

**LAND SUB-DIVISION EFFECT ON AGRICULTURAL PRODUCTIVITY IN
TRANS-NZOIA WEST SUB-COUNTY, KENYA**

**BY
EMMILY BAKHITA C. LIMO**

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DECLARATION

Declaration by the Student

This thesis is my original work and it has not been presented anywhere for examination.

Limo C. Bakhita Emmily

Reg. No. SHRD/PGD/03/11

Date

Declaration by the Supervisors

This thesis has been submitted for examination with our approval as university supervisors.

Prof. Leonard S. Mulongo

Department of Development Studies

School of Human Resource Development

Date

Prof. P.I. Omboto

Department of Quantitative and Entrepreneurial Studies

School of Human Resource Development

Date

DEDICATION

I dedicate this work to my late father, my dear mother and my siblings.

ACKNOWLEDGEMENT

Great appreciation goes to the almighty God for granting me strength, wisdom and resources necessary to carry out this work.

I am indebted to my supervisors Prof. Mulongo and Prof. Omboto for their constant guidance and support and to Moi University for granting me the opportunity to pursue Master of Science in Development Studies.

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God bless you all!

ABSTRACT

In most societies, land forms the basis for providing and sustaining peoples' livelihoods. In Kenya for instance, over 80% of the population derives its livelihood from land. The continued overreliance on land whether directly or otherwise has greatly increased the desire to own the same resource. This has resulted in land sub-division that has impacted greatly on agricultural productivity. Land sub-division especially in agriculturally dominated rural set-ups has been a blessing in disguise with no clear outcome on the agricultural sector. This study was therefore undertaken with a main objective of assessing the effect of land sub-division on agricultural productivity in Trans-Nzoia West sub-county. The specific objectives of the study were to: -assess the land sub-division situation in Trans-Nzoia West sub-county, examine the determinants of land sub-division in Trans-Nzoia West sub-county, and evaluate the effect of land sub-division on agricultural productivity within the sub-county. The study was guided by a conceptual framework developed by the researcher to examine the relationship between land and agricultural productivity while assessing the influence of government as well as other factors such as technology, weather conditions and demographic factors. A descriptive research design was employed and it targeted a population of 84,277 households of Trans-Nzoia West sub-county. Multi stage and simple random sampling techniques were used to select a sample size of 125 households for the study. Instruments of data collection were questionnaires, interview schedules and observation checklist. Data from questionnaires was subjected to SPSS software version 21 and analyzed descriptively and results obtained presented in form of tables, percentages, means, graphs and charts. Information from interview schedules was presented thematically while those from the observation schedules were presented in form of photographs. Arising from the study findings, land sub-division is indeed an evident occurrence in the study area despite the fact that it is being seen to be stabilizing over the last ten years. The sub-division is determined by a number of factors including financial, cultural and social factors. The study established that land sub-division negatively affects agricultural output. The study findings therefore underscores the need to have government intervention to enforce legislations to prevent worsening of the problem. Future studies could examine strategies that could be employed to increase agricultural output on small farm sizes.

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OPERATIONALIZATION OF TERMS

Land subdivision- A situation where farmers are splitting a larger element into resultant smaller elements and in this case, land.

Land Tenure-The manner in which property rights in land are held.

Property rights- Theoretical constructs that determine how a particular resource is owned, acquired and transmitted.

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LIST OF ABBREVIATIONS

Ha.	Hectares
CSP	County Spatial Plan
CIA	Central Intelligence Agency
SSA	Sub-Saharan Africa
NCPD	National Council for Population and Development
ASAL	Arid and Semi-Arid Land
FEWSN	Famine Early Warning Systems Network
HRS	Household Contract Responsibility System
LIS	Land Information System
KARI	Kenya Agricultural Research Institute
DfID	Department for Development Studies
ILRI	International Institute for Land Reclamation and Improvement
NLC	National Land Commission
ACZ	Agro Climatic Zone
GDP	Gross Domestic Product

CHAPTER ONE: INTRODUCTION

1.1 Overview

This chapter focuses on key issues that lay the foundation to the study. They include: background to the study, problem statement, objectives, research questions, significance, scope and limitation of the study as well as the theoretical framework adopted.

1.2 Background to the Study

As the main foundation for agricultural production and rural livelihoods, land is at the core of the challenge of triggering a green revolution and getting agriculture moving for food security and poverty reduction in Africa (ECA/SDD/05/09, 2004). But land is also a multi-dimensional concept which needs to be broken down extensively in order to understand its relationship with agricultural productivity. One dimension within the land concept is land subdivision. According to the Oxford English dictionary, to subdivide means to 'split up or separate into smaller and smaller pieces'. Land subdivision is therefore the process of making a section of a section; a part of a part. It has been a prominent feature in many countries since at least the 17th century (Tan, 2005) and is considered a global phenomenon closely associated with Europe and Mediterranean countries. Land subdivision has been studied in many other countries and regions all over the world: among others, in South Asia (Niroula and Thapa (2005); USA Brabec, E., and Smith, C. (2002); Ethiopia Manig, W. (2004); and Syria Bailey, E. (2003)).

The existence of subdivided landholdings is regarded an important feature of less developed agricultural systems (Van Hung et al., 2007; Hristov, 2009). Karouzis (1977) and Blaikie and Sadeque (2000) argue that land subdivision is a serious constraint preventing productivity whilst other authors (Wan, G.H., and Cheng, E.J. (2001) and Wu, Z., Liu, M., and Davis, J. (2005)) support the view that land subdivision has not had negative effects on productivity.

Land subdivision can be a major obstacle to agricultural development, because it hinders agricultural mechanization, causes inefficiencies in production, and involves large cost to alleviate its effects (Najafi, 2003; Thomas, 2006; Thapa, 2007; Tan et al., 2008). As a result, agricultural productivity and hence income are reduced (Karouzis, 1977 and Blaikie and Sadeque, 2000). In view of these considerations, numerous land consolidation and land reform policies have been implemented to reduce subdivision in European countries like the Netherlands and France, in African countries like Kenya, Tanzania, Rwanda and elsewhere (Sabates-Wheeler, 2002; Sundqvist and Anderson, 2006). In the larger context, if land subdivision means that more labour and other resources are used than is necessary; and that these resources can be used more effectively elsewhere in the economy, then there is likely to be an overall economic gain from reduced subdivision.

However, even though land subdivision may have negative impacts on farms and the overall economy, there are reasons why there may be benefits to farmers from some degree of subdivision. Land subdivision can mean that farmers are able to practice sound farm management techniques, identify areas of the farm that have different quality,

allowing them to diversify their crops, spread labour requirements, and reduce production and price risks.

In Africa, land tenure system has generally been broadly described as rigid, creating obstacles in the way of development. Extant literature has expressed the concern of reknown scholars (Olayiwola and Adeleye, 2006) on the problems of traditional land tenure system in Kenya. The expression of the scholars with respect to the problems of land tenure could be interpreted based on the duplicity of ownership of land with consequent excessive transaction costs, sub-division of land into uneconomic sized tracts, and inalienability of land which makes land part of the physical capital but not a part of financial capital. Solutions to the land tenure system have involved the adoptions of some institutional changes such as the promulgation of legislation or the adoption of some revolutionary principles. In Kenya, the intervention into the land problem involves the promulgation of the Kenya Constitution in 2010, the Land Act 2012, the National Land Commission Act 2012 and the Land and Environment Act 2012. These laws have been designed to deal with several problems encountered by the various operative on land since colonial times. Land reforms particularly those pertaining to land tenure systems have great implications on land use; which in turn affect agricultural productivity.

Western Kenya, under which Trans-Nzoia County falls, is among the most densely populated regions in SSA. Its high population is attributed to the earlier settlements that were motivated by the high agro-ecological potential of the area making it conducive for crop production and high fertility of soils in the region. Trans-Nzoia County is known as

Kenya's grain basket and agricultural holdings occupy the larger part of the county. These agricultural holdings are utilized for several purposes ranging from rural residential and farming practices to commercial agriculture. Agricultural activity in Trans Nzoia is characterized by farming operations mainly crop production including maize, tea, coffee, beans, wheat and horticulture. Other agricultural activities include sheep and dairy farming in the upper highland zone, small scale beef farming and fish farming (Trans-Nzoia CSP, 2014).

The County is predominantly rural with the majority of the population living in the country side as farmers since the land is highly productive. The rural settlements account for 84.6 percent of the population in the County. The mean holding size of land is 0.6Ha for small scale farmers and 80.94Ha for large scale farmers. The increased parcellation of land into smaller units has considerably reduced the mean holding size of land (Trans-Nzoia CSP, 2014).

Land subdivision at the household level depends on external policy and market factors, agro-ecological conditions, and farm household characteristics. The resulting level of subdivision, together with external factors, agro-eco-logical conditions and farm characteristics, affects agricultural production. In this study, we consider land subdivision as a phenomenon existing in farm management. It exists when a household operates an arm of the whole (Wu et al, 2005; Daniel et al, 2010). Therefore, this study assessed the effect of land subdivision on agricultural productivity in Trans Nzoia County, Kenya.

1.3 Statement of the Problem

Land is a finite resource that is constantly subjected to competing pressures from urbanization, infrastructure, increased food, feed, fibre and fuel production and the provision of key ecosystem services. But the importance of land in providing and sustaining peoples' livelihoods, above all, cannot be overlooked. Land forms the basis upon which our economies are based and most importantly, the basis for agricultural production. This dependence and reliance on land has driven people to great lengths to own even the smallest piece of it. Land subdivision makes land available for ownership but with consequences with regard to impact on agricultural productivity. Diminishing land sizes have varied effects on agricultural productivity. This study was therefore undertaken to assess the effect of land sub-division on agricultural productivity in Trans-Nzoia West sub-county.

1.4 Research Objectives

The main objective of the study was to assess the effect of land sub-division on agricultural productivity in Trans-Nzoia West sub-county, Kenya.

The specific objectives were to;

- i) Assess the land subdivision situation in Trans-Nzoia West sub-county.
- ii) Examine the determinants of land sub-division in Trans-Nzoia West sub-county.

- iii) Evaluate the effect of land sub-division on agricultural productivity within the sub-county.

1.5 Research Questions

- i) How is the land subdivision situation like in Trans-Nzoia West sub-county?
- ii) What are the determinants of land fragmentation in Trans-Nzoia West sub-county?
- iii) What is the effect of land subdivision on agricultural productivity?

1.6 Justification of the Study

Numerous studies have been done on the effect of various variables on agricultural productivity including the effect of land subdivision in varied parts of the world. The studies have examined scholarly articles that articulate the dichotomy of the effects of land subdivision on agricultural productivity. Upon examination of various literature, the researcher found that very little has been done on the effect of land subdivision on agricultural productivity in Trans-Nzoia West sub-county and hence the interest to undertake the study. The challenge of diminishing land sizes is evident in the study area and hence the need to have a clear understanding of the factors behind the subdivision. This will be of importance when formulating possible strategies to address the raised concerns as well as form the basis for improving existing regulatory frameworks in light of newly acquired information. The study will also be of interest to the world of academia through contribution to the knowledge base and provide areas for undertaking further research.

1.7 Significance of the Study

Agricultural land is considered a shrinking resource due to both physical as well as human factors including climate change, increase in population, conversion into other land uses among others. An understanding of these factors is paramount in addressing the dwindling agricultural output. By undertaking this study, its findings will facilitate the understanding of the land subdivision trend in Trans Nzoia West sub-county, the determinants of land subdivision and the effect thereof on agricultural productivity. This information is useful to policy makers in coming up with sound strategies to address the situation.

1.8 Scope of the Study

The scope of this study was limited to assessing the effect of land subdivision on agricultural productivity in Trans-Nzoia West sub-county, Kenya. The County is the country's grain basket and its records and landscape has witnessed transformation particularly in terms of plot sizes, with considerable impact on agricultural productivity. The area has a sizeable population that could be sampled and one that findings can be generalized from. The scope of the study was also be defined by the time to undertake the study which was conducted between February and March, 2015. The changes that may have occurred after this period were therefore not covered in the findings of this study.

1.9 Conceptual Framework

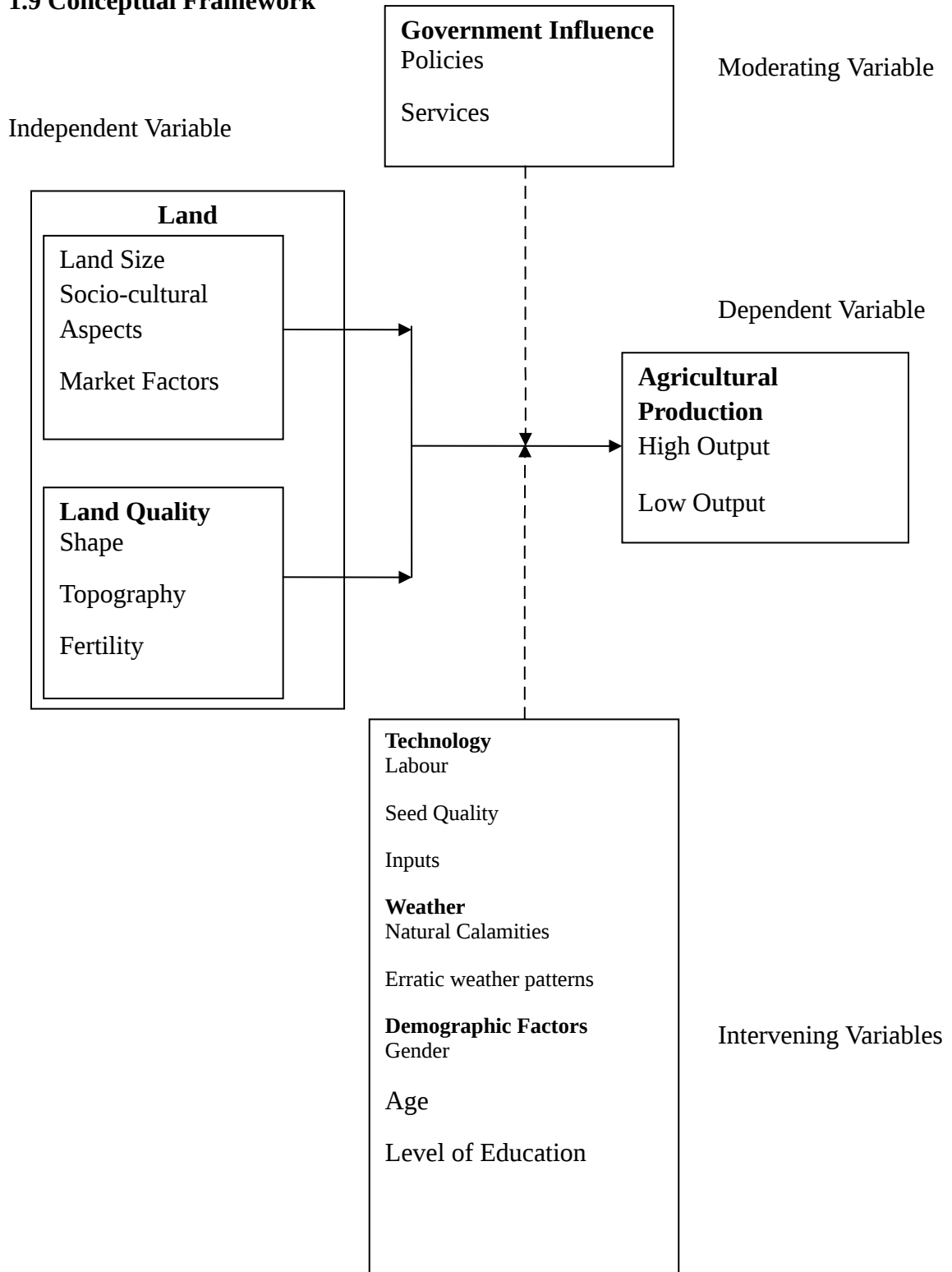


Figure 1:1 Conceptual Framework
Source: Researcher (2015)

Land is considered one of the major factors of agricultural production. But it is also multifaceted and it can be examined from two perspectives: land size and land quality. Land size is the resultant outcome of either land subdivision or of land amalgamation or consolidation; while land quality pertains to fertility, topography, shape, location; all of which influence agricultural production. The farmer's demographic characteristics also influence the level and nature of interaction with land. Other factors, for example government policies, community altitude, technology and weather conditions also influence the study's dependent variable.

1.10 Limitation to the Study

Language barrier was a limitation the researcher encountered since the study was conducted within a rural setup where the local dialect was not familiar to the researcher. The researcher, in some situation obtained the services of a translator.

Also, since land matters are sensitive, the respondents were not free enough to provide a lot of information. The researcher educated the whole community on the purpose of the research and emphasized on anonymity particularly on the answers given.

CHAPTER TWO: LITERATURE REVIEW

2.1 Overview

This Chapter reviews literature related to the title of the study and seeks to meet the purpose of the study. The literature is reviewed from journals and periodicals, books, online articles, newspapers and other relevant publications.

2.2 Land as a Resource and its Utilization

Land is one of the three most important natural resources that the entire earth system depends on, either directly or indirectly (Sengupta, 2006). It is a finite resource and therefore needs to be utilized in the best possible way, ensuring maximum benefits with minimal waste to ensure life continuity (Sengupta, 2006). Land resource meets many human needs. It provides the base for life, and forms the building blocks for development. But only 30% of the earth's surface is land, and of this land, only a fraction is habitable by man, the rest comprising of vast deserts, dense forests and rugged mountains. And 90% of the world's population lives on just 30% of the land area (Sengupta, 2006).

Kenya has one of the world's fastest population growth rates, ranking 31 out of 231 countries in 2012 in terms of population growth (CIA, 2012). The population is expected to nearly double over the next two decades, putting enormous pressure on resources for food and income. At the 2012 growth rate of 2.44%, the population is expected to grow

from 44 million in 2012 to about 77 million in 2030 (NCPD, 2012). About 75% of this population lives in the medium to high potential agricultural areas of the center and west of the country, where population density is six times the country's average. These areas comprise about 20% of the country's territory. The country's agro-ecological zones can be categorized in three broad zones, with some overlap: humid, semi-humid, and the ASAL. The humid zone under which Trans-Nzoia County falls is where most agricultural production takes place even though they are less than 20% of the country's land mass. Fertile soils and high rainfall totals make these zone the most productive agricultural regions in Africa (FEWSN, 2013).

Land is used for different purposes which varies from one region to another and may also vary within region over time. Some of this variance is accelerated by human related factors; one such being population dynamics. Increase in population converted initially continuous landscapes into fragmented ones whether for agriculture, residential, commercial or industrial use (Sengupta, 2006). Population increase in Trans-Nzoia County has accelerated the process of land subdivision as more people aspire to own land in line with societal expectations (Statistical Abstract, 2013).

According to Van Hung et al., (2007), land subdivision stems from the understanding that land is not a homogeneous resource hence subdivision provides an opportunity to reduce risks. Also land subdivision induced by land reforms has improved food security and equity (Blare et al., 1992). But subdivision also results in high production costs and increases negative externalities (Blarel et al., 1992). It causes resource disutilization and

underutilization (Wan and Cheng, 2001), results in complexity for certain crops (The World Bank, 2005) and constrains the delivery of support services (Blarel et al., 1992).

2.3 Kenyan Government Policy on Land and Land Use

Considering the importance of land in the life of any society, its use needs to be well regulated to ensure sustainable management for food production and security, sustenance of important biological resources and processes and the livelihoods of majority of the people and constitutes an important cultural heritage for many communities. It should be managed in a manner that recognizes its many attributes. In particular, the law seeks to establish a suitable framework for the sustainable management of land and land-based resources if they are to continue performing these vital functions (Akech, 2006).

The current land regime in Kenya comprises of The Constitution of Kenya 2010, The Land Act 2012, The Land Registration Act 2012, The National Land Commission Act 2012 and the Environment and Land Court Act 2012.

2.3.1 The Constitution of Kenya

The constitution of Kenya 2010 is the supreme law within the sovereign state of Kenya. It establishes a legal framework on land and the rights pertaining to land as well as land use within the country.

According to Article 42, every person has the right to a clean and healthy environment, which includes the right to:

- a) Have the environment protected for the benefit of present and future generations through legislative and other measures, particularly those contemplated in Article 69 (The Kenyan Constitution, 2010).

Article 60 states that (1) Land in Kenya shall be held, used and managed in a manner that is equitable, efficient, productive and sustainable, and in accordance with the following principles:

- a. Equitable access to land
- b. Security of land rights
- c. Sustainable and productive management of land resources
- d. Transparent and cost effective administration of land
- e. Sound conservation and protection of ecologically sensitive areas
- f. Elimination of gender discrimination in law, customs and practices related to land and property in land and
- g. Encouragement of communities to settle land disputes through recognized local community initiatives consistent with this Constitution.

(2) These principles shall be implemented through a national land policy developed and reviewed regularly by the national government and through legislation (The Kenya Constitution, 2010)

According to article 61, (1) All land in Kenya belongs to the people of Kenya collectively as a nation, as communities and as individuals.

(2) Land in Kenya is classified as public, community or private.

Article 66 states that (1) The State may regulate the use of any land, or any interest in or right over any land, in the interest of defense, public safety, public order, public morality, public health, or land use planning (The Kenyan Constitution, 2010).

According to Article 67, (1) There is established the National Land Commission (2). The functions of the National Land Commission are to:

- a. Manage public land on behalf of the national and county governments
- b. Recommend a national land policy to the national government
- c. Advise the national government on a comprehensive programme for the registration of title in land throughout Kenya
- d. Conduct research related to land and the use of natural resources, and make recommendations to appropriate authorities
- e. Initiate investigations, on its own initiative or on a complaint, into present or historical land injustices, and recommend appropriate redress
- f. Encourage the application of traditional dispute resolution mechanisms in land conflicts
- g. Assess tax on land and premiums on immovable property in any area designated by law and
- h. Monitor and have oversight responsibilities over land use planning throughout the country (The Kenyan Constitution, 2010).

Article 69 states that (1) The State shall:

- a. Ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits
- b. Work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya
- c. Protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities
- d. Encourage public participation in the management, protection and conservation of the environment
- e. Protect genetic resources and biological diversity
- f. Establish systems of environmental impact assessment, environmental audit and monitoring of the environment
- g. Eliminate processes and activities that are likely to endanger the environment and
- h. Utilize the environment and natural resources for the benefit of the people of Kenya.

(2) Every person has a duty to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources (The Kenyan Constitution, 2010).

The Kenyan constitution identifies the state as the sole owner of all the land within its territory. It bestows upon the NLC the custodial rights to manage this resource on its behalf for the people of Kenya. Despite the constitution identifying three categories of land i.e. public, communal and private land, the state has the absolute right in all the three

categories. It is mandated to regulate its use and promote sustainable exploitation, utilization, management and conservation of this natural resource. The state through the respective county governments formulates by-laws to restrict certain actions by individuals if these actions are likely to compromise on the sustainable use of land. For instance the subdivision of land into uneconomical units has proved to be a challenge in providing and sustaining people's livelihoods. County governments therefore come up with regulations to restrict the division of land up to a certain extent. This is meant to ensure that land is not split further into sizes that are not productive. To also reduce the shrinking of agricultural land, the county government can restrict the conversion of initially agricultural lands to commercial, industrial, educational or industrial zones.

2.3.2 The Land Registration Act 2012

The purpose of this statute is amongst other things to revise, consolidate and rationalize the registration of title to land, as well as to give effect to the principles of devolved government in Kenya. This statute has introduced a number of changes in the registration of land interests in Kenya, and where it has not introduced new provisions; it has consolidated the existing provisions into one law. The important highlights of this statute relevant to this study include the following:

- a) The Act provides for the establishment of a land registry and for the appointment of a chief registrar of land

- b) The Act provides for the doctrine of indefeasibility of Title as well as elaborate exceptions to the doctrine namely misrepresentation, fraud and unprocedural acquisition of land
- c) The Act Provides for additional overriding interests, which include inter alia; Spousal rights over matrimonial property, Trusts including customary trusts, Rights of way, Leases
- d) The Act recognizes the Jurisdiction of the Environment and Land Court established by the Environment and Land Court Act, 2012
- e) The Act repeals the following laws; The Land Titles Act, The Registration of Titles Act, The Registration of Land Act, The Government Land Act and The Way leaves Act.

Certain areas of the country including parts of the study area have land held under a communal land tenure system. This act attaches legality to such scenarios. It also prevents instances of fraud by ascertaining the indefeasibility of title. The act stresses the importance of land ownership documentation to prove legality of owning land. This may touch on instance of inheritance where land is only divided on the ground while the ownership documents still remain under the names of the forefathers.

2.3.3 The Land Act 2012

The purpose of this statute is to give effect to Article 68 (c) (i) of the constitution of Kenyan 2010, to revise, consolidate and rationalize land laws in Kenya and to provide for the sustainable administration and management of land in Kenya.

The important highlights of this statute relevant to the study include the following;

- a) The Act provides for three land systems in Kenya namely; Freehold, Leasehold and Customary land holding.
- b) The Act provides for the methods of land acquisition which include; Allocation, Land adjudication process, Compulsory acquisition, Prescription, Settlement programs, Transmissions, Transfers, Long term leases exceeding twenty one years created out of private land; or Any other manner prescribed in an Act of Parliament
- c) Under Part III and IV the Act provides for the administration and management of public Land in Kenya, previously this was regulated by the Government Land Act
- d) Under Part V the Act provides for the administration and management of private land in Kenya
- e) The Act provides for the Creation of and administration of secondary/ derivative interests in land these include leases, charges, and easements
- f) The Act provides for minimum and maximum land holding in Kenya, this provision
- g) The Act provides for compulsory land acquisition and establishes a land settlement fund.

According to section 159 of the Land Act, 2012:

- (1) Within one year of the coming into force of this Act, the Cabinet Secretary shall commission a scientific study to determine the economic viability of minimum and maximum acreages in respect of private land for various land zones in the country.

This statement is effected by the Minimum and Maximum Land Holding Acreage Bill 2015. This bill, if signed into law is meant to give effect to article 68 of the Constitution and establish regulatory frameworks and procedure to:

- a) Determine minimum and maximum land holding acreages in respect to private land
- b) Reducing inequality and promoting equitable distribution of land
- c) Regulating subdivision of land to ensure that land is held in economically and viable parcels
- d) Providing for the regular review of land holdings and the reorganization of rural settlements
- e) Facilitating self employment, sustainable utilization of private land and promotion of national security and economic stability

With the assent into law, the Minimum and Maximum Land Holding Acreage Bill, 2015 will determine land holding among married couples and family members, determine land holding by non-citizens, regulate land holding for different land uses by one person and any other matter relating to land holding. Periodic reviews to determine the economic viability of the minimum and maximum acreages in respect of private land for various land zones commissioned by the cabinet secretary will be undertaken. The review will be done in a participatory manner.

Agriculture is an industry of magnitude proportion and thus, this law seeks to protect the basis of the Kenyan economy. The bill takes into account ecological zones, demographic factors, land use and physical planning standards, land tenure system and economic factors, cultural and customary practices, infrastructure, public health and public order

and any other factor relevant to the national strategic interests. Without a mechanism to regulate land subdivision, fuelled by the existing desire to own land as depicted from the existent Kenya culture, the performance of the agricultural sector appears mediocre. A sub-county land control committee is meant to ensure that any dealings and processes in land conforms to the prescribed minimum and maximum land holding acreages.

The Minimum and Maximum Land Holding Acreage Bill, 2015 identifies 7 agro-climatic zones: Zone I-Humid, Zone II-Sub-humid, Zone III-Semi-humid, Zone IV-Semi-arid to arid, Zone V-Semi-arid, Zone VI-Arid and Zone VII-Very arid.

Table2.1: Prescription of Minimum and Maximum Land Sizes for Livestock, Agriculture and Fisheries

(Source: Minimum and Maximum Land Holding Acreage Bill, 2015)

S/No	County	Agro-Climatic Zone (ACZ)	Percentage of land mass under this zone	Minimum	Maximum
40	Trans-Nzoia	I-III	100	1	10
		IV	0	0	0
		V	0	0	0

2.3.4 The National Land Commission Act 2012

The purpose of this act 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 government in land

management and administration, and for connected purposes. It is effected by the provision of Article 67 (2) of the Kenyan Constitution, 2010. The functions of the Commission shall be to:

- a) Manage public land on behalf of the national and county governments
- b) Recommend a national land policy to the national government;
- c) Advise the national government on a comprehensive programme for the registration of title in land throughout Kenya;
- d) Conduct research related to land and the use of natural resources, and make recommendations to appropriate authorities;
- e) Initiate investigations, on its own initiative or on a complaint, into present or historical land injustices, and recommend appropriate redress;
- f) Encourage the application of traditional dispute resolution mechanisms in land conflicts;
- g) Assess tax on land and premiums on immovable property in any area designated by law; and
- h) Monitor and have oversight responsibilities over land use planning throughout the country.

By being mandated to undertake research related to land and use of natural resources, and make recommendations thereof, the NLC informs the formulation of various policies; to which land is a part of. In order to make land productive despite of the ongoing subdivision, it is important to understand the various dimensions of agricultural productivity. This is greatly encouraged from the promulgation of this law.

2.3.5 The Environment and Land Court Act, 2012

This Act establishes a judicial forum for adjudicating matters relating to land and environment, it is of the same status as the High court. It is established on the basis that the courts should ensure that land use, whether by government or individuals or groups thereof, adheres to the tenets of sound resource management (Akech, 2006).

According to section 2 of the act, the court shall have power to hear and determine disputes relating to environment and land, including disputes relating to environmental planning and protection, trade, climate issues, land use planning, title, tenure, boundaries, rates, rents, valuations, mining, minerals and other natural resources among others. This law is of importance to particularly the land owners with large tracts of land that doesn't conform to the standards as stipulated in the Minimum and Maximum Land Holding Acreage Bill 2015. They now have an avenue to air their concerns and provide a legal of settling disputes.

2.4 Land Tenure and Land Use

Land tenure refers to the terms and conditions under which the rights to land and land based resources are acquired, held, transferred or transmitted. It denotes the quantum of property rights that a given society has decided to allow individuals or groups thereof to hold and the conditions under which those rights are enjoyed (Ogolla and Mugabe, 1996).

A secure land tenure system provides incentives for sustainable land management through proper and optimal land use. Clarity in property rights reduces potential conflict over land and natural resources while strengthened local institutions manage and enforce

rights and embraces the diversity of solutions to arising land tenure and land use problems. Land tenure and land use should allow for equity as well as efficiency, consider empowerment of women, indigenous people and the rural poor, which is emphasized when we build on customary property rights and harmonize with statutory rules to avoid displacement (reduction or elimination of property rights) wherever possible (DfID, 2007).

In Kenya today land tenure is categorized into three, and all of which have different implications in terms of land use;

a) Public Land Tenure

This refers to a tenure regime in which the government is a private landowner. In Kenya, this regime originated from the Crown Lands Ordinance of 1902, which declared that all “waste and unoccupied land” in the protectorate was “crown land” (Ogolla and Mugabe, 1996). A 1915 amendment to this ordinance redefined crown lands to include land in actual occupation by “native” Kenyans. Subsequently, native lands were excised from crown land and vested in a Native Lands Trust Board established by the Native Lands Trust Ordinance of 1938. At independence, these native lands became trust lands, and were vested in county councils to hold them in trust for the benefit of all persons residing thereon. Further, crown land became government land, and was vested in the President, whom the constitution empowered to make grants or dispositions of any estates, interests or rights in or over unalienated government land. Some of these powers have, however, been delegated to the Commissioner of Lands (Akech, 2006).

Today, public land tenure is embodied in the Land Act 2012 and the National Land Commission Act, 2012, and has constituted the principal framework for the conservation of biodiversity established by the Forests Act and the Wildlife (Conservation and Management) Act. These statutes declare large areas of land as forest reserves, national parks or national reserves with the objective of protecting forests and wildlife. The effect of such declarations is to exclude all other forms of land use, and to vest monopoly rights of management and conservation in the government (Akech, 2006).

As far as agricultural productivity is concerned, public tenure may be justified on a number of grounds. First, it is argued that “biological resources such as forests and wild animals serve important functions and possess values that transcend the scope of immediate individual preoccupations,” such as the protection of water catchments, the propagation of species, and the maintenance of genetic diversity. While public tenure may ensure the realization of these functions and values, for food security, individual or community tenure may not. Secondly, proponents of public tenure contend that the management of such resources entails the outlay of human, financial and technical resources far beyond the capabilities of individuals or communities. Finally, it is argued that state control is crucial “since it will ensure an effective and sustainable framework for long-term planning and implementation” (Akech, 2006).

Unoccupied land within the county automatically is considered state land which may be vast. Considering the agro-ecological characteristic of Trans-Nzoia County, such areas

can be put to agricultural use to improve the levels of agricultural output. The state has adequate resources to undertake large scale farming as compared to individuals.

b) Private/Individual Tenure

Individual tenure is a regime in which land and land-based resources are owned by individuals. In Kenya, the quantum of the bundle of rights conferred by individual tenure depends on the statutory framework under which they are registered. Thus the statutory framework provides for freehold and leasehold. In theory, the freehold connotes the largest quantum of rights which the sovereign can grant to an individual. It confers unlimited rights of use, abuse and disposition, although it is subject to the regulatory powers of the state. The freehold was established by the Registration of Titles Act, the Land Titles Act and the Government Lands Act; which have been repealed by the Land Registration Act, 2012. For its part, the leasehold involves the derivation of rights from a superior title (that is, freehold) for a period of time certain or capable of being ascertained and the enjoyment of such rights in exchange for specific conditions including, but not limited to, the payment of rent (Akech, 2006).

Individual ownership of land and land-based resources is justified on the basis of the incentives said to be engendered by such ownership. It is argued that the possibility of personal gain fosters sound management of resources. That is, individual ownership is said to be the most rational, efficient and productive way of managing resources. The major shortcoming of this regime, however, is that it tends to ignore the wider social

implications of resource utilization. Individual ownership emphasizes short term economic interests at the expense of wider and long-term social interests (Akech, 2006).

It is believed that man is a rational being wired to engage in activities that result in gains. Individual tenure that is secure is motivation enough to facilitate intensive farming for food as well as economic gains.

c) Communal/Customary Tenure

Under this regime, a set of clearly defined rights and obligations over land and land based resources is held by a clearly defined group of users, which may be a clan or ethnic community. The group regulates resource use by employing rules and guidelines which, in the traditional form of this regime, are handed down from generation to generation. Rights to use the resources are distributed equitably among members of the group. However, non-members are excluded, and as a general rule, members of the group are prohibited from unilaterally transferring rights of use to non-members. It may thus be said that this regime represents private property for group members, given that non-members can neither use the resource nor make decisions over it (Bromley and Cochrane, 1994).

Apart from the exclusion of non-members, the other regulatory mechanisms under this regime which serve to ensure sustainable management are seasonal variations and social pressure. The latter mechanism operates within the framework of a closely-knit community which is deeply tied to the land, whose effect is to foster a commitment to

conservation. Such a commitment is also encouraged by social mores and the deification of the land, which is in many cases regarded as ancestral. And because the land is regarded as a heritage, the customary tenure regime also strives to accommodate concerns of intra- and inter-generational equity (Akech, 2006).

The advantage of this regime over the other two should by now be apparent. Individual tenure may lead to resource overuse and degradation as it ignores wider social concerns, while the state is often a poor manager of the resources it has expropriated. Customary tenure offers a viable alternative since it has a capacity for self-regulation that is not present under either individual or public tenure. Nevertheless, customary tenure is vulnerable to external interference, especially from the state. In Kenya, for instance, the policy has been to replace customary tenure with individual tenure, even where this is not suitable for sound resource management. Among other things, the policy of individualization tenure has been based on the erroneous argument that customary tenure systems have contributed to environmental degradation (Akech, 2006).

The effectiveness of customary tenure largely depends on the existence of socially recognized institutional arrangements that regulate the behavior of individuals with respect to resource use. When these institutions break down, so does the property regime. Unfortunately, the imposition of the institutions of the state through policies such as individualization has had exactly this effect, especially because it has been abrupt. Due to such imposition, traditional resource management institutions have been undermined to the extent that there is no longer a legitimate authority that can enforce the traditional

resource-use regulatory mechanisms. And in the absence of traditional institutional arrangements, many common property systems have been transformed into undesirable situations of open access, in which neither the rights nor user groups are clearly defined (Bromley and Cochrane, 1994).

Communal land tenure makes decision making pertaining to land use to take longer. This in some instances allows adequate time for consultation but in some instances result in delays on situations that require urgent decisions. It may reduce the rate of land subdivision because seeking consent to undertake the split may not be embraced by all members of the community.

2.5 Regulation of Land Use in Kenya

In many circumstances, a particular private property use generates far-reaching effects for the owners of other property and the public at large. Unfortunately, nuisance law and private arrangements such as restrictive covenants may not, and are often unable to, deal with such effects. Thus for instance, questions of standing, limit the effectiveness of public nuisance law to deal with the adverse effects of the use of private property. Among other things, this necessitates some form of state regulation of the use of private property rights. The assumption, then, is that there are public rights in private property, which justify state intervention in private land-use decision making (Ogolla and Mugabe, 1996).

In addition, certain governmental functions, which are developmental in nature (such as the building of roads), require land. Further, due to contemporary interests in environmental quality, the functions of the state have been extended to cover the

conservation of natural resources that are within its borders. For these reasons, the state may thus take property from its private owners and reallocate it to governmentally preferred uses, or leave the property in the hands of its owners but regulate its use. The first approach – taking property – is the method of eminent domain, which is also known as compulsory acquisition. The second approach – regulating property use – is the method of police power (Akech, 2006).

a) Eminent Domain

This is the power of the state or its assigns to acquire private property for public purposes, subject to the prompt payment of compensation. Whenever the state exercises this power, it forces involuntary transfers of property from private owners to itself or its assigns. The power of eminent domain is derived from the feudal notion that as the sovereign, the state holds the radical title to all land within its territory. In Kenya, this power is embodied in the constitution, which requires that private property can only be acquired compulsorily for public use. Further, the constitution requires that such public use must be weighed against the hardship that may be caused to the owner. Finally the constitution requires that the acquisition must be accompanied by prompt payment of adequate compensation. The constitution also provides for a modified form of acquisition in the case of trust land, which is referred to as “setting apart” and may be activated by the President or local authorities/County Governments (Kenyan Constitution, 2010).

The rules governing the setting apart of trust land and the payment of compensation to affected residents were contained in the contained in the Trust Land Act repealed by the

Land Registration Act, 2012 and the National Land Commission Act, 2012. All other cases of compulsory acquisition are regulated by the Land Act, 2012. The power of compulsory acquisition thus provides the state with a useful instrument for the conservation of environmental resources, this being in the public interest (Akech, 2006).

In situations where the government sees land subdivision as a menace requiring radical action to reverse the effects, it may compulsorily acquire parcels from farmers, consolidate them and engage in large scale agricultural practice to address the decreasing agricultural output due to decreasing land sizes.

b) Police Power

This is the power of the state to regulate land use in the public interest, such as to secure proper resource utilization and management. It is also an attribute of the sovereignty of the state. Unlike compulsory acquisition, it does not extinguish property rights but merely regulates their use in order to vindicate public rights deemed to be overriding. Again, the state is not obligated to pay compensation whenever it exercises this power, the rationale being that it is simply requiring the land owner to stop causing harm to the public. So that while compensation is required when the public helps itself to good at private expense whenever the power of compulsory acquisition is invoked, no compensation is due when the public – by exercising the police power – simply requires one of its members to stop making a nuisance of himself or herself (Akech, 2006).

In Kenya, the police power is exercised mainly through land use legislation, which determines the uses to which land may be put, seeks to reconcile competing demands on land and land-based resources, and seeks to ensure that established resource use and conservation standards and objectives are adhered to by holders of land rights. The regulation of the use of agricultural land and the regulation of the development of land illustrate the use of the police power in Kenya. The use of agricultural land is regulated by the Agriculture Act, which seeks to secure the proper utilization and management of agricultural land so as to maximize output. Among other things, the Agriculture Act empowers the Director of Agriculture to issue land preservation orders to owners or occupiers of agricultural land requiring the performance of certain acts to preserve the land and prohibiting acts which cause soil erosion as well as the sub-division of land into uneconomical sizes. On the other hand, land use planning is regulated by the Urban Areas and Cities Act, 2011 and the Physical Planning Act, 1999. Here, regulation seeks to maintain decent environmental standards and to regulate use and development within the context of intensifying land use. For instance, land owners or occupiers intending to put up structures on their property are required to obtain the permission of “planning authorities,” which are obligated to make physical plans. The idea is that any proposed structure must adhere to the requirements of such plans (Akech, 2006).

Generally the utilization of land and land based resources should adhere to the fundamental principles developed through both municipal and international processes principally concerned with ensuring sustainable utilization of natural resources. These principles are sustainability, intergenerational equity, principle of prevention, the

precautionary principle, the polluter pays principle, and public participation (Hunter, Salzman and Zaelke, 2002).

The principle of sustainability requires that natural resources should be utilized “in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations.” It strives for equity in the allocation of the benefits of development and decries short-term resource exploitation which does not consider the long-term costs of such exploitation. In short, it advocates for prudent utilization of natural resources. The principle of sustainability is examined together with that of intergenerational equity, which focuses on future generations as a rightful beneficiary of environmental protection. Essentially, the principle of intergenerational equity advocates fairness, so that present generations do not leave future generations worse off by the choices they make today regarding development. Its implementation requires the utilization of natural resources in a sustainable manner while avoiding irreversible environmental damage (Hunter, Salzman and Zaelke, 2002).

The coercing of farmers to for example engage in farming on their parcels rather than setting up residential estates or industrial use is one such example. This strategy may also be adopted to prevent the shrinking of agricultural land.

2.6 Land Sub-division

According to the Oxford Dictionary, Subdivision derives from the word ‘subdivide’, which refers to splitting up or separating into smaller and smaller pieces. It is sometimes referred to as sectionalization, segmentation, partitioning or parcellation. It is a situation where a single farm results in numerous split up parcels (King, R., & Burton, S. 1982; Van Dijk, T. 2003). King and Burton (1982) characterize land subdivision as a fundamental rural spatial problem.

Land subdivision has been a prominent feature in many countries since at least the 17th century (Tan, 2006) and in the literature is defined in different ways. Worldwide concern about it, started much later or in 1911, when a conference on the “consolidation of segmented holdings” was held to deal with the “evils of subdivision”. Subdivision is the “misallocation of the existing stock of agricultural land”, Tan (2006, p.12). Tan (2006) argues that a subdivided farm is “...a farm consisting of two or more parcels of land that are much smaller and result from the initial single piece such that is not possible to operate the resultant parcels as efficiently as would be the case if the parcels were reorganized and recombined”. Simply stated land subdivision is a basis for inefficiency. Land fragmentation is “the division of land into a great number of distinct parcels”. Here the distance between the plots can be seen as a main reason for inefficiency. Subdivision is “...a stage in the evolution of the agricultural holding in which a single farm results in several discrete parcels” (Tan, 2006).

The relationship between land and the people is reflective. Although the livelihood of people is directly linked to land, the ownership of land is decreasing rapidly (Niroula and Thapa, 2005). Land subdivision is a common feature of agriculture in many countries, especially in developing countries (Van Hung et al., 2007) and from the previous statements, can be considered as an obstacle to efficient farm management. Besides letting each land parcel grow smaller and smaller over the time, land subdivision leads to physical dispersion of parcels. “Subdivision used to be closely associated with Europe, but it has been documented in all parts of the world” (Sundqvist and Andersson, 2006, p.3).

2.6.1 Causes and Consequences of Land Subdivision

Even though causes of land subdivision may vary from country to country and from region to region, authors tend to agree that the factors triggering this situation fall into two broad categories: supply-side and demand-side causes (Van Hung et al. (2007); Niroula and Thapa, 2005).

The supply-side causes refer to an exogenous imposition on farmers of a pattern of land areas as a result of inheritance laws, population pressure and scarcity of land (McPherson, 1982; Blarel et al., 1992), while the second reflects varying degrees of subdivision chosen positively by farmers in order to reduce risk from natural disasters (such as floods, droughts, fires and other perils), promote crop diversification, as well as to ease allocation of labour over cropping seasons (Tan, 2006).

Several forces have been generally cited as causing or contributing to involuntary subdivision (Blarel et al., 1992). First of them is the partible inheritance. It is accepted that inheritance is the primary cause of land subdivision particularly when farmers desire to provide each of several heirs with land (Olayiwola and Adeleye, 2006). Inheritance laws applied in most countries facilitate or demand the subdivision of holdings into equal parts among all heirs or in some countries among only sons. This tradition has deep historical roots in old world countries' laws (e.g. the Napoleonic and Islamic inheritance laws) where the equal distribution of patrimony among heirs was a requirement (King, R., and Burton, S., 1982). As a result, land subdivision has become a continuous process with land holdings and land parcels getting smaller and smaller as they have been dispersed to successive generations. There is empirical evidence that inheritance is the prominent factor for land subdivision in many places such as in medieval England, in the Netherlands (Vanderpol, P.R., 1956) and in Cyprus (Burton, S. and King, R., 1982). This strong relationship between inheritance and land subdivision has also been demonstrated in a Portuguese study.

Population growth, which is linked with inheritance (King, R., and Burton, S., 1982), involves increasing demand for land acquisition. The trend toward increasing population leads to scarcity of land which may lead to subdivision as land owners try to respond to the existing demand for land and will be likely to accept any available parcel of land.

However, there are some contradictory views about this issue. In particular, (Motimore, M., and Gichuki, F., 1994) claim that population increase is a contributing factor towards better land management and increasing agricultural production. These views contest those

of the majority of other scholars causing some confusion. Since land is a multi-purpose resource, land markets play an important role in the whole process of ownership restructuring, because people wish to acquire a piece of land not only for agricultural activities, but also for other reasons such as investments, enhancing personal prestige and status, and having secure current and future living conditions for the family. Grigg (1980) notes that acquiring land is among the most important aims of many people in different societies all over the world. In principle, land markets contribute to further subdivision of the existing holdings since, land owners try to respond this demand by making land available. In instances where land transaction is not restricted, it can have negative effect on the land consolidation policy. However, in some cases, land purchase may reduce land subdivision when farmers acquire neighbourhood pieces of land to expand their holdings.

Nature also can be mentioned as reason for subdivision on the supply-side (ibid). More specifically the boundaries such as waterways and wastelands don't allow for continuous farming hence the acquisition of separate titles for such land.

Demand-side causes of fragmentation assume that the private benefits of subdivision exceed its private costs (ibid). The fact that subdivision may benefit farmers stems from the understanding that land is not homogenous. The parcels can be different with respect to soil type, water retention capability, slope, altitude and microclimate conditions. By diversifying the labour intensive cultures on different plots in peak times, the risk may be reduced. It is also possible that the transaction costs are adequately high so that farmers are unwilling to accept the set of land transaction that would be needed to reduce the degree of subdivision (Van Hung et al., 2007).

In addition, land subdivision induced by land reforms has improved food security and equity among farm households by distributing land plots in terms of soil quality and family size in several countries (Blarel et al., 1992). Land subdivision helps the farmers to avoid risk. According to McCloskey (1975), the destructive forces of hail, insect pests, plant disease, flood and drought may also strike one area and leave others untouched. Some fields produce well in some years, while others do well in other years. The above demand-side reasons for subdivision explain the choice of farmers to retain certain levels of subdivision that they perceive are beneficial to them.

However, land subdivision is more often believed to be one major problem existing in rural land management, especially in developing countries. Beside the positive effects, it is argued that land subdivision causes many negative effects including higher costs (extra labour, more fuel inputs for traveling between plots, more waste due to increased leakage and evaporation of fertilizers, water, pesticides, etc.), increased negative externalities (such as reduced scope for irrigation and soil conserving investments, access routes), loss of land due to borders and greater possibilities for disputes between neighboring farmers (Blarel et al., 1992).

Because of increased cost for inputs, farmers pay more attention to parcels which are closer to their farms and the more distanced parcels are less intensively cultivated, where sometimes in extreme situations farmers even abandon their parcels due to very low yields (Van Dijk, 2003). According to Wan and Cheng (2001), land subdivision causes

resource dis-utilization and underutilization; where it's hard to apply some new technologies of agricultural modernization and reap the economies of scale when farms are small and subdivided. It's most harmful for farms with high labour and capital costs. Small subdivided farms might also cause complexity for certain crops, and prevent farmers from changing to high profit crops. More profitable crops (fruit crops), require larger plot areas. Hence, if the farmers only have small and subdivided plots they may be forced to grow only less profitable crops (The World Bank, 2005).

Finally, Blarel et al. (1992) found out that land subdivision tends to constrain efficient delivery of support services because of the increased cost of extension and land improvement services that rise with the increased number of land parcels. Thus, if the crops are affected with diseases, extension workers have to depend only on the information provided by the farmers which may be incomplete and may not help in preventing the damage. Therefore, simply stated the impact of land subdivision is related to the number of plots and may be viewed to have an economic cost in terms of lower agricultural productivity and prohibiting proper land management and sustainable agriculture development. The less land people have the more efficient use they must make of it. As the plots sizes steadily decrease with land subdivision, it becomes crucial to discuss how a reduced parcel size influences agricultural productivity and profitability.

2.6.2 Land Subdivision and Agricultural Productivity

Ever since the publication of Schultz's theory (1964) which argues about the inverse relationship between land holding size and productivity there has been a debate about it

because of the general positive relationship belief (Niroula and Thapa, 2005). Despite this fact, many researchers such as Van Dijk (2003) have assumed that “a landholding is a single parcel and that there is no effect on accessibility to individual farmer’s share of land when it is subdivided” (Niroula and Thapa, 2005, p.360). But this hypothesis may not be the true in context of Trans-Nzoia County or other developing countries, where subdivision of the land holdings results in several parcels of different attributes, even though Niroula and Thapa (2005) argues that “several economists put the inverse relationship as valid for traditional agriculture”. The inverse relationship has been weakened due to the availability of size-neutral biotechnology such as seed and fertilizer, differences in management input and adoption on new capital intensive technologies.

Results from research on the negative effects imposed by land subdivision on productivity and efficiency in agriculture are mixed (Rahman and Rahman, 2009). Blaque and Sadeque (2000) argue that land subdivision is becoming a serious limitation in increasing productivity in Nepal, India and other nearby regions. On the contrary, in Malaysia and Philippines high land subdivision is not considered an impediment in paddy farming (Niroula and Thapa, 2005). In the case of China, the results on land subdivision’s impact over productivity are contradictory, where Wu et al, (2005) and Wan and Cheng (2001) found completely opposite effects. About the efficiency, Tan (2005) concludes that the increased number of plots has a positive relation with rice production in Cote d’Ivoire and China, whereas in Pakistan and Bangladesh land subdivision reduces efficiency in rice production.

Even though land subdivision may limit agricultural production, Brabec et al. (2002) argues “that a high degree of land subdivision is not always an important problem for development of the agricultural sector”. In Trans-Nzoia County, little attention has been paid to understand the impact of land subdivision on productivity, resource use, efficiency and profitability (production efficiency). A high level of productivity does not necessary mean high profitability. Empirical studies on how land subdivision affects productivity and profitability are few (Niroula and Thapa, 2005).

2.6.3 Addressing Land Subdivision

Various land management strategies can be employed to tackle certain problems in particular agricultural areas such as land consolidation, land funds and land banking; voluntary parcel exchange; and cooperative farming (Deininger and Nagarajan, 2010).

a) Land Consolidation

Land consolidation is a project-wise improvement of all physical limitations on agricultural production, for instance parceling, water management, infrastructure, soil quality and road infrastructure. It is the prominent land management measure applied as a solution to land subdivision that involves the re-organization of space by reconfiguring the land tenure structure in terms of parcels and landowners and the provision of appropriate infrastructure according to the aims of a scheme. As a result, production and hence the income of farmers are increased. The task of land consolidation is to eliminate land subdivision, ensure land reclamation and soil improvement, ensure improvement of the farm size as well as ensure improvement of the pattern of settlement (ILRI, 2000).

The results of land consolidation procedures can differ according to the type of land consolidation chosen. Some programmes have failed to overwhelm the disadvantages of fragmentation. One of the reasons for this is the non-willingness of the landowners to participate because of the fear that they will be driven out as employees of the agriculture due to farm mechanization facilitated by land consolidation (Niroula and Thapa, 2005). King and Burton (1983) cited in Niroula and Thapa, (2005) noted that the voluntary consolidation in India in the 80's had been a failure just because of the previously mentioned reason. Only minor economic advantages can be attained on a local level for the involved farmers. "Farmers tend to prefer a voluntary land exchange that lasts only a few weeks or months" (Wan G.H. and Cheng E.J., 2001).

One other factor that has to be mentioned as a constraint for land consolidation is heterogeneous land quality (Bromley and Cochrane, 1994). The farmers don't want to participate in the consolidation programme because they are not sure about the parcel quality level which is going to be allocated to them in exchange for their fertile parcel. Other impediments in conducting land consolidation as cited in Niroula and Thapa, (2005) are "lack of scientific land records, corrupt bureaucracy, legal loopholes and lack of technical skills on the part of officials".

Nonetheless, "consolidation experiences reveal varying degrees of administrative and farmer level participation" (Thapa, 2007). According to Thapa (2007), "in Austria, the decision to consolidate requires a minimum vote of 33% of the landowners of at least 50% of the land". "Consolidation programmes in Spain were led by a considerable

publicity campaign including meetings, films, news releases, radio broadcasts, demonstration visits, and interviews with farmers” (ibid). In India the land consolidation operation were commenced on a voluntary base only when one-third of the villagers at least one-third of the land demanded support for (Niroula and Thapa, 2005).

According to Burton & King (1983) cited in Thapa, (2007) land consolidation programmes sometimes were materialized with help by specially created decision-making agencies or legislation. An option to consolidation is to use government funds to relax some of the constraints which reduce voluntary consolidation. By improving the economic environment of farmers, farmers may be willing to participate in the consolidation process. “Improved access to credit, agricultural markets and related agricultural infrastructure such as transportation and irrigation, all improve the production incentives of farmers” (Thapa, 2007).

Evaluating the success of consolidation is to some extent complicated. “There is an evidential lack of empirical facts on land consolidation due to the complexity of comparing consolidated areas with previous holdings” (ibid). “While the measurement of the advantages of land consolidation are probably doable” (Thapa, 2007), it is possible to argue about the possible benefits and costs of consolidation in broad terms.

The potential results of land consolidation include merged, enlarged and better-shaped parcels where the farmer will gain better access to roads, water channels, and other infrastructure. Evidence from field research in Western Europe has shown that through

land consolidation or decreased number of parcels per owner which results reduction in the types of agricultural activities, especially traffic, it is possible to reduce operating costs by up to 20% (Thapa, 2007). Keyner et al. (1989) cited in Thapa (2007) found out that merged parcels from 3,5 to 1 will reduce the farmer working time by up to 40%, the productivity of full-time farmers increases with up to 44% and the productivity of part-time farmers by as much as 49%. In addition, consolidated and parcels have higher market values which will help to encourage the land market. Irrigation and/or drainage-systems may be renewed and adjusted to the new plots and parcel outline. Furthermore, some actions may be taken into consideration for flood protection and transformation of water bodies and sources, soil conservation and control of the erosion. Moreover, land consolidation is likely to promote an understanding of cooperation and to encourage the willingness of farmers to cooperate. On the contrary to their previous experiences farmers may recognize that cooperation has advantages for all parties involved (Keyner et al. (1989).

Although the benefits of land consolidation may ensure increased production, the potential costs for consolidation programmes are very high (Sundqvist & Andersson, 2006). The technical and administrative costs of consolidation “include surveying and detailed mapping of location, elevation, size, soil type, value etc. of every parcel” (ibid, p.6). Farmers often bear the indirect costs of consolidation, even if programmes are government sponsored (Hunter, Salzman and Zaelke, 2002). The consolidation process “can interrupt the crop cycle for several years, and disrupts the ecological benefits of land fragmentation” (Sundqvist & Anderson, 2006, p.6).

Land consolidation activities aimed to improve agricultural production and working conditions have negative impacts on the environment. Thapa (2007) states that “measures for increasing agricultural productivity during the 1960’s and 1970’s in Western Europe destroyed natural structures, biotopes, waterways, vegetation belts and other landscape features” where the ecological stability of landscapes was disturbed and biodiversity reduced. Hence, present land consolidation measures should assure the principles of sustainability.

Land consolidation is useful for a rapid reduction of subdivision, and it is also important for continuously adapting farm outlay to the constantly changing conditions of world market, agricultural policies or regional economic developments (van Dijk, 2003). While in the case of land subdivision the costs exceed the benefits, in the case of land consolidation the benefits exceed the costs. That’s why, according to King and Burton (1982), cited in Thapa, (2007) “large farms tend to benefit at the expense of small farms” due to the lower ratio of labour to land where they try to gain by diminishing their travel time through land consolidation.

The objectives of land consolidation include:

- a) Grouping of separate parcels to reduce the negative effects of subdivision;
- b) Reduction of production costs; and
- c) Encouragement of more effective agricultural plans and projects.

Land subdivision is a major problem in agriculture and land consolidation can alleviate its consequences. Since the end of World War II, the governments of many countries have approved legislation in favor of land consolidation; they have attempted to implement consolidation programs but only a few have been successful. Greece, in 1948, initiated a consolidation program whereby if the majority of farmers who owned at least half of the land in an area voted in favor of consolidation, the procedure was voluntarily implemented. In 1959, obligatory consolidation was initiated. In the 1960s, a significant part of the Greek population moved to the city and abandoned villages and the land. As a consequence (Keeler and Skuras 1990, p. 73), average farm size increased from 3.1 hectares in 1950 to 4.56 hectares in 1985. Both forms of consolidation (voluntary and obligatory) were at their height in 1965–1974. In the 1981–1985 period, the average size of parcel increased from 0.612 hectare to 0.765 hectare (in 1950, it was 0.47 hectare). In 1980, the government approved a law to appropriate abandoned land and to give parcels to farmers who did not have sufficient land. The status of subdivision of arable land in Greece has improved during the last 40 years. Approximately 21 percent of the arable land has been consolidated.

The authors of the University of Wisconsin Center for Cooperatives article (1994) explore the question, “Is consolidation the solution?” They describe different consolidation strategies in countries under different political conditions. Both Danish (in 1981) and Finnish (in 1957) governments approved land consolidation laws. Good results were obtained in Britain, Germany, Switzerland, and Austria before 1990. In India, land consolidation began in the nineteenth century when voluntary consolidation was

encouraged and farmers were told the advantages of consolidation. By 1939, the majority of farmers had accepted consolidation. In 1953, the government agreed to improve the system of irrigation and construct roads. As a consequence, production and farm size increased. Consolidation was encouraged in Holland, West Germany, France, and Spain during the twentieth century.

b) Land Funds and Land Banking

Land funds and land banking is the process when a landowner is not interested in extending his landholding but in distributing it to other established farms. It is based on the principle that the farmer who has the best possibilities of exploiting the land should still be able to acquire land from less efficient users. Thus, in such a case, his land may be used as a land buffer that enables the improvement of farms without intersecting other people's interests. More specifically, a land buffer is available for the improvement of other farms and the construction of agricultural infrastructure such as roads, irrigation and drainage systems. The land buffer itself is a land fund which can be used as an agricultural policy tool, and its use is referred to as land banking (Dijk, 2003).

c) Voluntary Parcel Exchange

Voluntary parcel exchange involves the exchange of parcels among three or more land owners resulting in a more efficient spatial layout since the aim is to group adjacent parcels of each landowner. However, according to Brabec E. and Smith C. (2002), the practical experience has shown negative results, mainly because of the reluctance of landowners to participate in these programmes. Reluctance is due to conflicting interests and perceptions among landowners and the fear of losing their rights.

From the above discussion, all the three instruments for reducing land subdivision have advantages and disadvantages and are only suitable for some certain situations. Land consolidation involves the most financial resources, labour and land parcel. It not only changes the subdivided land into large ones but also changes the pattern of production in order to raise the efficiency of agriculture. Because it is large and complex, land consolidation is usually carried out by the state and uses legal provisions to protect the rights of the participants and the general interest. Land fund and land bank rely on an efficient land market. From where the farmer that wants to expand his property and the land owner who has no will working on the land can change their information. If an active land market is not built, land tenure is not well registered and protected by the law, the land fund and land bank will not work successfully or play its due role. Compared with land consolidation, voluntary parcel exchange is more flexible, cost and time saving; and do not need a special legislative background. But the voluntary parcel exchange is only suitable for a limited number of owners, relatively small differences in soil quality and within a small area. So the problem of land subdivision cannot be solved by only one of them. The combination of using these three instruments based on different situation could be a good strategy (Yaslioglu et al., 2009).

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Overview

This chapter highlights the research design and the methodology that was employed in data collection. It also highlights the research area, the target population, sampling techniques that was used, data collection instruments, reliability and validity of the instruments, data collection procedures, data analysis techniques and ethical issues during the study.

3.2 Research Design

According to Kothari (2004), research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. Descriptive research studies are those studies which are concerned with describing the characteristics of a particular individual, or of a group. A survey is a non-experimental, descriptive research method that is useful when a researcher wants to collect data on phenomena that cannot be directly observed (Jackson, 2009:89). According to Babbie (2005:252), survey methods are the best when collecting original data from describing a population too large to observe directly. Descriptive survey design was used in this study. A descriptive survey attempts to describe or document current conditions or attitude that is to explain what exists at the moment (Wimmer & Dominick. 2006: 176). Likewise, Bell (1993) has observed that a survey research is characterized by obtaining information from a representative sample of the population and the findings are presented as being representative of the population as a whole.

According to Cohen & Manion (1980), the intention of survey research is to gather data at a particular point in time and use it to describe the nature of the existing conditions. Kerlinger (1983) has pointed out that descriptive studies are not only restricted to fact finding, but may often result in the formulation of important principles of knowledge and solution to important problems. Kerlinger (1983) further argues that descriptive survey design involves measurement, classification, analysis, comparison and interpretation of data. Orodho (2003) points out that a descriptive survey is a method of collecting information by interviewing or administering a questionnaire to a sample of individuals. It can be used when collecting data on people's attitudes, opinions, habits or any of the variety of education or social issues Orodho & Kombo (2000).

Mugenda and Mugenda (2003) describe a descriptive survey as collecting data in order to test hypothesis or to answer questions concerning the current status of the subject of the study. De Vaus (2003) argues that a descriptive study aims to collect data that will enable the description of events or association of variables and aims to answer the questions 'what'. Descriptive research provides an accurate portrayal or account of characteristics of a particular individual situation or group (De Vaus, 2003).

Kothari (2004) says descriptive design assists the researcher in collecting data from a relatively larger number of cases at a particular time. The descriptive survey design helps answer the questions like who, what, where and how on describing the phenomenon on study. Taylor-Powell and Herman (2000) argue that a survey is best used when the study

questions are best answered by the target people themselves. As such, the people give their own report of behaviors and opinions concerning the study questions.

This design was appropriate for the study because it enabled data collection from the sample on land sub-division and agricultural productivity within Trans-Nzoia West sub-county.

3.3 Study Area

The study was conducted in Trans-Nzoia West Sub-county of Trans-Nzoia County. The study area was purposively selected for the study since it has the highest number of households of the other two sub-counties i.e. Trans-Nzoia East and Kwana. According to the 2013 statistical abstract of Kenya, Trans-Nzoia West Sub-County has a population of 84,277 households and a total land area of 745.5Km², with a population density of 520 persons per Km². The study area is classified as a humid region (the highlands). It rises to an altitude of over 1500mm and receives an annual rainfall of over 1000mm with the wettest months being April and October. It is characterized by some volcanic rocks and the soils are mainly loamy; which makes it one of the most fertile regions in the country for crop production (Trans-Nzoia CSP, 2014).

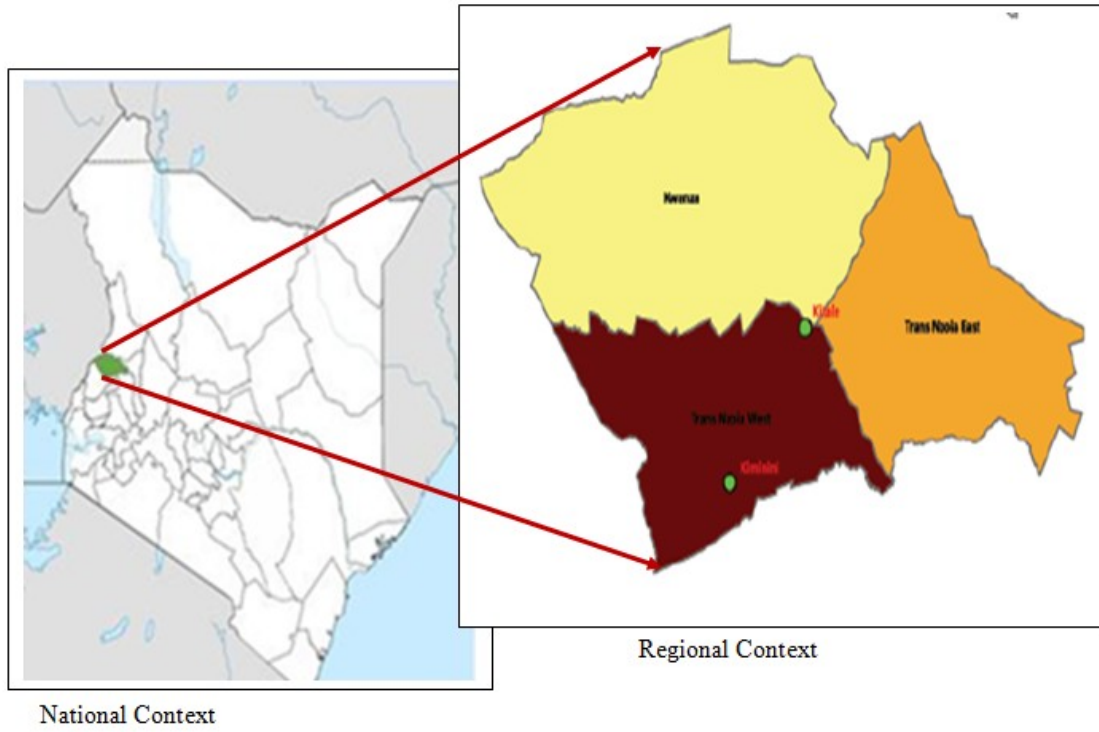


Figure 3.2: Map Showing the Study Area

Table3.2: Administrative Units of the Study Area

County	Sub-county	Division	Constituencies	Wards	Study area
TRANS-NZOIA COUNTY	Trans-Nzoia	Cherangani	Cherangani	Cherangani/	-
	East Sub-county	Kaplamai		Suwerwa, Kaplamai, Kiptoro, Makutano/ Motosiet, Simerere, Sitatunga	
	Kwanza	Endebess Kwanza	Kwanza Endebess	Chepchuna, Endebess, Kaibei, Kaisagat, Kapomboi, Kapsitwet, Kwanza	-
	Trans-Nzoia West Sub-county	Central Kiminini Saboti	Saboti Kiminini	Hospital, Kibomet, Kiminini, Kinyoro, Kipsongo, Kisawai, Lessos, Machewa, Masaba, Matisi, Milimani, Mumia, Saboti, Tuwani, Waitaluk, Webuye	Saboti Kinyoro Waitaluk Central/ Hospital Kiminini

3.4 Target Population

Target population is that population that the researcher wants to generalize the results of the study. Mugenda and Mugenda (2003) define target population as the entire group a researcher is interested in or the group about which the researcher wishes to draw conclusion.

According to the 2009 census and the 2013 Statistical Abstract of Kenya, Trans-Nzoia West Sub-County has a total of 84,277 households. The Sub-County covers an area of approximately 745.5Km² with a population density of 520 persons per Km². The study targeted all the 84,277 households of the sub-county.

3.5 Sampling Techniques

This section presents the method used to determine the study sample size from which data was collected. It also describes the sampling techniques used in selecting elements to be included as the subjects of the study sample. A sample size is a sub-set of the total population that is used to give the general views of the target population (Kothari 2004). The sample size must be a representative of the population on which the researcher would wish to generalize the research findings.

The study used both the probability and non-probability sampling strategies. Purposive sampling was used in selecting the study area which was Trans-Nzoia West sub-county because it has the highest population of the other two sub-counties i.e. Trans-Nzoia East and Kwanza. The sub-county has two divisions i.e. Saboti and Kiminini, which have a

total of sixteen wards, of which five of them were randomly selected for the study. Multistage cluster sampling procedure was then used to determine the locations, sub-locations and villages for the study. Multi-stage and cluster sampling is a variant of cluster sampling involving several cycles of listing and sampling (ibid). Residents of the selected villages were then randomly selected so as to give every household an equal and independent chance of being studied. The researcher picked 125 households based on Yamane's (1967) formula as described below.

3.6 Sample Size

Since the population targeted by the study was large i.e. 84,227 households, the study used Yamane's formula to work out the sample size. Yamane (1967, p.886) asserted that in case the population targeted by a researcher is significantly large, the formula below can be used to arrive at a representative sample size.

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

In this formula: n is the required sample size; N is the population and e= is the level of precision. The study sampled a size that would give 95% confidence level at a level of precision of 10% among the population of 84,227 households of Trans-Nzoia West sub-county. An attrition rate of 25% was included in Yamane's formula making the resultant sample size 125 respondents. Attrition or experimental mortality refers to the situation where many subjects drop out of the study before the study is completed (Mugenda and

Mugenda, 1999). This sample size is within the right margin for the researcher to manage comfortably. It is also adequate to give the researcher findings that would be generalized to the whole population without significant bias.

3.7 Research Instruments

Creswell (2003) indicates that research instruments are the tools used in the collection of data on the phenomenon of the study. A questionnaire according to Mugenda and Mugenda (2003) is a list of standard questions prepared to fit a certain inquiry. For this study the researcher used questionnaires and interview schedules.

3.7.1 Questionnaires

Taylor-Powell and Hermann (2000) argue that questionnaires are best used in surveys as they allow the respondents to simply give a response to experiences they've had with the variables being tested. Questionnaires are cheap and manageable to administer to respondents that are scattered over a large area. They are also convenient for collecting information from large population within a short period of time. Kothari (1985) gives the merits of structured questionnaires by saying that they are simple to administer and relatively inexpensive to analyze.

Questionnaires save on time when collecting data particularly when they are self-administered. They are also cheap since the researcher only has to submit them to the respondents and collect them after some time without physically interviewing and

recording the results though they may have a lower return rate than other data collection methods (Babbie, 2010).

The study collected primary data through structured questionnaires which ensured that all respondents were able to reply to the same set of questions. The questions in the questionnaires were both open and closed-ended. Open ended questions were used to seek the views of the respondents with a view of meeting the objectives set in the study. The respondents were allowed to express themselves freely and make suggestions free from any form of interference and biasness. The respondents were also provided with time to give well thought out answers. The questionnaires were administered randomly and sought to collect information from the households of Trans-Nzoia West sub-county on land sub-division, agricultural productivity and the relationship between the two variables.

Questionnaires were advantageous because studies have shown that a person's reasoning ability is affected by factors such as fatigue, stress, illness, heat and density (Bailey, 1994) and as such, it was likely that these factors would have affected the respondents had the researcher opted to use other means to collect data from them. The questionnaires provided the best opportunity for the respondents to answer the questions when the adverse effects were at a minimum even if it meant filling the questionnaires during their free time as the researcher administered them personally and collected them at an agreed date and time. This, however, did not affect the submission deadline from the respondents as they were all returned before the specified date.

3.7.2 Interview Schedules

An interview is a direct face-to-face attempt to obtain reliable and valid measures in form of verbal responses from one or more respondents. It is a conversation in which the roles of the interviewer and the respondent change continually (Key, 1997). Interviews consist of collecting data by asking questions. Data can be collected by listening to individuals, recording, filming their responses, or a combination of both methods. Of the four types of interviews i.e. structured, semi-structured, in-depth interviews and focused group discussion, the study adopted the semi-structured approach. This type of interview approach includes a number of planned questions, but the interviewer has more freedom to modify the wording and order of questions. Interviews are more personal as compared to questionnaires, allowing use to have higher response rates and the collection of information with greater understanding. It also allows for control over the order and flow of questions and most importantly, one can introduce necessary changes in the interview schedule based on initial results, which is not possible in the case of a questionnaire (Abawi, 2013).

Interview schedules as tools of collecting data are very powerful especially for qualitative investigations. Key (1997) argues that interviews are advantageous in that they allow the interviewer to clarify questions, can be used with young children and illiterates, allows the informant to respond in any manner they see fit, allows the interviewer to observe verbal and non-verbal behavior of the respondents, means of obtaining personal information, attitudes, perceptions and beliefs, reduces anxiety so that potentially threatening topics can be studied.

The study utilized structured oral interview schedules to collect information from the concerned county officials. The questions in the interview schedule that was prepared were open ended. This was to enable the interviewer to discuss issues more openly and exhaustively. The schedule was flexible enough to give respondents enough room to probe for in-depth answers. The order in which the questions appeared on paper was not strictly followed but was to depend on the responses from the respondents. The prepared schedule was to ensure that all the respondents responded to the questions and therefore minimizing researcher subjectivity. Also the interview schedule acted as a guide to ensure the interviewer does not go out of focus by for example, venturing into areas outside the context of the discussion, or disregarding time factor.

Prior arrangements were made with the concerned county officials for interview appointments. During the booking of appointments, the researcher took time to explain to the expected respondents (the County Surveyor and County Agricultural Officer) what the objectives of the study were. The interviews were carried out at the respondents' place of work. The interviewer recorded the responses in a notebook as interviewees responded to the questions asked. Each interview session took about forty five minutes. This approach was expected to enhance dependability, accuracy, clarity and adequacy of administered instruments (Mugenda & Mugenda, 1999).

3.7.3 Observation Checklists

According to Moser & Kalton (1971), the observer shares the life and activities of the community observing in the strict sense what is going on around them. In this study, this

method was used as a complementary method to the structured oral interviews and the questionnaires. To ensure that accurate data was collected, the researcher utilized an observation checklist to record land sizes, agricultural activities engaged in and sizes of agricultural storage facilities. Photographs and hand written notes were taken to aid the researcher in data analysis and compliment the findings from the other data collection methods.

3.8 Reliability and Validity of Research Instruments

According to Joppe (2000, p.1) reliability is “the extent to which results are consistent over time and an accurate representation of the total population under study. A reliable research instrument produces similar results under different but similar methodology. To ensure reliability, the researcher pre-tested the questionnaire on a pilot sample of respondents from the county. The inconsistent questionnaires were corrected until they gave the desired level of reliability.

Validity is defined as the appropriateness, correctness, and meaningfulness of the specific inferences which are selected on research results (Frankel & Wallen, 2008). It is the degree to which results obtained from the data analysis actually represent the phenomenon under study. Joppe (2000, p.1) considers validity as “the extent to which an instrument measures what it is intended to measure.” As such, validity is the process of ensuring the instrument is not ambiguous or gives inaccurate data. This research study concerned itself with content validity. Content validity according to Kothari (2004) is the extent to which a measuring instrument provides adequate coverage of the topic under study. The researcher developed multiple choices of the responses respondents were

likely to give. This ensured that the researcher limits respondents' ability to give varying answers. The questions were also made direct, clear and short for the respondents' ease of understanding.

3.9 Piloting Instruments

Ailwright (1988: 88) argues 'Even the most carefully constructed instrument cannot guarantee to obtain one hundred percent reliable data'. Babbie & Mouton (1973) says that the instruments may be re-tested on a sample of at least ten respondents who do not have to be representative. In conducting a pilot study, the researcher is interested in establishing whether the respondents have the understanding of the subject matter and thus would be able to offer the information required. Before embarking onto the current study, a pilot study was carried out in Nyaru area, Elgeyo Marakwet County. A sample of 20 respondents was randomly selected and engaged in the study. The pilot study enabled the researcher to determine the effectiveness and validity of the data collection instruments that were to be used during the actual study. Similarly, pilot data was analysed and results were used to modify and more so to improve the questionnaires before embarking on the actual study.

3.10 Data Analysis

The researcher examined all the questionnaires for completeness and consistency. Qualitative data from the open ended questions in the questionnaires and oral interview schedules was categorized into meaningful categories for analysis. Data from the observation checklist was presented in form of photographs. The data that was collected

from the closed ended questions in the questionnaires was coded and entered into Statistical Package for Social Science (SPSS program version 21) and analyzed descriptively. The results obtained was presented in form of tables, percentages, means, graphs and charts.

A mixed method approach to data analysis was adopted to cater for both quantitative and qualitative data. According to Mugenda and Mugenda (1999), the purpose of descriptive statistics is to enable the researcher to meaningfully describe a distribution of scores or measurements using a few indices or statistics. Each statistic used in descriptive statistics has a purpose or role. Babbie (2010) identifies descriptive statistics as analysis methods that only allow the researcher to describe the data as it is. As such, Babbie (2010) argues that descriptive statistics do not allow the researcher to make inferences but rather explain the data as it is. This kind of statistics will give the data high accuracy.

3.11 Ethical Consideration

The researcher acquired a letter of authorization from Moi University then obtained a permit from the National Council for Science and Technology and Innovation before embarking on the study. As per the requirements of the permit, the researcher reported to the office of the County Director of Education and the County Commissioner, Trans-Nzoia County prior to commencing the research.

The researcher promised to maintain confidentiality at all times during and after the research. The researcher explained the purpose of the research to all respondents in advance and debriefed them afterwards. The use of the study is specified as academic

purpose only. Respondents were requested to participate in the study voluntarily and they were free to leave the study if they chose to at any time provided they communicate to the researcher.

CHAPTER FOUR: RESULTS, DISCUSSIONS AND INTERPRETATION

4.1 Overview

This chapter provides the data presentation, analysis, results and interpretation of survey findings from the study. The sections presented include: the demographic information of the respondents such as gender, age, marital status and farming experience and also a discussion of land sizes, land use, land ownership and agricultural productivity.

4.2 Demographic Information of the Respondents

The main objective of this research was to assess the effect of land sub-division on agricultural productivity in Trans-Nzoia West sub-county. The data for this study was collected within the months of February and March 2015 using questionnaires. In total 125 questionnaires were distributed to the households of Saboti constituency of Trans-Nzoia West sub-county. Out of these, 100 (80%) questionnaires were successfully completed and returned to the researcher, a figure considered sufficient for the study. Analysis of the profiles of sample respondents was based on the demographic characteristics of the respondents in terms of gender, age, years of experience as a farmer and level of education.

The researcher also interviewed the County Surveyor and the County Agricultural Officer on the 18th of August 2015. The responses were put in various thematic categories for ease of understanding and to contribute towards the answering of the study objectives.

4.2.1 Distribution of Respondents according to Gender

Results indicate that from the 100 respondents, 60% were female while 40% were male as indicated in Figure 4.3 below.

From the study findings it is clear that there are more women than men who are left at home to take care of the farm and hence able to engage in the study. The findings are also consistent with information in the statistical abstract of 2013 which points out that the county has more females than males. The numbers are 407,172 males and 411,585 females.

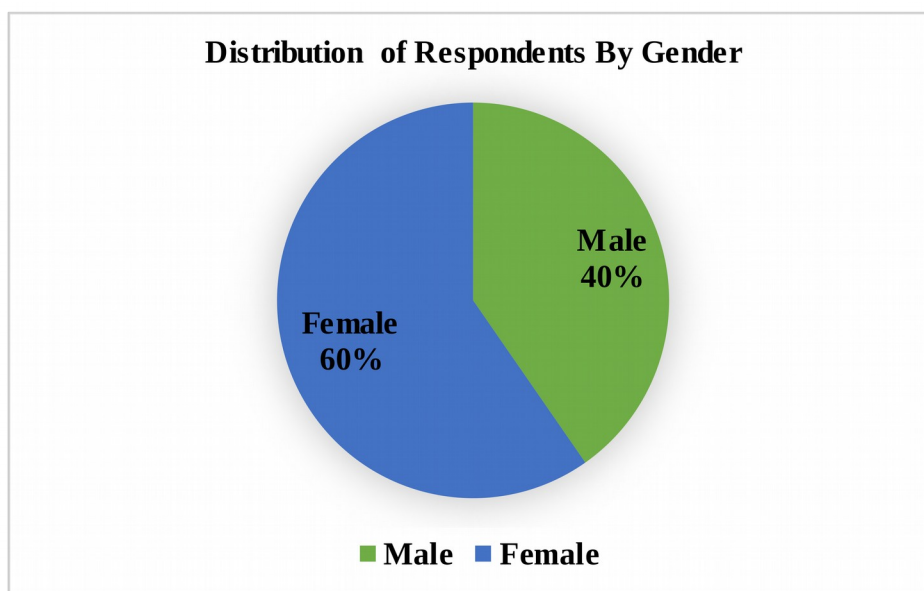


Figure4.3: Distribution of Respondents according to Gender

Source: Field Data, 2015

4.2.2 Distribution of Respondents by Age

Results indicate that 8.3% of the respondents are between 18 and 25 years of age, 16.7% are between 26 and 30 years, with the same percentage for respondents between the ages of 41 and 45 and 46 and above years. Respondents between the ages of 31-35 are 15.3% while those between the ages of 36 and 40 years are 26.4%.

From Figure 4.4 below, it is evident that majority of the respondents were aged between 36 and 40 years. They constituted 26.4% of the total respondents. From the study findings, this age group is considered experienced and informed since they have witnessed the changes that have occurred in the study area over time in terms of land size and agricultural productivity.

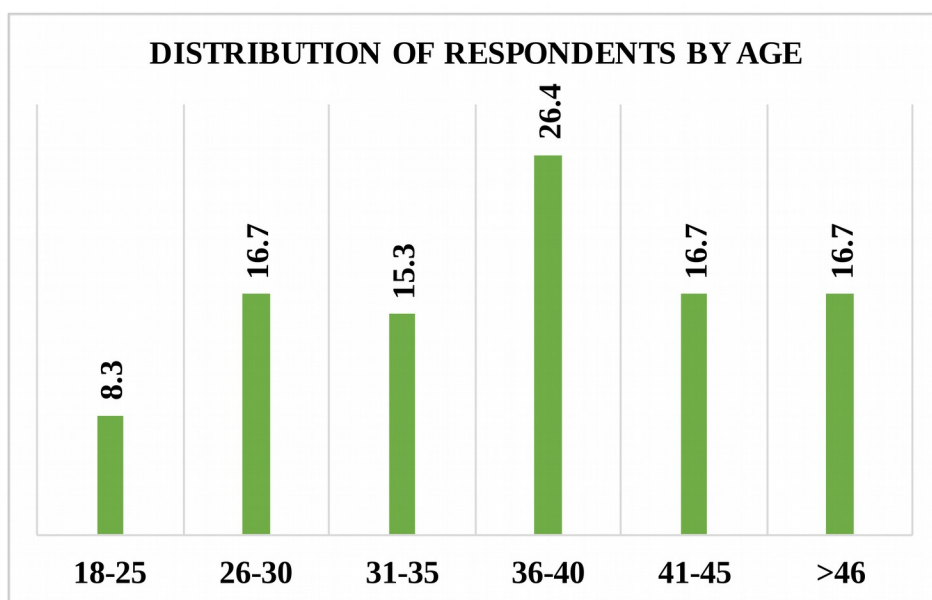


Figure4.4: Distribution of Respondents according to Age

Source: Field Data, 2015

4.2.3 Level of Education of Respondents

Results indicate that some of the respondents had no formal education whatsoever while others had some level of education. 6.9% of the respondents have university degrees with the same percentage of the respondents having no formal education, 15.3% attended technical institutions, 37.5% have secondary school certificates and 33.3% have primary school certificates.

Table 4.3: Respondent's Level of Education

Level of Formal	University	6.90%
Education	Technical Institution	15.30%
	Secondary School	37.50%
	Primary School	33.30%
	No education	6.90%

Source: Field Data, 2015

From the study findings indicated in Table 4.3 above, most of the respondents have secondary level education. This provides them with basic knowledge on land and land related issues.

4.2.4 Household Size

Results indicate that households with only one individual formed 4.2%, those with between 1 and 3 members formed 23.6%, those with between 4 and 10 members formed 69.4% while those households with more than 10 members formed 2.8%.

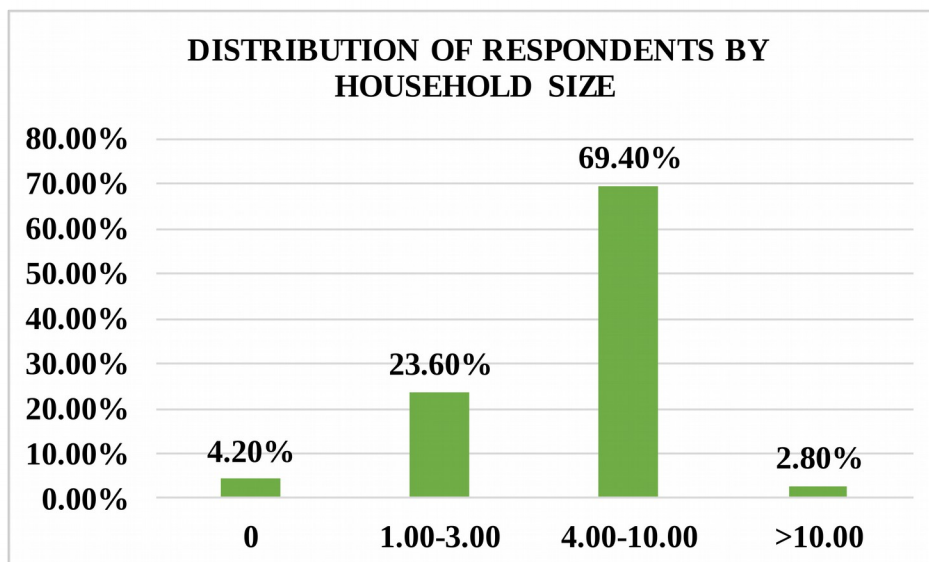


Figure 5.5: Distribution of Respondents by Household Size

Source: Field Data, 2015

From the study findings indicated in Figure 5.5 above, majority of the households have between 1 and 10 members. The number of household members determines the household size which in turn influences overall agricultural output. The larger the household size, the larger the area set aside for the family homestead which means less land available for agricultural production. The household size also influences the future size of the land because of existent cultural practices like inheritance where offsprings are allocated land belonging to parents upon their demise. The land is shared among the household members. Large households therefore have lesser and lesser land size with each subsequent generation. The average household size in the study area is 3.

4.3 Agricultural Production System

Land is considered the one of the main factors of production. It is a natural resource upon which most of our economies are based. Land within the study area supports agriculture. The study area is situated within a humid agro ecological zone making engagements in agricultural activities generate optimal returns.

4.3.1 Land Size

Results indicate that households with land measuring less than 1 acre formed 32%, those with land measuring between 1 and 5 acres formed 41.7%, households with land measuring between 5.1 and 9.9 acres formed 11.1% while those with land measuring more than 10 acres formed 15.3%.

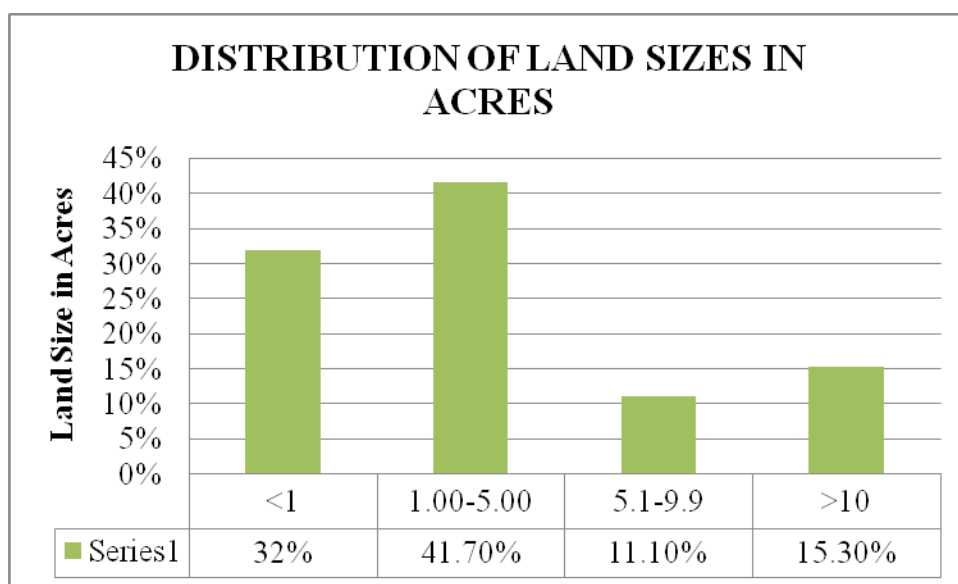


Figure4.6: Distribution of Land Sizes in Acres

Source: Field Data, 2015

From the study findings indicated in Figure 4.6 above, majority of the households own land measuring between 1 and 5 acres. This land is distributed across various activities including farming area, foot paths and area for the homestead.

The average land size in the study area is 2.0451 acres.

4.3.2 Trend in Land Sizes

On whether households experienced a change in their land size, results indicate that 76% of the households did not experience a change in their land size over time while 24% did experience a change in the household land size. This is depicted in Figure 4.7 below.

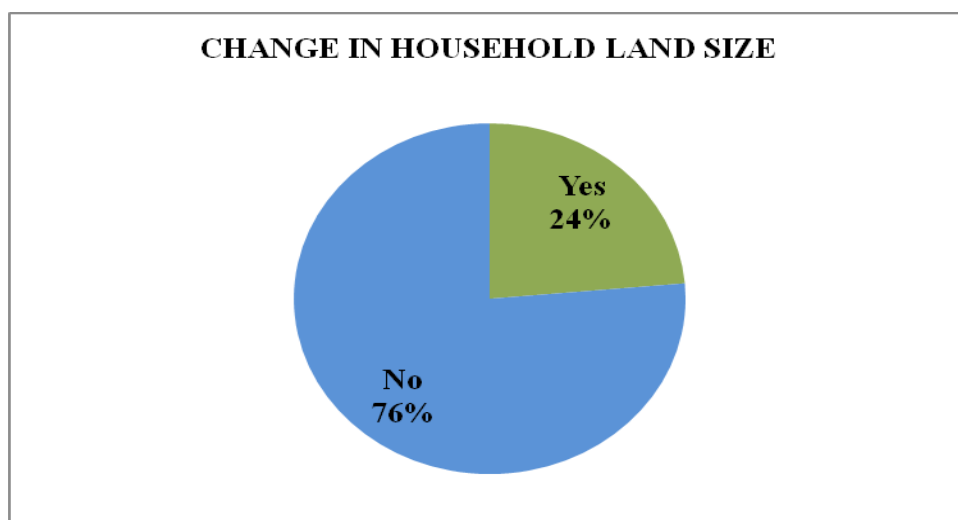


Figure4.7: Change in Household Land Size

Source: Field Data, 2015

From the study findings land size has fairly remained static over time with neither an increase nor a decrease being witnessed. This statement is consistent with the interviews

conducted which confirmed that indeed land sub-division is currently stabilizing as compared to about 10 years ago.

But despite this, there's a fraction of households that have experienced either a positive or negative change in their household size.

On nature of change in land size, results indicate that of the 24% of households that experienced a change in their land size, 6% of them witnessed a positive change while 18% of the households witnessed a negative change. The remaining 76% of the household had their land witnessing neither an increase nor a decrease in size. This is depicted in Figure 4.8 below.

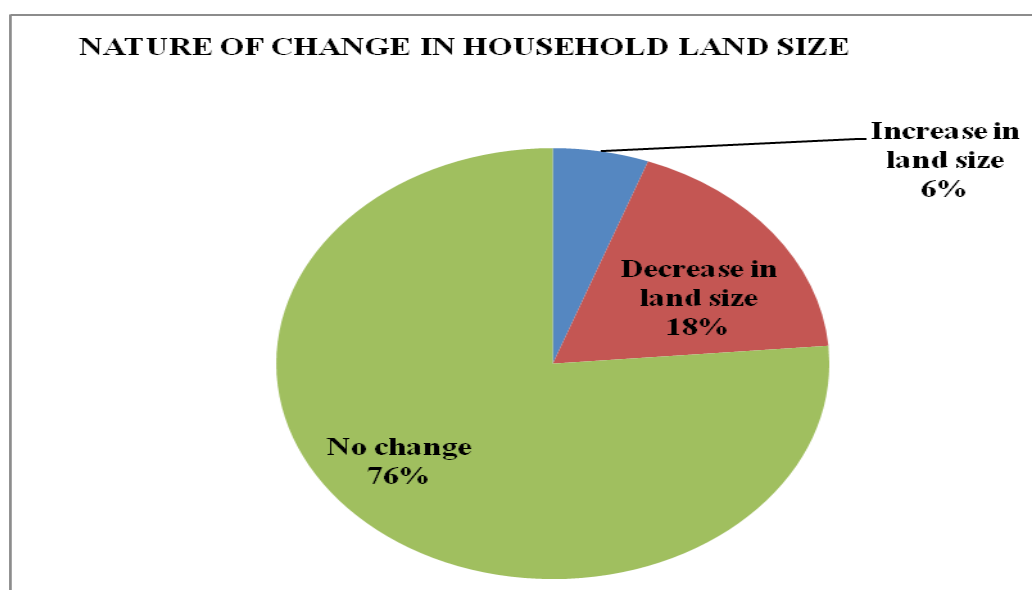


Figure4.8: Nature of Change in Land Size

Source: Field Data, 2015

From the study findings, of the 24% of households that experienced a change in their land size, 6% of them witnessed a positive change because their land increased in size while 18% of the households that experienced a change in their land size witnessed a negative change because their land decreased in size. The remaining 76% of the household had their land witnessing neither an increase nor a decrease in size. It remained static. The positive change is attributed mainly to the aspect of business farming which has immensely slowed down the rate of land subdivision as economies of scale are attained on rather large farms.

On neighbouring household's land sizes, results indicate that 47% of them experienced a change in their land size while 53% did not experience any change in their land size. This is depicted in the Figure below 4.9 below.

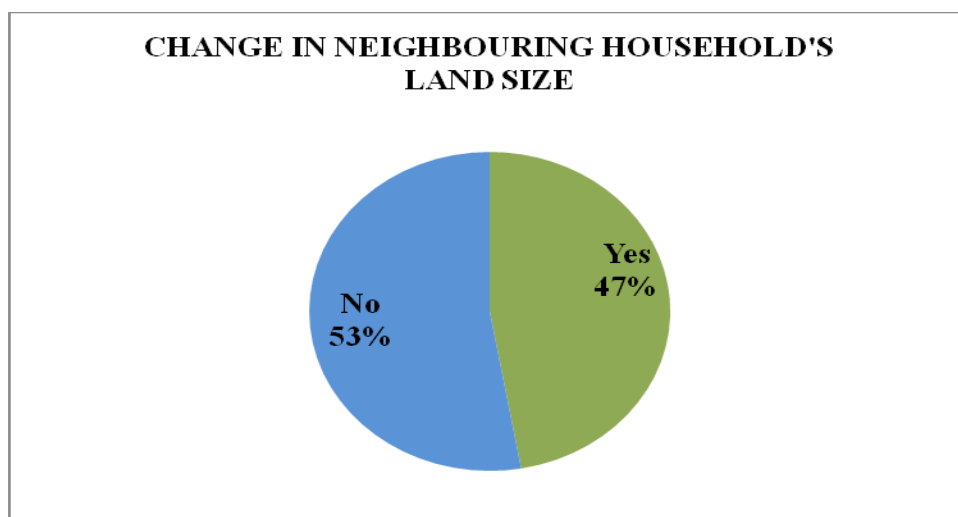


Figure 4.9: Change in Neighbouring Household's Land Size

Source: Field Data, 2015

From the study findings majority of neighbouring households did not witness a change in their household's land size but regardless, quite a number of households witnessed a change in their household's ;and size.

On the nature of change in neighboring household's land size, of the 47% of households that experienced a change in their land size, 17% of them witnessed a positive change while 30% of them witnessed a negative change. The remaining 53% witnessed neither an increase nor a decrease in their land size. .

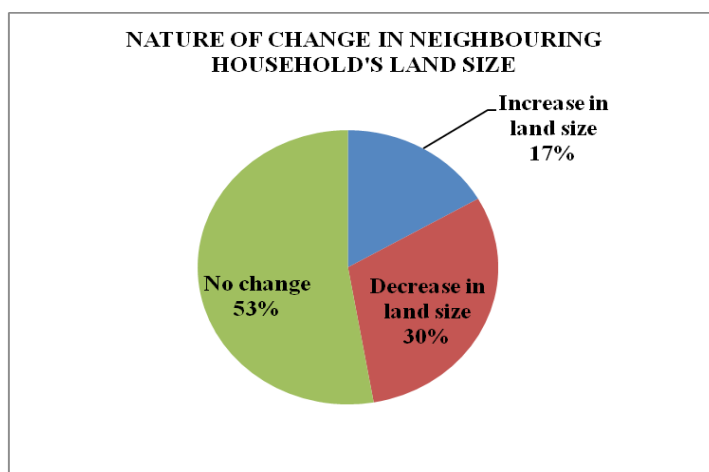


Figure4.10: Nature of Change in Neighbouring Household's Land Size

Source: Field Data, 2015

From the study findings, of the 47% of the neighbouring households that experienced a change in their land size, 17% of them witnessed a positive change because their land increased in size while 30% of the households that experienced a change in their land size witnessed a negative change because their land decreased in size. The remaining 53% witnessed neither an increase nor a decrease in their land size. The land size simply

remained static. The positive change is similarly attributed to business farming and the need the realization of economies of scale.

4.3.3 Land Acquisition

Results obtained indicate that 4.2% of the respondents were given their current land holding as a gift, 38% of the respondents acquired their land through inheritance, 56.3% of them bought their current land holding while 1.4% are renting their current land holding. This is depicted in the Figure 4.11below;

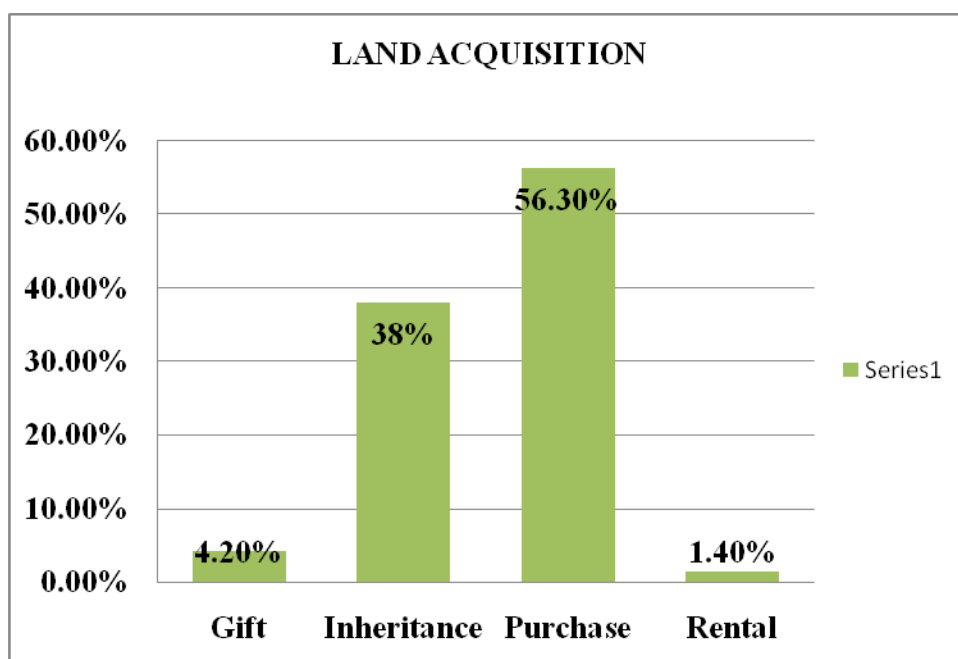


Figure4.11: Nature of Land Acquisition

Source: Field Data, 2015

From the study findings, the most popular means of land acquisition is through purchase. The households have realized the importance of owning land together with the prestige

attached in owning a piece of it. This therefore drives them towards purchase of land. Inheritance is also another popular means of land acquisition. Siblings are allocated land upon the demise of the parents. This practice goes on for every subsequent generation and also provides an opportunity to own land.

4.3.4 Land Rights

Results indicate that 84.7% of the respondents have absolute rights over their land, 11.1% have a leasehold interest over their land while 4.2% of the respondents have their land held in a communal manner.

Table4.4: Holding of Land Rights

	Rights	Percentage
Holding of Land		
Rights	Absolute	84.7%
	Leasehold	11.1%
	Communal	4.2%

Source: Field Data, 2015

From the study findings majority of the respondents relate with their land in an absolute manner. This type of land tenure system bestows upon the owner the right to own, use and transfer land in totality. Land owners may therefore undertake land subdivision to make land available for those willing to buy as a response to the existing demand and market factors. Imposing certain restrictions on this type of tenure may conflict with the statements giving legality to it.

Leasehold land tenure system forms the second highest category at 11.1%. This tenure system may come with certain restrictions which may include conforming to a specified land size and as such control the incidence of further land subdivision or to a certain land use hence increase or maintain the land area under agriculture. Communal land tenure system forms the least percentage at 4.2. With this type of tenure, land is held by the community who have a common interest.

Despite the existence of these types of land tenure, the state has the power to alter the rights to land as it is considered the custodian of all the land within its jurisdiction. These rights are given legality by the Land Act 2012, the Land Registration Act 2012, the National Land Commission Act, 2012 and the Land and Environment Act, 2012.

4.3.5 Land Use

Land is used for various purposes. The Physical Planning Act, Cap 286 identifies 8 categories of land uses. These are residential, industrial, educational, recreational, public purpose, commercial, public utility, transport and deferred/agricultural land use. Majority of the households in the study area engage in agriculture as the major land use activity, though in recent years, other land uses have been seen to come up. From the interviews conducted, it was ascertained that the landscape in the study area has witnessed introduction of other users especially residential use. It was also noted that many a times when people buy absolute land, there's a possibility that land use might change with change of land owner.

4.4 Determinants of Land Sub-division

Results indicate that 68.1% of the respondents do not consider ‘cultural aspects’ as a determinant of land sub-division, 65.3% of the respondents consider ‘the existence of willing buyer & seller’ as a determinant of land sub-division, 53.20% of the respondents consider ‘the desire to own land’ as a determinant of land sub-division, 69.10% of the respondents do not consider ‘the need to get money’ as determinant of land sub-division and 56.60% of the respondents do not consider ‘soil fertility’ as a determinant of land-sub-division.

Table4.5: Determinants of Land Sub-Division

		Yes	No
Determinants of Land			
Sub-division			
	Cultural aspects	31.90%	68.10%
	Willing buyer & seller	65.30%	34.70%
	Desire to own land	53.20%	46.80%
	Need to acquire money	30.90%	69.10%
	Soil fertility	43.40%	56.60%

Source: Field Data, 2015

From the study findings, the most common factor that drove people to land sub-division is the availability of willing buyer and willing seller. The existence of a laissez’s faire economy allows buyers and sellers to interact freely and respond to the existent market factors. Desire to own land is also a popular reason for land sub-division. In and out migration provides room to dispose and opportunity to own land.

From the interviews conducted, some of the determinants of land subdivision included the price of land as well as the cultural factors. The price of land set is within affordable rates where both the buyer and the seller are likely to gain from the transaction. Social factors also influence land sub-division.

4.5 Agricultural Productivity

Agriculture is considered the main economic activity in the study area with over 90% of the resident engaging in some form of it. The county falls within the humid agro-ecological zone which is ideal for agriculture. High annual rainfall also encourages the practice of agriculture.

4.5.1 Type of Agriculture Practiced

Results indicate that 59.70% of the respondents engage in crop farming, 11.10% of the respondents engage in animal keeping, 23.60% of the respondents practice both crop farming and animal keeping, 1.40% of the respondents engage in crop farming and tree growing while 4.20% of the respondents practice quill farming.

Table 4.6: Type of agriculture engaged in

Agriculture engaged in	Percentage
Crop farming	59.70%
Animal keeping	11.10%
Crop farming & Animal keeping	23.60%
Crop farming & Tree growing	1.40%
Quill farming	4.20%

Source: Field Data, 2015

From the study findings indicated in Table 4.6 above, crop farming is the most popular type of agriculture engaged in followed by the practice of mixed farming where farmers practice both crop farming and animal keeping, followed by the practice of animal keeping. Also practiced are apiary, agro-forestry and fish farming.

From the interviews conducted, households practice dairy farming, beef farming, sheep keeping, pig farming (whose number have decreased and most farmers abandoned the practice after the collapse of the company handling pork processing), rabbit farming (whose number has increased because of Rabbit World-a company concerned with rabbit farming), poultry farming (whose number has also increased because the practice is encouraged by KENBROCK who provide advice on poultry farming particularly chicken rearing) and goat farming although on a very small scale because the butter fat content in goat milk is very high. Households also engage in crop farming.

4.5.2 Crop Farming

Results indicate that 26% of the respondents grown maize only, 2% of them grow beans only, 29% of the respondents grow maize & beans, 14% of them grow maize & beans. 15% of the respondents do not practice crop farming while the remaining percentage grow trees, vegetables, bananas or a combination of these.

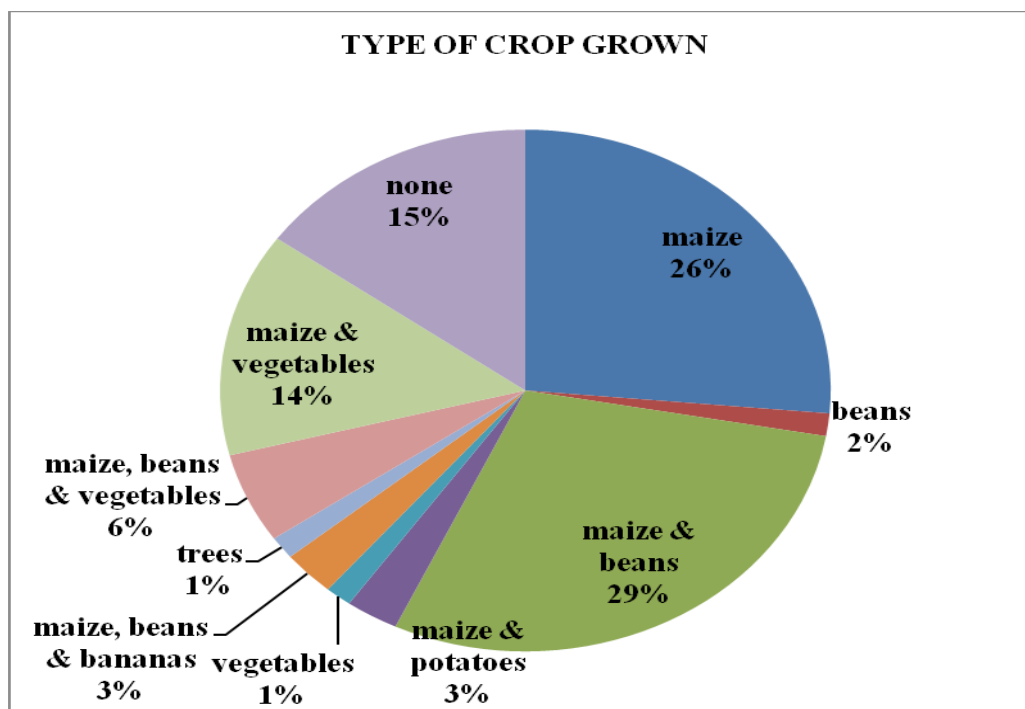


Figure4.12: Type of Crop Grown

Source: Field Data, 2015

From the study findings, the most common crop grown is maize. It is grown as a single crop or in combination with others including beans, vegetables and potatoes.

From the interviews conducted, crops grown include maize, sugar cane, beans, sorghum (though in very small scale), bananas, potatoes (both sweet and Irish), tea, coffee, wheat, oats and sunflower. Vegetable farming is mainly done along the riverine. Fruit trees grown include avocados and mangoes.

Results from the study indicate that 54.30% of the respondents engage in mixed cropping while 30.60% of them engage in mono-cropping.

Table4.7: Type of Crop Farming Engaged in

Type of crop farming	Percentage
Mono-cropping	30.60%
Mixed cropping	54.30%
None	15.10%

Source: Field Data, 2015

From the study findings, the agricultural practice of mixed cropping is the most common at 54.30% with the most common crop combination being maize and beans at 29.2%. These crop combinations depict that the farmers engage in small holder farming which is labour intensive and provides little room for mechanization, if any. With mixed cropping particularly the crop combination of maize and beans farmers will have different time periods for planting, weeding and harvesting the two crops. This is costly in terms of both labour and time. Mono cropping depicts some element of large scale farming that allows for mechanization.

The average land area set aside for crop farming is 4.231acres.

4.5.3 Animal Keeping

Results indicate that 6.90% of the respondents keep cattle, 1.40% of them keep sheep and 8.3% of the respondents keep chicken. 61.2% of the respondents did not engage in form of animal or bird keeping. The remaining percentage kept cattle with a combination of either chicken, sheep or goats. 1.4% of the respondents kept sheep & chicken.

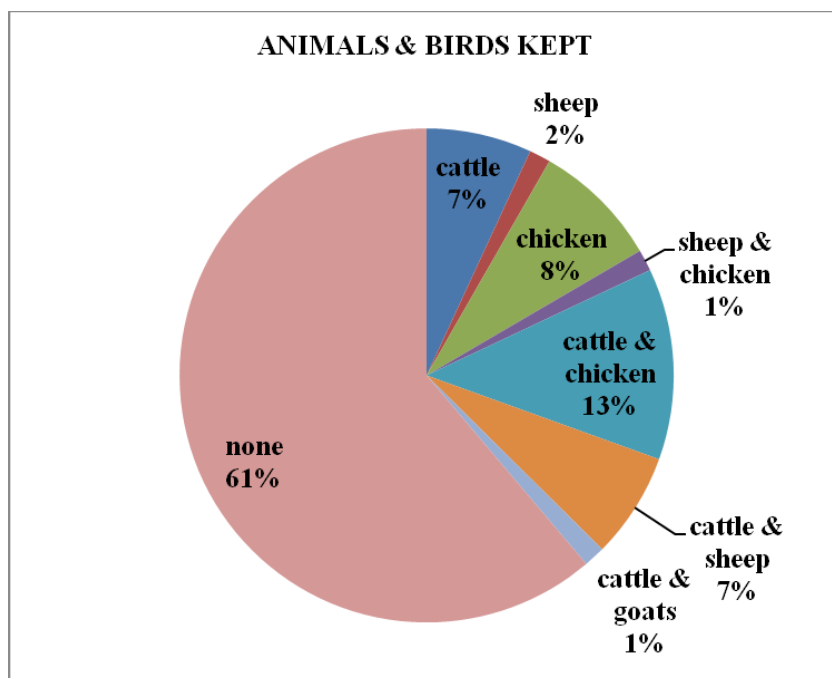


Figure4.13: Animals and Birds kept

Source: Field Data, 2015

From the study findings, majority of the respondents who practiced animal and bird keeping kept the combination of cattle & chicken. This combination was followed closely by the respondents who kept chicken only, followed by those who kept cattle only and cattle & sheep. Animal and bird keeping requires a considerable size of land to run. This explains why not so many of the respondents engage in it despite the high rate of return that is expected from this investment.

The average land area set aside for animal and bird keeping is 2.078 acres.

4.5.4 Farming Techniques

Results indicate that 52.40% of the respondents practice intensive farming, 15.30% of the respondents have embraced mechanization, 14.20% of the respondents use better species and breeds while only 2.80% of them practice agro forestry.

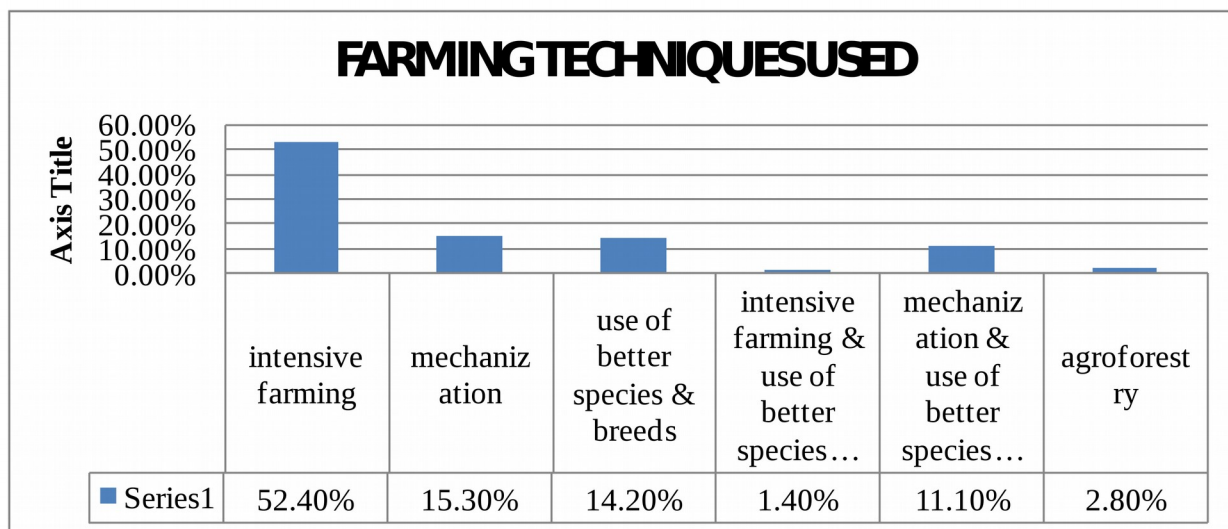


Figure4.14: Farming Techniques Used

Source: Field Data, 2015

From the study findings, majority of the respondents practice intensive farming. This is a technique that is characterized by low fallow ratio.

From the interviews conducted some of the agricultural techniques employed include paddocking, crop rotation, soil testing which is done to determine type of fertilizer to be used (for instance rather than using DAP throughout , it can be interchanged with Mavuno fertilizer), liming the soil to reduce soil acidity and ploughing early to encourage weeds to rot and become manure.

4.6 Agricultural Output

Results indicate that from the average land size cultivated by households the anticipated crop output is approximately 71 bags of maize, 6 bags of beans, 2 bags of potatoes and 10 bunches of bananas on average per annum.

Table 4.8: Anticipated Crop Output Per Annum

Crop farming anticipated output		
	Quantity	Price per unit (Kshs)
Maize	71 bags	2,500/=
Beans	6 bags	3,200/=
Potatoes	2 bags	2,800/=
Bananas	10 bunches	700/=

Source: Field Data, 2015

Crop output is largely dependent on rain, soil quality, and agricultural input.

Results indicate that from the average land size set aside for animal keeping by households, the anticipated output is approximately 2,425kg of meat, 31,953 litres of milk and 4,558 crates of eggs on average per annum.

Table 4.9: Anticipated Animal Keeping and Bird Rearing Output Per Annum

Animal & bird keeping anticipated output		
	Quantity	Price per unit (Kshs)
Meat	2,425 kg	400/=
Milk	31,953 litres	60/=
Eggs	4,558 crates	360/=

Source: Field Data, 2015

Animal and bird keeping is dependent on quality of breed and species as well as animal husbandry.

From the study findings, the keeping of animals and rearing of birds is likely to have a higher output as compared to crop farming. From the interviews conducted dairy farming is on the increase due to fluctuating cereal prices. Farmers practice both long range grazing techniques as well as zero grazing. The practice of dairy is also encouraged by the County Government that distributed milk coolers throughout the wards. The milk is later transported to creameries. The approximate milk production within the county is 3,600 litres per day.

4.7 Land Sub-Division

Results indicate that 58% of the respondents do not advocate for land sub-division, 37% of the respondents see no harm in undertaking land sub-division and therefore advocate for it while 5% of the respondents had no opinion on land sub-division.

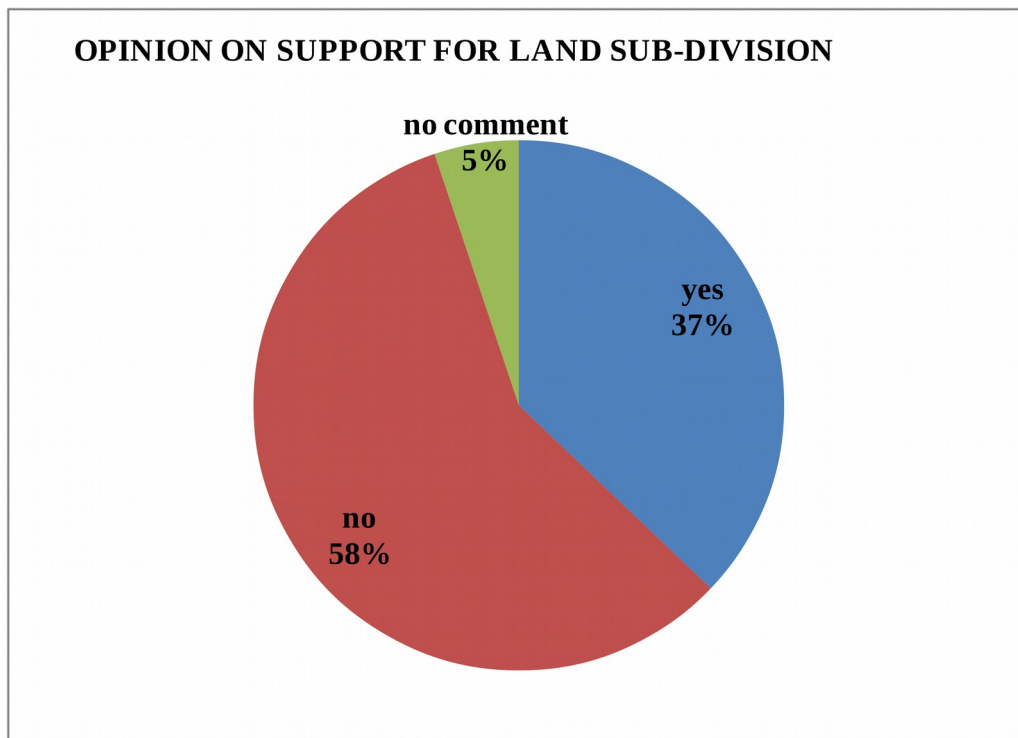


Figure 15: Opinion on Support for Land Sub-Division

Source: Field Data, 2015

From the study findings majority of the respondents do not support the practice of land sub-division. From the interviews conducted it was established that land sub-division adversely affects the riverine (which affects aquatic life), swampy areas, recharge points and forests. With a rate of desertification standing at 10km² per year, the practice of agriculture faces a serious challenge.

It was also established that land sub-division reduces agricultural productivity due changing land uses and activities. According to the Agriculture act Cap 318 the average piece of land that can generate economies of scale is one measuring 2.5 acres; less of which productivity decreases.

4.8 Addressing Land and Agricultural Related Challenges

From the interviews conducted, several measures can be undertaken to address the challenges pertaining to land and agricultural output. Some of these include: consolidating conflicting land laws since agricultural production depends on land, considering demand driven extension services approach, adopting new farming technologies e.g. GMO since change is inevitable, improving communication channels, improving literacy levels, considering total irrigation system through water harvesting, promote tenure security especially where farmers are using allotment letters and sale agreements, the government should increase the ease of having title deeds or lease certificates, subsidizing agricultural inputs, providing markets for agricultural products, providing farming grants, allowing the formation of co-operatives for milk production and provide a means to cushion farmers from the unexpected hard economic times by the government.

CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Overview

This chapter presents the summary of the findings, the conclusions and the recommendations of the study. The study also presents the areas for further study based on the data analysis.

5.2 Summary of Key Findings

Most of the respondents engaged in the study were female at 60%. Majority of respondents were aged between 36&40 years old at 26.4%. This age group is considered experienced enough to provide information on trends in land sizes, agricultural output and the relationship between these two variables. Most of the respondents, at 37.5%, had secondary school level of education. This provides them with access to basic information and knowledge on land and land related issues. On the household size, the study established that most of the households had between 4-10 members with the average size being 3.

The first objective of the study was to find out the land fragmentation situation in Trans-Nzoia West Sub-County. To address this objective various questions on land were asked. The study found out that majority of the households at 41.70% owned land measuring between 1-5acres with quite a number of them at 32%, owning land that is less than 1 acre. The average land size in the study area is 2.0451acres. This land is distributed across various activities including farming area, foot paths and area for the homestead.

76% of the households did not experience a change in their land size over time while 24% did experience a change in the household land size. Land size has fairly remained static over time with neither an increase nor a decrease being witnessed. This statement is consistent with the interviews conducted which confirmed that indeed land sub-division is currently stabilizing as compared to about 10 years ago. But despite this, there's a fraction of households that have experienced either a positive or negative change in their household size. Of the households that experienced a change in their land size, 6% of them witnessed a positive change through an increase in their land size while 18% of the households witnessed a negative change through a decrease in their land size. The remaining 76% of the household had their land witnessing neither an increase nor a decrease in size. The land size simply remained static. The positive change is attributed mainly to the aspect of business farming which has immensely slowed down the rate of land subdivision as economies of scale are attained on rather large farms.

On neighboring household's land sizes, majority of the households did not experience any change in their land size but a considerable number witnessed a change in their land size. Of the 47% of the neighboring households that experienced a change in their land size, 17% of them witnessed a positive change because their land increased in size while 30% of the households that experienced a change in their land size witnessed a negative change because their land decreased in size. The remaining 53% witnessed neither an increase nor a decrease in their land size. The land size simply remained static. This positive change is similarly attributed to business farming.

The most popular means of land acquisition is through purchase. The households have realized the importance of owning land together with the prestige attached in owning a piece of it. This therefore drives them towards purchase of land. Inheritance is also another popular means of land acquisition. Siblings are allocated land upon the demise of the parents. This practice goes on for every subsequent generation and also provides an opportunity to own land.

Of those owning land, majority of them have it being held in an absolute manner. This type of land tenure system bestows upon the owner the right to own, use and transfer land in totality. Leasehold land tenure system which forms the second highest category at 11.1% has its holders bearing certain restrictions which may include conforming to a specified land size and as such control the incidence of further land subdivision or to a certain land use hence increase or maintain the land area under agriculture. Despite the existence of various types of land tenure systems, the state has the power to alter the rights to land as it is considered the custodian of all the land within its jurisdiction.

On land use, agricultural use was considered the most predominant user with over 90% of the residents engaging in some form of it. In recent years, other land uses have been seen to gain acceptance especially residential use. From the interviews conducted, it was noted that many a times when people buy absolute land, there's a possibility that land use might change with change of land owner. From the study findings, the trend in land sub-division depicts a scenario where land sizes have been decreasing at a higher rate as compared to their increase.

The second objective of the study was to examine the determinants of land sub-division. The study brought to light a number of factors that influenced the decision to undertake land sub-division. The most common factor identified was the availability of willing buyer and willing seller. The existence of a *laissez's faire* economy allows buyers and sellers to interact freely and respond to the existent market factors. The desire to own land is also a popular reason for land sub-division. In and out migration provides room to dispose and opportunity to own land.

From the interviews conducted, some of the determinants of land subdivision included the price of land as well as the cultural factors. The price of land set is within affordable rates where both the buyer and the seller are likely to gain from the transaction. Social factors also influence land sub-division.

The third objective of the study was to evaluate the effect of land sub-division on agricultural productivity in Trans-Nzoia West Sub-County. To address this objective, a number of questions were asked and information gathered.

From the interviews conducted, households practice dairy farming, beef farming, sheep keeping, pig farming, rabbit farming, poultry farming and goat farming. They also engage in crop farming. Crop farming was identified as the most popular type of agriculture engaged in followed by the practice of mixed farming and thereafter the practice of animal keeping. Also practiced are apiary, agro-forestry and fish farming.

With regards to crop farming, results from the study indicate that 54.30% of the respondents engage in mixed cropping while 30.60% of them engage in mono-cropping. The most common crop grown is maize. It is grown as a single crop or in combination with others including beans, vegetables and potatoes. From the interviews conducted, crops grown include maize, sugar cane, beans, sorghum (though in very small scale), bananas, potatoes (both sweet and Irish), tea, coffee, wheat, oats and sunflower. Vegetable farming is mainly done along the riverine. Fruit trees grown include avocados and mangoes.

Of the agricultural practice of mixed cropping the most common crop combination is maize and beans at 29.2%. These crop combinations depict that the farmers engage in small holder farming which is labour intensive and provides little room for mechanization, if any. With mixed cropping, and particularly the crop combination of maize and beans, farmers will have different time periods for planting, weeding and harvesting the two crops. This is costly in terms of both labour and time. Mono cropping depicts some element of large scale farming that allows for mechanization.

The study found that of the respondents who practiced animal and bird keeping the combination of cattle & chicken was the most common. This combination was followed closely by the respondents who kept chicken only, followed by those who kept cattle only followed by those who kept cattle & sheep. Animal and bird keeping requires a considerable size of land to run. This explains why not so many of the respondents engage in it despite the high rate of return that is expected from this investment.

From the study findings, majority of the respondents practice intensive farming. This is a technique that is characterized by low fallow ratio. Other practiced techniques include mechanization, use better species and breeds and agro forestry. From the interviews conducted some of the agricultural techniques employed include paddocking, crop rotation, soil testing which is done to determine type of fertilizer to be used, liming the soil to reduce soil acidity and ploughing early to encourage weeds to rot and become manure.

From the average land size cultivated by households the anticipated crop output is approximately 71 bags of maize, 6 bags of beans, 2 bags of potatoes and 10 bunches of bananas on average per annum. From the average land size set aside for animal keeping by households, the anticipated output is approximately 2,425kg of meat, 31,953 litres of milk and 4,558 crates of eggs on average per annum.

From the study findings, the keeping of animals and rearing of birds is likely to have a higher output as compared to crop farming. From the interviews conducted dairy farming is on the increase due to fluctuating cereal prices. Farmers practice both long range grazing techniques as well as zero grazing. The practice of dairy is also encouraged by the County Government that distributed milk coolers throughout the wards.

On the opinion of land sub-division, majority of the respondents do not support the practice of land sub-division. From the interviews conducted it was established that land

sub-division adversely affects the riverine (which affects aquatic life), swampy areas, recharge points and forests. This poses a serious threat to the practice of agriculture. It was also established that land sub-division reduces agricultural productivity due changing land uses and activities. According to the Agriculture act Cap 318 the average piece of land that can generate economies of scale is one measuring 2.5 acres; less of which productivity decreases.

From the interviews conducted, several measures can be undertaken to address the challenges pertaining to land and agricultural output. Some of these include: consolidating conflicting land laws since agricultural production depends on land, considering demand driven extension services approach, adopting new farming technologies e.g. GMO since change is inevitable, improving communication channels, improving literacy levels, considering total irrigation system though water harvesting, promote tenure security especially where farmers are using allotment letters and sale agreements, the government should increase the ease of having title deeds or lease certificates, subsidizing agricultural inputs, providing markets for agricultural products, providing farming grants, allowing the formation of co-operatives for milk production and provide a means to cushion farmers from the unexpected hard economic times by the government.

5.3 Conclusions

The study made conclusions with special regard to each of the objectives of the study. The study established that the trend in land sub-division depicts a scenario where land sizes have been decreasing at a higher rate as compared to their increase. But despite the

current decreasing rate, it can be said that the situation is stabilizing as compared to about ten years ago. This is attributed to many factors including business farming and the realization of economies of scale through operating larger farms. On the determinants of land subdivision, various reasons came up. The availability of willing buyer and willing seller, emphasized by the existence of a *laissez's faire* economy allows buyers and sellers to interact freely and respond to the existent market factors. The desire to own land is also a popular reason for land sub-division where in and out migration provides room to dispose and opportunity to own land. The existent land rates was also impressive and influenced people's decisions to undertake land sub-division. Other determinants were cultural as well as social.

With regards to the effect of land sub-division on agricultural productivity, it was established that land sub-division reduces agricultural productivity due changing land uses and activities. Being in line with the Agriculture Act Cap 318 the average piece of land that can generate economies of scale is one measuring 2.5 acres; less of which productivity decreases. The average land holding size in the study area was found to be 2.0451 acres. This means that farmers have to device ways and strategies to generate output enough for subsistence as well as for commercial purposes despite the dwindling land size. Land subdivision is currently not supported the majority of the residents within the study area. This is not only because of the effect it has on agricultural output but also on the environment.

5.4 Recommendations

In order to address the evident challenge facing the agricultural sector with regards to land and land related concerns, various strategies need to be put in place and in scenarios where measures have been placed, they need to be enforced through a supervised implementation strategy to assess their success. Some of the strategies that can be employed include;

- i. Educating the local community on the importance of land while examining its various dimensions. This is to encourage the community to appreciate its value rather than engaging in uneconomical subdivision whose result has adverse multiplier effect in almost all sectors of the economy considering the factor that agriculture is one of the greatest contributor in the country's GDP.
- ii. Advising the community on the importance of investing in non-farm activities which generate alternative sources of income. This will greatly reduce the over reliance on land and especially on agriculture.
- iii. Encouraging the local community to adopt admirable agricultural techniques to ensure that productivity is witnessed all year round and is not dependent on the weather conditions. The community is also advised to adopt techniques to increase output on rather smaller farm sizes.
- iv. Enforcing existing regulatory frameworks particularly those touching on land to reduce conflict and encourage investment in agriculture.

- v. Promoting the provision of services by extension officers and in situations where the services no longer exist, have it revived to enable the farmers and households engage in productive agricultural practices despite the decreasing land sizes.
- vi. Adoption of land consolidation procedures to enable household engage in large scale farming whose output is enough for both subsistence as well as commercial purposes.

5.5 Suggestions for Further Research

Since land consolidation strategies that have been implemented elsewhere have been to seen to face objection and challenges particularly with their implementation, the study recommends the need to come up with strategies ideal for the study area to encourage the consolidation of small land parcels. This will go a long way in encouraging large scale productivity which makes it easier to realize the economies of scale.

The study also recommends a study on ways to increasing productivity with low land acreages.

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APPENDICES**APPENDIX I: HOUSEHOLD QUESTIONNAIRE**

P.O. Box 5043-30100,

Eldoret.

e-mail: bakhitaemmily@gmail.com

0726 77 42 62 or 0733 95 72 94

Dear Respondent,

RE: REQUEST FOR RESEARCH DATA

I am a postgraduate student at Moi University majoring in Development Studies. I am required to submit as part of my research work, a research project titled, **Land Subdivision and Agricultural Productivity in Trans-Nzoia West Sub-County, Kenya**. Trans-Nzoia West Sub- County was chosen as the study area. I kindly request you to fill in the attached questionnaire to generate data required for the study. This information will be used purely for academic purpose and your name will not be mentioned anywhere in the report.

Your assistance and co-operation will be highly appreciated.

Thank you.

Yours Sincerely,

LIMO EMMILY BAKHITA CHEPTOO

Reg. No. SHRD/PGD/03/11
Researcher (Student)

Freehold Leasehold Communal

10. Which activities do you undertake on the land?

Crop farming Animal keeping Mixed farming
Any other

11. How long have you practiced agriculture?

.....

12. a) Has your land size changed over time? Yes No

b) If yes, how has it changed?

Increase in size Decrease in size

13. a) Have the neighbouring land sizes changed over time? Yes No

b) If yes, how have they changed?

Increase in size Decrease in size

14. What is the average land size per household?

.....

DETERMINANTS OF LAND SUB-DIVISION

15. a) Is land subdivision a common occurrence in this area? Yes No

b) Explain your answer in 15 a) above.

.....
.....

16. Generally, what drives people towards land sub-division?

.....
.....

17. Generally, how best should we address the issue of land sub-division?

.....
.....

EFFECT OF LAND SUB-DIVISION ON AGRICULTURAL PRODUCTIVITY

18. How much do you get from your farm?

.....
.....

19. Which farming techniques do you employ?

.....
.....

20. a) In your opinion, does land size affect agricultural productivity?

Yes No

b) Explain your answer on 20 a) above.

.....
.....

What other factors affect agricultural output?

.....
.....

Thank you for your cooperation

APPENDIX II: INTERVIEW SCHEDULE

I Emmily Bakhita Cheptoo Limo, SHRD/PGD/03/11, a Master of Science (Development Studies) student from Moi University hereby request for your participation in this study by answering the attached interviews questions. This interview seeks information that will enable me write my Master's Thesis Report. You are one of the people who can help in supplying related information on land sub-division and agricultural productivity within Trans-Nzoia West Sub-county. The information that you will provide will be held confidential. Please you are required to answer the questions as truthfully as possible. The results of the study shall be made available in the Moi University library.

1. Has Trans-Nzoia County and especially Trans-Nzoia West Sub-county witnessed significant transformation in terms of change in land sizes? If yes, what is the nature of this change and what are some of the factors behind the change?
2. Is land subdivision a common occurrence within the county as well as the sub-county?
3. In your opinion, what are the factors behind land subdivision?
4. Which farming techniques have been employed by farmers to increase agricultural production?
5. Do you think land subdivision affects agricultural production? Please expound.
6. How best can we address the issue of excessive land subdivision?
7. Has the government taken any initiative to assist farmers to increase agricultural output? If Yes, what are they and if not is anything being done about it?

APPENDIX III: OBSERVATION CHECKLIST

I am a Master of Science (Development Studies) Student at Moi University. This observation checklist seeks information that will enable me write my Master's Thesis Report. The results of the study shall be made available in the Moi University library.

1. Land sizes
2. Agricultural activities
3. Size of storage facilities

Activity	Time Period											
Development of proposal	April 2014											
Defence of proposal		Aug 2014										
Proposal correction and development of research instruments/pre-testing of instruments			Jan 2015									
Training research assistants/collection of data				Jan 2015								
Data analysis					Feb-Dec 2015							
Writing & submission of 1 st draft thesis						Jan 2016						
Correction and submission of 2 nd draft thesis							Feb 2016					
Writing final draft thesis report								March 2016				
Thesis submission for examination										April- Aug 2016		
Correction of final thesis											Aug- Oct 2016	
Submission of thesis for binding												Nov. 2016

APPENDIX IV: WORK PLAN

APPENDIX V: RESEARCH BUDGET

Stationery	Quantity	Amount in Kshs.
Printing of questionnaires	150 @20/=	3,000/=
Review of secondary data	3 nights out @2,500/=	7,500/=
Training of 2 research assistants	@2000/=	4,000/=
Travel	10days @1,500/= per day	45,000/=
Subsistence for research assistants and the principal researcher	30days@1,000/=	90,000/=
Printing, Photocopying & Binding	-	70,000/=
TOTAL		219,500/=

APPENDIX VI: MOI UNIVERSITY INTRODUCTION LETTER



MOI UNIVERSITY
SCHOOL OF HUMAN RESOURCE DEVELOPMENT
DEANS OFFICE

P.O. Box 3900
 ELDORET
 KENYA.

Fax 254-053-43183/43420 Ext.434

REF: MU/SHRD/PG/77

24th February 2015

TO WHOM IT MAY CONCERN

RE: EMMILY BAKHITA C. LIMO – SHRD/PGD/03/11

The above named is an Msc. student at Moi University, School of Human Resource Development, Department of Development Studies. She has completed her coursework and successfully defended her proposal titled “**An Assessment of the Effect of Land Fragmentation on Farm Productivity in Trans-Nzoia County, Kenya**”.

It is a requirement of her Msc. Studies that she conducts research and produces a Thesis. Having defended her proposal successfully, she has been cleared by the School to proceed to the field and collect data.


Any assistance accorded to her will be highly appreciated.

DEAN
 24 FEB 2015
Ruth J. Tubey

DR. RUTH J. TUBEY
DEAN, SCHOOL OF HUMAN RESOURCE DEVELOPMENT

/mc

**APPENDIX VII: TRANS-NZOIA COUNTY REASERCH AUTHORIZATION
LETTER**



THE PRESIDENCY

MINISTRY OF INTERIOR AND COORDINATION OF NATIONAL GOVERNMENT

Telephone: 054 – 30020
Fax No: 054 – 30030

COUNTY COMMISSIONER
TRANS NZOIA COUNTY
P.O BOX 11 - 30200

E-mail: ctransnzoiacounty@yahoo.com
When replying please quote

27th February, 2015

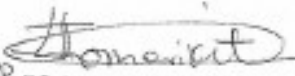
REF: TNZC/CONF/ED. 12/2/VOL. 1/150

TO WHOM IT MAY CONCERN


RE: RESEARCH AUTHORIZATION

This is to inform you that **EMMILY BAKHITA C. LIMO – SHRD/PGD/03/11** of **MOI UNIVERSITY School of Human resource Development Deans Office** has been authorized by National Commission for science and Technology to carry out research on **“An Assessment of the Effect of Land Fragmentation on Farm Productivity in Trans Nzoia County, Kenya”**, for a period ending 31st August, 2015.

Please accord her the necessary assistance.



PP **JOASH ABONGO**
FOR: COUNTY COMMISSIONER
TRANS NZOIA COUNTY



APPENDIX VIII: NACOSTI RESEARCH CLEARANCE PERMIT


THIS IS TO CERTIFY THAT:

MISS. EMMILY CHEPTOO LIMO
of MOI UNIVERSITY, 5043-30100
ELDRET, has been permitted to
conduct research in Transzoia County
on the topic: LAND SUBDIVISION
EFFECT ON AGRICULTURAL
PRODUCTIVITY IN TRANS-NZOIA
COUNTY, KENYA

for the period ending:
13th June, 2017

Bakinta
Applicant's Signature

Permit No : NACOSTI/P/16/7378/11278
Date Of Issue : 16th June, 2016
Fee Received : Ksh 1000




SmmmmB
Director General
National Commission for Science, Technology & Innovation

CONDITIONS

- 1. You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit**
- 2. Government Officers will not be interviewed without prior appointment.**
- 3. No questionnaire will be used unless it has been approved.**
- 4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.**
- 5. You are required to submit at least two(2) hard copies and one(1) soft copy of your final report.**
- 6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice**

REPUBLIC OF KENYA



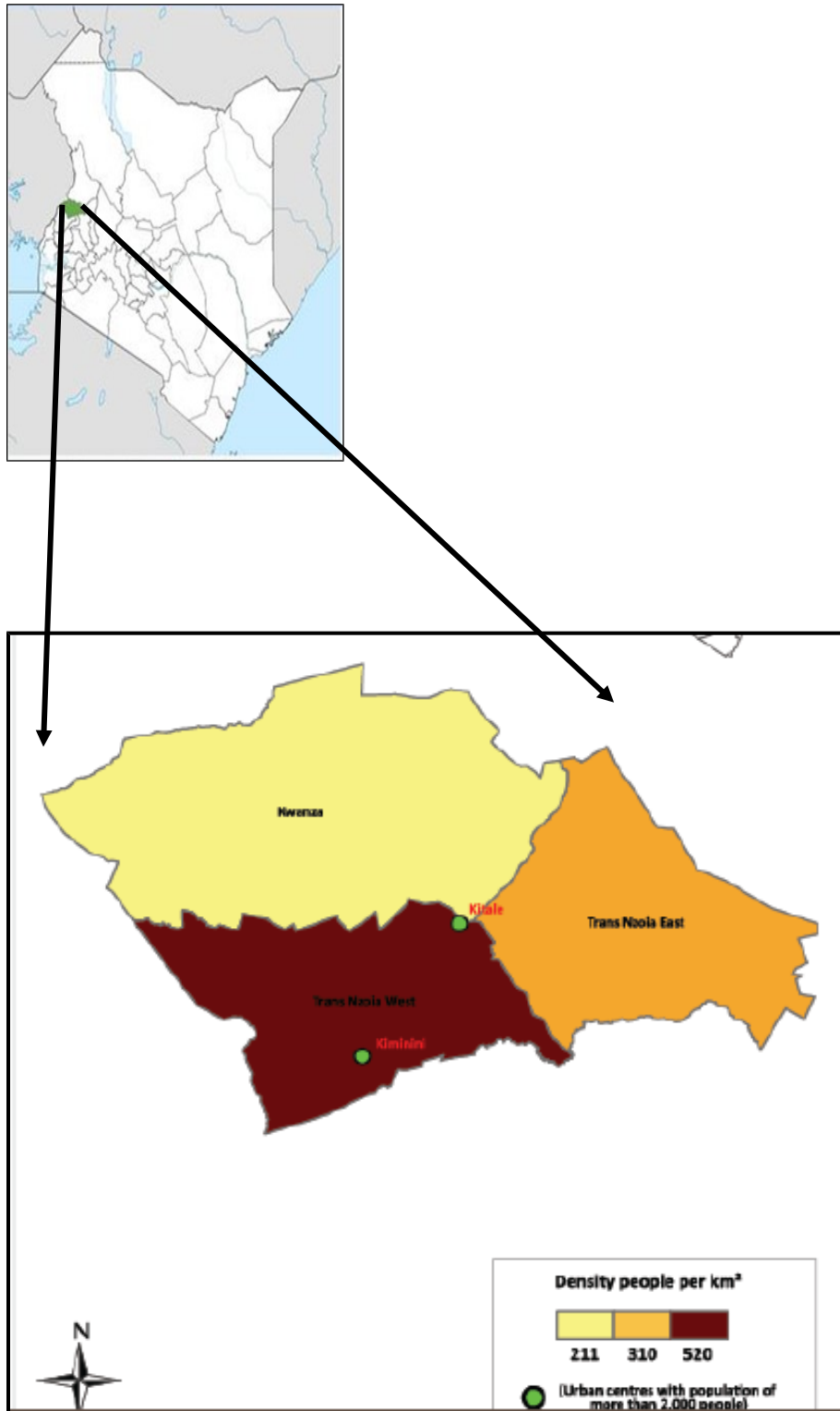
National Commission for Science, Technology and Innovation

RESEARCH CLEARANCE PERMIT

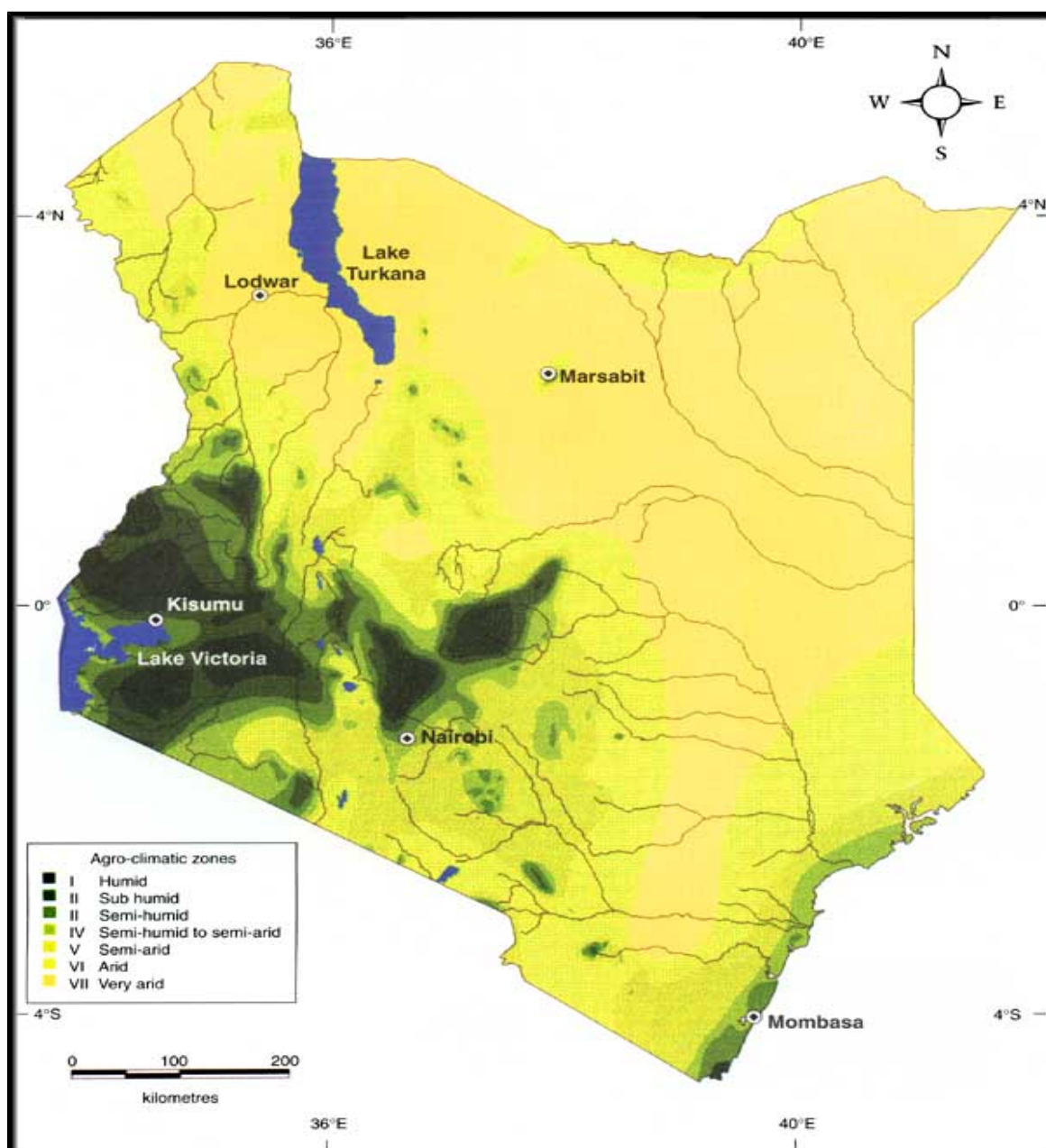
Serial No. A: 9555

CONDITIONS: see back page

APPENDIX IX: STUDY AREA



APPENDIX X: AGRO-ECOLOGICAL REGIONS OF KENYA



**APPENDIX X: PHOTOGRAHS TAKEN DURING OBSERVATION SCHEDULE
WITHIN THE STUDY AREA**



a) One of the grain storage facilities in the study area



b) Mixed cropping and land preparation in the study area



c) Monocropping and maize harvesting in the study area



d) Animal keeping in the study area



e) Poultry farming in the study area



- d) Small land sizes whose acreage is distributed among the various functions i.e. homestead area, pathway and farming area



- e) Larger farms in the study area

APPENDIX X: PHOTOGRAPHS TAKEN DURING INTERVIEWS

