

**RURAL LAND SUBDIVISION AND ITS IMPACT ON HOUSEHOLD MAIZE
PRODUCTION: A CASE STUDY OF KIMININI SUB COUNTY, TRANS-NZOIA
COUNTY**

BY

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DECLARATION

This thesis is my original work and has not been presented for examination or degree award in any other University.

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This thesis has been submitted for examination with my approval as the University Supervisor

.....Date.....

DR. FRIDAH WILUMILA MUGO

DEDICATION

This thesis is dedicated to Trans Nzoia County Government, My Parents Mr. & Mrs Musumba and my daughter Kylie Achieng for their unconditional support throughout the period of my study at the Department of Urban and Regional Planning, University of Nairobi.

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I wish to acknowledge the support of my supervisor Dr. Fridah W.Mugo for her invaluable guidance, suggestions, criticisms and encouragements. Her contribution to the research work as a supervisor has gone a long way in the timely completion of this Master of Arts (Planning) degree programme. I would also like to acknowledge my family members for their financial support towards my studies.

ABSTRACT

Globally, around three million hectares of agricultural land is lost each year to other land uses. This results in a huge decline in household food production. In addition, rural land subdivision and the resultant encroachment by residential development is a threat to food production. Maintaining rural land in optimally sized allotments is critical for sustainable primary food production. Sustainable natural resource management and increased productivity of primary industries can also be assured by ensuring that economically viable land sizes are maintained. The literature reviewed indicates that there is limited information on land sub-division trends and its associated impacts in the settlement schemes of Kenya. It is also not clear whether there are any development control measures in the rural area land use especially in Kiminini sub-county. This study investigated the trend of rural land subdivision in Kiminini Sub-county from 1963 to 2018. It examined the causes of rural land subdivision in the sub-county, determined the impacts of rural land subdivision on household maize production in the study area, and has proposed policy interventions to reduce rural land subdivision in Kiminini for food and livelihood security. A cross-sectional survey of 120 households was conducted. Focus group discussions, key informant interviews and observations were also used to collect data. The findings have revealed that household land size has decreased from the initial 30 acres in 1963 to 1.5 acres in 2018 leading to a reduction in maize production from the potential 600 (90 kgs) bags per household to 30 (90kgs bags), a 95% reduction. At the yield of 20 bags/acre, 5 acres would be required per household of 5 persons. If the yield is doubled to 40 bags/acre, only 2.5 acres of land will be required. The main causes of land sub-division were found to be for inheritance, selling, population pressure and poor implementation of policies. There was no land use plan for the sub-county to guide both rural and urban land use and there were no guidelines to regulate development. The study recommends land use planning through development of a local physical development plan, determination of a minimum land size for maize growing zones, agricultural land protection zoning where land zoned for agriculture cannot be converted to other uses, formulation of rural land use guidelines, policy review of the land inheritance tradition to guide land rights transmission such as farmers leasing land for 50-60 years for farming from government and not being allowed to sub-divide, consolidation where it has been subdivided to uneconomic units and promotion of alternative technology for intensive and sustainable agricultural practices that require little land.

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CHAPTER ONE

1 INTRODUCTION

1.1 Background to the research problem

Subdivision of land involves dividing allotment of land to create one or more additional allotments (Scott and Whitehead, 2009). The creation of additional entitlements and resultant land use changes can adversely affect primary industry operations and future development. Maintaining rural land inefficient and productive sized allotments is critical for maintaining opportunities for sustainable and profitable primary food production. Natural resource management and improving the economic value of primary industries can be done by ensuring that the productive sized land is maintained.

Subdivision of agrarian land and the subsequent encroachment of residential development pass a long term threat to land dependent household maize production. Apprehensions about the loss of prime land from Agriculture have led to significant research in Europe, Canada, Bulgaria, the USA and the United Kingdom. Measures including legislation in many cases are put in place for the protection of prime agricultural land in these countries. In Bulgaria, the transition from a centrally planned economy to a free market economy called for changes in the Agricultural sector (FAO, 2002). Change from communism to capitalism contributed to land fragmentation. Land fragmentations hinder the implementation of new technologies and hamper the establishment of viable and profitable farms. To solve this problem, effective resource allocation through land consolidation and spatial planning was done. The regions in Kenya show similar concerns regarding unsustainable subdivision of land.

Land is a limited resource, which is subject to numerous conflicts and competitions (Ulriker&Hartmut, 2011). In every society, land is linked to a sense of property tenure, power, wealth and lineage. This emphasizes the prominence of land to society. Use of land, therefore has to be planned, managed and controlled pragmatically.

Unsustainable land sub-division comes at a cost. Alteration of extensive land to smaller residential plots decreases the amount of land available for agricultural production(Wu, 2008).

In Kenya, intensive rural land subdivision is experienced in the highlands mainly in the western and central regions. Land is, in most forms of society, the most important of the natural resources required for the creation of wealth. As a direct result, control of land brings economic power, which in turn, is often the basis of social and political power. The centrality of land in human life made it the main reason for the struggle for Kenya's independence from the British colonial rule.

Land has been, and will continue to be the mainstay of Kenya's economy, where over 80% of its population derives its livelihood from agriculture (Alila&Atieno, 2006). Therefore, its ownership, distribution and utilization is of great concern to most Kenyans. Land subdivision in the rural area is done without control, and this has led to a number of impacts including land use conflicts, reduction in production, rural poverty and lack of utilities. The development of Agriculture is important for poverty reduction since a higher population depend on Agriculture as their main source of livelihood. Trans Nzoia County is the food basket of Kenya known to produce majorly maize, sugar cane, beans and dairy products for the Kenya Population. However, intensive and uncontrolled rural land subdivision has led to a reduction in Agricultural production (Alila&Atieno, 2006).

The lack of an all-inclusive land use policy has led to inappropriate land use in rural areas. Important water catchment areas and wetlands are damaged while arable land parcels end up being subdivided to uneconomic land units. There are different systems of land tenure in peri-urban areas. These systems determine the availability of land for urban use. Agevi (1981) reveals that; the dominant forms of land tenure in any given area have an intense effect on physical rural patterns and the flexibility of adapting to the pressure of population growth. The land tenure disturbs not only the land usage or land acquisition but also the way the land uses respond to growing population pressures created among different competing uses. Furthermore, various forms of tenure systems determine the amount of control that municipal authorities can assert over a given piece of land.

The land use conversions have been spurred by a weak control and regulatory framework from the defunct local authorities. The consequence is land subdivision and conversion to residential uses leading to massive social economic and environmental impacts. Although environmental change occurs first, a complex web of demographic, economic, and social changes ensue that feedback to the environment. These direct, indirect, and induced, local to global, short- to long-term, systemic and cumulative, reversible or irreversible impacts threaten the long-term viability and sustainability of natural and social systems (Briassoulis, 2008).

According to Scott and Rik whitehead, (2009), sustainable agricultural development should ensure that land resource base on agriculture is protected from fragmentation and alienation. Critical farm and rural infrastructure should be provided in land use planning decisions. As a result, land use conflicts will be reduced, negative environmental impacts will be avoided and viability of the land will be upheld for productive purposes.

The second government effort was the development of the Sessional paper No. 1 of 1986 on Economic management for renewed growth, which re-emphasized that agriculture remains the leading sector in stimulating growth and job creation. In terms of land tenure, the policy paper observed that there had been no major policy review since independence. The government was therefore to appoint a commission in early 1986 to review the land tenure laws and practices in the country and to recommend legislation that would bring the law into conformity with Kenya's independence needs (Kenya, 1986).

1.2 Research Problem

Kiminini Sub-County is a major agricultural area located within Trans-Nzoia County. Its role in food production has remained vital, not only locally but also nationally. The dominant agricultural enterprises are maize, beans and production of dairy products. According to the Kenya Agricultural Research Institute, Trans-Nzoia maize yields have been reducing from 2003 to 2018 at a rate of 15% per annum. This is not a good trend for food security in Kiminini Sub-County and the entire country.

Despite the important role that the sub-county plays in household maize production, the land subdivision rate is becoming a threat. Initially, the average size of the agricultural

parcels ranged between 30 and 10 acres (Trans Nzoia CIDP 2013-2017). However, over time due to population increase and the inheritance tradition, the demand for land has gradually increased leading to fragmentation of the otherwise prime farm land. Today, there are households with plots as small as 0.1 acres. Studies elsewhere indicate that production can increase or decrease with decreasing land sizes. It is not clear how maize production is changing with the changing land sizes in the study area and the implication of this on food security. The purpose of the study therefore is to examine the emerging pattern of land sub-division in Kiminini sub-county and its effect on household maize production.

1.3 Research Questions

- i. What has been the trend of rural land subdivision in Kiminini Sub-County from 1963 to 2018?
- ii. What causes rural land subdivision in the study area?
- iii. What are the impacts of rural land sub-division on household maize production in Kiminini Sub-County?
- iv. What policy interventions can be employed to ensure sustainable maize production for food security in Kiminini Sub-County.

1.3 Research Objectives

1.3.1 Overall Objective

This study sought to analyse rural household land subdivision and its impact on household maize production which is the main source of food security in Kiminini Sub County.

1.3.2 Specific Objectives:

The specific objectives of the study were:

- a) Examine household land size change in Kiminini Sub-County from 1963 to 2018.
- b) Determine the main causes of rural household rural land subdivision in Kiminini.

- c) To find out the impacts of intensive rural land subdivision on household maize production in Kiminini.
- d) Propose policy and planning interventions to ensure optimal household land size in Kiminini Sub-County.

1.4 Study Assumptions

- i. Intensive rural land subdivision will reduce household maize production which is the main source of livelihood in Kiminini.
- ii. The rural land has been subdivided into smaller portions over the years which produce lower agricultural yields.
- iii. Some of the reasons why land is being subdivided in Kiminini is inheritance, selling of land, population pressure and poor policy implementation among others.
- iv. To reduce, land subdivision in Kiminini, the local and county government should formulate subdivision of land and monitor its implementation.

1.5 Significance of the Study

This study helps to bring out the trends of rural land subdivision and its impact on household maize production which is the main source of livelihood in Kiminini Sub County. The increasing population has led to subdivision of agricultural land and the study seeks to confirm and explain the impacts of such subdivision to maize production.

Kiminini Sub County is just an example in Kenya of agricultural land that is slowly being turned into rural settlements where land is being subdivided into unproductive lots. The study will therefore propose mitigation measures to ensure that the excessive subdivision is reduced so as to improve productivity.

As a case study, apart from providing information that would contribute to informed and realistic planning in rural areas, the wealth of knowledge generated from Kiminini Sub County's characteristics will fill the knowledge gap that relates to rural planning and development.

The study is important for rural planning which has been neglected in Kenya. It will fill in the gap of rural planning which is inadequately researched on. It will be used in

informing policies to enhance rural land use. The rural areas have been left to grow without any proper regulation and this has resulted in underdevelopment.

Kiminiwas selected using purposive sampling due to its central geographical location, poverty index, ethnic diversity and a fairly distinct agricultural area.

1.6 Justification of the study

Intensive agricultural land sub division has created uneconomic sizes of land which has a direct impact on agricultural and livestock production. This poses a major threat to food security in the country especially with the increasing population. The effects of agricultural land subdivision are cumulative and their aggregate impacts threaten human existence and economic development.

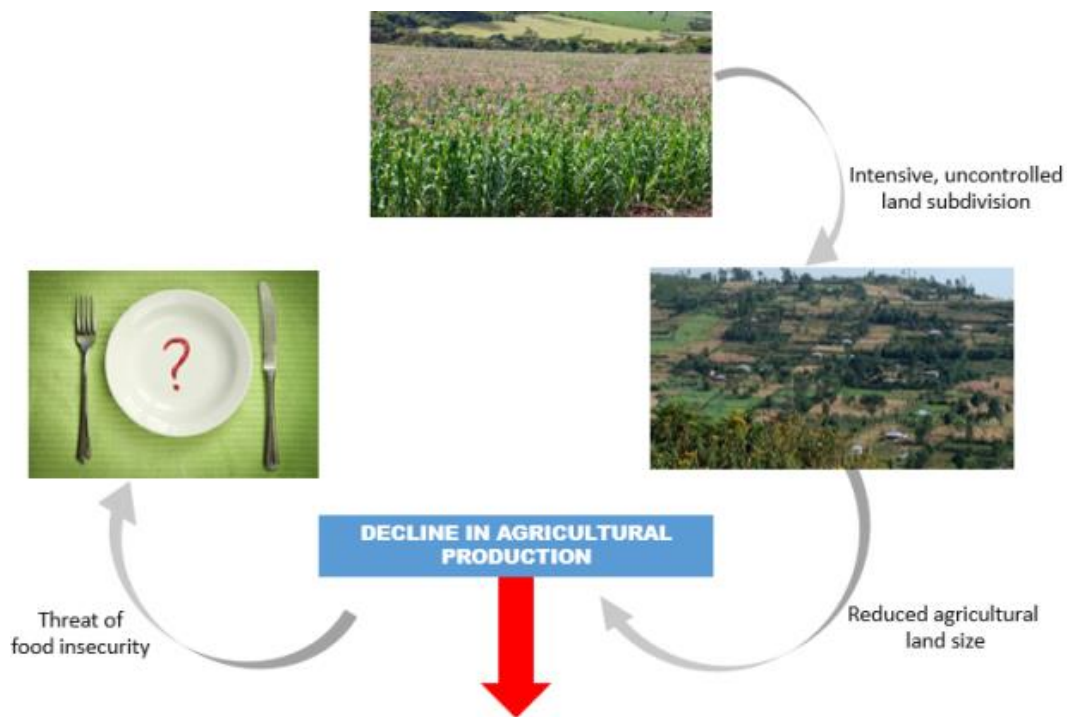


Figure 1-1 Cycle of uncontrolled subdivision

Source: Author, 2018

Subdivision of agricultural land poses a long term threat to land-dependent agricultural industries and therefore this is an area of study that carries much weight and relevance. For agricultural land to continue playing the key roles of food production for the

country's ever-increasing population, there is need to preserve and protect this land in economical sizes. Kenya aspires to increase agricultural productivity and use this sector to drive growth towards the realization of Vision 2030 but to achieve this, conservation of prime agricultural land is vital.

1.7 Definition of Key Terms and Concepts

A number of terms used in this research project are defined below:

Rural Land: A geographic area that is located outside the town or city. Typical rural land has low population and is characterised by farm lands (Republic of Kenya, 2012).

Subdivision: Separation of any land held under one title into two or more parts. The subdivision could be through transference, partition or for the purpose of trade, gift or lease (Republic of Kenya, 2012).

Land Adjudication: A practice whereby present rights in a certain parcel of land are finally and with authority ascertained (Dale and McLaughlin, 1988).

Easements: These are partial interests on land and property which give a person a right of use of another person's land and property without any profit or a public right of way; (Mureti, 2014).

1.8 Research Methodology

The study was carried out in 2017 and focused on rural land subdivision and its impact on household maize production in Kiminini Sub County. Study sites selection was based on the tenure status and age. Probability and non-probability sampling techniques were used to determine the sample. Simple random sampling and quota sampling methods were selected equally from different villages in Kiminini Sub County including Masaba, Kananachi, Nabiswa and Mbai Villages.

The primary data collection involved a total household survey of 45, 3 focused group discussions with farmers, a women group and a youth group. Several key informants Interviews including the Chief, Trans Nzoia County Planner, Agricultural Officers and Surveyors. Direct observation and photography was also used to collect data in the study

area. Secondary data was collected through studying literature in the Library, the Kenya National Archives, the Kenya Bureau of Statistics and internet search among others. Satellite images and maps were acquired from the Regional Center for Resource Survey and Remote Sensing.

1.9 Study area background

This study focused on Kiminini Sub County located in Trans Nzoia County in Kenya. The sub county covers an area of 395.3Km². Land in Trans Nzoia County is generally classified into 3 agro-climatic zones (Humid, sub-humid and semi-humid). Kiminini Sub County is one among many Sub Counties in the Kenyan Uplands that is good for maize production. There are no elements of proper planning of the rural lands in this area and the study is meant to highlight the essence of proper planning for rural development. Adequate effort will be made to ensure fair representation of respondents based on age and gender. Additionally, being a study that will focus on land, which is an emotive subject in Kenya, challenges experienced regarding land will be revealed.

CHAPTER TWO

2 LITERATURE REVIEW

2.1 Introduction

This chapter covers in detail all issues pertaining to rural subdivision of land, more so its causes and gradual impacts on the maize production in different areas of the world. The section further reviews relevant public literature as well as official documents to deepen the understanding of issues concerning the topic of study. This helped the researcher to gain relevant understanding on the dynamics of rural land subdivision and the impacts not only on the production systems but to the economy in general. Rural planning theories are also explored here which give a basis for understanding of rural planning techniques and procedures. The chapter also raises concerns over the loss of prime land from agriculture to other land uses. It concludes by presenting a synthesis of literature on how to explain the phenomenon and how the particular variables in this study connect with each other.

2.2 Utilization and management of agricultural land.

Unlike other factors of production, land is fixed in supply and is also one of the most important natural resource for the creation of wealth in many societies. Its ownership and control brings economic power, which in turn, is often the basis for social and political power. Basic dilemma in rural societies is the situation brought about by natural increase in population against a finite resource base which is land. The authority of individuals over land has continuously been linked to the diversification in land use experienced in the rural areas. In Kenya, various forms of ownership manifested over the years since the coming of the white settlers brought new land use patterns. The individualization of tenure through land registration has led to the subdivision of agricultural land to uneconomic units that are unsuitable for agricultural activities. Productive land is being

changed to other forms of developments that seem more profitable to the land owners (FAO, 2002).

The country through the Ministry of Lands has been trying to put in place mechanisms for effective land management. In 2005, the land minister then issued a caveat limiting subdivision of private agricultural land to 2.5 acres. This was however not received well by the public and there was an immediate and immense public outcry forcing him to revoke the gazette notice just three months later. The major concern raised was the issue of inheritance for families holding smaller parcels of land.

2.3 Urbanization versus agricultural land

Productive rural land is a critical asset for any developing country. It provides food and other products for local consumption and export, contributes annually to the national economy, and underpins employment and investment in regional and rural communities. High potential farm land is being alienated at an alarming rate, largely as a result of urban pressure (Wirzba, 1984). In this instance, land conversion to urban related land uses in rural areas is governed primarily by market forces. Urbanization has created pressure and expectations to allow new residential dwellings thus resulting to numerous rural land subdivisions. Normally, the agricultural industry cannot compete with urban-related land uses for agricultural land. Demand for land by these urban related land uses has led to irreversible loss of large tracts of prime farm land which ultimately jeopardizes future food production. Rural land owners do not realize that fragmenting productive land into smaller lots with dwellings may also affect future opportunities for viable primary production activities.

2.4 Trends of rural land subdivision in Kenya

Of the total land area in Kenya of 56.9 million hectares, more than 90 percent is agricultural land (both crop and pastoral land). Agriculture is the backbone of the Kenyan economy contributing to approximately 25% of the GDP. However in the recent past, agriculture in the rural areas all over the country has been greatly challenged especially due to the pressure from commercial and other urban-generated land uses (Republic of Kenya, 2003).

Prime agricultural land in Kenya is becoming alienated from mainstream agriculture due to urban encroachment and rural residential development. The quality and quantity of agricultural land in the country is thus diminishing (Nyadimo, 2006). This trend has adversely affected the country's agricultural resource base because of the reduced arable land. Cultural land inheritance in the rural areas has been one of the major factors which has made land almost too small for significant production (Scott & Whitehead, 2009). Indeed it still poses a great challenge for the country given that we need to guard against our declining maize production. To offset production losses associated with a shrinking agricultural base, the remaining farm land will have to be more intensively utilized.

Maize is the main staple food in the diet of over 85% of the population in Kenya. The per capita consumption ranges between 98 to 100 kilograms which translates to at least 2,700 thousand metric tonnes per year. Conservation of maize farms is of importance to ensure food security in Kenya (Nyoro et al, 2004)

2.5 Rural Planning Theories

Planning as a discipline is well endowed with theories which provide an essential basis for understanding of planning procedures. These include systems theory and the classical theory of land use

2.5.1 Systems Theory

The thesis of the systems theory, can be applied to an analysis of the rural areas if one views rural areas as systems with persistent human activities, especially those that occur and recur at specific locations or within particular zones (McLaughlin, 1969). A system, in the physical sense, refers to adapted spaces (such as forests, parks) described by the conscious and regular use, rather than, the physical construction and development. The most important argument for the analysis of the systems theory as relates to this study is that many activities take place in the adapted spaces that were not originally intended and equally activities may take place on the same space. The systems approach also

contends that land is a dynamic entity which evolves through time in ways which depend upon changes in land use.

The Key systems affecting rural land uses have been identified as social systems, environment systems and economic systems. Social systems concern ways in which institutions of households, firms and governments organize their affairs daily. Their interaction involves communication whether through the media or face to face made possible by transport (Chapin &Kraiser, 1979). Economic systems on the other hand focus on processes that convert and reconvert space and adapt it for human use in the pursuit social systems.

The main agents of land subdivision and development include land owners who hold the land ripe for development. Developers are involved with land conversions to re-conversion subject to availability of finance, public agency approvals and disposal. Other agents include consumers who purchase or lease the already developed property in order to accommodate their social status. Others include financial intermediaries and public agencies.

Environmental Systems are also important in impacting on land use. They include biotic aspects. The biotic agents are the living things that impact abiotic agents of land, water and air. These help in functioning of the economic and social systems. In a nutshell, rural planning requires insight into the fundamental characteristics of social, environmental and economic systems. The concept of a system is not any concerned with the identification of spatial patterns of these systems as they exist, but also why they take the form they do and how these systems are likely to change in future and impact land use. Indicators to measure these land use impacts are important. The table below gives such indicators for measuring impacts of land subdivision:

Table 2-1: Indicators for measuring impacts of land subdivision

ECONOMIC	SOCIAL	ENVIRONMENTAL
Property value Cost to provide public service Economic development and productivity	Relative accessibility for different groups of people Integration of communities Public health Aesthetics	Deforestation Loss of fertile land Drainage Green space and wildlife habitat Pollution and emission Flooding

Source: Adapted from Kroll et al. (2009)

2.5.2 The Classical Theory of Land-Use

This is put forward by Alonso's Work in early 1960s. Alonso developed a model of the interaction of land values and uses. In this theory, Alonso explains that preference on the demand side and land location on the supply side are mediated through the market and political processes. He assumed that households locate so as to account for costs of all inputs on necessities including land costs at the same time trying to minimize on transportation costs. The intensive land subdivision and development is done along the transport networks. Wingo achieved location equilibrium by substituting transportation costs to space costs.

2.5.3 Economic Base Theory

This theory was developed by Myrdal. Economic base theory asserts that the means of strengthening and growing the local economy is to develop and enhance the basic sector. The basic sector is therefore identified as the "engine" of the local economy and called as the economic base of the local economy. It argues that a community's economy may be divided into two sectors: an export or basic sector and local consumption or non-basic sector. The basic sector trades outside its boundaries and brings money into the local

economy, which provides inputs for future economic development. The non-basic sector, on the other hand, supplies local consumption of goods and services whose activity depends upon basic sector export sales. External demand for an areas exportable goods and services injects income into the local economy, which in turn augments local demand for non-exportable goods and services. The study area; Kiminini focuses more on producing for subsistence rather than conserving land to be able to produce for export

However the study area is a rich natural resource base, which can be used to produce basic goods and services for export. The natural resources include fertile agricultural land. According to Economic Base theory, these resources should be used to produce goods and services for export to other regions which will result to development of the area.

2.5.4 *Malthusian theory of population growth*

Malthus was very concerned by the condition of the poor and particularly by rural poverty. Thomas Malthus thus gave his views regarding the rate of population growth and the potential of earth to produce food which was a basic need for sustaining the population on earth. In his work published in 1798, he believes that human population is growing at a faster rate compared to the rate at which food is being produced. This is because the increase in population puts pressure on land resource causing land conversion from agricultural use to other urban uses to satisfy the demand created by the population. According to the theory, in areas where land is abundant and fertile, population when unchecked grows in a geometric ration and will be double every 25 years.

2.6 Causes of Rural Land Subdivision

The increase in rural population and the increase in demand for arable land, accelerated by the co-operative movement has resulted in intensive sub division of land that has denied this country preservation of precious agricultural land that may sustain food production to feed the nation without relying on food hand-outs (Njuguna and Baya, 1999). Population growth has increased the demand of land thus further land subdivision to fit the demands for the growing population

According to Thomas (2006), Transformation from traditional communities to centrally planned market economy has led to excessive subdivision and selling of land. Privatization of land after independence has led to subsequent fragmentation of land to serve the demands of the market economy. Liberal inheritance law and traditions is one cause of Rural Land Subdivision (FAO, 2002).

The rural areas are characterized by poor enforcement of the existing development control measures and they are left to organically develop with very few restrictions

2.7 Impacts of Rural Land Subdivision

On one hand, sustainable land subdivision can provide land for farmers to carry out agricultural activities to improve their livelihood. On the other hand, unsustainable agricultural land fragmentation and subdivision can undermine economically and environmentally sustainable uses of land and other resources. In agricultural systems, very small holdings and severe land fragmentation can hinder economic and environmental investments such as tree planting, irrigation and terracing. Agro ecological conditions also influence optimal farm sizes in some regions; land fragmentation is a way for the poor to diversify livelihood strategies as in Rwanda (FAO, 2007). This may negate on policies of national food security and nutrition since reduction in agricultural land may lead to reduction in maize production in countries that rely heavily on rain-fed agriculture like Kenya. Moreover, agricultural land sub division may also lead to increase in land values, increase in housing costs and rentals (United States Department of Agriculture, 2008).

Uncontrolled and uncoordinated subdivisions result into conflict of land uses. This calls for an urgent need to have strategic plans in place to contain and guide this type of development. Land subdivision is a major environmental concern and there is need to adopt sustainable patterns of development. Rural land subdivision has led to reducing farmlands, causing loss of wildlife habitat and scenic qualities that attract tourism, increased air pollution and increased energy consumption (Mureti, 2014).Excessive land subdivision has led to formation of rural slum areas.

2.8 Rural Planning

2.8.1 Key elements of rural planning

There are basically three elements:

i. Population

The residents in any rural area are quite critical in the planning of the area, basically because the population; generates activities, creates demand for services, provides services, produces chaos if not well planned for or managed, has experiences, skills, talents and resources that one can tap or utilize. When people settle in a place, various land use activities emerge, as they are either demanded by some or provided by others (Alila&Atieno, 2006).Below is simplified schematic representation of rural population and related land use activities

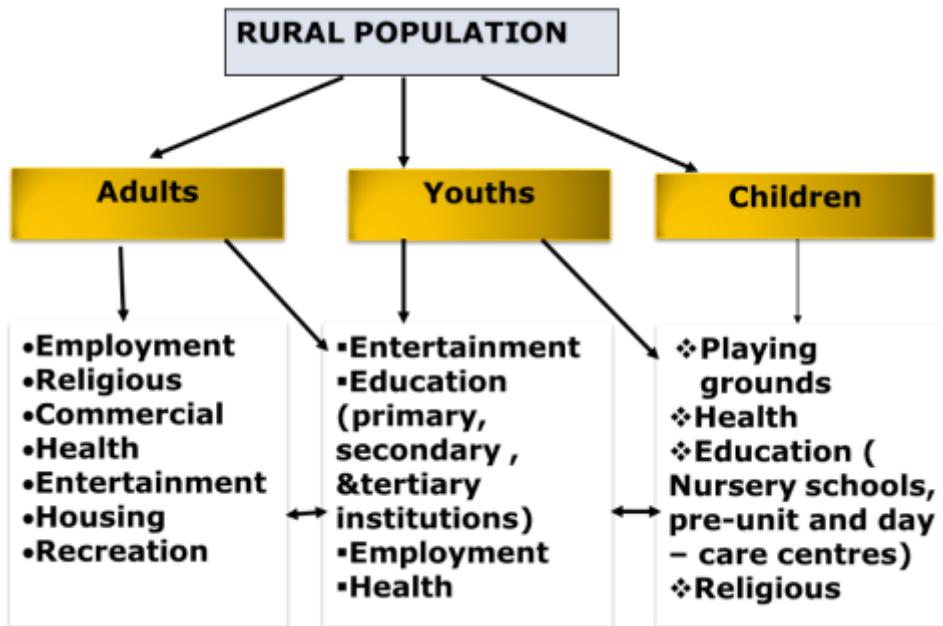


Figure 2-1 Population as an element of planning

Source: Author, 2018

To successfully plan for any rural area therefore, it is vital to identify how many people are in this rural area, composition of the population in terms of the sex differentiation and population density. Where population is concentrated in a limited area, this helps

determine the services to be provided for the concentrated /densely and sparsely populated areas. Population density also gives a hint as to the kind of land values that prevail in a certain place and thus gives an understanding to the sub division trends observed in the area. Migration patterns as will be brought out later in this report are also a key focus while analysing the population since it affects the population density.

ii. Space

Space here refers to land available, a commodity which is fixed in supply. The first step to identifying the space available for planning is delineation of the area boundary. Space available inspires the strategies adopted for development.

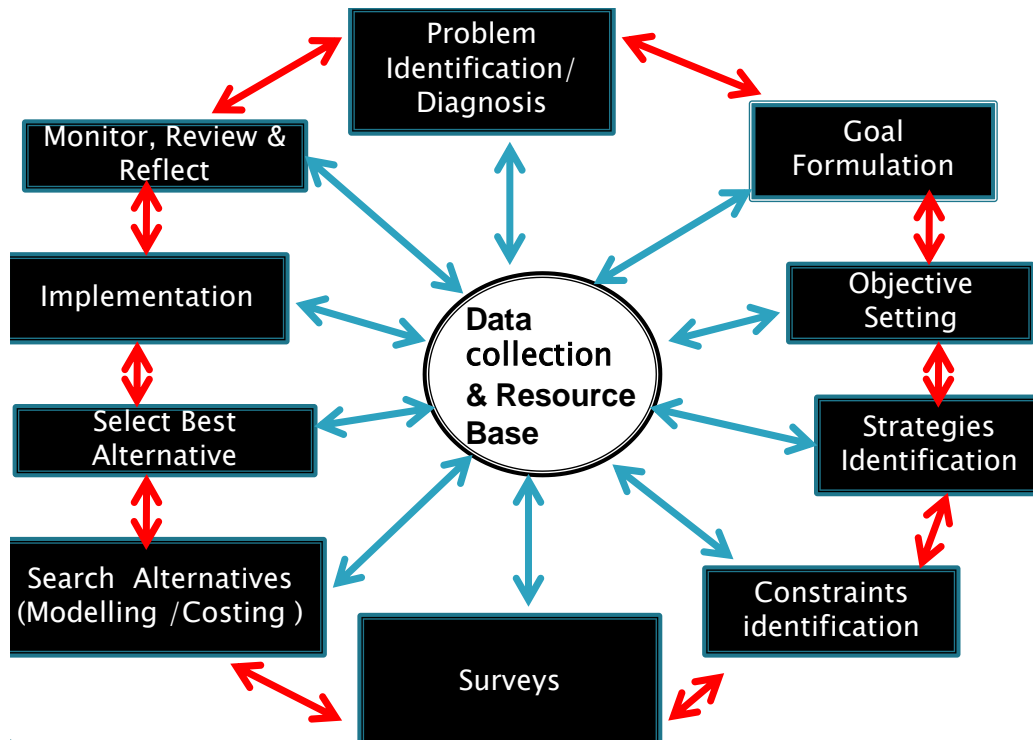
iii. Mobility channels / networks / linkages

This mainly refers to the existing physical and social infrastructure in the area of study.

2.8.2 *The process of rural planning*

Rural planning is undertaken systematically. The activities involved feed into and rely on each other. Data collection and analysis remains at the heart of the process since the plan depends on the findings and reference is made to the findings throughout the process. Baseline data collection should be confined to the requirements of the proposed development plan and should focus on the mandatory and discretionary objectives. Below is a summary of the cycle of planning:

Figure 2-2 Process of rural planning



Source: (Nzainga, 2014)

PHASES OF RURAL PLANNING	STAGES OF PLANNING
<p>I. I. OBSERVATION</p> <ul style="list-style-type: none"> i. Physical land characteristics ii. Present land use iii. Human aspects 	<ul style="list-style-type: none"> i. Identification of the problem and determination of need ii. Collection and analysis of data iii. Development of goal and objectives

<p>II. II. COMPILATION</p> <p>viii. Rural land unit identification</p> <p>ix. Physical land potential</p> <p>x. Rural land use requirements</p> <p>xi. Feasibility aspects</p> <p>xii. Ecological considerations</p> <p>xiii. Social and economic consideration</p> <p>xiv. Development aims</p> <p>xv. Rural land use plan development</p>	<p>iv. Classification and diagnosis of the problem and surrounding issues</p> <p>v. Identification of alternative solutions</p> <p>vi. Analysis of alternatives</p> <p>vii. Evaluation and recommendation of actions</p>
<p>III. IMPLEMENTATION</p> <p>xvi. Rural Land use implementation</p>	<p>i. Development of an implementation program</p>
<p>IV EVALUATION</p> <p>i. Baseline Evaluation</p> <p>ii. Evaluation of impacts</p> <p>iii. Ecological Aspects</p> <p>iv. Socio-economic and technical aspects</p>	<p>ii. Surveillance, monitoring and evaluation of the outcome</p>

Source: Author 2018

2.9 Statutory framework to guide planning of rural areas

2.9.1 Policy Framework

2.9.1.1 The Kenya Vision 2030

This is a long-term development strategy in Kenya which aspires to make Kenya a globally competitive and prosperous nation. This blueprint mainly focuses on its three key pillars; economic, social and political. The economic pillar recognises the importance of agriculture, and other sectors that have a great potential in spurring economic growth. In order to achieve economic growth, Kenya will raise incomes in agriculture, livestock and fisheries by processing and thereby adding value to the products before they reach the market. This will create value for the agricultural sector thus attracting people to prioritize the activity. This in the long run will prevent the conversion of agricultural land into other land uses which currently seem more profitable than agriculture. The sub-county has a strong background in the agricultural sector and proper implementation of the plans set in this document will lead to development of the area. Of key importance to this study also is the vision's plan in preparation and passage of consolidated agricultural policy reforms which will create a new revolution in the agricultural sector.

2.9.1.2 National Land Policy, 2009

The land question has manifested itself in many ways such as fragmentation, breakdown in land administration, disparities in land ownership and poverty. This has resulted in environmental, social, economic and political problems including deterioration in land quality, squatting, landlessness, disinheritance of some groups and individuals, urban squalor, under-utilization and abandonment of agricultural land, tenure insecurity and conflict. To address these problems, the Government embarked on the formulation of a Sessional Paper No. 3 of 2009 on National Land Policy through a widely consultative process with the aim of producing a policy whose vision is to guide the country towards efficient, sustainable and equitable use of land for prosperity and posterity.

This policy document identifies key issues that need to be addressed in land use planning. These include strategies for human settlement in relation to the transport and communication network. The Policy has a vision to guide the country towards a

sustainable and equitable use of land. The National Land Policy designates all land in Kenya as public, private (freehold or leasehold tenure), or community/trust land held, managed and used by a specific community. This land policy seeks to address land administration, access, use, planning, and restitution of historical injustices, environmental degradation, conflicts, proliferation of informal settlements and out dated legal framework. The table below shows the techniques used in land policy:

Table 2-2: Various techniques used in land subdivision policies

	Tactic/Routine	Objective	Legislation	Current Practice
1.	Land Banking	Create reserves of cheap land; Control supply of land for housing	Local Government Act. Land Acquisition Act	Piecemeal accumulation for specific project
2.	Rating	Raise revenue	Rating Act	Rating based on market value of unimproved site.
3.	Development Levy	Revenue raising control rate of development.	Physical Planning Act	Development application upon subdivision or change of user
4.	Density Zoning	Prevention of overcrowding	Public health Act; Building by-laws; Physical Planning Act; The Land Act	Plot ratio, site coverage, height restriction, minimum plot size and number of dwellings
5.	Building Control	Ensuring safety; Reduce fire hazards; Establish space standards; Establish sanitation standards	Building by-laws grade I & II	
6.	Development Control	Regulate type and density of development Aesthetic Control; Maintain health and safety standards; Protect Environment servicing standards	Physical Planning Act; County Gov't Act; Public Health Act; Building By-laws	Planning permission and approval; Enforcement Planning inspection by various experts.

7.	Sub-division Control	Control densities; Enforce space standards; Enforce servicing standards.	Physical Planning Act; Registered Land Act; Street Adoption Act	Subdivision application. Survey; Registration and planning
8.	Physical Planning	Provide orderly basis for development Improve quality of life Protect the Environment	Physical Planning Act; Local Gov't Act; Building By-laws	Preparation of various development plans

Source: Yahya, 1987

Legal Framework

2.9.1.3 The Constitution of Kenya, 2010

The promulgation of the constitution of Kenya 2010, (GoK, 2010), ushered in a structure of the government with a two tier system, one at the national and the other at the county level. Under the new governance structure, a number of laws have been enacted to guide governance at both levels and their modalities of cooperation. These include the County Governments Act (GoK, 2012a) (GoK, 2012b), the Urban Areas and Cities Act (2011), the Intergovernmental Relations Act (2012) and the National Government Coordination Act (2012). Following the principles stated in the constitution development planning in Kenya should be based on integrated national values, equity, resource mobilization and concerns of minorities and marginalized groups. The constitution also requires an integrated development planning framework to enhance linkage between policy planning and budgeting. The legislation governs planning at national and county levels.

2.9.1.4 The Land Act, 2012

The purpose of the Land Act, 2012 as presented by its preamble, was to give effect to Article 68 of the Constitution of Kenya, 2010. Specifically, the Act was to revise, consolidate and rationalize land laws in Kenya, and to provide for the sustainable administration and management of land in Kenya. Key highlights of the statute include:

- a) Section 5 of the Act provides for the land systems in Kenya as freehold, leasehold and customary land holding,
- b) Section 7 provides for the methods of land acquisition. They include allocation, land adjudication process, compulsory acquisition, prescription, settlement programs, transmissions, transfers, long-term leases exceeding 21 years created out of private land or any other manner prescribed in an Act of Parliament.

The Act also provides for the conversion of land from one category to another for the various listed purposes which include land use planning. It also prohibits the allocation of public land that has not been planned and that does not have development guidelines.

2.9.1.5 The Land Registration Act, 2012

The Land Registration Act, 2012 was legislated to among other things, revise, consolidate and rationalize the registration of titles to land in Kenya as well as to give effect to the principles of devolved government in Kenya. The statute has effected a number of changes in the arena of land registration in Kenya; where it has not brought new provisions, it has significantly consolidated the provisions of earlier existing provisions of earlier existing provisions into one law. Key highlights from the statute include:

- a) Section 101 of the Act recognizes the jurisdiction of the Environment and Land Court established by the Environment and Land Court, 2011 No. 19 of 2011 on matters emanating from the Act. The act repeals the Land Titles Act, The Registration of Titles Act, The Government Land Act and The Government Land Act

2.9.1.6 Maximum and Minimum Land Holding Acreage Bill, 2015

This is a bill for an act of parliament to give effect to article 68 of the constitution which empowers Parliament to legislate on land sizes owned by private individuals in Kenya. The bill seeks to regulate minimum and maximum land holding sizes and subdivision of private land. Very relevant to this study, one of the key objectives of the bill is **to regulate the subdivision of land to ensure that land is held in economically viable parcels**. The land use parcel is put into is a guiding principal for determining the maximum/minimum land holding sizes. Depending on land use the bill proposes the zoning of private land into:

- i. Agricultural land- Cash crop farming, food farming, subsistence and commercial farming
- ii. Livestock and pastoral land- pastoral farming, beef farming, zero grazing dairy farming, goat and sheep farming, poultry farming and fisheries
- iii. Urban and peri-urban land

Categories i and ii above generally define the study area. In order to prevent uncontrolled subdivision of agricultural and livestock/pastoral land, the bill provides that no consent shall be given if subdivision into two or more parcels will result in lesser than the minimum prescribed land holding acreage. The bill provided that land in Tranzoia County in which the study area is located, the minimum land size would be 1 acre while the maximum would be 10 acres. To support this, Sub County land control committees and County land appeal committees would be formed to give consent before subdivision or transfer of land. The bill provides exemptions to the ceiling provisions for large scale farming, wildlife conservancies, forestry and other major investments.

The bill however faced opposition and critique due to its focus on regulation of land sizes rather than proper and efficient land use practices. Through focusing on land sizes rather than land use, it infringes on the constitutional provisions on the right to own land (Land Development and Governance Institute, 2015). These are issues legal experts and economic and social rights activists urge should be resolved before enacting the law (Ayodo, 2015).

2.9.1.7 The National Land Commission Act, 2012

The purpose of the National Land Commission Act, 2012 (GoK, 2012f) is to make further provision as to the functions and powers of the National Land Commission, qualifications and procedures for appointments to the Commission; to give effect to the objects and principles of devolved governments in land management and administration.

2.9.1.8 The County Government Act, 2012

According to the County Government Act, 2012, (GoK, 2012a) each county shall prepare a county integrated plan which shall be the basis for all budgeting and spending of public funds. The acts clearly states that “A county government shall plan for the county and no public funds shall be appropriated outside a planning framework developed by the county executive committee and approved by the county assembly” The county integrated plan shall focus on economic, physical, social, environmental and spatial planning.

Service delivery and urban and regional planning rests squarely on County governments. They require counties to develop integrated plans and setting up such plans as the basis for fund allocation and spending means that counties have no choice but to develop proper integrated plans. Such plans are likely to curb the informal land subdivisions to uneconomic portions.

2.9.1.9 The Environment and Land Act, 2011

This act establishes a judicial forum for adjudicating matters relating to land and environment. Section 4 of the Act gives this forum the same status as the High court. Indeed, Kenya has an excellent policy and legislative framework for effective land management. The framework nonetheless remains that, 'a framework'. Unless efforts are put in place, starting from local levels to effect the robust framework for efficient and sustainable land management, the current state in the country risks remaining the same.

2.9.1.10 The Land Control Act, 2012

The Land Control Act regulates development, use and subdivision of agricultural land, it was designed to ensure that agricultural land is used and developed in such a way that good husbandry is not compromised. Consequently the process required that the regulatory institution known as the Land Control Board must be satisfied that the user of the land or the prospective user is capable of putting the land to productive agricultural use. For instance the Board may ask for what purpose the land is being purchased and whether it is being put to good use, secondly the board must ensure that land is not subdivided into sizes which are not capable of being put into agricultural use.

2.9.1.11 The Physical Planning Act (Cap 286)

The Physical Planning Act (Cap 286), (GoK, 1996) is a much more comprehensive statute that provides for physical planning and development control. The Physical Planning Act was enacted in 1996 repealing two earlier statutes the Town Planning Act (Planning Urban Areas) and the Land Planning Act (Planning in rural areas). The Physical Planning Act provides for planning in both urban and rural areas. Institutionally,

the Physical Planning Act places the functions of Physical Planning in the Office of the Director of Physical Planning; administratively the director of physical planning is an officer in the ministry of lands.

The physical planning act, Cap 286 will inform the study where section 29 gives the Local Authority power to control or prohibit subdivision of land or existing plots into smaller areas. Section 17 (2) states that the Regional Physical Development Plan should deal with matters of land potential including distribution of Agricultural land Potentials, their relative values, population and land imbalance, land tenure and other resource endowments. The Trans Nzoia county government will therefore propose and implement a land use plan that will enhance household maize production in Trans Nzoia County.

Section 41 gives provision on subdivision of land (1) No private land within the area of authority of a local authority may be sub divided except in accordance with the requirements of a local physical development plan approved in relation to that area under this Act. (2) The subdivision and land use plans in relation to any private land shall be prepared by a registered physical planner and such plans shall be subjected to the approval of the Director. (3) Where in the opinion of the local authority an application in respect of development, change of user or subdivision has important impact on contiguous land or does not conform to any conditions registered against the title deed of property, any conditions registered against the title deed of property, the local authority shall, at the expense of the applicant, publish the notice of the application in the Gazette and serve copies of the application on every owner of the property adjacent to the land.

The Act provides for three kinds of physical planning

- (a) Regional Physical Development Plan
- (b) Local Physical Development Plan
- (c) A Special Area Physical Development Plan

The regional physical development plan is prepared by the director with reference to any land within the area of authority of county council for purposes of improving the land and providing for the proper physical development of such land. It is also designed to secure

provision for transport, public purpose, utilities and services, commercial, industrial and recreational areas and to make provision for the use of land for building and other purposes. A regional physical development plan is prepared for a rural area. The purpose of the plan is to provide proper physical development and also to provide for commerce transport. Under Section 23 the Director may declare an area with unique development potential or problems as a special planning area. The declaration of a special planning area enables the preparation of a physical development plan irrespective of whether such an area lies within the area of a local authority.

2.9.1.12 The Building Code

The building code is one of the legislation that has, along with others been instrumental in influencing planning standards, although it is more concerned with housing quality and building materials. It also contributes to planning standards in that it deals with the siting and space about buildings (Part II of Grade I by-laws); and minimum areas of plots or buildings thereon (Grade II by-laws). They contribute to planning and design, regulation control of a residential environment.

2.9.1.13 The Water Act, 2007 (Cap 37-2)

The Water Act (Cap 37-2) provides for the conservation, control, apportionment and use of water resources of Kenya. Various institutions have been found to oversee matters of water utilization such as water retainment.

2.9.1.14 The Agriculture Act, 2013 (Cap 318)

The Act aims to promote and maintain a stable agricultural environment by providing for the conservation of soil and its fertility. It provides rules to guide good agricultural practice and the use of agricultural land and aiming at its development and preservation. Furthermore, the act also provides for administrative instruments to ensure a sound agricultural development and the marketing of agricultural products. It also calls for the stimulation of good land management and husbandry.

2.9.2 Institutional framework

2.9.2.1 Ministry of lands, housing and urban development

The ministry handles all national lands matters and other concerns. Generally apart from providing political leadership, policy formulation and monitoring, the ministry is responsible for:

- a) Developing policies on land and facilitating the implementation of land policy and reforms
- b) Coordinating the management of the national spatial data infrastructure
- c) Coordinating the formulation of standards in the land sector
- d) Regulating service providers and professionals, including physical planners, surveyors, valuers, estate agents and other land related professionals to ensure quality control
- e) Monitoring and evaluating land sector performance.

2.9.2.2 The County land management board

Under the Constitution of Kenya, 2010, county governments are in charge of land management within their jurisdiction through county planning, land survey and mapping. Within the county are land management boards which are tasked to:

- a) Process applications for allocation of land
- b) Change and extension of user
- c) Subdivision of public land and renewal of leases
- d) Perform any other functions that may be assigned by the NLC or by any other written law.

2.9.2.3 National Land Commission (NLC)

This is an independent government commission whose establishment was provided for by article 67 of the constitution. It was officially established under the National Land Commission Act, 2012 to amongst other functions, manage public land on behalf of the national and county governments, monitor and have oversight responsibilities over land use planning throughout the country.

2.10 Case studies

2.10.1 Agricultural land protection in South Africa

In South Africa, the subdivision of agricultural land is not permitted without the consent of the Minister of Agriculture. Strict legislation that has been put in place is praise worthy since the state does not want to see good agricultural land sacrificed to other forms of development or parcelled up to the point where the farm might struggle to survive as a smaller entity. All agricultural subdivisions in the Republic of South Africa is thus regulated by the Subdivision of Agricultural Land Act 70 of 1970 whose main objective is to prevent the creation of uneconomic farming units and this purpose is achieved through the requirement that the Minister of Agriculture, Forestry and Fisheries (“Minister of Agriculture”) must consent to the proposed subdivision (Republic of South Africa,, 1970).There is strict registration of all agricultural land and subdivision is regulated depending on the crop grown; For instance agricultural land for cash crops like maize are protected to ensure they are not sub divided below 5 acres.

2.10.1.1 Role of the legal document

In South Africa, majority of the prime agricultural land is owned by white farmers. A concern in the country however rose due to the creation of uneconomic farming units. The Act thus provided which stated the ‘agricultural land shall not be subdivided without written consent from the Minister of Agriculture’. By empowering and mandating the Ministry of agriculture to approve or deny applications for agricultural subdivisions, the state gets control and thus prime agricultural land is preserved in the national interest.

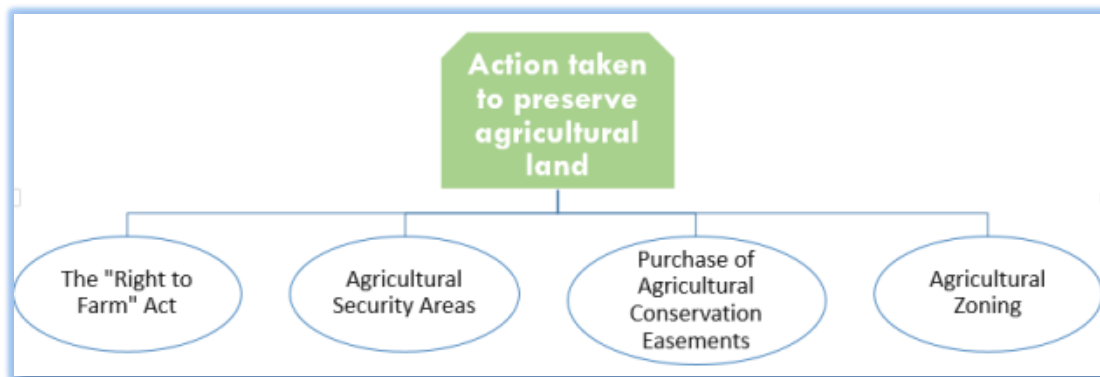
However, legislative approach faces criticism since the context and policy from which the Act was created serves as a historical background. This history identifies the illegitimate purpose of the Act, namely the preservation of prime agricultural land for white occupation and ownership. The legislative tool is thus placed in an apartheid context which limits black African entitlements to agricultural land and the residents propose that it should be repealed.

2.10.2 Agricultural land choices in Pennsylvania

Pennsylvania in North Eastern, America had over time been experiencing uncontrolled agricultural subdivisions. The residents of the area felt an inexorable pressure of developments due to the subdivisions which not only affected their lifestyle and environs, but also the state's leading industry; agriculture. Despite the major role of agriculture in Pennsylvania, the state has progressively lost significant amounts of agricultural land. Approximately 125,000 acres of farmland are converted to non-agricultural uses annually.

2.10.2.1 Call to action

The subdivisions and land conversions posed a threat to the agricultural sector in the state. National organizations, such as the American Farmlands Trust, thus mobilized forces in order to deal with this problem. The state and the local government also responded to the agricultural loss. The Pennsylvania legislators heeded this call to action by enacting many statutes aimed at protecting agricultural activities and farmland.



The main concepts borrowed from this case study are:

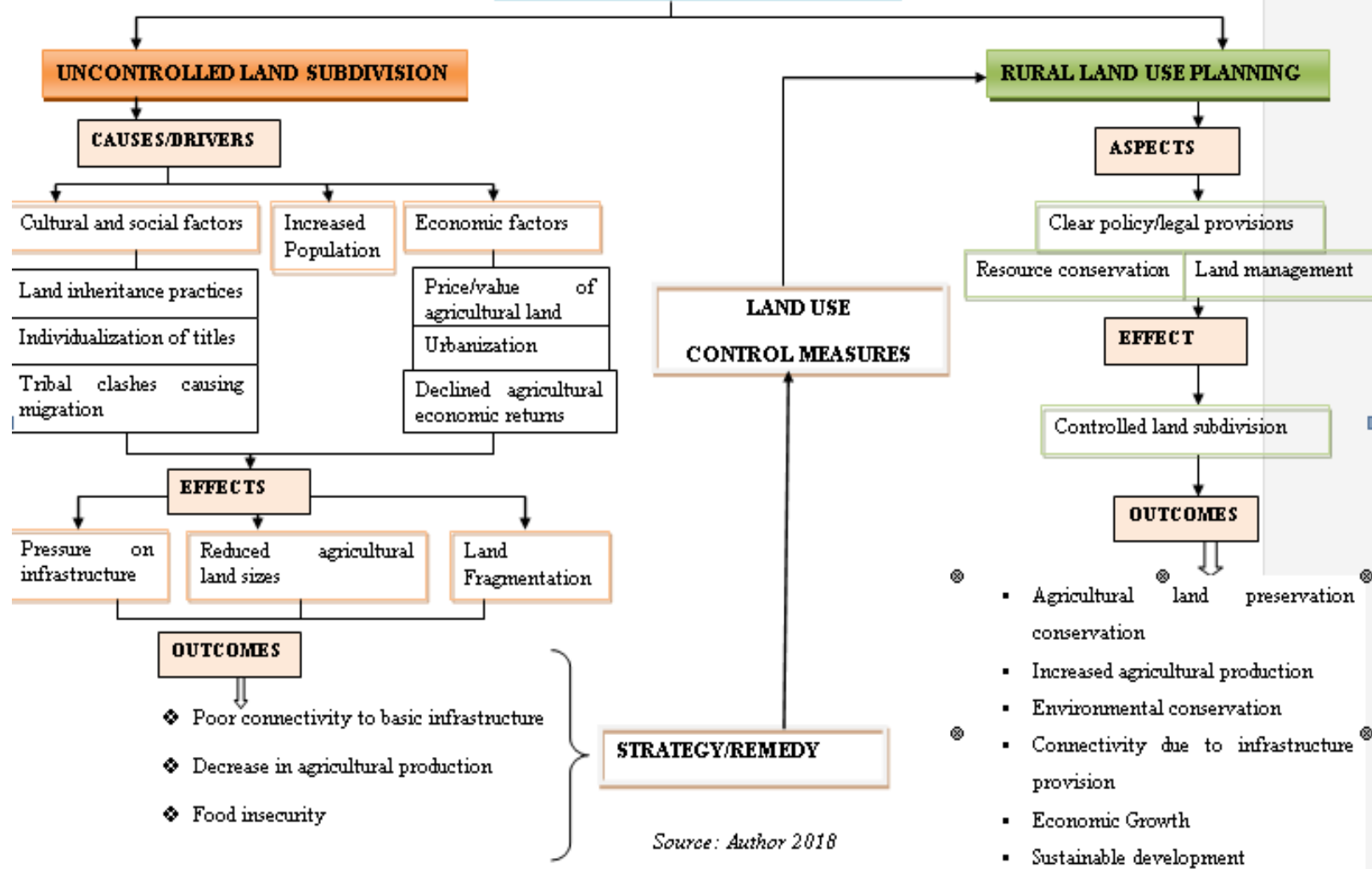
- **Right to farm act:** This act intended to protect farmers by making it difficult for neighbouring landowners or tenants to stop typical farm operations. This approach thus protected farmers and agricultural operations from neighbouring changes in land uses.
- **Agricultural Zoning:** This approach is to distinguish between conflicting land uses, to promote the protection and continuation of agricultural activities in suitable areas, and to protect prime agricultural soils. In Pennsylvania inclusion of land within a district zoned for agriculture was considered recognition that agricultural operations are the highest and

best use of that land. Two major forms of agricultural zoning were proposed. These are exclusive agricultural zoning which prohibits construction of non-farm dwellings and nonexclusive agricultural zoning was more permissive, allowing a limited amount of non-farm developments.

2.11 Conceptual Framework

The figure below depicts the causes of rural land subdivision and its impacts on household maize production. It goes further into the details by outlining the key aspects pertaining to agricultural land. Generally the conceptual framework below summarizes the findings and highlights noted from the literature review in this chapter.

**Figure 2-3: Conceptual Framework
RURAL AGRICULTURAL LAND**



As can be obtained from figure 2.5, Agricultural Land subdivision is caused by increased population and uncontrolled subdivision. This rural land subdivision then results in reduced agricultural produce, pressure on infrastructure, Environmental degradation, Poverty among others thus leading to Unsustainable development. To curb these negative effects, approaches on sustainable development should be used so that the use of natural resources by the present generation does not compromise the future generation to acquire the same resources. Land use Control measures such as Land registration, monitoring the subdivision processes and abolish informal land subdivision through enforcement of the Laws of the Land.

This study therefore, forms the starting point in understanding the impacts of rural land subdivision on household maize production and food security thereof. Impact of land subdivision in the rural areas has not been investigated to establish how it plays out in Kiminini. This study was hinged on the relationship between land subdivision and household maize production. Managing such relationships remains at the core of any policy agenda for integrated development for rural areas. This study will fill in the gap of rural planning which is inadequately researched on.

CHAPTER THREE

3 RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the methodology that was employed during the study, describing the instruments used and procedures that were followed in conducting the study. This research was carried out in stages; the first stage was to collect data both published and unpublished from library sources country wide. The purpose of such literature was to gather background information on the broad area of the topic and find out what others have done. The literature was used to guide the process of preparing field research instruments. Primary data was then collected. The methodology for analysis of the information which created a deeper understanding of the issues on the ground and guided the recommendations is also presented in this chapter.

3.2 Research Design

A research design can be described as the structure of the research. It is a scheme, an outline or plan that is used to generate answers to research problems. A research design can be regarded as an arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance with research purpose. It is the conceptual structure within which research is conducted. It constitutes the blue print for collection, measurement and analysis of data (Kothari, 2004). The scheme or plan used in this study is descriptive survey. The major purpose being description of the state of affairs as they exist.

The research design hereby describes how this study was planned to be conducted from the beginning to the end. The research questions and objectives continued to guide the research design. The design thus incorporated whom to study, what to observe, when the observations should be made. Formulation of study problem preceded the research process. This helped in structuring of questionnaires and coming up with the observation list. Reconnaissance survey followed and was important in knowing the area better and revising of the questionnaires.

The purpose of the survey was to obtain information of the sample so as to generalize for the population.

3.2.1 *Types of data required*

To achieve the purpose mentioned above, both primary and secondary data were collected.

3.2.1.1 Secondary data

Secondary data comprises of information already collected by other individuals and recorded in books, articles, magazines, newspapers, journals among other sources (Kadam, 2013). In this study, secondary data provided an insight and deeper understanding of the topic under study. It paved way for the research process. The study made use of existing and available information, including raw and unpublished data on the types of land use patterns, existing methods of geo-data acquisition and management. Secondary data that was reviewed for this study included; historical development of the study area, the policy and regulatory framework for subdivision of rural agricultural land, trends in household maize production in Kiminini from 1963 to 2018 and in the country in general.

This data was obtained from the land registry and maps, development plans and existing institutions. Land use development and subdivision approvals records were obtained from records in the physical planning offices of Trans Nzoia planning offices. Data on the trends in growth of population was obtained from census reports on population and housing of 1969 to 2009. Data from various books, journals, government documents and studies on the effect of land use changes was gathered and analyzed.

Information on the socio-economic elements of Kiminini Sub County such as population size and dynamics, employment and business types was obtained from the central bureau of statistics and census reports. Relevant satellite images and topo-sheets covering the past and present land use patterns in the study area were also acquired. Information on best practices with regards to rural land subdivision was also gathered and reviewed and thus guided the researcher on items to observe and analyze.

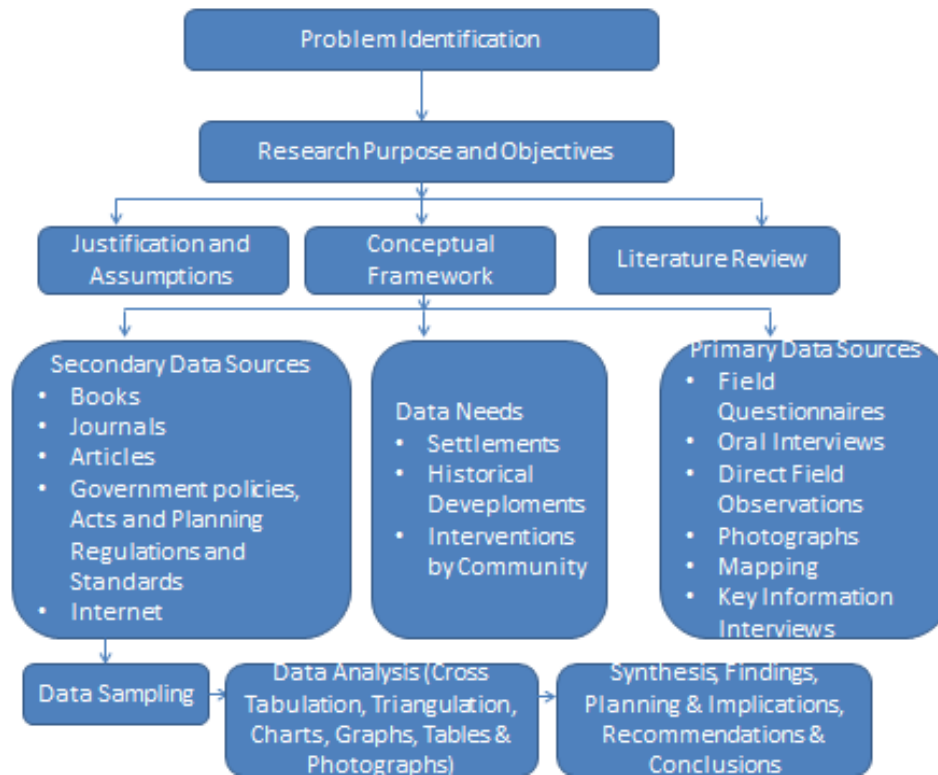
3.2.1.2 Primary data

This consisted of information collected from field surveys in the study area. The survey was done in two stages: reconnaissance and the main field survey. A reconnaissance survey was undertaken as a familiarization tour of Kiminini Sub-County. The survey allowed for the feasibility of the proposed instruments to be assessed and their suitability estimated. Data was then collected through an interactive and evaluative field survey. The survey involved asking questions to a representative sample of the target population. A total of 120 standard household questionnaires were administered, key informants from various key national and county government departments and real estate investors in the area were also administered. Photography, observations and existing maps and satellite imagery were used to complement the questionnaire. Semi structured interview schedules were used to interview key respondents from government departments.

The primary data for this study thus included; population size and composition of the study area, population growth trends in the settlement, household maize production in Kiminini sub county, trends in rural land subdivision, causes of rural land subdivision in Kiminini; impacts of intensive rural land subdivision on household maize production in Kiminini and proposed policy measures to reduce rural land subdivision in Kiminini.

Simply put the information required from the study included establishing the land subdivision practices in the sub county, their effects, causes and implications of the effects. The respondents also provided information on possible planning interventions for effective rural land subdivision in Kiminini Sub County. The design allowed for the collection of both quantitative and qualitative data at the same time.

Figure 3-1: The research design



Source: Author 2018

3.3 Research Population

Kiminini Sub County has an estimate population of 231,191 people (Trans Nzoia County Integrated Development Plan 2013-2018). The subjects of the study who were the target population were drawn from six locations but the target population consisted of mainly farmers. The wards include Kiminini, Waitaluk, Sirende, Hospital, Sikhendu and Nabiswa. Key informants required for this study included; Ministry of Lands, housing and urban development officers, the local area administration, surveyors, national environmental management authority and Trans Nzoia County Officials.

3.3.1 Sampling Plan

For the purpose of administering questionnaires and dealing with a rational number of respondents, probability sampling was used in this study. This was to be done in order to ensure representativeness of the sample. For this method of sampling, each household

had an equal chance of being selected. Systematic random sampling was then used to select the samples. The method involved giving a number to every subject of the accessible population, and determining the interval of selecting the subjects. 20 households were selected in each of the six wards in Kiminini to give a total of 120 households

Purposive sampling technique was used in the identification of key informants relevant to the study. Key informants were officers of the Ministry of Lands, the local area administration, surveyors, national environmental management authority and Trans Nzoia county officials. A list of possible key informants was drawn. Content analysis of the services that they are mandated to offer was then done to establish their relevance to the study. Those whose mandates were found to be of benefit to the study were selected and interviewed to establish various issues that made up this study.

Cadastral plans of the area were also used to establish the sampling frame. Parcel numbers from the cadastral were picked at intervals for each land parcel.

3.4 Method of data collection

As mentioned earlier, primary and secondary data were required. Therefore, different methods were employed to sufficiently collect all the information required for the study.

3.4.1 Content review

Existing literature was reviewed. This was a qualitative research technique and the information acquired was both qualitative and quantitative. This method was used to describe, summarize, evaluate and clarify the existing literature. Published and unpublished articles, theses, journals, archived data and other written material provided information about rural land use, agricultural land subdivision, effects of uncontrolled subdivision to productivity and historical trends of subdivision in the country, and specifically in Trans Nzoia County.

3.4.2 Observation

Direct observation is a valuable method of collecting information. ‘Seeing’ and ‘listening’ are key to observation. Observation provides the opportunity to document activities, behavior and physical aspects of the study area without having to depend upon

people's willingness and ability to respond to questions. Direct observation also gives the researcher first-hand information about different planning problems, encompassing the study area.

In this study, it consisted of field and site reconnaissance. This involved walking around the settlement and capturing observable variables and recording them down. Some of the aspects that were observed included settlement patterns in Kiminini, type of agricultural activities, sizes of agricultural land, types of economic activities, upcoming developments and the general appearance of the settlement.

3.4.3 Administration of questionnaires

It involved question and answer session where the respondent is able to answer questions as asked. The respondent could have more information than what the researcher can observe. Questionnaires give detailed answers to complex problems (Olive M.Mugenda, 2009). In this study, questionnaires were administered to the area residents, who are mainly farmers.

3.4.4 Key informant interviews

This is a face to face question and answer session and between the researcher and the respondent where the selected sample will be engaged using both structured and unstructured questionnaires. Key informants are individuals with specialized knowledge on a particular topic. They may include academic specialists, community leaders and elders, government officials and experts in various fields of expertise. The use of interviews to collect data from key informants begins with the assumption that the participants' perspectives are meaningful, knowable, and can be made explicit, and that their perspectives affect the success of the project. The purpose of key informant interviews is to explore the views, experiences, beliefs and knowledge of these specific individuals on specific matters.

The study employed the use of unstructured key-informant interviews. Unstructured interviews consisted of several key questions that helped to define the areas to be explored in detail, but also allowed the interviewer or interviewee to diverge in order to respond in more detail. The study therefore sought to identify various key individuals and

stakeholders with particular interest to land use in Kiminini. With regard to this study, the informants included; Ministry of Lands, housing and urban development officers, the local area administration, surveyors, national environmental management authority and Trans Nzoia County Officials.

3.4.5 Mapping

Mapping was employed to establish the plot sizes and distribution within the settlement. Mapping also provided the spatial distribution and location of various land use activities, infrastructure and services, as well as the physical characteristics of the study area, and its growth over time.

Geographical coordinates were used to map out the geographical location of the study area, while Google Earth images brought out the physical characteristics of the study area and its immediate surroundings, including the different adjacent land uses.

3.4.6 Photography

Photography was done to capture first-hand information that portray land use activities, spatial organization of the activities, space utilization, as well as general character of the site. Pictures of various phenomena were taken for illustration purposes.

3.5 Tools used for data collection

3.5.1 Questionnaires

For the successful completion of this study, household questionnaires were prepared and administered to the residents and farmers. The questionnaire was well organised to capture information on current land uses, causes and impacts of uncontrolled rural agricultural land subdivision. The tool also allowed the respondents to give their views on measures that could be undertaken to mitigate the impacts mentioned.

3.5.2 Key informant schedule

Face to face interactions with the key informants were carried out. A schedule to guide the discussions/interactions was prepared. The schedule listed out the issues of concerns which were aimed at raising a discussion during the interviews. Here, the researcher obtained first-hand information.

3.5.3 Observation schedule

This is a list that was used to guide observations and thus ensure that nothing was left out unobserved. The observation schedule in this case was inclusive of: observation of settlement patterns, type of agricultural activities, sizes of agricultural land, types of economic activities, upcoming developments and the general appearance of the settlement.

3.6 Analysis of data

The first step after data collection was to clean data and code it for ease of analysis. Data collected was thus cleaned, sieved and synthesized for meaningful interpretation of research findings. The purpose of analyzing the data was to obtain usable and useful information. The analysis was done with the understanding that regardless of whether the data is qualitative or quantitative, it may:

- Describe and summarize the findings.
- Identify relationships between variables.
- Compare variables.
- Identify the difference between variables.
- Forecast outcomes.

For qualitative data, coding was done to enable the researcher to locate and retrieve the required information. For quantitative data, numerical codes were used to represent various attributes. Analysis of the quantitative data was mainly through simple descriptive statistics, by use of measure of central tendency such as mean and mode. The data such as level of production was analyzed and presented using statistical methods such as charts, frequency distribution, and analytical tables. Content analysis was also used in analyzing the content of the questionnaires. In analyzing qualitative data the researcher first organized the data derived from the field notes and interviews by reading through and cleaning data. Various categories were then derived which helped the researcher to make deductions about the existent problem in the study area. Photographs

were equally used to illustrate observable traits such as types and forms of agriculture and nature of developments.

Land use change analysis was used to detect changes in land use of the area. This involved classification of different land uses on satellite imagery at different times (epochs) and comparison of the land use maps. GIS software was used in this analysis. Satellite imagery was geo-referenced using proper coordinates that were collected from the field using a global positioning system (GPS) receiver. These points were used as ground control points. Topographic maps were scanned and digitized to create a base map over which the land use maps were placed.

3.7 Ethical Considerations

The researcher and her assistants explained to the respondents about the research and that the study will be for academic purposes only. It was made clear that the participation was voluntary and that the respondents were free to decline or withdraw any time during the research period. Respondents were not coerced into participating. They were guaranteed that their privacy will be protected by strict standards of anonymity.

3.8 Data Needs Matrix

Table 3-1: Matrix of Data Needs

Research Objectives		Information Required	Source	Techniques of Analysis
1.	To investigate the trend of rural land subdivision in Kiminini from 1963 to 2018	Historical summary of activities in Kiminini Original land sizes Current land sizes Trend of land subdivision Livelihood of the residents	Development plans Satellite imagery Cadastral maps Reports and studies Households	Literature review on existing land uses. Map reading GIS analysis Quantitative analysis
2.	To examine the causes of rural land subdivision in Kiminini.	Assessment of all activities in the settlement and their returns Cultural systems/procedures Cost of land Residents' priorities with respect to land ownership and economic activities	Key informant interviews Reports and studies	Literature review Qualitative analysis

3.	To find out the impacts of intensive rural land subdivision on household maize production in Kiminini	Changes in level of household maize production over time	Photography Reports and studies Agricultural reports Key informants	Literature review Qualitative analysis
4.	To propose policy measures to reduce rural land subdivision in Kiminini.	Successful ways of controlling rural land subdivision Ways of reducing negative effects of rural land subdivision	Community suggestions and recommendations Policies and regulations Studies, reports and other written literature	Literature review Qualitative analysis

Source: Author, 2018

4 CHAPTER FOUR

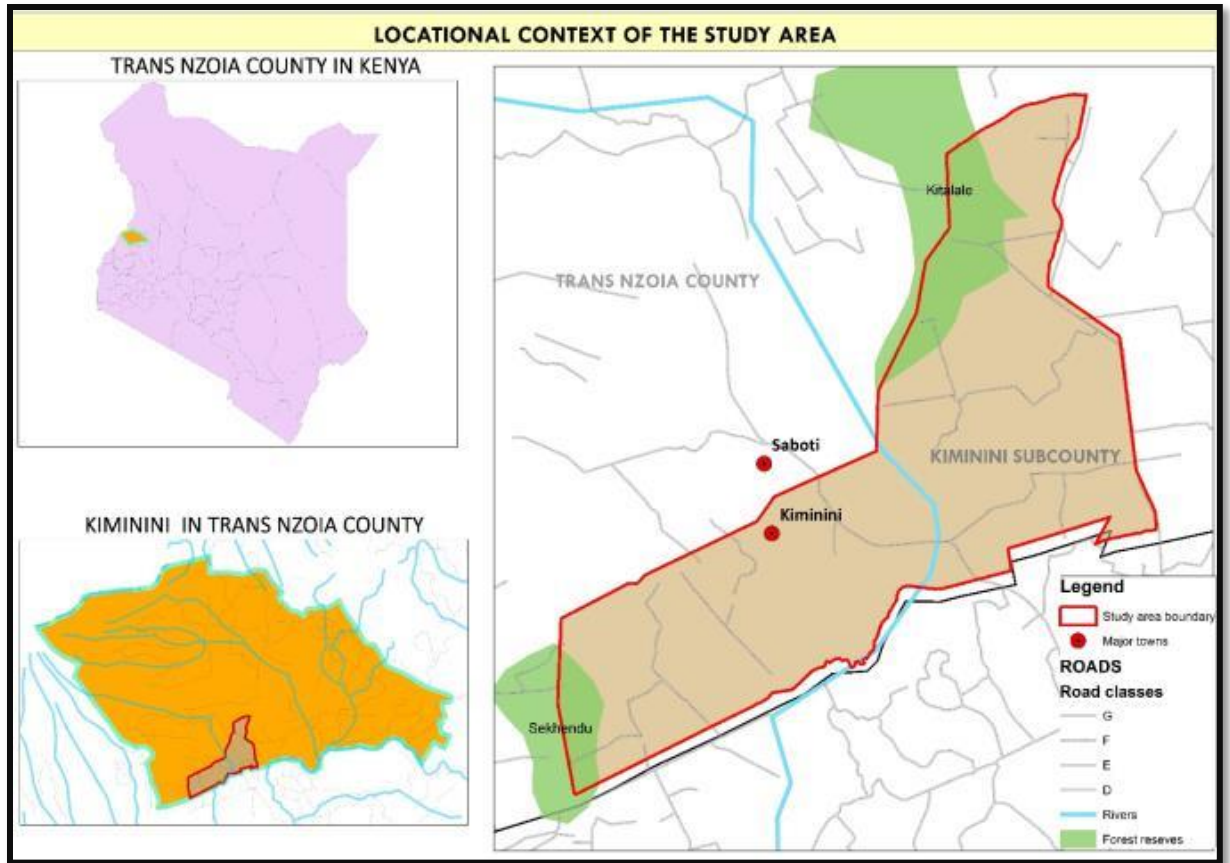
4.0 PROFILE OF STUDY AREA

This chapter places the study area within its local and regional context. The chapter gives an outline of the various characteristics that define and influence the study area. These include administrative boundaries, historical development of the settlement, social cultural and the physical characteristics. The spatial dimensions and neighbouring districts to the study area are presented so as to provide information about its geographical background. The demographic characteristics of the area are also explained.

4.1 Location and extent of the study area

4.1.1 *National context*

Kiminini sub-county is located in the Western region of Kenya. Kenya has 47 counties. It is within the jurisdiction of Trans Nzoia County which lies on the western side of Mount Elgon in the former Rift Valley province, some 380 km north west of Nairobi, the capital city of Kenya. Trans Nzoia County covers an area of 2495.5 KM². The broader Kiminini constituency is one of the electoral regions of the county. The county is largely agricultural with both large scale and small scale wheat, maize and dairy farming. The county is referred to as the food basket of Kenya for its role in food supply in the country. One of the major towns within Kiminini sub-county is Kiminini town which is a small yet a busy town located some 22 kilometres from Kitale along Kitale-Webuye road. It is a significant agricultural centre (Trans Nzoia County, 2010). The map below shows the location of Trans Nzoia County in Kenya and the specific location of the study area in the county.



Map 1:Location of the study area

Source: Author, 2018

4.1.2 Local context

Kiminini Sub County lies on GPS Coordinates $00^{\circ}54'00''$ N and $34^{\circ}55'00''$ S. The sub county covers an area of 395.3Km^2 (Kenya Bureau of Statistics, 2010). Kiminini Sub County is one among many Sub Counties in the Kenyan Highlands that is good for household maize production. Kiminini lies between altitude 1700-1850 meters above sea level and has a rugged topography.

Features that comprise the surroundings of the area are hilly slopes, Mount Elgon forests and River Kiminini (a tributary of Nzoia_River). There are no elements of proper planning of the rural lands in this area and the study is meant to highlight the essence of proper planning for rural development.

4.2 Population size

According to the 2009 National Census, Trans Nzoia County has a total population of 818,757. Kiminini Sub County is the most populous area in the county. The Su- County has a population of 231,191 people with 114,902 males and 116,289 females. The growth rate from 1999 to 2009 was 3.7 percent. Assuming the growth rate is maintained, the population for Kiminini is projected to be about 318,094 in 2019 using the population projection formula of $P_T = P_0(1+K)^t$. P_T is population at time T, P_0 is population at time zero, K is growth rate and t is elapsed time in years from time zero.

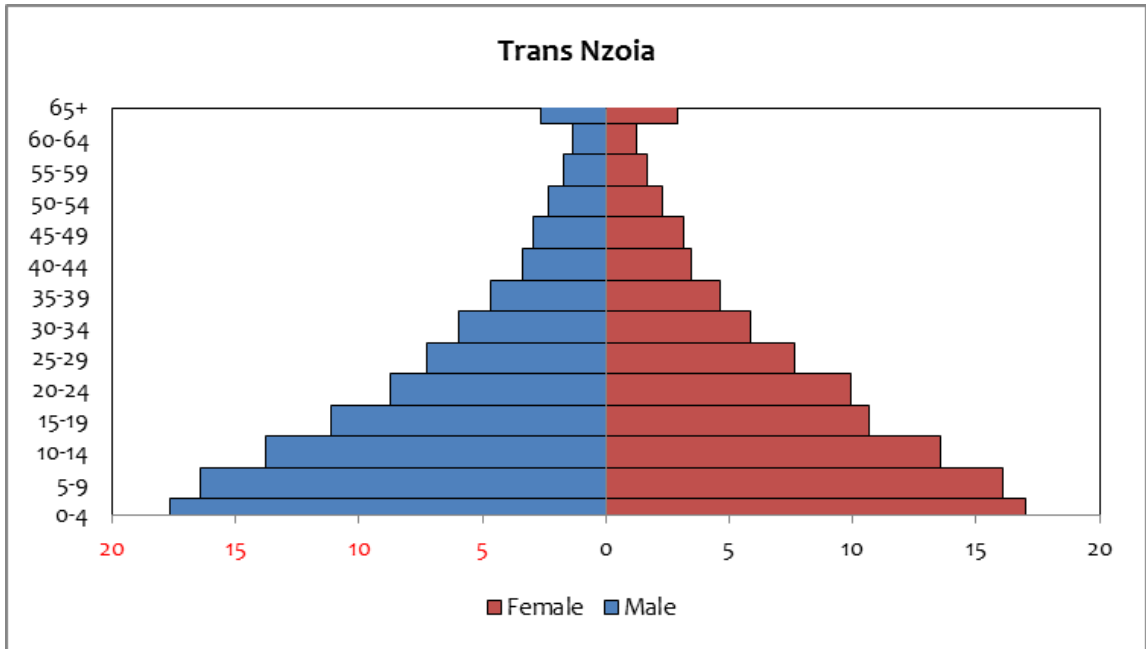


Figure 0-1: Population Distribution in Trans Nzoia County

Source: Kenya National Bureau of Statistics

Trans Nzoia County is a child rich population, where 0-14 year olds constitute 47% of the total population. This is due to high fertility rates among women as shown by the highest percentage household size bracket of 4-6 members at 41%.

4.2.2 Population Growth

Population growth is a major driver of development change in Kiminini and as such is a determinant of other parameters such as land subdivisions, solid waste generation, food security, water consumption, land use patterns and settlement. Population growth is partly explained by net migration into the area. Post-election violence of 1992 and 2007 in the Mount Elgon region led to immigration of many people to Kiminini area which was a shelter for the post-election violence victims. Most people want to purchase a piece of land in the fertile grounds of Kiminini. Projections show that immigration will continue unless a deliberate effort is made to preserve the land for large scale agriculture. The overall population density of Kiminini sub county is 584 people per square kilometer.

4.3 Physical and Natural Resources

Kiminini is rich in natural features and resources. It lies in Trans Nzoia county which is known as “The food basket of Kenya’. It covers part of Mount Elgon forest catchment and tributaries of Nzoia river flow through Kiminini sub county. These include River kiminini and river Kabuyefwe among others which are a unique resource for environmental and wildlife conservation. The rivers are however threatened by encroachment, agriculture and other human activities along the riverbanks. On average the county has an altitude of 1,800m above sea level. Most land is under agricultural use. The rocks in Kiminini are mainly a succession of lava from former Mount Elgon volcanoes. The soils of the area are products of weathering of mainly volcanic rocks. Weathering has produced red soils that reach more than 50 feet in depth. This is good for crop production (Trans Nzoia CIDP, 2013-2017)

4.4 Climate Characteristics

Kiminini has a highland equatorial type of climate. The rainfall is well distributed throughout the year. The annual rainfall ranges between 900mm and 1400mm. The slopes of Mt. Elgon to the west receive the highest amount of rainfall. The long rains occur from April to June, while the short rains fall from July to October. The mean temperature in the county is 18.6⁰C. However, temperatures range from a low of 10⁰C to a high of 30⁰C. (Trans Nzoia CIDP, 2013-2017). The average daily relative humidity is 65 percent and the wind speed is two knots. The county has a favorable climate for both livestock and crop production.

4.5 Leadership & Governance

In terms of governance, Kiminini Sub County falls under the Trans Nzoia County. The County Government Act, 2012 is the main legal statute that governs the operations of Kiminini. Trans Nzoia County is responsible for providing services such as health, primary education, refuse collection, water and sanitation and fire protection services to its residents. Over the years, however, its service delivery capacity has deteriorated. There is no water and sanitation infrastructure in Kiminini Sub County whose population is growing day by day. Inadequate provision of services in the area has been linked to the fact that the rural areas are not planned. Population growth rates are high and the resource

base low. Hence the need to introduce planning of the rural areas; the technical and institutional capacity needed to increase service coverage is lacking, hence impacting negatively on planning and foresight. Kiminini Sub County is represented in the County Assembly by six ward representatives.

4.6 Education

The government of Kenya introduced free primary education (FPE) in 2003. This was embraced well in Kiminini with the enrolment rate superseding the recommended pupil-teacher ratio of 40:1, (Kiumi, Kibe&Nganga, 2013). FPE was intended to broaden access to primary schooling especially among poor households. There are seven primary public schools in Kiminini including Kiminini Primary, Masaba Primary, Nyamira Primary, Namawanga Primary, Wekhonye Primary, Mitoto Primary and Mufutu Primary. In 2018, the Government of Kenya gave subsidy for secondary school students where 22,400 were remitted for every student. Public secondary schools in Kiminini include St Bridgids Girls, St Vincent, Masaba Secondary, Mufutu Secondary, WekhonyeSecondary, St. Joseph's Boys, St. Joseph's Girls', Kabuyefwe Secondary, Kiungani Secondary. Kiminini School for the handicapped is also in the sub-county. Good performance is seen in most National and County schools but the sub county schools is characterized with poor performance and high rate of school drop outs.

4.7 Land and LandUse

4.7.2 Historical Perspectives

In 1899, the British Colonialists declared that all land was 'crown land' and therefore available for alienation to white settlers. Africans were considered 'tenants at the will of the crown'. In 1902, the British government granted the private East Africa Syndicate 1300Km² of land in Rift Valley and surrounding highlands to promote white settlement and export agriculture. The fertile highlands were established as large scale plantations. Many local people were forced to leave their homes. In 1941, the British came up with resettlement schemes involving forceful evictions and repatriations of Kenyan natives, back and forth between central highlands and rift Valley (where Trans Nzioa County lie).

During the emergency period, the colonial government removed the land owners of Kiminini and dumped them into native reserves. After Kenya's independence, many residents moved back to their original homes. The independent government resettled some of those who had been displaced. Trans Nzoia County has many squatters who live near the large scale farmers and are laborers for these farmers (TCIDP 2013-2017). However, Kenya's New Constitution of 2010 provides hope for historical injustices. Meanwhile the population has grown over time partly due to the 1992 and 2007 post-election violence where people migrated from Mt. Elgon region to Kiminini which was peaceful. Many people have migrated to Kiminini from different parts of the country due to its fertile arable land.

4.7.3 Land adjudication and consolidation

The process of land adjudication defines the politics of Kenya since independence. Land adjudication has been defined as a process whereby existing rights in a particular parcel of land are finally and authoritatively ascertained (Dale and Mclaughlin, 1988). The other key cadastral process, but which is embedded in the land adjudication process is the land division and consolidation. Land adjudication in Kenya dates back to the colonial era, when the process was initiated to transform land in Trust Land areas from the customary land tenure to the statutory freehold tenure (Nyadimo E, 2006). Following independence, the new government appointed a mission on Land consolidation. The mission recommended that the ascertainment of land rights be carried through land adjudication, hence the birth of the process. The process is anchored in the land adjudication act chapter 284 of the laws of Kenya.

Anybody having a claim to the land to be adjudicated must be present to show his boundaries to the demarcation process. Anyone who feels that his rights have not been taken into consideration is required to lodge a complaint to the adjudication committee chaired by the Adjudication Officer. The process of land consolidation and adjudication in Kenya were the strategic process that brought security of tenure to lands that were reserved for and occupied by indigenous Africans.

While land adjudication is noble and has birthed hurdles that contribute to excessive agricultural land subdivision. It has a number of weaknesses which includes inadequate

resources and capacity (Njenga, 2005) and coordination challenges (Nyadimo, 1990) which slow the adjudication process. Further, adjudication of land whose owner is dead has historically been faced with many obstacles. Since the development objectives, strategies and policies to guide Kenya's sustainable development are hinged on the Vision 2030, the contribution of land as a factor of production and a driver of a city's or an area's dynamics of change requires urgent attention. This is particularly essential considering the importance of land in the light of emerging dynamics in the implementation of Kenya's Constitution, 2010; like administrative boundaries in light of devolution in the country. The role that land tenure plays in mitigating rural land subdivision cannot be overemphasized.

4.7.4 Land Tenure

The land tenure system in Kiminini has evolved over time. At the time of independence the whole of Trans Nzoia County was crown land reserved for the 'white farmers'. After independence the ownership was transferred to the Government of Kenya. The county has two types of Land ownership; public and private. The government owns the land where government facilities are erected and also river and road reserves. The privately owned land was previously owned by the government but it has now been allocated or sold to individuals and institutions. Freehold land is mainly agricultural land. Leasehold land is given for a period ranging from 33, 66, 99 & 999 years.

4.7.5 Crop, Livestock & Fish Production

The Main crops produced in Kiminini are maize, beans, wheat, tea & potatoes. Other crops include coffee and a variety of horticultural crops. The average household farm size in Kiminini is one and half acres for small scale and 30 acres for large scale farming(Trans Nzoia County Department of Agriculture, 2013). The main Livestock reared include: Cattle, goats, chicken, sheep and fish.

4.7.6 Residential Land Use

There are residential areas of various types. The settlement in Kiminini area has led to a wide range of land sub division. Homesteads with large farms are mostly fenced by trees and shrubs. There are squatters and slum like residents who have space for a house only

with no trees or crops planted. These households buy food and work as laborers in the surrounding large farms.

4.7.7 Forestry & Agro Forestry

Kiminini has approximately 18 percent of its surface area under forest cover as compared to the country which has a cover of 1.7% (Kenya National Climate Change Strategy, 2010). The main forest types in Kiminini are natural, plantation, bamboo and moorland.

The main forests in acres are Saboti Forest (10,035) Sosio Forest (10,035) and Kitale Forest (2, 037), (Forest Department, 2018). As land sizes diminish less land is allocated to forestry.

4.7.8 Current Infrastructure

Trans Nzoia County has a total Road network of 1,060.94Km comprising of 154 km of bitumen roads, 167.07Km of gravel, 786.37km earth road and 2953.5Km of rural access roads. Kitale- Webuye Road is the major road passing across Kiminini Sub-county and it has been expanded. This has led to further land developments along the road. Most roads are however in a poor condition and are impassable during the rainy season and many have been narrowed by farmers who use road reserve for agriculture.

The poor condition of the roads is a major bottleneck to development in the county which is rich in agricultural production. It makes it difficult for farmers to access the market; especially for perishable produce. An air strip is available at Kisangani and provides an opportunity for the growth of horticulture as well as reduced travel time for air passengers. Studies in South Africa have shown that improved infrastructure tends to be associated with increased land sub-division.

CHAPTER FIVE

5 FINDINGS AND DISCUSSIONS

5.2 Introduction

This chapter presents the results and discussions on how rural land subdivision in Kiminini has affected household maize production. Here, an analysis of the findings of the data collected from both the secondary and primary data and organized along the research objectives is reported. The section starts by explaining land uses in Kiminini, the process of land sub-division, sizes of land and trends of land sub-division in Kiminini. The causes of rural agricultural land sub-division according to the respondent's feedback are highlighted in this chapter. The section also reports the impacts of rural land sub-division on household maize production, livelihood, infrastructure and natural resources. In this chapter, the findings are presented in form of charts, pictures, and maps and explained through detailed descriptive texts, to bring out the layout, condition, various relationships and characteristics of the study area. The chapter concludes by highlighting various intervention measures to be put in place to mitigate the land sub-division concerns.

5.3 Background Characteristics of Respondents

5.2.1 Gender of Respondents

The farmers were asked to indicate their gender on the questionnaire. This was important, as it would help to determine the number of women that owned farms and therefore practised farming.

Table 5.1 Shows Gender of respondents

DESCRIPTION	FREQUENCY	PERCENTAGE
Female	51	42.9
Male	69	57.1
TOTAL	120	100

Source: Author, 2018

The outcomes of data analysis disclosed that 69(57.1%) of the respondents were male while 51(42.9%) were female. This showed that more men were into household maize production as opposed to the women. This was also an indicator that men had more land tenure rights than women. Most women that responded to the questionnaires answered because they stayed on the farm while their spouses worked in the urban areas.

5.2.2 Age brackets of respondents

The researcher wanted to discover the age of the respondents to determine the involvement of youth in agricultural activities. This is due to the cross cutting issues of land inheritance and buying of land. The age also has implications of farmers of tomorrow.

Table 5.2 below shows Age brackets of respondents

DESCRIPTION	FREQUENCY	PERCENTAGE
20-29 years	12	10%
30-39 years	18	15%
40-49 year	25	21%
Above 50 years	65	54%
TOTAL	120	100

Source: Author, 2018

The older people own pieces of land in kiminini. They own more resources to be able to purchase land in Kiminini. With the culture of inheritance, they pass down their land by sub dividing it amongst their sons.

5.2.3 Level of education of respondents

Level of education was important to determine the literacy levels of the respondents. Education is very important for the rural dwellers that depend solely on agricultural activities for their livelihood.

Table 5.3 Below shows the level of education of respondents

DESCRIPTION	FREQUENCY	PERCENTAGE
Primary	31	26%
Secondary	48	40%
Tertiary	41	34%
TOTAL	120	100

Source: Author, 2018

Education provides an alternative to land subdivision as the well-educated members of the family opt to pursue other careers apart from farming.

5.4 Land uses in Kiminini Sub-county

The study area is characterised by a number of diverse land uses. The original settlers were farmers and thus agriculture was the dominant land use. This is because the land in the area is arable but with time this trend is changing due to population increase. Agricultural land is the most prevalent with 61% of the respondents saying that agriculture is the main land use. Upto 28% of the respondents alluded that residential land use is prevalent while 11% of them indicated commercial to be the main land use. Kiminini was mainly agricultural land but the study shows that residential and commercial land uses are slowly invading the land that was meant for agriculture.

5.4.2 Agriculture

The economic base in Kiminini for a long time has been dominated by small scale and large scale farming. Approximately 61percent of the population depend on agriculture

directly or indirectly to sustain their livelihood. Over the years, agricultural land has been diminishing through selling of land for residential and commercial developments and also through sub division of land for inheritance.

5.4.2.1 Agricultural activities

Farming in Kiminini is carried out at small scale levels and large scale levels at approximately 63% and 37% respectively. Small scale farming is mainly for subsistence while large scale farming is mainly for commercial purposes. Up to 52% of the farmers practice subsistence agriculture while only 48% of the respondents sell their produce. The average land sizes for small scale farming in Kiminini is one and a half acres while that of large scale farming is fifteen acres. Small scale farming was more predominant in Kiminini. Maize farming is widely practised, and mostly at a commercial level. The study revealed that one acre of land produce about 20 bags of maize and 3bags of beans mainly for subsistence. Large scale farmers whose farms range from 10 to 100 acres produce as much as 200bags to 2000 bags of maize and 30 to 300 bags of beans. These large scale farms have diminished over time. The study revealed that the average predominant land size was one and a half acre which produces 30 bags of maize and 4.5 bags of beans. Respondents gave the average land size before they acquired as 30 acres which would produce 600 bags of maize and 90 bags of beans if the conditions were held constant.

Tea, coffee and horticulture are also practised at the wider county level. There's also dairy farming, Companies such as K.C.C are located in the County which not only provides market for dairy products but also creates employment for the residents.

5.4.2.2 Crop farming

Most farmers practice mixed farming of both crop and animal rearing. With the diminishing Agricultural land, Kiminini dwellers cannot depend only on maize production which requires large tracts of land. They therefore opt to supplement crop farming with animal rearing.

Figure 5-2: Main Crops Grown in Kiminini Sub County

Source Author, 2018

Maize and beans are the main food and cash crops grown in Kiminini Sub-County. The study revealed that one acre of land produces about 20 bags of maize and 3 bags of beans. Large scale farmers whose farms range from 10 to 100 acres produce as much as 200 bags to 2,000 bags of maize and 30 to 300 bags of beans. These large scale farms have diminished over time. The study revealed that the average predominant land size was one and a half acre which produces 30 bags of maize and 4.5 bags of beans. Respondents gave the average land size before they acquired as 30 acres which would produce 600 bags of maize and 90 bags of beans if the conditions were good. The Kenya Integrated Household and Budget Survey, 2015/2016 recommends that the minimum per capita amount of money required to sustain an adult in the rural areas is Kshs. 39,024. For a household that has five persons, the amount required is Kshs 195,120. Annual gross income from one acre yielding 20 bags (Kshs. 2500/bag) of maize and 3 bags (Kshs. 7,000/bag) of beans is about Kshs. 71,000. Considering 40% inputs cost leaves net returns of Kshs. 42,600. A household depending on maize and beans alone will therefore require about 5 acres to survive. If the yield of maize and beans is doubled, the minimum land size can come down to 2.5 acres. If 2 dairy cows are added, the size could come down further to 1.5 acres.

Some farmers also plant bananas to be consumed at household level as shown by the image below:



Figure 5-3: Banana crop;

Source Author, 2018

5.4.2.3 Livestock farming

Animal rearing in the study area complements crop farming since, with the decreased sizes of agricultural land, crop production is barely sufficient. The types of animals reared are as shown below:



**Figure 5-4: Types of Livestock Reared in Kiminini Sub
County**

Source: Author, 2018

Cattle and poultry are the main livestock reared in Kiminini. Sheep is also reared but very few farmers keep them.

5.4.2.4 Challenges facing agriculture

Kiminini has been faced with two broadly-based changes in its weather that have affected its agriculture, especially crop farming. The first is the quantity and timing of rainfall. The other is temperature. Both factors affect agriculture, but not necessarily in the same way since though higher carbon dioxide (CO₂) concentrations are linked to global climate effects, the relative effects on crops depends on other associated circumstances. For example, while higher CO₂ levels may result in higher yields for crops, *ceteris paribus*, concurrent high heat and low moisture levels may interfere with germination or fruiting in unpredictable ways, thus supporting rapid growth with little or no fruit (Trans-Nzoia CIDP 2013-2017).

The apparent great variation in temperature and rainfall have in turn affected many variables that influence agricultural productivity, including seed germination rates, the presence or absence of beneficial or harmful insects, the effectiveness of soil treatment etc together, these influences have affected agricultural productivity and the type of agriculture that is extant in the area. Moreover, changes in rainfall patterns have resulted in higher erosion levels and net decrease in agricultural production. The reduction in farm sizes due to significant increases in the area's population and migratory effects have reduced household maize production to what level. This has made people who derived their livelihood mainly from the farms to delve in poverty.

5.4.3 Commercial activities

Increasing business enterprises have replaced the vast agricultural land to cater for the needs of the increasing population in Kiminini. Commercial activities include shops, hardwares, salons and barbers, cereal stores, agro-vets and vegetable stores. Road side businesses involving frying of *mandazi* and *chips* extensively use biomass. There are timber businesses in Kiminini which cause extensive logging. Reduced farm lands have reduced household incomes that have pushed many into extreme poverty and unemployment.

A number of improvements to the physical infrastructure of KimininiSub County were observed during the study. They include renovation of shops, building of a market, a bus park and expansion of Kitale-Webuye road. The proliferation of unplanned settlements is rampant in the market areas of Kiminini, Matunda, Kiungani and Lukhome. Subdivisions due to inheritance and selling have increased influx of the population various goods and services. Increased land subdivision is done along the main roads to put up commercial structures. This has led to increased prices of the land along the roads.

5.4.4 Residential land uses

Agricultural land is slowly being turned into residential land use due to increasing population in Kiminini Township. Up to 12% of the respondents migrate to Kiminini due to its peaceful nature during political clashes. Up to 62% of persons interviewed have settled in Kiminini due to due to employment and search for fertile land for cultivation while 26% are originally from Kiminini. Increased population has led to proliferation of rural slums which are characterized by poor housing made of mud and iron sheets, most of them with inadequate sanitary facilities and water; they are inaccessible and do not have green cover of grass, shrubs and trees. Most of these informal rural settlements host thieves and robbers because they have no employment or farms to carry out agriculture. Farmers occupying one acre and above mostly practice agro forestry where their farms are fenced with trees and shrubs, live fences; most of their farms are accessible to vehicles.

5.5 Process land Sub division in Kiminini

2003



2018



The above Google images show the process of land sub division over the years

The google images also show that more sub divisions are done along transport corridors according to Alonzo’s classical theory of land use.

Land is sub divided through survey procedure or clan agreements. Land for sale is sub divided by a contracted surveyor. An agreement is then written in the presence of an advocate, land seller, land buyer and witnesses. The application for land title is submitted to the county lands offices. Upto 61% of the land owners interviewed still don’t have their title deeds. Customary land for inheritance is sub divided by the clan elders. Seventy four percent of the residents interviewed acquired land by buying while 26% others acquired through inheritance.

Table 5-1: How Respondents Acquired their Land

<i>Method of Land Acquisition</i>	<i>Frequency</i>	<i>Percentage</i>
Buying	89	74%
Inheritance	31	26%
Total	120	100%

Source: Author, 2018

5.5.2 *Sizes of land and trends of land Sub-division in Kiminini Sub-division*

Average land size of farms in the study area was one and a half acres for small scale farming and 15 acres for large scale farming. Respondents gave the average land size before they acquired as 30 acres. 33% of the sample population intend to sub divide their land for inheritance purpose while 23% of the sample intend to sub divide the land for selling purpose. Up to 44% do not intend to sub divide the land but as much as they do not want to sub-divide the land, if need arises most of them will eventually sub divide their land. Market demand encourages subdivision into even smaller plots.

Land sizes are reducing in Kiminini Sub-County. The land sizes for the respondents are as shown in the table below:

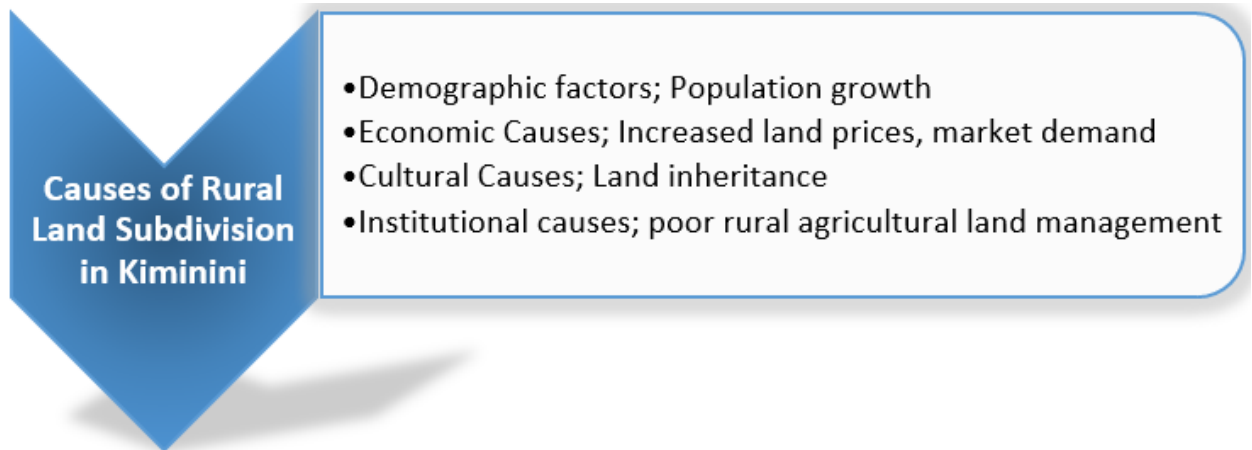
Table 5.4 below shows the land sizes of respondents

Land Size	Frequency	Percentage
Below 1acre	54	45
1-5 acre	36	29
6-10acre	18	15
Above 10acres	13	11
Total	120	100

5.6 Causes of rural land subdivision in Kiminini

The study sought to establish the causes of land sub division in Kiminini. The chart below summarized the causes as revealed from the field survey:

Figure 5-5: Rural subdivision causes



Source: Author, 2018

5.6.2 Demographic factors

Population growth and immigration has put land in the study area under pressure to transform to urban land use such as residential use. The proximity of the study area to Mt Elgon Forest has made the area an ideal ‘safe zone’ for squatters evicted from the Mt Elgon Forest in order to conserve the forest. The eviction of the Mt Elgon Forest residents without alternative options for their livelihood has created problems for the study area. The population in Kiminini has increased tremendously. Population growth

has increased the demand for land thus further land subdivision to meet the demands of the growing population. The sample population was asked the extent to which population increase has led to land sub division in Kiminini.

The responses given range between very great and great thus confirming that with increased population, cases of land subdivision increase uncontrollably due to the market created by the population. This gradually results to a decline in household maize production due to the decreased sizes of agricultural land. Demand for residential space has led to land sub divisions and its extent is as shown below:

From the study, it was established that 71% of the respondents thought that demand for residential space has caused land sub divisions in Kiminini to a very great extent; 27% alluded that demand for residential space has caused land sub divisions in Kiminini to a great extent while only 2% responded that residential space demand is just a neutral cause for rural land sub division.

Some of the respondents (12%) immigrated to Kiminini due to post election violence in Mount Elgon of 1992 and 2007. This led to an increase in population in Kimininitownship, some of the immigrants sold their land in Mt. Elgon and bought land in Kiminini which is a more peaceful environment. Therefore the nature and condition of the neighbouring settlements affects Kiminini.

5.6.3 Economic Causes

Broadly speaking, economic factors influence agricultural land subdivisions through market forces, ie the supply and demand for agricultural land (Syagga, 2018). Economic drivers may also interact with institutional factors and policies. Privatization of land after independence has led to subsequent fragmentation of land to serve the demands of the market economy. Out of the residents interviewed 62% of persons interviewed bought land in Kiminini due to employment and search for fertile land for cultivation. Many land owners in Kiminini sell part of their land or the whole of their piece of land to meet their needs such as school fees, food, for funerals and to start businesses among other needs. The per capita income in the study area influences agricultural land owners to subdivide their land and sell to property developers. This is also encouraged by the fact

that the return from agricultural activities is not enough to support the livelihood of the residents. Subdivision trends in Kiminini are expected to increase since 23% of the sample population intend to sub divide the land in future both for inheritance and commercial purpose but 77% do not intend to sub divide their piece of land.

5.6.4 Cultural causes

Numerous cultural factors influence the decision making process of an agricultural land owner. Liberal inheritance law and traditions is one cause of Rural Land Subdivision (FAO, 2002). In East Africa land inheritance practices and land tenure systems (for example customary rights), individualization of titles and acceptability to sell agricultural land (commodification of land) directly affects agricultural land subdivision. The case is no different in Kiminini. Cultural/social ties have affected land subdivision with 26% of the respondents inheriting land from their clans. The land is sub divided to each generation from father to son. This leads to decrease of agricultural land sizes with every subsequent generation.

The study interviewed one prominent farmer, *Mwalimu Milimo*, who owns 100 acres of land. He has preserved his land and has not sub divided to the sons. He said the large tract of land gives better amount of produce and is easier for mechanization. His fear however, is that once he dies; his sons will sub divide the land. Such productive land should be preserved according to *Mwalimu Milimo*.

5.6.5 Institutional causes

The use of resources such as agricultural land is facilitated by local and national policies thus institutions play a great role in the designation of property rights and thus has an impact on individual land owner decision making. In Kenya, the rural areas are characterized by poor enforcement on the existing development control measures and they are left to organically develop with very few. The study therefore sought to know whether weak and ineffective land institutions led to excessive land sub divisions in Kiminini.

The study showed 56% of the respondents indicated that weak and ineffective land institutions led to excessive land sub divisions in Kiminini to a very great extent and 22%

said that weak and ineffective land institutions led to excessive land sub divisions to a great extent. According to 10% of the sample population, weak and ineffective land institutions led to excessive land sub divisions to a little extent while 12% said that weak and ineffective land institutions did not lead to excessive land sub divisions.

5.7 Impacts of Rural Land Sub division on Household Maize Production

Land fragmentation has had both socio-economic and environmental impacts on rural development. Some of these impacts are discussed below:



Figure 5-6: Rural subdivision impacts

Source: Author, 2018

5.7.2 Diminishing agricultural land.

Average land size of farm lands in the study area was one and a half acres for small scale farming and 15 acres for large scale farming. Respondents gave the average land size before they acquired as 30 acres.

As indicated by the statistics, agricultural land sizes have been declining with time. By 1963 in Kiminini, the average agricultural land size was 30 acres but due to subdivisions, the average size has reduced to as low as 1.5 acre. Prime agricultural land is being lost as a result of subdivisions, sale and conversion to a variety of urban uses.

5.7.3 *Reduced Household Maize production*

Subdivision of agricultural land has significant impacts on household maize production. Reduced farm sizes translates to decreased outputs.

The study revealed that the original agricultural land sizes which were 30 acres would produce 600 bags of maize and 90 bags of beans. Currently, the household maize production is 30bags of maize and 3bags of beans for the average land size which is 1.5 acres. This level of production does not allow sale of the produce thus it is mainly for subsistence. The original large scale farms have diminished over time.

5.7.4 *Increase in land values*

Demand created by the increasing population has led to increased land prices. Households thus opt to sell part of their land to get monetary returns which are more valuable to them. As revealed earlier by the findings of this research, agricultural produce is not enough to fulfill the needs of the residents, therefore the opportunity of subdividing and selling agricultural land to sustain their upkeep and satisfy their needs seems the best and only option available for them. The chart below summarizes the findings of the extent to which increased land values have affected agricultural land subdivision:

Increased land values have led to a reduction in the number of investors who are willing to invest in land for agriculture. Leasing land for one year in Kiminini is now approximately Ksh 8,000 per acre which is expensive for the area and therefore they opt to do other businesses rather than farming.

Kiminini sub county has been experiencing ribbon developments due to the presence of Kitale-Webuye highway. The land values at these areas are exorbitant and developers will always want to put up development that will give the maximum returns. This process has also resulted into uncontrolled subdivision of Agricultural land along the road into very small plots that are economically unviable and with no reference to change of use (Mureti, 2014).

5.7.5 *Rural slums on agricultural land*

Subdivisions in the study area have also influenced the mushrooming of informal settlements within the Sub-County. These are characterized by poor housing, lack of

proper accessibility and generally deplorable conditions. The sample population was asked the extent to which land sub division has led to increased rural slum.

Observations during the field survey revealed that there were dilapidated housing characterized by small mud houses, less vegetation, inadequate sanitary facilities and water supply with narrow roads leading to these dwellings. Such villages include *Muthangari*, *Kwa Thomas* and *Sokomoko* among others. *Muthangari* and *Kwa Thomas* were squatter settlements for the workers of large scale farmers. *Sokomoko* was a large farm that has since been sub divided into small portions.

5.7.6 *Pressure on the existing infrastructure*

The respondents gave one effect of land sub division to be reduced access road width. It was observed that some roads were narrow and could not allow tractors and lorries to pass through. This therefore causes farmers to use oxen and human beings to do ploughing, planting and harvesting because the roads are too narrow to allow mechanization. Lack of mechanization definitely leads to reduced agricultural produce.

River fronts have also been cultivated leading to silting of river Kiminini and agro chemical pollution of the river.

Some of the residents, 68%, use wells where most home steads have dug boreholes and this has led to dried wells. Underground water is being over utilized and this may lead to depletion of ground water reservoir. This was evident during the study where some wells were said to be drying up during dry season.

5.7.7 *Other effects of rural land sub division*

The study inquired on any other effects of rural land sub division and the respondents listed the following:

High crime rate is one effect where farm produce is stolen and therefore many farmers are discouraged to do large scale farming. The farm produce are stolen because of the upcoming rural slums where residents don't have agricultural land so, they steal from the nearby farms to survive.

Conflicts on the land boundaries is another effect of unsustainable rural land sub division. Farmers explained that there are many conflicts over land boundaries where some neighbors move their boundaries to acquire land that is not theirs. There is a lot of road and river reserves acquisition by private individuals and this has caused a lot of conflicts in Kiminini. Conflicts arise also from planting of eucalyptus tree species on boundaries and this has led to reduced maize production and drying of boreholes since eucalyptus utilizes excess ground water.

Deforestation is another result of unsustainable rural land sub division. The study revealed that most residents with less than one acre did not plant trees on their boundaries because they save the land for little maize and vegetable production. The rural slums are characterized by little vegetation where the whole land is used for building houses and no space is left for trees, shrubs, grass or flowers.

5.8 The measures in place to mitigate Rural Land Sub division in Kiminini

The study sought to get mitigation measures in place to mitigate Rural Land Sub division in Kiminini.

5.8.2 *Traditional measures*

Customary land for inheritance is sub divided by the clan elders. The elders are the only ones allowed to sub divide the land to their sons. As mentioned earlier in this document, 26% of the land owners acquired their land through inheritance from their parents.

5.8.3 *Legal measures*

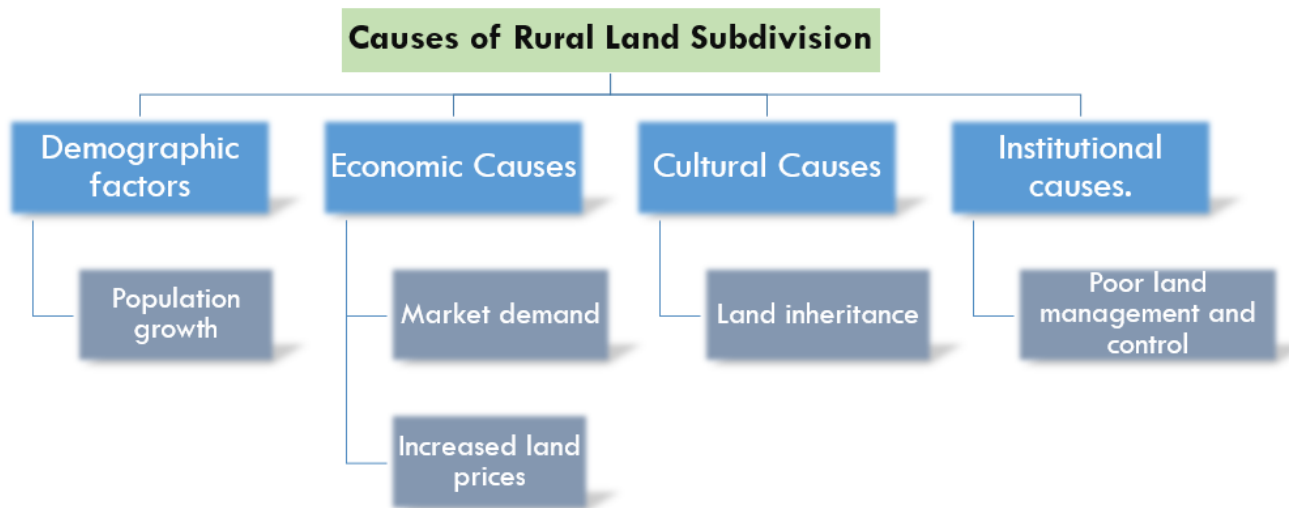
Sub division application is done to the Lands department by the proponent. The Physical planning Act Cap 286, Section 41; gives provision that no private land within the area of a local authority may be subdivided except in accordance with the requirements of the local physical development plan. Land for sale and development is sub divided by surveyors who present the sub division schemes to the Lands Department in Trans Nzoia County. Registration and planning is then done in the land registry and a land title is given afterwards. The legal requirements are available but enforcement is inadequate hence there is increase in informal land subdivision.

CHAPTER SIX

6 SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

6.2 Summary of Findings

According to the research and detailed analysis carried out in Kiminini, socio-cultural and economic factors stand out as the most significant drivers of rural agricultural land subdivision. Therefore as revealed by these findings, agriculture is not a stand-alone sector and its productivity can be affected by other factors.



Source: Author, 2018

Land sizes in Kiminini have reduced greatly over time and the situation is bound to get worse. Immigration into the study area has caused an increase in population which in turn has created demand for land. The high population density has exerted enormous pressure on the available land resource thus resulting in intensive land use in the locality. Residents, who mainly are farmers have continuously sold portions of their land for monetary returns. Economic status of the residents highly contributes to this. The returns

gained from sale of agricultural products are not enough to satisfy their needs. Uncontrolled subdivisions have thus been carried out in the area with no consideration for social and physical infrastructure.

These subdivisions have both socio-economic and environmental impacts on rural development. Population densities in the study area have created a demand for land, which has thus attracted an increase in land pricing. Some residents migrating into the settlement (mainly squatters) cannot afford to purchase land due to the prices and thus opt to set up temporary structures on government and private unoccupied land. This has led to a gradual growth in the number and extent of rural slums. These kinds of settlements are mainly associated with insecurity, poor infrastructural connection and the case is no different for the slums in Kiminini. Sub division of riparian land and public utilities land for agricultural practices reduce environmental integrity in the study area. Rural land subdivision has an impact on household maize production because it has led to diminished agricultural land from an initial average of 30 acres to the current 1.5 acres;

The original sizes of agricultural land have reduced with the land being substituted for residential use. Although productivity can be higher, overall, smaller land sizes tend to produce less produce. Therefore the agricultural production in the study area and the county at large has reduced which directly translates to lower food supply and incomes for the residents. Small land sizes also lock out the mechanization of agricultural land therefore resulting in poor agricultural practises and techniques. Agricultural growth is important for stimulation of economic growth, sustainable development and for poverty alleviation. Sustainable development for rural areas is an interaction of both social, economic and environmental aspects as shown below:

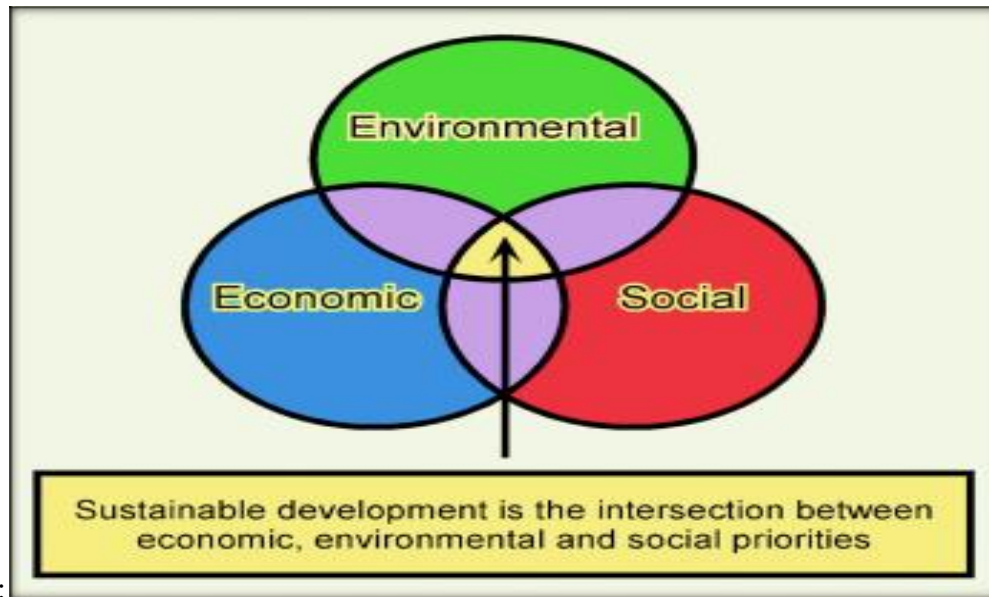


Figure 6-1: Drivers of Sustainable Development

Land and agricultural activities have an impact on people’s income (economic impact), the state of the environment and conservation of resources (environmental impact) and the general lifestyle and interactions of the people (social impact). Therefore all the activities taking place in these rural areas have to score highly in these three key aspects, in order to achieve sustainable rural growth and development.

6.3 Conclusion

Kenya is an agricultural based economy and has a majority of her population deriving their livelihood from different forms of agriculture. Agriculture not only creates employment, earns income for farmers but also it ensures food security in the nation. It is thus the main driving force of the Kenyan economy and should be supported. The trends in rural land subdivision and the resultant loss of agricultural land does not look promising for the future of agriculture in Kenya.

As revealed by the research many agriculture-based rural areas which were synonymous with large tracts of agricultural land have been transforming in spatial dimensions due to subdivision of land into uneconomical sizes and uncontrolled sale of agricultural land to private housing and commercial developers. Subdivision therefore remains a major threat for agriculture in the rural areas. If no action is taken, Kenya will definitely not achieve

its vision 2030 objective of increasing agricultural production and raising incomes in agriculture. In the study area, the population growth has been putting pressure on the arable land. Residents have been carrying out uncontrolled land subdivisions causing land fragmentation where there are dispersed parcels of small and irregular sizes. Due to this the area cannot attain its optimal productivity in agriculture. All factors which encourage rural land subdivision are an obstacle to agricultural production and productivity and interventions should be put forward to address this.

One of the major factors affecting land use and land subdivision is tenure. Land tenure types and policies tend to determine the nature of agriculture carried out and influences other land use practises. In order to achieve sustainable agriculture the country needs to adopt policies and strategies that promote conservation of highly productive agricultural land. This should be by devolving the natural resources such as land to local communities and encouraging local level sustainable resource management.

As mentioned earlier in this document, Kiminini is in Trans Nzoia County which is the food basket of Kenya. This means that agricultural land in this area should be preserved to avoid depletion of this fertile land. Agricultural land subdivision into uneconomic portions is not sustainable for household maize production.

6.4 Recommendations

Increased urbanization is a reality and cannot be held back but it can be guided. Conversion of tracts of agricultural land to non-farm use results into long-term consequences. Non-farm developments exhaust the agricultural production of an area. The study thus recommends that land use planning should be undertaken and enforced in the rural areas to enhance sustainable production and development. In order to reverse the existing trend of subdivision and its impact, the following approaches are recommended:

6.4.2 Local physical development plan

A spatial plan should be prepared for the study area in order to guide its development and transformation in socio-economic structure. The plan should seek to foster a strong sustainable rural economy by enhancing the potential of agricultural land and creating seamless connectivity for all land use activities. Existing of one land use should not cause

extinction of another, therefore during planning, it is vital to zone the study area and accommodate all the required land uses. Cluster form of development should be encouraged during zoning. This is because the approach allows homes to be clustered on part of the development parcel and the rest of the land preserved as productive agricultural land.

6.4.3 *Agricultural Protection Zoning*

This is a concept borrowed from the City of Pennsylvania in the United States of America. Agricultural protection zoning (APZ) is a form of zoning that designates areas where farming is the primary land use and discourages other land uses in those areas. APZ ordinances typically restrict the density of non-farm residential development and may also contain limits on subdivision and site design criteria including buffers and setback requirements. They may permit complementary, on-farm commercial activities that enhance farm profitability (Estelle Ruppert, 2009). APZ stabilizes the agricultural land base by keeping large tracts of land relatively free of non-farm developments, which can reduce the likelihood of conflicts between farmers and their non-farming neighbours. Also by limiting development, APZ can help keep land affordable to farmers and ranchers. Finally, APZ can help promote orderly growth by redirecting development to areas with adequate infrastructure to support it. This would be a very effective strategy to address the issue at hand in Kiminini. This will ensure even with population growth; agricultural land is conserved, land prices are controlled and infrastructure to serve the population is available.

6.4.4 *Improving access to international markets*

Agriculture will be sustainable in the long term only if farmers enjoy the immediate benefits of agriculture. Reliable market access is critical for helping unlock the potential of farmers. If we just focus on increasing productivity, farmers will produce and be left looking for buyers and potentially lose any possible gains in income. When farmers are assured of satisfactory returns from agriculture, they will value their agricultural land and prioritise maintaining it in economically productive sizes. Rewarding farmers for their efforts also motivates them to adopt new practises to increase productivity of their farms.

6.4.5 Land Size and Land Consolidation

This approach towards conservation of agricultural land can be executed at two levels. One is at household level where land subdivision as a result of cultural causes (inheritance) will be stopped. Here, the household head who is the land owner will encourage his heirs to practise combined farming as opposed to the farming on small subdivided plots. This will ensure economically productive agricultural land sizes are maintained. At the neighbourhood level, neighbours farming the same crop on their land which could yield more when planted in large scale can pull their resources together. The farmers can even employ new technologies since most mechanization requires large agricultural land sizes to achieve full economies of scale. Through this three objectives will be achieved: promotion of large scale farming, increased household production and increased income/returns from agriculture. From the findings, a 5 member household depending on maize and beans alone harvesting 20 bags of maize and 3 bags of beans per acre will therefore require about 5 acres to survive. If the yield of maize and beans is doubled to 40 bags per acre, the minimum land size can come down to 2.5 acres. If 2 dairy cows are added, the size could come down further to 1.5 acres and land tenure has to be revised to restrict sub-division.

6.4.6 Alternative agricultural practices that use less land

Land resource is slowly reducing. With decreasing land sizes as a result of subdivision in the area, residents are already finding it hard to survive on farming alone. Optimal and sustainable farm management should be exercised even by farmers who have small land parcels. While campaigning to eradicate uncontrolled agricultural land subdivision, it will be important to deal with the aftermath as it is in Kiminini. To do this, farmers with smaller tracts of land should be trained and encouraged to diversify their farming system. This will increase the family income and thus residents will not be forced to sell part of their land to sustain their needs.

6.4.7 Review of cultural land inheritance practices

Informal land subdivision is carried out as a result of the culture of inheriting land. The younger people who receive land from their elders are involved in inappropriate land subdivision. Subdivision should be banned to preserve agricultural land.

6.4.8 Policy based approach

Rational use of agricultural land is influenced by land use limitations. The government of Kenya should draft and enforce policies that support large scale farming. The policies drafted also should address the issue of traditional land inheritance. The priority of these policies should be on maintaining and improving the capacity of the higher potential agricultural land.

6.4 Suggested Areas of Further Research

The areas suggested for further research are:

- (a) Estimate the proportion of residential land use in the rural areas and its impact on agricultural production
- (b) Evaluate planning approaches and practices for sustainable land production.
- (c) Determine the strategy and legal framework design to preserve agricultural land as well as green spaces.
- (d) Determine the enforcement measures needed to protect the road reserves and river reserves from encroachment by farmers.
- (e) Investigate alternative measures to replace land inheritance

REFERENCES

- Briassoulis, H. (2008). *Land-use, Land-cover Changes and Global Aggregate Impacts*. Athens, Greece: Encyclopedia of Life Support Systems.
- Food and Agriculture Organization (2002). *Land Fragmentation and Consolidation in the Agricultural Sector; A Case Study from Bulgaria Munich*. International Forum for Land Fragmentation and Consolidation in CEEC from 25-28 February 2002
- Food and Agriculture Organization (2006). *Improving Tenure Security for the poor in Africa*, By McAuslan, P. Rome
- Food and Agriculture Organization (2007). *Improving Tenure Security for the Rural Poor*. Mozambique Country. Case Study by Norfolk, S., Tanner, C., Rome
- Food and Agriculture Organization, (2007). *SARD & Rural property rights*. Sustainable Agriculture and rural development (SARD) Policy Brief 9
- Joachim Thomas (2006). *Property rights, Land Fragmentation and the Emerging Structure of Agriculture in Central and Eastern European Countries*. A Journal of Agricultural & Development Economics Vol.3, No.2 of 2006
- Government of Kenya (GoK), (1965) *Sessional Paper No. 10 of 1965 on African Socialism and its Application to Planning in Kenya*. Government Printers, Nairobi
- Government of Kenya (GoK), (2010). *The Constitution of Kenya, 2010*. Nairobi Government Printers.
- Government of Kenya (GoK), (2012). *Physical Planning Act Cap 286*. Nairobi, Government Printers.
- Government of Kenya (GoK), (1970). *The Land Control Act, Cap 302*. Government Printer, Nairobi.

Government of Kenya (GoK), (2003).*Economic recovery strategy for wealth and Employment Creation for the period 2003-2007*. Government Printer, Nairobi.

Government of Kenya (GoK), (2007).*Sessional paper No. 3 of 2009 on National Land Policy*. Government Printer, Nairobi.

Government of Kenya (GoK), (2012). The Land Act No. 3. Government Printer, Nairobi.

Humphrey, K. Njuguna And Martin, M. Baya, (1999). *Land Reforms in Kenya: An Institution of Surveyors of Kenya (ISK) Initiative*. Kenya

Kenya National Bureau of Statistics (KNBS). (2010) <http://knbs.or.ke/census%results/KNBS%Brochure.pdf> Retrieved December 2017

Kiumi, J., Kibe, S., & Nganga, S. (2013). Influence of pupil teacher ratio and school location on pupils' performance in exit examination in Kenya's Free Primary Education Program. *International Journal of Economy, Management and Social Sciences*, 2(6), 423-431.

Mugambi Charles Mureti, (2014). An investigation into causes and effects of encroachments on riparian reserves. A case study of Ruaka River. University of Nairobi

Mugenda O. M. and Mugenda A. G. (2003), *Research Methods: Quantitative and qualitative approaches*. ACTS press, Nairobi.

Njenga, L. (2005). Rik Whitehead & Andrew Scott, (2009).*Farm Subdivision Assessment Guideline: Developments with the Potential for Creating Additional Dwelling Entitlement*. Primefact 972

Nyoro, J.K, Kirimi, L. and Jaye, T.S. (2004), *Competitiveness of Kenya & Ugandan Maize Production; Challenges for the future*, Working Paper 10, Egerton University, Tegemeo Institute, Nairobi.

Nyadimo, E. (2006). *The Role of Private Sector in Land Adjudication in Kenya: A suggested Approach*. Shaping the Change (pp.1-12). Munich, Germany: XXIII FIG Congress

Nyadimo, E. (1990). *Land Title Registration Process in Kenya. Land Registration and Land Information Systems in Developing Countries*. Nairobi, Kenya: UNHABITAT

Rik Whitehead & Andrew Scott, (2009).*Farm Subdivision Assessment Guideline: Developments with the Potential for Creating Additional Dwelling Entitlement*. Primefact 972

Patrick Alila& Rosemary Atieno, (2006).*Agricultural Policy in Kenya; Issues and Process*. A Paper for the Future Agricultural Consortium Workshop, Institute of Development Studies

Patty, S. (2011). Regulating Controversial Land Uses. 39 Real Estate L. Journal, 526.

Trans Nzoia County Government (2013-2017) Trans Nzoia County Integrated Development Plan. www.transnzoia.go.ke

Ulrike, K.&Hartmut, M. (2011). Local Spacial Data Infrastructure, a Solid Base for Sustainable land Management in germany. *The Empowerment of Local Authorities: Spatial Information and Spatial Planning Tools* (pp.1-21). Paris, France: FIG Commission

Wu, J. (2008). Land use changes: Economic, social, and environmental impacts

UNIVERSITY OF NAIROBI

DEPARTMENT OF URBAN & REGIONAL PLANNING

RURAL LAND SUBDIVISION AND ITS IMPACT ON HOUSEHOLD MAIZE

PRODUCTION (Kimininisub county)

Household Questionnaire

Part A: Background Information.

(Tick One)

1. Gender

1. Male []

2. Female []

2. Marital Status

1. Single []

2. Married []

2. Separated []

3. Age

1. 20 years and below []

2. 21-30 Years []

3. 31-40 Years []

4. 41 – 50 Years []

5. Above 50 Years []

4. What is the highest level of education you have attained?

1. No Education []

2. Primary incomplete []

3. Primary complete []

4. Secondary incomplete []

5. Secondary complete []

6. Post-Secondary Certificate []

7. Undergraduate degree []

8. Postgraduate degree []

5. Employment Status

- 1. Employed []
- 2. Self Employed []
- 3. Unemployed []

Part B: Current land Uses

6. How prevalent would you say are the current agricultural land subdivisions in Kiminini Sub county?

Very prevalent()

Moderate ()

Not prevalent ()

7. What is the current prevalent land use in Kiminini Sub county?

Residential buildings ()

Commercial buildings ()

Agricultural activities ()

8. a) Do u own a piece of land inKiminini Sub county?

Yes ()

No ()

If Yes,

b) How did you acquire it?

Buying ()

Inheritance ()

Gift ()

Other (specify).....

9. What is the size of your land (in acres)?
10. What is the nature of your land ownership?
- Freehold ()
 - Squatting ()
 - Leasehold ()
 - Customary inheritance ()
 - Temporary Occupational License ()
11. What was the previous size of this land before you acquired it?

b) Do you have a title deed for your land?

c) What process of Land Subdivision did you use?

12. How much produce do you harvest per year?

a) Maize

b) Milk

c) eggs

d) Poultry

e) Goats

f) Sheep

Any other

b) Do you sell your farm produce?

If Yes, How much?

13. What is the type of road that leads to your Piece of land?

14. Is your farm accessible by lorry and tractors?

15. What are your main sources of power?

a) *Lighting*

- Electricity ()
- Solar ()
- Diesel ()
- Paraffin ()

b) Cooking

- Biogas ()
- Charcoal ()
- Wood fuel ()
- Parafin ()
- LPG ()

16. What is your main source of water?

Part C: Causes of Rural Land Subdivisions

1. Do you intend to subdivide your piece of land?

- Yes ()
- No ()

b)If Yes, for what purpose?

- Inheriance ()
- Selling ()
- Gift ()

2. Rate the extent to which land sub division have led to low agricultural returns in the in Kiminini Sub county?

- Very great extent ()
- Great extent ()
- Nuetral ()

Little extent ()

No extent ()

3. Rate the extent to which demand for residential space has led to land subdivisions in the in Kiminini Sub county?

Very great extent ()

Great extent ()

Nuetral ()

Little extent ()

No extent ()

4. Rate the extent to which increase in population has led to land subdivision in the in Kiminini Sub county?

Very great extent ()

Great extent ()

Nuetral()

Little extent ()

No extent ()

5. Rate the extent to which weak and ineffective land institutions have led to land sub division in the in Kiminini Sub county?

Very great extent ()

Great extent ()

Nuetral ()

Little extent ()

No extent ()

Part D: Impacts of Rural Land Subdivision

1. Rate the extent to which land subdivision in Kiminini Sub county has led to diminishing agricultural land?

Very great extent ()

Great extent ()

Nuetral()

Little extent ()

No extent ()

2. Rate the extent to which land subdivision in Kiminini Sub county has led to reduced household maize production?

Very great extent ()

Great extent ()

Nuetral()

Little extent ()

No extent ()

3. Rate the extent to which land sub division in Kiminini Sub county has led to Increase in land values?

Very great extent ()

Great extent ()

Nuetral()

Little extent ()

No extent ()

4. Rate the extent to which land sub division in Kiminini Sub county has led to rural slum?

Very great extent ()

Great extent ()

Nuetral()

Little extent ()

No extent ()

5. Rate the extent to which land sub division in Kiminini Sub county has led to pressure on the existing infrastructure?

Very great extent ()

Great extent ()

Nuetral()

Little extent ()

No extent ()

6. From your experience, what are the effects of agricultural land sub division in this area?

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

Part E: Intervention Measures to Minimise Adverse Effect of Rural Land Subdivisions

1. Rate the extent to which Policy framework to regulate agricultural land use subdivision is adequate and effective

Very great extent ()

Great extent ()

Nuetral()

Little extent ()

No extent ()

2. Rate the extent to which legal framework to regulate agricultural land subdivision is adequate and effective

Very great extent ()

Great extent ()

Nuetral()

Little extent ()

No extent ()

3 Rate the extent to which institutional frameworkto regulate agricultural land sub division is adequate and effective

Very great extent ()

Great extent ()

Nuetral()

Little extent ()

No extent ()

UNIVERSITY OF NAIROBI

DEPARTMENT OF URBAN & REGIONAL PLANNING

RURAL LAND SUBDIVISION AND ITS IMPACTS ON HOUSEHOLD MAIZE

PRODUCTION (Kimininisub county)

INTERVIEW SCHEDULE (EXPERTS IN THE LANDS)

1. What is the process of land subdivision in Kiminini Sub County?
2. What are some of the causes of rural land subdivision in Kiminini Sub County?
3. What are the impacts of rural land subdivision on Maize production in Kiminini Sub County?
4. What are the mitigation measures to improve the process of rural land subdivision in Kiminini Sub County?