvest at least 2.53kg per tree to establish economic viability. This study found that respondent’s average yield per coffee bush was 4.76kgs, which makes coffee farming economically viable.

#### **5.4 Objective Two**

This objective sought to establish the existing household land uses and their respective financial returns. The primary land use in the study area is coffee growing, with secondary land uses that include a diverse range of other crops, as well as dairy and poultry farming. Food crops grown for subsistence include sugarcane, greens, sweet potatoes, tomatoes, cassava, and cabbage. Non-food crops grown include Napier grass. The survey respondents identified sale of bananas, macadamia nuts, avocados, beans, maize, arrow roots, trees, dairy and poultry as supplementary sources of income contributing to household income.



Source: Field Survey, 2019



Source: Field Survey, 2019

Coffee farming, which is the primary land use, has the highest financial returns. Maximum annual income from coffee farming was Kshs 1, 951, 3000.00 while the minimum annual income was Kshs 5,000.00.

Among the various other land uses, dairy farming carries the next highest financial returns, followed by macadamia nut farming, arrow root farming, avocado farming, tree farming, banana farming, maize farming, poultry farming, and bean farming, in descending order. Despite having food crops on their farm, the respondents still spend an average of Kshs 6,344.00 of household expenditure on food and other household goods.

Income from other land uses is shown in the table below.

<b>On Farm Land Use Activity</b>	<b>Average Annual Income (Kshs)</b>
Coffee Farming	140,435/=
Dairy Farming	116,333/=
Macadamia Nut Farming	106,250/=
Arrow Root Farming	50,800/=
Avocado Farming	36,355/=
Tree Farming	30,000/=
Banana Farming	21,092/=
Maize Farming	12,000/=
Poultry Farming	10,266/=
Bean Farming	8,000/=

Source: Field Survey, 2019

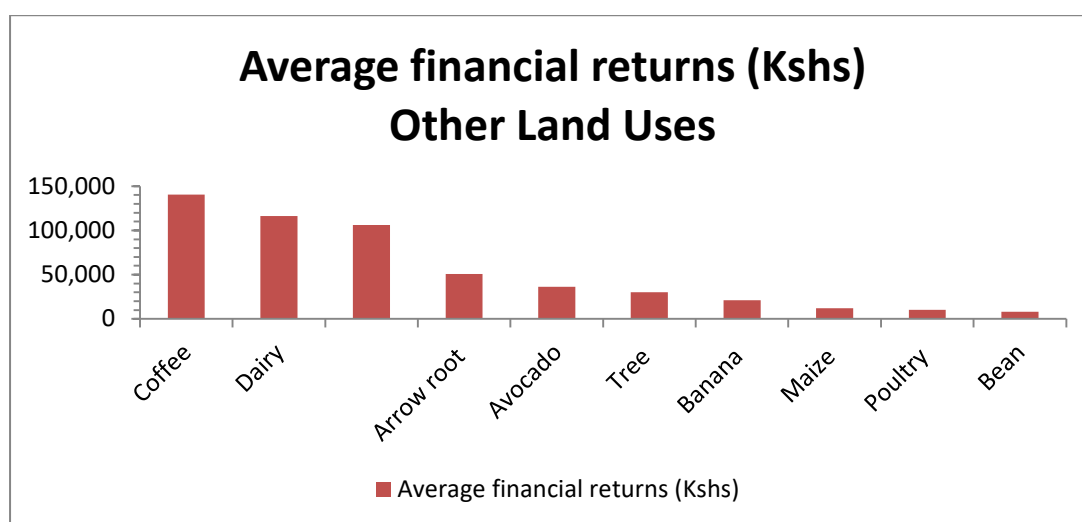
Land holdings in the study area range from 0.051 to 12.140 Ha with a majority of farmers growing coffee on 0.2023Ha. The study found that there was a difference in total owned family land size and total area under coffee farming. Households prefer not to put their entire land holding under coffee. A similar study conducted by True Price in Kenya, Fobelets, Rusman and de Groot Ruiz found the same; they noted that the Kenya average farm size was 0.71Ha but the area of coffee production was 0.23Ha.



**Total annual coffee sales (Kshs)**

N	Valid	90
	Missing	7
Mean		140,435.67
Median		57,000.00
Mode		50,000
Range		1,946,300
Minimum		5,000
Maximum		1,951,300

Source: Field Survey, 2019



Source: Field Survey, 2019

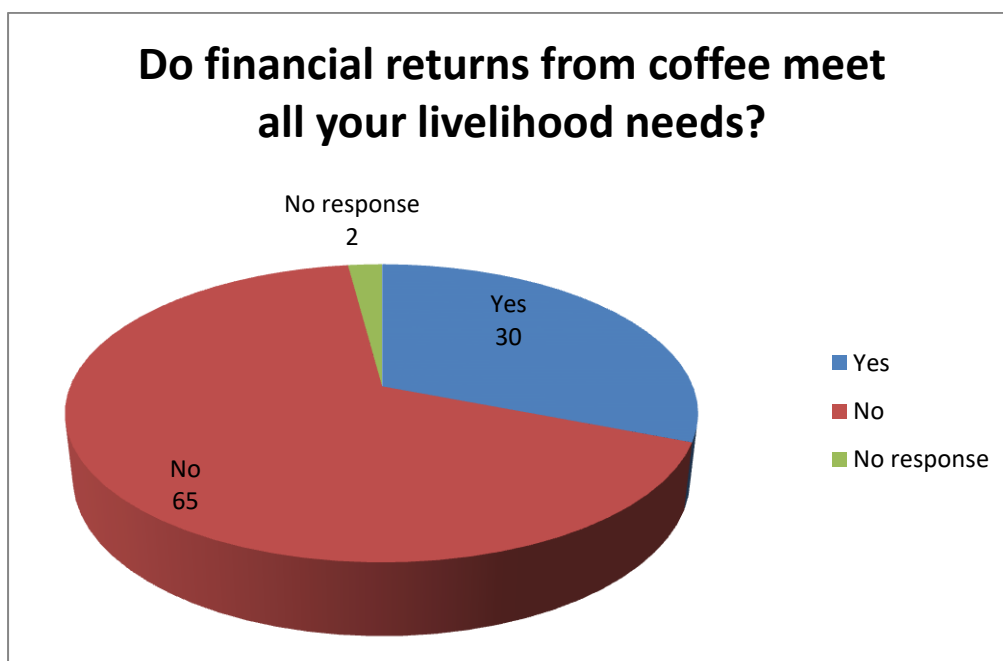
A majority of respondents in this study also reported not being able to meet their livelihood needs solely from coffee farming, and practice mixed farming in order to supplement their income. The advice to practice mixed farming was received from various sources including fellow farmer, coffee co-operatives, and county extension workers.

The table and pie chart below illustrate the above reality for coffee farmers in Kiganjo sub location.

**Do financial returns from coffee meet all livelihood needs**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Yes	30	7.7	7.7	82.9
No	65	16.6	16.6	99.5
No response	2	.5	.5	100.0
Total		100.0	100.0	

Source: Field Survey, 2019



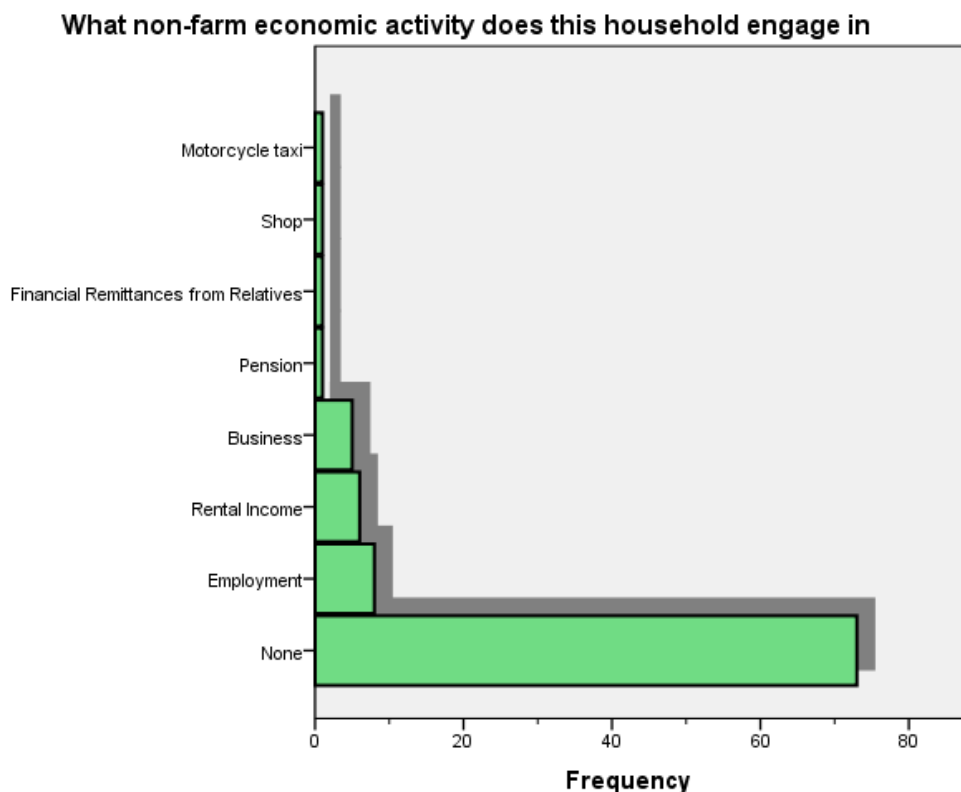
Source: Field Survey, 2019

The Crops Act No. 16 of 2013 outlines crops that are classified as ‘scheduled crops’ which include coffee, Irish potatoes, beans, maize, bananas, sweet potato, cabbage, tomatoes, fruit trees including avocado, spinach, cassava, among others. In the Act, it envisions that ‘an Authority shall regulate all aspects of scheduled crops, with a view to promote productivity, provide incentives to farmers, avail credit facilities, and value addition’. In view of this, coffee farmers in the study area, who have already embraced scheduled crops in the form of

mixed farming, stand to benefit once the above-mentioned incentives are implemented and regularized. In so doing, the livelihood capacities of famers in the study area will be greatly enhanced.

### 5.5 Objective Three

This objective sought to examine the household livelihood diversification strategies, and their respective financial returns. The data showed that 75.3 per cent of respondents do not have a livelihood diversification strategy, as they are not involved in any non-farm economic activity. The respondents with financial returns from non-farm economic activity are engaged in employment (8.2 per cent), rental income (6.2 per cent), business (5.2 per cent), motorcycle taxi, shop, pension, and financial remittances all represented by 1 per cent of respondents.



Source: Field Survey, 2019

The leading source of income from livelihood diversification is running a shop, followed by employment, business, rental income, motorcycle taxi, pension, and financial remittances from relatives, in descending order.

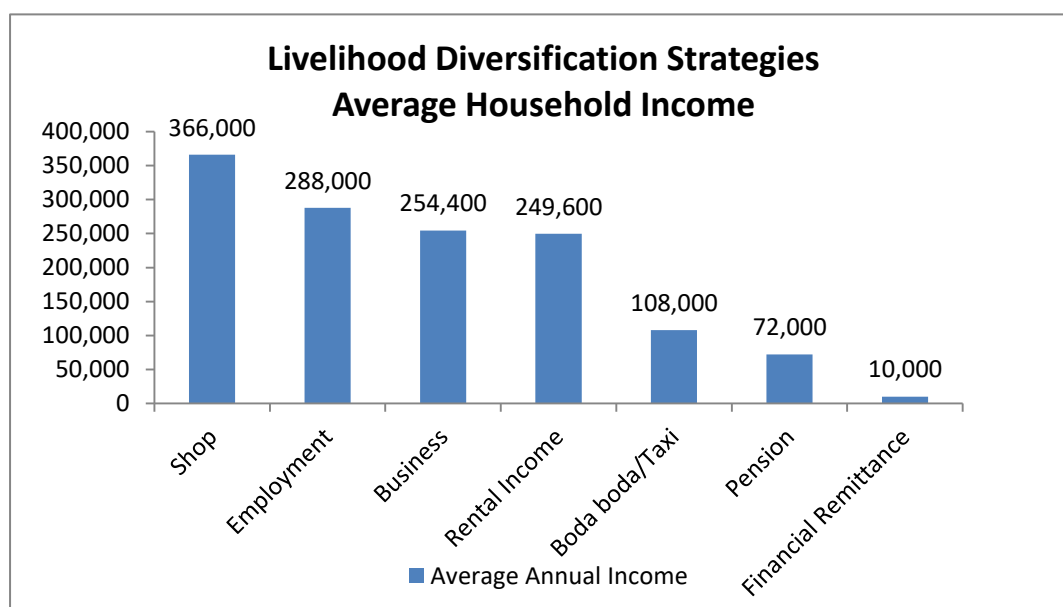
Livelihood Diversification Strategies, Kiganjo Sub-Location, Gatundu South Sub-County		
Economic Activity	Modal Financial Return (Kshs)	Maximum Financial Return (Kshs)
Shop	12,000	720,000
Employment	120,000	600,000
Business	72,000	600,000
Rental Income	120,000	720,000
Motorcycle taxi	108,000	108,000
Pension	72,000	72,000
Financial remittance	10,000	10,000

Source:

Field

Survey,

2019



Source: Field Survey, 2019

Literature suggests that straddling is a good approach to sustainability of livelihoods. In view of a majority of respondents not engaged in off-farm diversification strategies off, the mix of on-farm and off-farm activities should be encouraged, as profits from off-farm income could be ploughed into improving the farm system. Intensification of rural-urban linkages would

greatly enhance livelihoods, noting the proximity of the study area to the capital city; approximately 51.7 kilometres away.

## 5.6 Objective Four

This objective sought to determine the possible land use planning interventions that people living in Kiganjo sub-location would propose in order to ensure sustainable rural livelihoods.

### 5.6.1 *Moving to Live in Urban Areas*

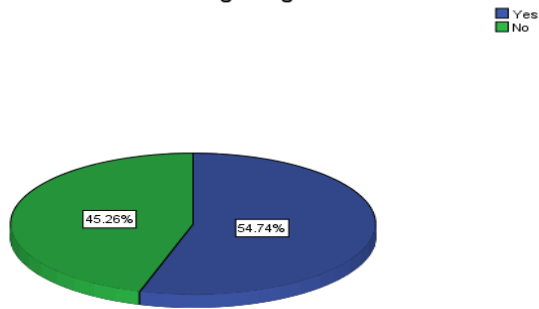
A majority of respondents (52 per cent) proposed the idea of households moving to live in urban centres in order to preserve rich agricultural land. This idea is similar to the Government views contained in Vision 2030 policy paper where the government envisages more than fifty per cent of Kenyans living in urban areas by the year 2030. This is a window of opportunity that the Kenya (national) and Kiambu (county) governments can explore together with the people, with a view to preparing urban areas to accommodate rural-to-urban migration in order to release rich agricultural land for farming.

#### **Would you support idea of households moving to live in urban areas instead of building on agricultural land**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Yes	52	53.6	54.7	54.7
No	43	44.3	45.3	100.0
Total	95	97.9	100.0	
Missing 88	2	2.1		
Total	97	100.0		

Source: Field Survey, 2019

Would you support idea of households moving to live in urban areas instead of building on agricultural land



Source: Field Survey, 2019

The Kiambu County Integrated Development Plan 2018-2022 notes that nucleated villages or clustered settlements are what characterize the study area. These ‘settlements cluster around a central focal point, which is close to the needs of the people’ (Kiambu CIDP, 2018-2022).

Current laws support the implementation of the above land reform. The County Government Act, 2012 envisions a spatial plan that captures the desired spatial form of the county, and proposes desired patterns of land use. In addition, it empowers the city or municipal to develop building and zoning plans.

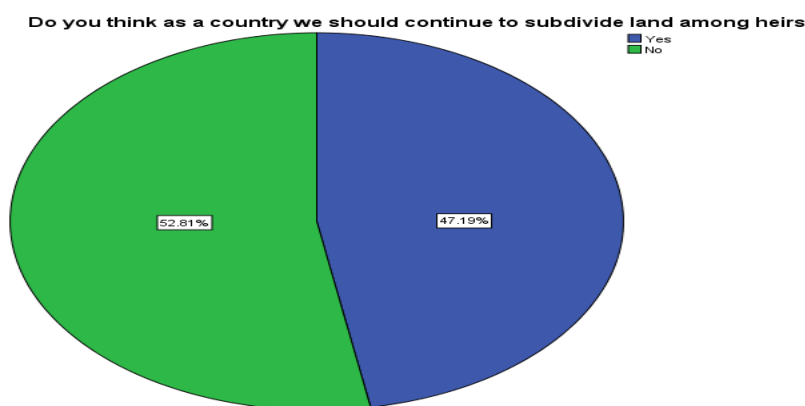
#### 5.6.2 *Subdivision of land to heirs*

On the question of subdivision of land to heirs, 52.8 per cent of respondents believe that this practice should be discontinued.

**Do you think as a country we should continue to subdivide land among heirs**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	42	43.3	47.2	47.2
	No	47	48.5	52.8	100.0
	Total	89	91.8	100.0	
Missing	88	8	8.2		
Total		97	100.0		

Source: Field Survey, 2019



Source: Field Survey, 2019

The following include the negative effects of subdivision that were cited by respondents; decreased profits for farmers, low coffee yields, over ploughing leading to weak soils, reduced value of land, conflicts among relatives, and famine.

The National Land Use Policy notes that continued fragmentation of land threatens the country's productive capacity and its long-term food security (NLP, 19).

**5.6.3 Government action on land subdivision**

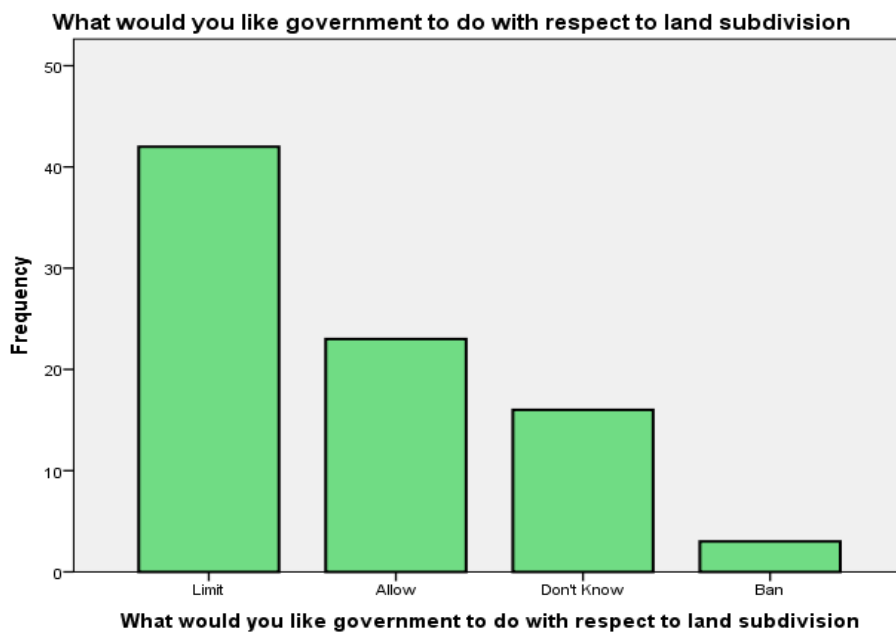
Consistent with the response on subdivision above, a majority of respondents believe the government should limit the subdivision of rich agricultural land.

In response to the question on government action with respect to land subdivision, the frequency values are as follows; 42 support limiting subdivision, 23 support allowing subdivision to continue, 16 respondents did not have an opinion on specific government action regarding subdivision, 3 support banning land subdivision.

**What would you like government to do with respect to land subdivision**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Ban	3	3.1	3.6	3.6
	Limit	42	43.3	50.0	53.6
	Allow	23	23.7	27.4	81.0
	Don't Know	16	16.5	19.0	100.0
	Total	84	86.6	100.0	
Missing	88	13	13.4		
Total		97	100.0		

Source: Field Survey, 2019



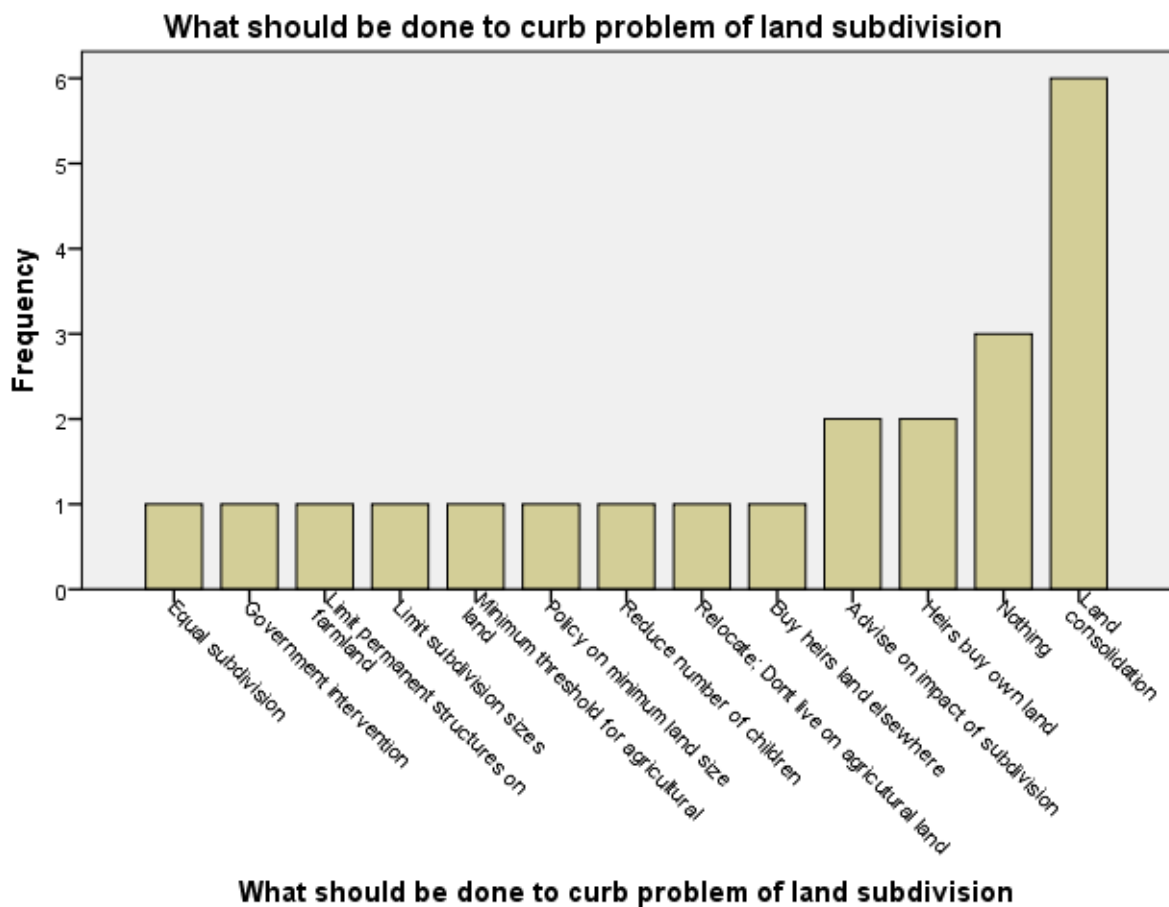
Source: Field Survey, 2019



Indeed, there are numerous policy plans to address the issue of subdivision. The National Land Use Policy states that ‘rural land use inundated with laws, institutions and bureaucratic agencies all concerned with one aspect or another of agriculture or livestock development. These instruments notwithstanding a number of problems peculiar to rural land use still remain...to address these the government shall encourage consolidation of holdings and re-organization of rural settlements as a method of controlling fragmentation of rural land’ (NLUP, 34)

#### 5.6.4 Solution to problem of land subdivision

Respondents had a myriad of solutions to the problem of land subdivision. The graph below summarises the responses, with a majority in favour of land consolidation.



Source: Field Survey, 2019

Measures of a similar nature can be found in government policy papers such as Sessional Paper No.3 of 2009, and Sessional Paper No. 1 of 2017 both addressing National Land Policy.

#### 5.6.5 Minimum land size

What minimum land size can sustain household in full time coffee farming

N	Valid	76
	Missing	21
Mean		1.5800
Median		1.2140
Mode		1.21
Std. Deviation		1.42433
Minimum		.00
Maximum		8.09
Percentiles	25	.8090
	50	1.2140
	75	2.0230

Source: Field Survey, 2019

Respondents were asked to state the minimum land size that would be sufficient to sustain the household if solely engaged in coffee farming. The responses indicated an average land size of 1.58 Ha, while a number of respondents did not see the necessity of a minimum land size.

In their publication, *Implications of Agricultural land subdivision on productivity; A case study of Kajiado County, Kenya*, Museleku et al, 2018 state that a ‘minimum floor ceiling on agricultural land has been pegged at 1 Ha or more depending on various factors like whether agricultural land is irrigated, or arable, type of crop planted, scale of operation, among other factors’.

Using data from this study, the findings point to a minimum land size of 0.5Ha. This study found that 1 Ha of land produces an average of 6,175 kilograms of coffee, which is sold at Kshs 50.00 per kilogram. This results in household income of Kshs 308,750.00. Assuming input costs at Kshs 36,852.00 per Ha, the net household income is Kshs 271,898.00. Data from the KIHBS indicates that rural households have an annual average income of Kshs 127,596.00. A ratio of the data gives a minimum land size of 0.469 Ha.

#### *5.5.6 Land use planning interventions*

On the question of land use planning interventions that would ensure sustainable rural livelihoods, the responses were varied. The list below is a summary of suggested interventions;

- i) Reform the Land Act in order to change the land tenure system
- ii) Government to lease unutilized agricultural land and allocate idle land to active farmers through long term leases
- iii) National and county governments to buy unutilized agricultural land and lease to active farmers for cultivation
- iv) Prioritise human settlements in urban areas for people to move out of farms
- v) Encourage mixed farming to include cash crops, food crops, and livestock so that each farm has at least three farming activities, for example coffee farming, banana farming, and dairy farming.
- vi) Land consolidation, starting with voluntary selling of land among relatives.
- vii) Formulate and strictly enforce the minimum land size rule

## **6 Chapter Six: Conclusion and Recommendations**

### **6.1 Introduction**

This chapter seeks to draw conclusions on the four study objectives that have been analysed using SPSS.

### **6.2 Objective 1**

The first objective of this study was to determine the change in inter-generational household land size in Kiganjo sub-location, and the conclusion is that land size is indeed reducing from one generation to the next. The rate of change from generation one to generation two is 75 per cent, from 3.93 Ha to 0.98 Ha. The rate of change from generation two to generation three is 76 per cent, from 0.98 Ha to 0.24Ha. Between generation one and three, the rate of change in land size is significant at 93.96 per cent.

The conclusion is that land size is reducing with each new generation. The change is slight yet unsustainable for livelihood security in the long term within the coffee growing zone of Kiganjo sub-location. There is urgent need for policy directives to address the issue of minimum land size for each agro-ecological zone. This study recommends that the minimum land size be set at 0.5Ha for coffee farmers. Since the average land size in generation two is 0.98 Ha, deft government action could prevent further subdivision of land into uneconomical land sizes and ensure food and livelihood security. In addition, and as proposed by respondents in this study, the county government should encourage communal farming in the form of land pooling.

### **6.3 Objective 2**

The second objective of this study was to establish the existing rural land uses at household level, and their respective financial returns within Kiganjo sub-location. The study found that respondents engage in coffee farming as the primary land use, while also engaging in other

land uses of food crop and non-food crop farming. The study found that the financial returns for respondents involved in coffee farming average Kshs 140,435.00 per annum. However, the average household expenditure was found to be Kshs 306,415.00, which indicates an unsustainable income shortfall. Consequently, households engage in other land uses both for subsistence and to supplement household income.

The other land uses that this study identified as significant in raising household income are dairy farming, macadamia nut farming, and arrow root farming, each having an average annual income above Kshs 50,000.00. The data shows that these secondary land uses do not require separate acreage and do well in a mixed farming environment. Having been well embraced by respondents, they would provide a sustainable livelihood if farmers were provided with marketing and extension services from the county government as envisioned in the fourth schedule of the constitution, and the Crops Act No. 16 of 2013.

The new Ruralism theory would provide a good framework for progressively introducing smart growth and agricultural urbanism in land use since the location of the study area is an urban edge rural agricultural area.

#### **6.4 Objective 3**

The third objective of this study was to examine current household livelihood diversification strategies together with their respective financial returns. The conclusion is that the study area has untapped potential in livelihood diversification strategies. Despite its proximity to the capital city, Nairobi, the study area exhibits little urbanizing influence in its livelihood diversification strategies, for example there is lack of value addition of agricultural produce, which could find a market in the capital city. The study identified diversification strategies with high financial returns as rental income, motorcycle taxi, shop, employment, and business all of which have average annual returns above Kshs 100,000.00

Despite the potential to increase household income through diversification strategies, a majority of respondents are not currently engaged in livelihood diversification strategies. The county and national governments need to create a conducive environment that enables residents of the study area access information and credit in order to promote livelihood diversification.

#### **6.5 Objective 4**

The fourth objective of this study was to determine land use planning interventions that would ensure sustainable rural livelihoods in the study area. The conclusion is that residents of the study area are desirous of government intervention to limit land subdivision and therefore government should move speedily to enact laws on minimum land sizes.

The respondents in this study area favour moving to live in urban centres rather than building houses on rich agricultural land. This data could inform the Big 4 agenda on affordable housing, as well as the Kiambu County Integrated Development Plan, to encourage linkages and integration with national housing policies and projects.

In addition, the Kiambu county government could incentivize preservation of agricultural land by creating agricultural districts, which would reduce non-agricultural activity in the study area. Additionally, the county government could provide economic incentives including tax breaks to farmers who opt to preserve agricultural land.

#### **6.6 Cross Cutting Recommendations**

The cross-cutting recommendations envisage multiple stakeholders coming together to positively impact livelihoods in Kiganjo sub-location. The actors, ranging from extension workers, coffee researchers, manufacturers and suppliers of inputs, investors, and dispute resolution agencies need to come together to give a coordinated effort to improve sustainability of livelihoods in the study area.

## **6.7 Future Research**

Areas of future research include the following: i) the economic viability of long term leasing of land rather than owning land for coffee farming; ii) the effect of the law giving women and men equal rights to inheritance of family land on household land size and coffee production; iii) detailed study on the ideal minimum household land sizes for food and livelihood security as perceived by different stakeholders in the coffee sector; iv) viability of extension services through coffee co-operatives.

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