

TITLE

THE IMPACT LAND SUB-DIVISION AND FRAGMENTAION ON RURAL
DEVELOPMENT: A CASE STUDY OF VIHIGA COUNTY

DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

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DEDICATION

This thesis is dedicated to my father for his greatest influence on my life, the late Mr.Gerrishom Kihima.

Mr.Kihima did not only raise and nurture me but also was a zealous supporter of my education and intellectual development over the years.

ACKNOWLEDGEMENT

I would like to express here my deepest gratitude to my thesis supervisor, Dr. Fridah Mugo, University of Nairobi, for her superb guidance, caring, patience, and providing me with an excellent advice for doing the research.

I would like to thank all of the participants in the study: The respondents, research assistants and local administrative authorities, for the time and help given throughout. Without their participation, this research would not have been possible.

My sincere thanks to all members of the Department of Urban and Regional Planning, both staff and students, whose continuous support have made this thesis possible.

Finally I thank my family and friends. Your encouragement and support has never faltered, without you this thesis would not have been started or completed! Thank you.

ABSTRACT

Vihiga is one of the most densely populated counties in Kenya with a current population density of 1,045 persons per square km. The high population has exerted enormous pressure on available land resource resulting in land fragmentation and uneconomic subdivision. However the seriousness of the problem has not been systematically analyzed and documented. This study determined the level, causes and analyzed impacts of land fragmentation and uneconomic sub-division on rural development, assessed the acceptability of alternative human settlement pattern and has proposed policy and planning interventions. Using simple random sampling method, 127 households from Lusengeli Sublocation in Sabatia District and 183 households from Esianda Sublocation in Vihiga District were interviewed to determine the level and causes of land fragmentation and un-economical land subdivision. In addition to secondary data, primary data were collected using household questionnaires, observation, check list, key informant interviews and focus group discussions. The data was analyzed by use of descriptive statistics and presented in form of tables, charts, photographs and text. With Simons Index (SI), the study reveals presence of land fragmentation in the county. However, the level of fragmentation is higher in Lusengeli Sublocation (0.5) compared to Esianda Sublocation (0.8) with a total average of 0.65. There is also problem of small land size and uneconomical land sub-division with average household land size of 0.41 hectares. A large proportion of households (56.5%) lack title deeds of the land on which they reside. The cause of land fragmentation and uneconomic land subdivision is tradition of land inheritance, land purchase for purpose of farming, investment or bequeathing the heirs and need for space of settlement. Land fragmentation has had both socio-economic and environmental impacts on rural development. There is reported low household income, population out migration and negative environment impact in addition to land related conflicts that are linked to Land fragmentation and uneconomic sub-division in the county. Though dispersed settlement pattern is preferred, the challenge it poses to a highly populated area with scarce land resource is noted. However, the values of cluster settlement are acknowledged though there is need of attitude change to embrace this form of settlement. The study recommends the following: Adhering to land use planning both in rural and urban areas, starting a land bank program, enabling functional and dynamic land market by facilitating acquisition of land title deed, alternative form of inheritance to replace land inheritance, land consolidation at both household and neighborhood level, creation of more job opportunities and family planning to control population growth.

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ACRONYMS

MDG: Millennium Development Goal

WWII: World War II

FAO: Food and Agricultural Organization

GOK: Government of Kenya

GIS: Geographic Information System

LGA: Local Government Area

PRSP: Kenyan Poverty Reduction Strategy Paper.

NEMA: National Environmental Management Author

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the research problem

1.1.1 Characteristics of rural economies

The world is experiencing demographic explosion with world population estimated at 7.5 billion in 2017 which is an increase from 7.35 billion in the year 2015. This is projected to increase to 11.2 billion by the year 2100. Most of this increase in population is happening in the developing countries. A further look into world demographic statistics indicates that 815 million people in the world do not have enough food to eat. Similarly, the world poorest people are found in the rural areas of which 75% are involved in agrarian production for livelihood. Further statistics shows that 50% of world hungry people are from households practicing farming.

These statistics has informed development scholars and policy makers to believe that investment in agrarian production is the best approach in developing the rural areas of the developing countries. This is informed by several studies and statistics that has shown that agricultural induced development as an approach to poverty reduction in most of rural societies is twice effective compared to development induced by other sectors. The contribution of agriculture has seen the establishment of technology and innovation in most of developing countries as well as helping these nations in building capacity and achieving better infrastructural development. These has led to policy

formulations that has aimed at enhancement agrarian markets and ensuring the accessibility of small scale farmers to finance, insurance services and the general improvement in science and technology to improve production.

Whereas this efforts have aimed at reducing world poverty by emphasizing increase in farm output, it is emerging that world poverty can be best tackled by expanding the scope at which it is being addressed. This is after realizing that the world is becoming more urbanized as there is an increase in the rural-urban migration. By the middle of year 2009, urban dwellers (3.42) had surpassed the rural dweller (3.41 billion). Although more of the urban dwellers were reported in developed regions of world, it is estimated that half of population in less developed regions will be living in urban areas by 2020. This has informed renewed efforts to focus on the role played by small and medium sized urban areas in achieving rural development and the general poverty reduction. This is because most of rural-urban migration takes place in these centers. In addition to these, activities in these urban centers are linked to the rural landscape. They offer market for goods produced in rural areas and are centers for financial services and information dissemination while the rural areas tend to feed the population in such urban areas. Thus most development scholars have advocated for policy formulation that enhances the interdependency and interrelationship between village economy and these small and medium scale urban areas economies. Therefore reducing poverty in Africa and other developing countries requires policy interventions that will ensure improved agricultural sector as well as dynamic and functional small and medium sized rural towns. However, with increasing population, land available for farming (arable) and for holding the ever increasing urban

population (for urban housing, transport network and other social amenities) has been declining over time. Addressing this problem requires planning from a regional perspective.

1.1.2 Declining smallholder farms

As a factor of production, several studies have revealed scarcity of land in most of rural agro potential areas in Africa. For instance, Jayne et al, (2003) reports that half or more smallholder farmers in Africa utilize farms below 1.5 hectares with limited area to expand. Yamano et al, 2009 links scarcity land to increasing off-farm activities in Kenya and the increase in land purchase through land market as one of ways family members can own land because there is a decrease in land inheritance due to limited land resource. A review of the changes in arable land in Africa over a period of 10 years is given in the table 1 below.

Table 1 Hectares of arable land per person in agriculture

	1960-69	1970-79	1980-89	1990-99	2000-09 ¹	2000-09 land-person ratio as % of 1960-69
Ethiopia	0.501	0.444	0.333	0.224	0.218	43.5%
Zambia	0.643	0.607	0.398	0.342	0.297	46.2%
Kenya	0.462	0.364	0.305	0.264	0.219	47.4%
Uganda	0.655	0.569	0.509	0.416	0.349	53.3%
Malawi	0.480	0.466	0.357	0.304	0.307	64.0%
Zimbabwe	0.613	0.550	0.452	0.420	0.469	76.5%
Rwanda	0.212	0.213	0.195	0.186	0.174	82.1%
Mozambique	0.356	0.337	0.320	0.314	0.294	82.6%
Ghana	0.646	0.559	0.508	0.492	0.565	87.5%
Nigeria	0.982	0.860	0.756	0.769	0.898	91.4%

Source: FAO STAT, (2010)

Table 1 shows a ten year changes in cultivatable land to changes in agricultural population in ten African countries. For instance considering Kenyan case, there has been a reduction from 0.462 hectares in 1960s to 0.219 hectares in 2000-2009 of the total cultivatable land per person in agriculture. Further statistics from Kenya Central Bureau of Statistic indicates that in 1977 mean size of small holder farms across provinces ranged from 2.10 to 3.48 hectares. However, from 1977 to 2010 Egerton University's nationwide survey reports mean farm size to be 1.86 hectares (Jayne and Muyanga, 2012).

1.1.3 Reasons for declining smallholder farms

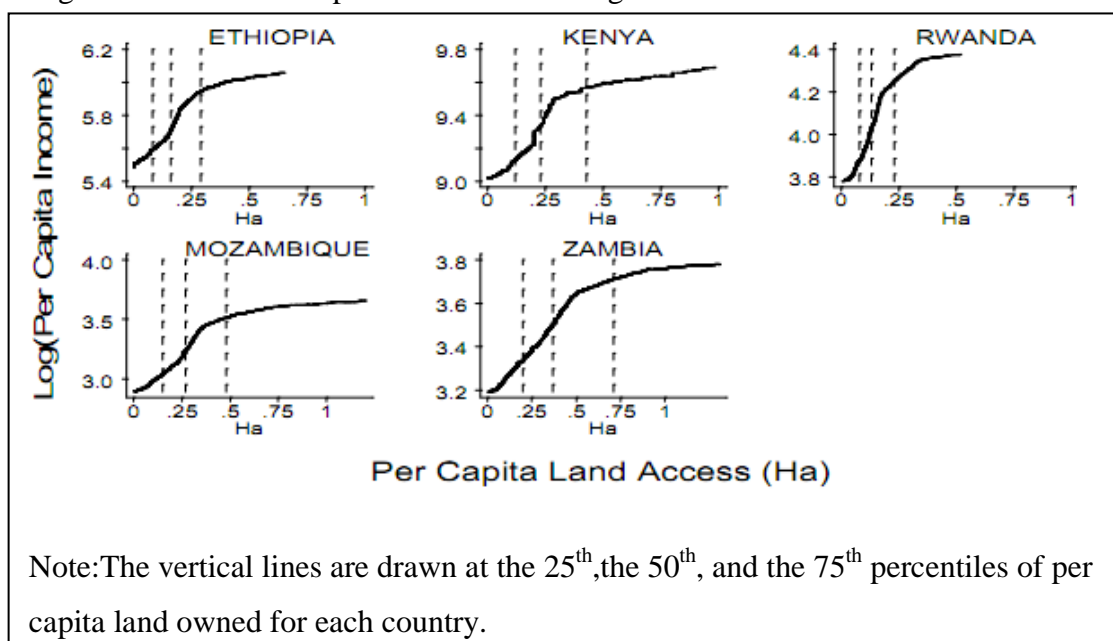
There are two main reasons given for why smallholder farms are shrinking over time. It is often observed that most of rural settlement is concentrated in particular areas while a vast areas remain unsettled. This is evidenced by Jayne and Muyanga, 2012 whose study findings indicates that in rural Kenya, roughly 40 percent of population settlement are found on five percent of its potential agricultural and productive land. Jayne et al, 2009 has tried to explain this scenario by arguing that most of the arable land is not settled or utilized because it lacks basic physical infrastructure like roads, electricity, irrigation, clean drinking water supply, schools, health facilities and other services that are vital for economic land production thereby attract migration and settlement to such places. Several governments have initiated policy measures aimed at addressing these challenges however the approach taken has encouraged the establishment of large scale investment at the expense of smallholder led agrarian enterprises that are practiced by majority of the rural poor.

The other reason has been land tenure system whereby there has been a continuation of colonial land tenure system that separated “customary lands” from “state lands”. This has happened in most of countries with colonial settlers’ history including Malawi, Kenya, Zimbabwe and Zambia. Population explosion has been witnessed in regions with customary land tenure resulting into pressure on the limited land resource considering the mode of production practiced. However, land under state authority is usually underutilized and efforts to avail it to production has either taken the form of exchange for political gain to non-farming class living in cities or allotment in large size which is not affordable by small scale farmers (Stambuli,2002;Namwaya,2004).

1.1.4 Relationship between landholding size and household income

Muyanga and Jayne, (2012) analyses how income varies with a change in farm size as shown in Fig 1.

Figure 1 The relationship between landholding size and household income



Note: The vertical lines are drawn at the 25th, the 50th, and the 75th percentiles of per capita land owned for each country.

Source: Muyanga and Jayne, (2012)

Studying the table reveals that there is an improvement in household income as farm size that are below 0.5 hectares (approximated to 2.5 hectares considering mean family size adjustment) increases. Any further subdivision that goes beyond 0.5 results into a flatten relationship as portrayed by the graph. Considering that most of small scale farmers in rural Africa have land parcels below 2.5 hectares, Muyanga and Jayne, 2012 argues that policies that will ensure small scale farmers have access to land can be a best approach to rural poverty reduction.

1.1.5 Declining farm sizes in densely populated areas: the need for research to inform policy making

There is a general consensus among development economists and policy makers' that initiatives aimed at promoting small scale agricultural enterprises can help transform rural communities and achieve poverty reduction in developing economies.

Rural-poverty in Sub-Sahara Africa can be best tackled by achieving agricultural growth through inclusion of smallholder-led strategy in development process. The main challenge, as pointed out by Muyanga and Jayne, (2012) is how such programs can be implemented in densely populated rural areas that exhibit declining farm sizes and are dependent on one seasoned rain fed agricultural activities. This has been attributed to limited information on possible challenges that may arise due to population explosion amidst land scarcity in rural Africa. Also there has been little discussion on how to enrich policies to address issue of land tenure system to ensure accessibility to land especially by small scale farmers a process that can guarantee them security of their farm enterprises (Muyanga and Jayne, 2012). This study is inspired by the need to add to the existing literature regarding the dynamics of rural

poverty by analyzing the role of uneconomic land subdivision and fragmentation on rural poverty. The study looks into the status and possible causes and consequences of uneconomical land subdivision and fragmentation which will help in deriving possible policy interventions.

1.1.6 Scarce land resource and poverty level in Vihiga County

Vihiga County is regarded as one of the counties in Kenya with highest population density and insufficient food to feed its population (GOK, 2005). An average household land size in the county is less than 0.4 hectares (GOK, 2004). Efforts to address these challenge has faced difficulties because of the ever increasing population and the dwindling land resource. Nyanweso et al, 2000 reports that 57.6 percent of the population lives below the poverty line in Vhiga County.

1.2 Problem statement

Most of poverty incidences in Kenya are reported in rural areas, but also substantial and increasing over the last decade in urban areas. Using the 1997 Kenyan Welfare Monitoring Survey results, Wobst, (2005) reports that 95.6% of all “ultra-poor”, (below food poverty line) people are concentrated in rural areas while only 66.6% of the “moderately-poor” (between food and basic needs poverty lines) are located in rural areas. In most cases, the affected group is rural small-scale farmers who depend on primary extraction from land resource in terms of economic values of land-agricultural-related (food and fiber), environmental values-the biodiversity resource extraction and the social equity values-as a place of living. This has led to development scholars and experts interested in rural area recognize the contribution land resource utilization in their economic policy recommendation aimed at

developing rural areas. Wobst (2005) asserts that in an economy that is predominantly agriculture in terms of primary goods production, agricultural-related (food and fiber) processing industries, as well as a growing service sector in support of agrarian enterprises and marketing, the contribution of agriculture towards sustainable economic growth and development is crucial. This notion is supported by Muyanga and Jayne (2012), who believes that rural-poverty and underdevelopment in Sub-Saharan Africa can be best tackled by enhancing the production of land through inclusion of smallholder-led strategy in the development process. As noted earlier, the challenge has been how to achieve this in rural areas with high population density and declining farm sizes. Vihiga County is characterized by scarce land resource. The limited land resource has curtailed the efforts of improving the standard of living in the county and to a larger extent the undeveloped rural society. This is because agriculture which is the main system of economic production low yield due to both small land sizes and declining soil fertility.

Table 2 Population projection per Constituency

CONSTITUENCY	Area Km ²	Pop 2009	Density	Pop 2012	Density	Pop 2015	Density	Pop 2017	Density
Hamisi	156.4	148,259	948	156,594	1001	165399	1058	174698	1117
Emuhaya	94.5	89,147	944	94150	996	99453	1052	105044	1112
Vihiga	90.2	91,616	1016	96767	1073	102208	1133	107954	1197
Sabatia	110.9	129,678	1169	136,968	1235	144670	1305	152,804	1377
Luanda	85	95,923	1132	101316	1192	107012	1259	113,029	1329
COUNTY	531	554,622	1044	585795	1103	618742	1165	653529	1231

The population density rose from 1,033 persons per square kilometer in 2004 to 1,045 persons per sq km in 2013. By 2017, the population density in the County (as indicated in Table 2 above) will be very high, rising from 1165 in 2015 to 1231 in 2017.

Source KNBS, Vihiga 2013 in First County Integrated Development Plan 2013-2017

This high population density is now forcing some people to migrate to other counties to settle there. However data on the migration in the county is not available (NEMA, 2009). The out migration has been linked to scarcity of land, limited household income alternatives and not embracing modern farming technologies which are the characteristic of undeveloped community. This study links land issues in particular land fragmentation and uneconomic land subdivision which can result from high population growth or cultural values to causes of rural under development.

1.3 Purpose of the study

The purpose of this study is to identify the level, causes and effects of land fragmentation and uneconomical land subdivision on the rural development of Vihiga County. In addition, the study aims at identifying policy interventions that can help reduce or stop fragmentation and the uneconomical land subdivision while improving the rural economy. This study was inspired by the need to address the declining farm sizes in densely populated county of Vihiga on its development. This can be achieved by adding more information to the existing literature regarding the dynamics of rural poverty through analyzing the nature of uneconomical land subdivision and fragmentation.

1.4 Scope of study

The study took place in Vihiga County in two sublocations. These are: Esianda Sublocation in Emusenjeri Location Emuhaya Division; Vihiga sub-county and Lusengeli Sublocation in Wodanga Location; Sabatia sub-county. The study looked at both land fragmentation and uneconomic land subdivision. Emphasis was placed on the causes and effects of land fragmentation and uneconomic subdivision, possible

interventions, approaches that can help stop or reduce it and who can help in implementing the interventions. The economic impact was looked at by considering farm output; on-farm and off-farm activities at household level and house hold income relating them to the occurrence of land fragmentation and uneconomic subdivision. The study also examined key causes of out-migration reported in the study area to find out if it has been triggered by issues directly or indirectly related to land fragmentation or uneconomic subdivision or both. In addition to this, other coping mechanisms to challenges posed by land fragmentation and uneconomic subdivision was looked into. The impact of land fragmentation and uneconomic subdivision on the environment was also considered. Emphasis was given to changes observed on plant and animal biodiversity, water bodies including wetlands and swamps, impact on community cultural values and on open spaces all of which can be directly or indirectly attributed to land fragmentation and uneconomic land subdivision. Lastly, the study considered policy interventions that can help in addressing the problem of land fragmentation and uneconomic land subdivision.

1.5 Research questions

- (a) What are the causes of land fragmentation and uneconomic land subdivision?
- (b) What is the impact of land fragmentation and uneconomic land subdivision on rural development?
- (c) How do existing and the preferred settlement patterns affect rural development?
- (d) What policy interventions can help achieve rural development?

1.6 Research objectives

The following were objectives of the study:

- (a) To determine the causes of land fragmentation land uneconomic land subdivision.
- (b) To analyze the main impact of land fragmentation and uneconomic land subdivision on rural development.
- (c) To find out how the existing and the preferred settlement pattern affects rural development
- (d) To propose policy and planning interventions that could help achieve rural development.

1.7 Justification and significance of the study

The study is justified on the ground that most of the studies in Vihiga County have only partially considered the challenge posed by land on the rural economy. Although land has been recognized as scarce and linked to the existing food insecurity in the County, a gap exists in available literature especially on detailed analysis of the contribution of land fragmentation and uneconomic land subdivision on the rural economy; taking into consideration the broader perspective of its impact on the rural economy, environment, demography and cultural values. On the same note, no study has come out with policy interventions that are acceptable to the community on how to reduce the continued subdivision of land into uneconomical land in the County. The results of this study are expected to translate to policy recommendations on how uneconomic land subdivision is going to be stopped and how the rural economy of Vihiga County will be improved. The findings will be useful to both inhabitants of

Vihiga County and policy makers' especially the County Government as it is likely to inform them while addressing development challenges in the County. In particular, issues related to ways of improving small scale agricultural farming, avoiding uneconomic land subdivision and general rural economy e.t.c, are of major concern to the County Government. Most of these issues are the development challenges facing Vihiga residents and are either directly or indirectly related to land as a natural resource. Thus this study will form one of relevant reference documents for policy makers.

1.8 Definition of terms and variables

Poverty: Inadequacy of income and deprivation of basic needs and rights, and lack of access to productive assets as well as social infrastructure and markets.

Poverty line: The minimum level of consumption at which basic needs are assumed to be satisfied.

The term '**Land Fragmentation**' was limited to mean the type of land ownership pattern where a single household owns numerous discrete parcels (plots), often scattered over a wide area. 'Uneconomical land subdivision', has been used to mean dividing land into small units that are unprofitable for production considering the type of economic production in the area (in this case agricultural production and settlement purposes).

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter presents literature review of various studies that tries to relate high population density and rural economy, land fragmentation and rural economy, both high population density and land rural poverty relate with population migration from rural areas. Eventually it looks into approaches used to achieve rural development in areas characterized with land fragmentation and uneconomic land subdivision. In particular it considers the land consolidation and the rural land use spatial plan as some of ways aimed at achieving sustainable rural development.

2.2 High population density and rural economy

Land as a natural resource has been at the center of mankind in sustaining his life. A study into man's prehistory clearly brings out man's transition from food gathering-hunting to the domestication of plants and animals and the ultimate fully fledged cultivation of the selected plants in the selected areas. Throughout this transition, man has extracted economic value from land through provision of food and fiber, the environmental value through the use of biodiversity resources and the social equity value by acting as a place of living. This has seen man adapt to his environment. He has managed to extract the economic, social equity and environmental values from land resources and in the process developed adequate knowledge about the resources as well as the technical means to exploit them for survival. Quite often he had to compete with other wild animals for food but he learned how to live in symbiotic relationship with other competitors and resources in varied environments. Several

authors have studied this transition with Menberu (2014) suggesting that climate change caused a shift from hunting-gathering to village farming communities. Smith (1976) the dependency on few cultivated and domesticated plants necessitated the maintenance of food producing economy and led to the transformation of the traditional base of the society and /or modifying of the landscape. From the village farming community grew cities and the state.

Cohen (1977) believes the transition to community village farming was necessary in order to make adjustment to the naturally growing population. According to Smith (1976) the most significant consequences of food production society were: Increase in the number and density of human population, larger settlement and sedentism, impact on physical environment in addition to technological innovation. The increased population and the need for food induced more and quicker exploitation of available natural resources.

Man has interacted with environment through extraction of environmental goods and services to sustain his life. As world population increases, the rate at which environmental goods and services have been extracted has increased with some methods of extraction to a larger extent affecting the sustainability of environment to sustain human life. This has informed the various theories that have tried to explain the relationship between man and environment including Malthusian theory that is concerned with possibility of the finite resources of earth to feed the ever increasing world population. Another theory advancing the same debate is the limit to growth theory. Such theories have informed policy formulation aimed to address development challenges in the world especially the developing countries. The recent world

population explosion has taken place mainly in developing countries with consequences such as farmland fragmentation, reduction in farm size, land degradation and adverse environmental consequences.

The population-environment related problems have been more severe especially in Africa than other Third World Countries. This is because majority of poor people in Africa live in rural areas. Such areas have been characterized with dwindling land resource and high population pressure. This has meant that population-environment related problems have been more severe in such rural areas in Africa. Most of development scholars have directed their efforts in understanding how man interacts with the finite land resource as he extracts the economic value, environmental value and the social equity value in the midst of ever increasing population and resulting impacts. The intention has been the need to find the balance of all the three of these components to achieve a sustainable future of these rural areas.

Richer j. et al (2014) analyses the demographic and economic activities of the rural Malawi. In particular, he looks into how a change in population density affects agricultural activities and the household income. The finding of the study is that regions characterized with high population density has residence owning smaller farm sizes, lower income from agriculture sector and increase in off-farm enterprises.

In Nigeria, Agbo et al, (2014) analyses the impact of population density on rural land use patterns. The finding of the study is that most of agricultural land has been has been converted into settlement and other human activities due to high population pressure. The consequence of this has been reduction in food crop production leading

to hunger in urban Federal Capital Territory (FCT) of Abuja. Among the recommendation of the study as a remedy is a proposal for the government to construct low cost houses in designated places to avoid the conversion of agricultural land into settlement and other activities as a result of high population density.

The rural Ethiopia has majority of households engaging in agricultural activities. The favorable agro-ecological zones in Ethiopia highlands have attracted high population resulting into pressure on available land resources. The high concentration of agrarian population has resulted into shortage of cultivation farms, land fragmentation, vegetation clearance that has been accompanied with erosion. Menberu.T (2014) analyses the impacts of population growth of farmland and reports that scarcity of farmland and land fragmentation as the results of high population growth in rural highland of Ethiopia. The author advocates for family planning to reduce population growth while at same time encouraging intensification of agricultural activities and encouraging income generating non-farm activities.

Muyanga.M and T.S.Jayne(2014) tries to look into how Kenyan farmers responds to variation in population density and the accompanying land pressure. The study recognizes that about 40 percent of rural population resides on 5 percent of its rural land. The finding of the study is that there is reduction in farm size with an increase in population density and increase in land intensification to roughly 500 persons/sq.km. The study report a further increase in population density beyond this is accompanied with decline in farm intensification and household income.

2.3 Land Fragmentation and rural economy

2.3.1 Definition of Land Fragmentation

Land fragmentation refers to pattern of land ownership where an individual owns several parcels of land that are scattered over a geographical space. (Bentley, 1987). Farm composed of just one plot will be considered consolidated while a farm made up of several plots that are not adjacent to each other will be referred to as a fragmented farm. Land fragmentation is different from a similar but different concept of land subdivision and small sized farms. Natalia, 2013 notes that it is important to understand the difference as it will help in precise determination of nature and cause of land fragmentation thus help in coming up with proper policy interventions.

2.3.2 Causes and impact of land fragmentation

The causes and impact of land fragmentation varies among countries. For example, land fragmentation in Nigeria is seen to be caused by existing land tenure system and increasing population. It is believed to have an impact on both agricultural productivity and commercialization. Okezie Chukwukere Austin et al, 2012 tries to look into the impact of land fragmentation and how it affects food production. The study reports a higher level of land fragmentation with an average of 0.55 that has negatively affected agricultural sector as it is likely to lead to a lower application of modern farming inputs.

A review of literature on land fragmentation in Bulgaria recognizes its present and identifies it as a major hindrance to the achievement of sustainable socio-economic growth and development. In particular, land fragmentation has been blamed for poor evolving of land markets, poor extraction and utilization of land and other agricultural

or environmental resources, discouraging both the public and private investment e.tc in Bulgaria. The genesis of land fragmentation is believed to be the transition of the society in 1991 that saw Bulgaria adopts land reforms that resulted into a shift from a centrally planned society to a market economy society (Natalia Botalia, 2013). There is a need for distinction to be made between development challenges brought about by issues related to undersized farms from the related but different development issues of land fragmentation i.e having several parcels of farms. Natalia Botalia, 2013 emphasizes this by noting that presence of undersized farms may be a development problem but there is a need for policy makers to be certain with challenge they are addressing. This will ensure that right policy intervention targets correctly the problem to be addressed.

Just like Bulgaria, land fragmentation has been reported in other Central and Eastern Europe (CEE) countries. This has been due to changes both in their structural and policy dimension over the past decades. This has taken the form of collapsing the once large parcels that were collectively owned and that belonged to the state that characterized the socialist agriculture into a more individualized market oriented structured society (Klaus Deininger et al, 2012). For example, step taken by Albania in such structural land reforms is believed to have introduced the problem of land fragmentation despite helping avert a serious food crisis in 1990s. The believe that Albania's land ownership structure being characterized as too fragmented thus hindering effective and optimal production potential of land resulted into development experts advocating for a state initiated programs to consolidate land holdings (Klaus Deininger et al, 2012).

In his study Klaus Deininger et al, 2012 notes that inefficiency of small plots is one of reasons to why most of producers usually fail to utilize most of country's productive land resources. The author points out that there is possibility of farmers abandoning of cultivation fields whenever there is too small sized plots that are not guaranteeing an economically viable cultivation, limitation of transportation to farm land in cases where plots are far away from home or whenever there is a limited accessibility to capital thus making cultivation of such farms uneconomical. As a solution to problem of land fragmentation in Albania, the study recommends a sustainable cost effective land consolidation to address the problem of land holding size being too small for production. Also the need to address the failures in land markets if the poor and inefficiency in land markets is the reason for abandoning cultivation fields. Another study on effects of land fragmentation is given by Okezie Chukwukere Austin et al, 2012 who reports that in situations with a more pronounced land fragmentation there is evidence of high cost of production, reduced crop yields and case of lower financial returns.

2.4 Land Fragmentation, poverty and out migration

Migration refers to the movement of people or other organism usually in search for a better socio-economic or environmental opportunities or resources. Such movement are usually triggered by the unfavorable condition at the place of origin also referred to as push factors or can be due to attractiveness of the destination place, also referred to as pull factors. A combination of pull and push factors may work simultaneously in affecting migration of the place and their influence on migration may change with passage of time.

Such movement may be analyzed and understood differently. In first place, it may be seen as a way of adapting or a coping mechanism to a local problem as it regards resource use that is intended to last for a short time. Such movement may as well be understood as to introduce a more prolonged and much spread consequences despite solving a local short time challenge (Anderics and Hegmon,2011).

Man usually interacts with the environment and his activities triggers both environmental and social impacts. Mimbres region in southwest New Mexico gives a good case study. It is reported that this region experienced much reduction in soil fertility and vegetation cover during the drought season. This has been blamed for the major changes that occurred including the depopulation of the major villages in addition to the end of one of cherished tradition known as Mimbres Classic at about CE 1130(Nelson et al,2010).

Similarly,Sarfaraz Alam,(2003) reports that environmental crisis is one of the reason for the movement of people from Bangladesh towards India. The study notes that the existence of scarcity of resources in terms of land and water witnessed in rural Bangladesh has been brought about by a sudden population growth together with the witnessed environmental changes and unequal distribution of key resources. As a result, there has been a dwindling wages, household income together with degradation of natural human environment. The consequence of this has been migration as a coping mechanism for the affected rural population of Bangladesh to India where they perceive better prospects of life. The study point out the solution to such movement would entail remedial measure that should be taken at place of origin of such movement otherwise it is mostly likely to continue unabated.

Another study, Mahanta and Dasisy,(2012) tries to look into the link that exist between the migration that take place in the state of Assam in India and the degradation of the common resources. The study asserts that because rural peoples' livelihood is dependent on private property and common property resources, any changes that leads into reduction in their quality or quantity will end up reducing their livelihood. As a result of this, the affected population will tend to move to the nearby small and medium sized urban areas in such for livelihood. The study clearly brings about the relationship that exists between resource degradation, poverty and migration.

Ezra Markos,(2001) contributes to this topic by carrying out a study that tries to show how migration in the rural Ethiopia is related to the ecological degradation and the prevalence of poverty. Using a multilevel analysis, the author tests the hypothesis that several factors including individual, community characteristics as well as household characteristics influence decision making regarding outmigration. Analysis from the data sourced from Household and Community Survey conducted in 1994-1995 reveals that for economic reasons, there is a higher chance of out migration from household believed to be poor and living in an ecologically vulnerable environment when compared to households from less vulnerable ecologically environment and are considered wealthier.

The author tries to explain this. In the regions with greatest ecological degradation, the presence of high population and scarcity of cultivatable farms has resulted into surplus labor and unemployment. The poor households then send their family members to areas perceived to be having more employable opportunities. Ecological decline can be characterized by decrease in crop and animal production, famine and drought,

reducing sizes of farms e.t.c. Such occurrences necessitate the adoption of a coping mechanism that may include migration to other places in addition to diversification of household income generating activities.

Such findings have informed Government policies dealing with rural development in most of developing economies to include migration related components. In reference to Ethiopia, national population policy adopted by the government in July 1993 included the objective aimed at curbing rural-urban migration and the desire to achieve a more spatially balanced distribution of population. Such policies have been in consideration as it has been captured in regional policies under the concept of Rural-Urban balance. For instance, the 1979-1983 Kenya's National Development Plan emphasizes the need of simultaneously development of both rural areas and urban areas because should development concentrate in urban areas at the expense of rural areas will result into increased rural-urban migration at the rate which urban areas will not be able to accommodate the sudden increase population (Kenya,1979:45). The Sessional Paper No.10 on Economic Management for Renewed Growth advocates for policies that will ensure the growth of urban areas at same time promoting the growth of agriculture sector. The reason for this is the possibility of agriculture generating productive employment that will benefit rural population thus discouraging migration to urban areas. Similar argument for promotion of rural agriculture while developing urban areas is captured in Kenyan Poverty Reduction Strategy Paper (PRSP) policy document.

Promotion of agricultural sector is considered by development scholars as one of strategies that can help transform rural areas. Statistics show that most of the rural

poor engage in agricultural activities which is characterized by low farm production and low investment which has resulted into lower incomes for rural households. Manda et al, 2001 reveals that there has been a deterioration of living standards in Kenya as indicated by increased population without enough food, inaccessibility to basic needs including safe drinking water, good education and health services. Vihiga County exhibits such characteristic as it is considered as County that is densely populated and whose population lacks enough food (GOK, 2005). The ever rising population and the shrinking resource endowments have been blamed for hindering efforts to reverse this situation. It is reported that the country's farmland is on a steady decline move both in terms of size with average size at 0.5 hectare and soil fertility (Amudavi, 2002 and Mango, 2002). In 1999, there was a 58% of population in the county who were considered to be below poverty line which is 3% increase from the same category of people in 1994 that was reported to be 53 % (Republic of Kenya, 1998; Republic of Kenya, 2003a). This has attracted a number of studies in the region most of which aim at improving the rural economy and the general welfare in the region.

In effort to understand the dynamics of poverty in this region, Gamba and Elliot, (2004) carried out a study with three main objectives: In first place, the study measured the prevalence of rural poverty in 1997 and 2000, based on the nationwide Tegemeo survey data. Then it categorizes households according to whether they were above the poverty line in both 1997 and 2000, entered into poverty or exited from poverty between 1997 and 2000, or were above the poverty line in both years. Lastly, the study identifies the household-level and community-level factors

associated with rural poverty through econometric analysis. In addition to this, the implications of these results for the design of appropriate poverty reduction strategies were considered. Such analysis was intended to guide donor programs and interventions designed to attack the roots of chronic poverty. The panel data used in the analysis was obtained through rural household surveys conducted in 1997 and 2000. These surveys covered 1441 households in both 1997 and 2000. Eight (8) zones which formed 26 districts were analyzed of which Western Highland zone was composed of Vihiga and Kisii Districts. The result of poverty dynamic by zone classified Western Highland, under category of chronic poverty, in a third position with 58.3% of household considered to be chronically poor. Western Transitional zone Bungoma and Kakamega districts had 59% while Western Lowlands composed of Kisumu Siaya districts had 68.6%. The term chronically poor as used in the study referred to those households which fell below the poverty line in both 1997 and 2000.

Wasswa Kuyiah et al, 2006 reports that 60% of total household income in the study area comes from farm production. The study also links the income from farms and the size of farms by indicating that there is a decrease in household income as farms continue to decrease in size irrespective of the on farm enterprises. This low household income affects other sectors of production. It takes the form of unemployment as small farms can be managed by family labour other than hiring labour force. It also affects those engaged agricultural chain of production as there is lose of employment and income among traders and consumers of agricultural goods and services. The development of rural areas like Vihiga requires an emphasis on higher value enterprises that will be able to generate more returns on the limited land resources as

opposed to subsistence production as mostly practiced by rural households. Given the ever decreasing land size, off-farm and non-farm enterprises provides a viable option which rural households can secure their livelihoods. Development policies that encourage the growth and establishment of rural non-farm enterprises in addition to the accompanying favorable institutional framework are likely to bring about household income diversification. This will lead to the absorption of excessive labour force from the farm activities. Because most of poor rural population depends on the extraction of primary resources, more research should be carried out to determine efficient extraction of available resources as well as proposing the best land use or mode of production that satisfy the different needs of farmers who have heterogeneous endowment of such resources and potential of extraction.

Mango et al (2004) expounds on the argument for diversification of household income and the need to protect and conserve key resources on which rural livelihoods depends. This is through his work that seeks to understand the social aspects of dynamic poverty trap in Vihiga, Marsabit and Baringo counties. He does this by analyzing how different households have managed to struggle out of poverty or maintained to stay out of poverty for a period of ten to twenty years and compared to household that have either descent or got trapped in poverty over the same period of time. The study finding indicates that poverty is a result of interaction of various forces that interact with each other as well as reinforcing each other. Such interaction includes socio-economic processes, political processes in addition to environmental processes. The study reports that diversification of farm activities, engaging in off-farm activities and investing in education were some of the key strategies adopted by

households that managed to escape from poverty in the period of the study. The study also acknowledges the link between the management of natural resources and the prevalence of poverty. On this it notes that households that managed to escape poverty in the study region over the stated period of time were more involved in the management of natural resources than households that either slipped or got trapped into poverty.

2.5 Solution to problem of high population density, land fragmentation and rural poverty

2.5.1 Concept of land consolidation

This is a process that involves a property being given to different individuals in varying portions as determined by an individual contribution. As a process, it is not limited to a simple re-allocation of farm parcels to address the challenge of land fragmentation but finds a wider application in economic and social reform. (FAO, 2003). It also takes the dimension of agrarian spatial planning and farm parcels re-adjustment. On this note, it represents agrarian structure aimed at achieving stability on farm activities, production in agriculture sector and the improvement in physical infrastructures in the rural areas (Vitikainen, 2004). Land consolidation has been considered by several development scholars as best approach to achieving improved agricultural production as well as general rural livelihoods improvement. Among those advocating for land consolidation believe that by helping address land fragmentation, it ensures improvement of tenure structure thus helping in rural development. Also ensures better agrarian arrangement by helping achieve fewer land parcels that are large and better shaped (FAO, 2003).

2.5.2 The concept of land bank

Damen (2004) defines land bank as a process where there is a temporal acquisition and management of a land parcel by an impartial agency with aim of giving it back through redistribution or by lease out in order to achieve improved agricultural structure for better production or assigning the land for other uses of general public interest. Land bank helps in achieving changes in land by:

Place: An individual can exchange by selling in one location and buying in another place.

Quantity: Small farm parcels can be joined to form larger parcels

Quality: An individual can sell or give an amount of lower quality land in return for smaller quantity of better quality land and vice versa.

2.5.3 Approach to implementation of land consolidation in Europe

Land consolidation is not a new concept in most of Western European countries. In Denmark, it can be traced back in 1780s when family ownership of land replaced individual entitlement to land ownership Hartvigsen (2005). Despite these earlier evidence of land consolidations, development scholars have linked improved standards of living in European countries that happened mostly after World War II to land consolidation that took place during this period Thomas (2006b). Such improvements have led to scholars and development experts to consider land consolidation as an important approach to the realization of rural development.

The objectives land consolidation implementations have varied among the European countries. This has included the desire to create more job opportunities in rural areas

and promotion of those activities that will realize the general improvement of rural residents' livelihoods. To help realize this, approaches advocated for has been ones that avoid or reduce further division of land and land tenure system that encourage the use of land without or with limited chances of changing its ownership. Lemmen and Sonnerber (1986) attributes the vibrant agricultural and a stronger economic development of rural areas in Western Europe to rural land consolidation. This notion is supported by Vitikainen (2004) who asserts that land consolidation in West and Eastern European countries has been instrumental to the realization of improved infrastructure, public social amenities, better housing, the safeguarding of natural resources and the general sustainable development of rural areas.

Two approaches have been used by several Western Europe countries in implementing land consolidation process. For instance; Denmark has adopted the voluntary land consolidation approach. However, some countries like Germany, Netherland and Sweden compulsory participation have been reported in some of projects of land consolidation.

The problem of land fragmentation and farm size has been dealt with differently in Western Europe when compared to Central Europe. This is because the nature of the problem manifest differently in the two regions. Western Europe had a problem of both land size and that of internal fragmentation. Internal fragmentation means that several parcels of land are owned by one person a challenge that was addressed by both land consolidation and land banking approaches. Considering Central Europe, another challenge of land fragmentation was witnessed. There were more land owners as well as fragmentation in terms of land use. This meant that process of land

consolidation was complicated by the fact that there was a strong attachment between farmers and their land when compared to Western Europe. Land banking was the best alternative to land consolidation in Central Europe. This is because it can consider both challenge of land size as well as separation of the use and ownership of the farms. Land bank acquires and redistributes land parcels for the purposes of enlarging the existing farm in addition addressing the issues or the gap between land ownership and its use by ensuring current uses own land through purchase. Thus Van Dijk(2004) concluded that “land banking generally makes a better match with central European land fragmentation than land consolidation does”.

Land consolidation has also been encouraged as a solution to land fragmentation problem in Africa. Gabresclasic (2006) reports farm fragmentation as one of the structural farming in Ethiopia where farms are fragmented on average in 2.3 plots each with 0.35 hectares. One of the solutions to these challenges has been the federal government of Ethiopia advocating for land consolidation but under voluntary exchange (Alemu, 2012).

2.5.4 Rural land use planning

Some countries have recognized the role played by rural areas such that serious plans have been developed to ensure continued economic viability of such regions. An example of such countries is Australia. To understand how Australia plans and develop its rural areas, this study reviews Australia’s *State Planning Policy No. 2.5: Rural Planning (SPP 2.5)* which was prepared by Western Australian Planning Commission. The aim of this policy is to ensure that values of such rural areas are extracted sustainably. Such values includes but not limited to extraction of rural

economic values, extraction of rural natural resources, food bucket to feed the ever increasing population in addition to aesthetic values. This policy was formulated in realization that optimal extraction of such important values from rural areas can only be achieved when various conflicts of land uses is avoided.

This policy has been a vital in informing planning decision making both at national level by the state and at local level by local government. For instance it has informed decision on subdivision request for various zoned rural land in conformity with the Development Control Policy 3.4: Subdivision of rural land. The general aim of the policy is to ensure compatibility of various land uses that will ensure sustainable wealth generation from the rural areas.

2.6 Theoretical Framework

The study is based on two theoretical frame works. The Malthusian Theory of Population growth and Limit to growth theory. Malthus was very concerned by the condition of the poor and particularly by rural poverty. It's because of this that his work was skeptical of notions of the perfectibility of the society. Thomas Malthus gave his views regarding the rate of population growth and the potential of earth to produce food which is a basic need for the sustaining population on earth. In his work published in 1798, he believes that human population is growing at a faster rate compared to the rate at which food is being produced. Malthus is of the opinion that policy measures should be put in place to ensure a balanced rate of population growth to that of food production. According to the theory, in areas where land is abundant, population when unchecked grows in a geometric ratio and will double every 25 years. Because subsistence food production grows at an arithmetic ratio, there still will be

growth of production but due to the different growth ratio population will eventually press against means of subsistence. Malthus is of the view that there will be a decrease in population once a ceiling is reached because any further increase in population will be prevented or controlled by both positive and negative checks. Negative checks will take form of low fertility rate that will come about because of abstinence or late marriage. Preventive checks to population growth are those applied by man and takes different forms. For instance, man will prefer a smaller family after seeing distress and challenges of raising a larger family by referring to individuals or households with large families. Man may fear that he is likely to drag his children in poverty or charity as he is likely to be unable to provide to them effectively. In addition to this, there is a higher possibility of being exposed to a greater hardship and strenuous labour as he struggles to provide for his family. By considering this, man will prefer to have a smaller sized family. Positive checks will take any form that will lead to increased mortality rate while reducing life expectancy. This will include events like famine, war and diseases. These processes will ensure that population is reduced to a level that can be sustained by available quantity of food production.

The limit to growth has roots in Malthusian theory which view population growth as a function of food production. Limit to growth theory is traced back in 1972 to 'Club of Rome', which was set up by environmentalists, bureaucrats, scientist etc that published a report in book 'Limit to Growth' in which they said that development cannot go infinitely. According to this theory, any activity man engages in requires input either directly or indirectly of natural resources. In addition to this, such activities produce waste. The theory notes that there is a limit how much environment

can absorb without permanently impairing one or more of its resources and processes. The theory predicted that the planet was not capable of supporting and sustaining growth activities infinitely. The model has been criticized for not accommodating the rate at which innovations can appear and for the perception of the finite capacity of man creativity. It has also been criticized for predicting about the world collapse and energy resources exhaustion by 1992, an event that has not happened. However, it's worth noting that the idea was more to suggest the criticality of situation and not to predict the exact date. In other words the concept is not an exact prediction but is suggestive of the future possibilities in terms of consequences. The model conclusions were based on the appreciation of the world from a system's perspective by accounting for interaction of different components with emphasis on how they influence or enhances each other. This is grounded on the fact that the world problems are not simple linear cause-effect relationship and because of the complexities involved, it is not possible to objectively identify the precise triggering factor. Credit is given to the model for accounting to such a dynamic interdependence across the components as man interacts with the environment.

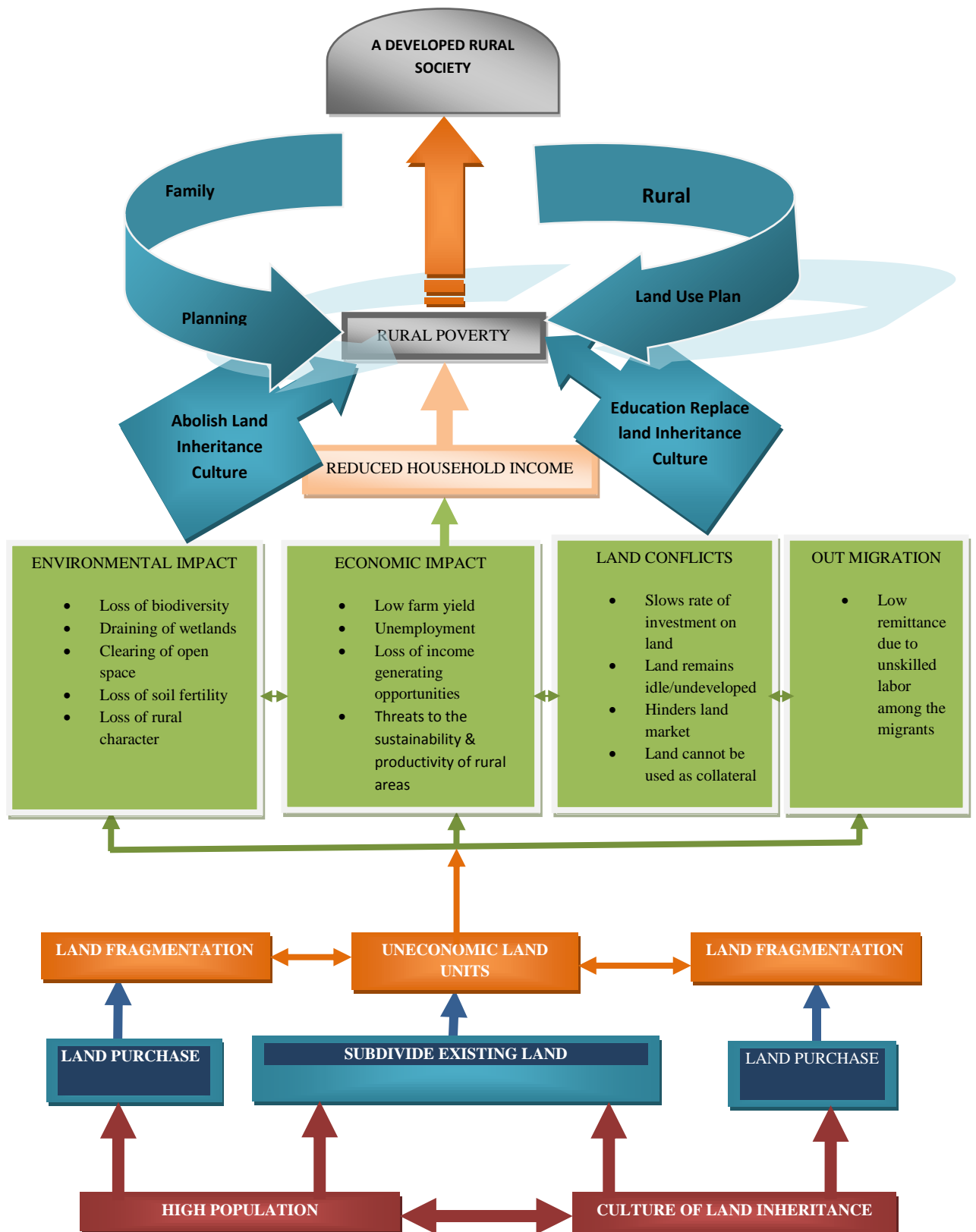
2.7 Conceptual Framework

Land is a gift of nature and limited in supply. It is on this limited resource that majority of poor in the developing economies depend. With increasing population, which has led to an increase in demand or wants, a lot of pressure is placed on land with need to get basic needs. At the same time, culture in most Africa societies demands family head to subdivide family land equally among the heirs. This has resulted into decreasing land units after every generation. Man has reacted to the

situation by intensifying cultivation and extraction of this limited resource. In effort to increase land space for cultivation, wetlands have been drained, forest cleared and ecologically fragile places converted to agricultural land. Open spaces as well have been converted to agricultural land.

However the impact has been reduction in both quality and quantity of farm yields. This has been attributed to exhausted land nutrients, land degradation in form of soil erosion and loss of important substances provided by land that are sourced from both plants and animals due to loss of biodiversity. Man has come up with coping mechanism to deal with challenges brought about declining output from land resources. At one level, this has taken the form of diversification of land use, commercialization of farming and incorporating modern technology while others have opted to increase the farm size by purchasing additional land parcels. Farmers rarely find a willing farmer with adjacent land who can sell his/her parcel. The only option available is a piece of land that is separated from his land by parcels belonging to different farmers. This leads to land fragmentation. On same note, house head with small family piece of land tend to acquire more through purchasing with aim of satisfying the passing equal size to the heirs. The same result in Land fragmentation because they get different land parcels that are not adjacent to the family land. Family heads that are unable to purchase land because of financial constraints, have no option but to adhere to the requirements of tradition of inheritance by subdividing the little they have among the heirs. This has resulted into small sized land units that are uneconomical for development considering the type of production system in the area.

Figure 2 Conceptual Framework



CHAPTER THREE

3.0 METHODOLOGY

3.1 Introduction

This chapter reports the procedure that was followed in carrying out the study. It starts by describing the study area research design and how the respondents were identified. The methods used in collecting data are also given in addition to methods of analyzing the data. The information is presented in form of maps, charts, tables, photographs and text.

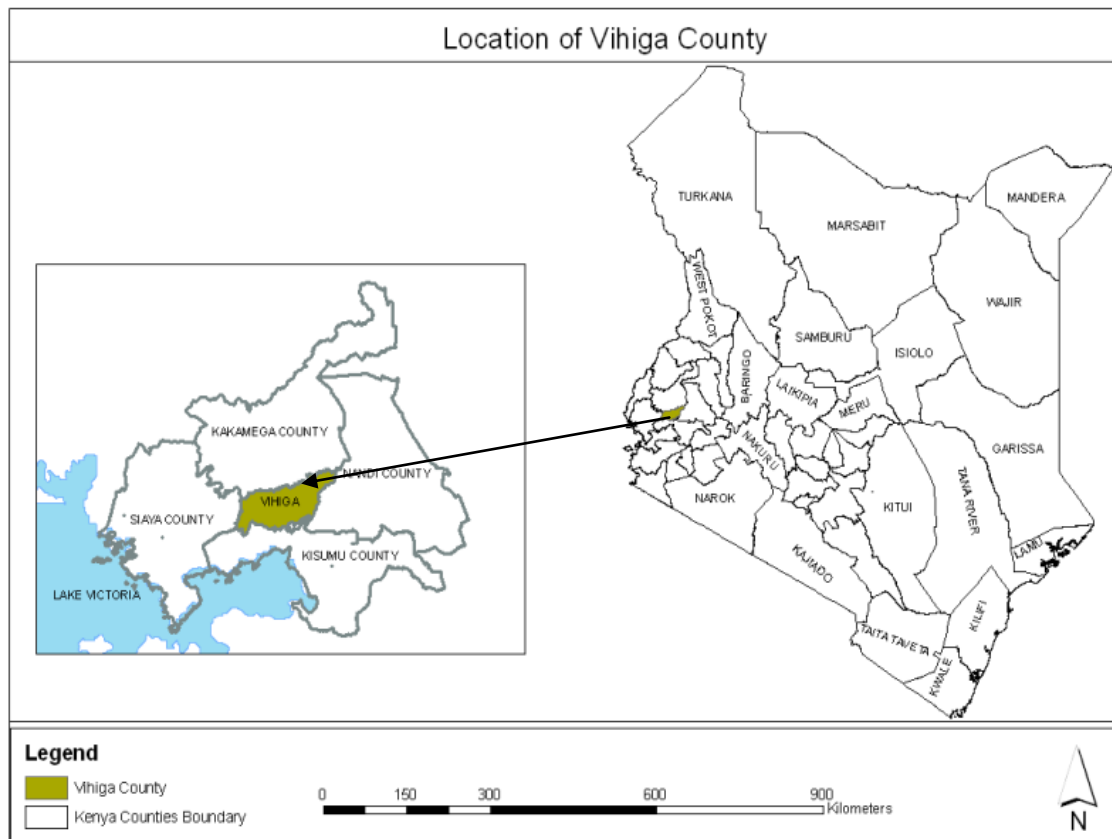
3.2.0 The study area

3.2.1 Position and size of the County

Vihiga County is one of the 47 counties recognized in the constitution of Kenya. Geographically, the county is found in Western part of the country within the lake Basin Region. It lies between longitude 34°30' and 35° 0' East of prime meridian and latitude 0° 15' North. The equator cuts through area at the south tip of the county and therefore has an influence on the climate of the county. The county measures 33 km wide from east-west and 19 km from north to south. Vihiga County borders Kakamega to the North, Kisumu to the South, Siaya to the South-west and Nandi to the East. Presently, there are three local authorities in the County: Municipal council of Vihiga, County Council of Vihiga and Town Council of Luanda. The three local authorities have twenty nine (29) electoral wards as follows; County Council of Vihiga (18) wards, Municipal Council of Vihiga (6) wards and Town Council of Luanda (5) wards.

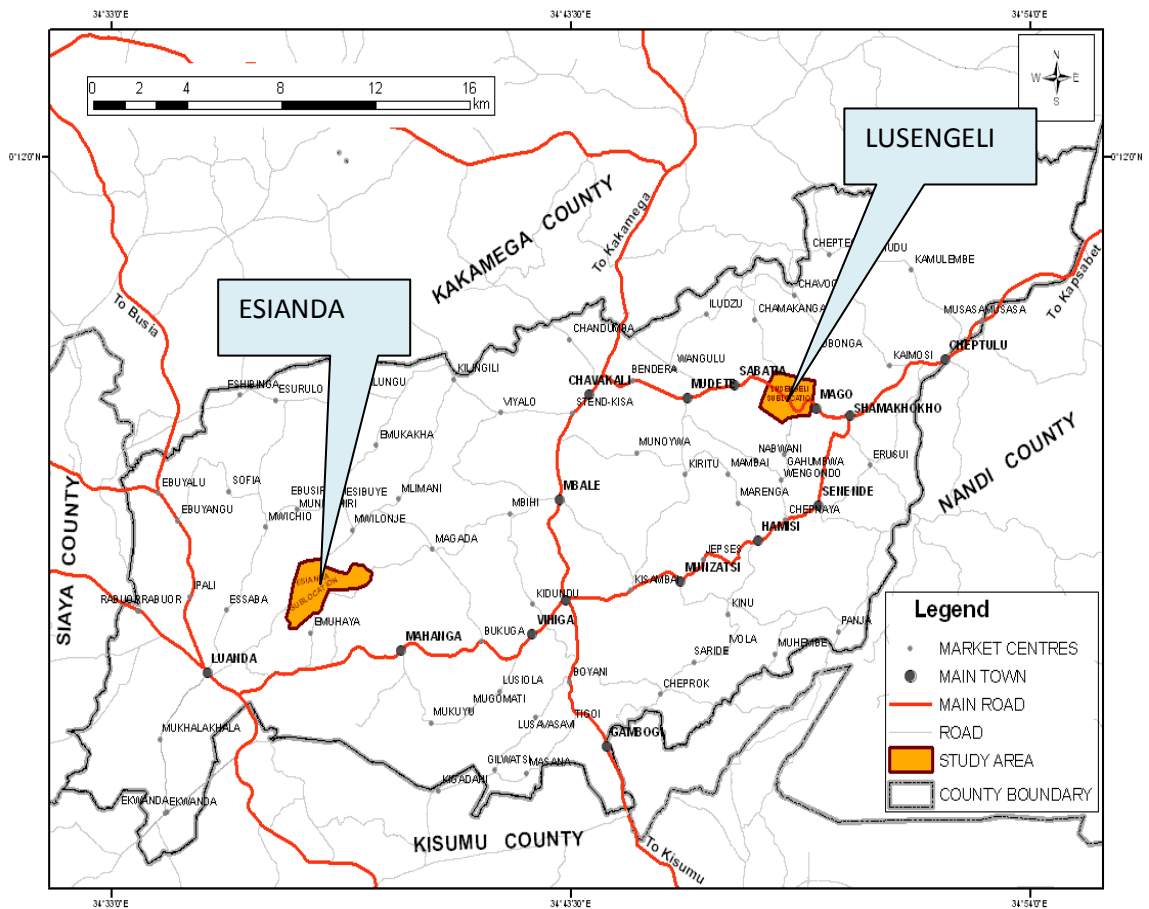
The County is administratively divided into four sub-counties i.e. Vihiga, Emuhaya, Hamisi and Sabatia.

Figure 3 Location of Vihiga County



Source: Author, 2017

Figure 4 Location of study area



Source: Author, 2017

3.2.2 Physical and topographic features

Vihiga County is characterized with undulating hills and valleys. River Yala nad Esalwa together with several streams generally flows in northeast to southwest drain into Lake Victoria. Agricultural activities which includes cash crops like tea and coffee is supported by good soil classified as sedimentary and rainfall that ranges from 1800-200mm. The County is suitable for crop and livestock farming that includes fruits and horticulture production. There are rocky hills in many parts of the county notably in South Maragoli, Jepkoyai, and Gamoi and around Kima.

3.2.3 Climatic conditions

The county's climate is characterized as equatorial, average annual precipitation of 1900mm, rainfall range of 1800-2000mm, temperature range between 14°C -32°C with mean of 23°C. There are two rainy seasons; long rain in month of March, April and May while short rain in month of September, October and November. The humidity of 41.75% is experienced in the month of December, January and February which are the driest and hottest months.

3.2.4 Ecological conditions

There are two agro-ecological zones in Vihiga County. The Upper and Lower midlands which are well drained fertile soils; the lower midland zone which have red loamy sand soil that has been derived from sedimentary and basalt rocks. Hamisi, sections of Vihiga constituency and Sabatia are found in Upper midlands zone while Emuhaya and Luanda constituencies are found in lower midland zones. These zones have influenced the type of land use as well as settlement pattern in the county.

3.3 Research design

A case study approach was adopted for this research using both qualitative and quantitative data. This study took place in two sublocations, Lusengeli Sublocation in Sabatia sub-County and Esianda Sublocation in Vihiga sub-County. The two sub-Counties is part of four sub-Counties that make up Vihiga County.

The two sublocations were selected through a process of simple random a sampling from sampling frame made up of all sublocations in the county. In addition to the interview of key informants, observation and household questionnaire, the use of focus

group discussions was also adopted as a method of data collection. Composition of the focus group discussion was designed in such a way that all villages in the concerned Sublocation were represented. Gender consideration was emphasized with both men and women attending; not forgetting the age composition. This included the old members of society (oldest date of birth recorded is 1934), the middle aged groups (with the age of birth recorded ranging from 1950 to 1977) and the youth (with the age of birth recorded ranging from 1980 to 1987). Secondary data were collected from books, published reports, journals and authoritative websites on land fragmentation and uneconomical land subdivision. The data was collected with the help of four research assistants, two male and two female. The research assistants were required to have secondary school level of education in addition to being able to speak the local language.

Figure 5 Household interviews



Information from administrative authorities and secondary data were collected by the researcher himself. The target population was all households in Vihiga County with respondents being head of the household or their spouse. In addition to this, opinions of administrative authorities and village elders were sought. Focus group discussions were held with sixteen (16) locals born between 1934 and 1987 in Lusengeli Sublocation in Sabatia District and five (5) Village elders in Esianda Sublocation in Vihiga District.

Figure 6 Some of the occasions during the focus group discussions



Figure 7 Participants in focus group discussion at Esianda Sublocation



Purposive sampling was used to select more of locals whose livelihoods had once depended on agriculture and who had spent most of their lives in the area. The discussion was designed to cover the life history of the informants, from childhood to the present focusing on their individual experience and perception of landscape change while putting the conversation within the broader context of changes in land size and the resulting social and economic changes that can be attributed to the ever shrinking land sizes and land fragmentation. The intention was to collect quality information from inhabitants in the area who had lived in the area for a long time thus are in a position to point out some of the key changes that have occurred in the region. Choice on who to involve in the focus group discussion was made with the help of village elders of the study area.

The focus group discussion was preferred because it enhances a face to face interview that can allow the moderator to keep the discussion under control and focus on the areas of interest as described in the moderator discussion guide. Free and open discussion among the respondents can help in generation of new ideas. In addition to this, a focus group can enable the researcher to observe the discussion in order to better understand the research findings and also to control the quality of the whole process. A house hold questionnaire was used to capture details at the household level regarding the topic under the study. Key informants included religious leaders, assistant chiefs, academicians and other government officers.

During the focus group discussion in Lusengeri, three groups were formed based on their age: the old aged group (with age range of 1934-1950), the middle aged group (age range of 1951-1975) and the youth (age range of 1976-1987). With the help of research assistants (who were trained to moderate the focus group discussions), the three groups were separated and same questions asked. The youth and middle aged group were given a card and required to write responses to asked questions. Discussion was allowed among the respondents after completing the questions. Those in the age group of 1934-1950 had a separate open discussion on the study topic. The intention was to get the views of different age group and compare. Before administering the household questionnaire, research assistants were trained on how to probe for more information and also on the need to report information as presented and avoid biased reporting. Research ethics and good personal relation was emphasized. The field work started by requesting research permission from respective sub county offices with research authorizing letter being addressed to both the Chief

and Assistant chief of the respective sublocations (See appendix I and II). With the help of Assistant chief and Village elders, focus group discussion was organized. Research assistants were informed of the expectation of the research and trained on use of the data collection instruments. The household questionnaire was tested in Mudete Sublocation to determine its effectiveness. The errors identified were corrected in the final household questionnaire and clarifications made by the researcher as per the questions asked by research assistants. Possible challenges to be met were identified, discussed and agreement on how to solve them agreed on. After this, the following day was an intensive field data collection.

3.4 Research population

The population under study was all households in the study area. The study took place in Esianda Sublocation, Emusenjeli Location; Emuhaya Division Vihiga sub-County and Lusengeli Sublocation in Wodanga Location in Sabatia sub-County.

The total number of households in the study areas was 1, 629 (Lusengeli 665 and Esianda 964), giving the population under study as 1,629 households.

3.5 Sample size

The calculation of the number of households to be used in the study was based on a standard sample size calculation formula (*Fisher et al, 1991*) designed for large populations.

$$n = \frac{(Z_{\alpha/2})^2 pq}{L^2}$$

Where n = sample size

$Z_{\alpha/2}$ = Z-the value at the chosen confidence interval (for 95% confidence interval=1.96)

p = estimated population with attributes of interest which

If unknown we use

p = 0.5

q = 1-p and

L = precision (chosen to be 0.05)

For this study, sample size calculation was done using the following values:

p = 0.5

q = 0.5

$Z_{\alpha/2}$ = 1.96 for 95% confidence interval.

L = 0.05

Therefore $n = \frac{(1.96)^2(0.5 \times 0.5)}{(0.05)^2} = 384$ households

p=0.5 (maximum variability). The study desired a 95% confidence level and $\pm 5\%$ precision. The resulting sample size is demonstrated in the equation above.

Because of finite population, the sample size was reduced slightly. This is because a given sample size provides proportionately more information for a small population than for a large population. The sample size (n_0) has then been adjusted using the equation that follows.

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

Where n is the sample size and N is the population size. The population under study is 1629 households. (Lusengeli 665, Esianda 964). The sample size that would now be necessary is derived from the equation below;

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}} =$$

$$\frac{385}{1 + (385-1)} = 310 \text{ households}$$

1629

The number of household per sublocation was arrived at as follows:

Lusengeli Sublocation=

$$665/1629 * 310 = 126.55 = 127 \text{ households}$$

Esianda Sublocation=

$$964/1629 * 310$$

$$= 183.449 = 183 \text{ households}$$

All households in each of the sublocation were listed with the help of village elders.

Each household was given a unique identification number (numerical) and using simple random method, the households to be interviewed were selected.

3.6 Data collection methods and analysis

3.6.1 Measuring land fragmentation with the Simmons Index

Land fragmentation was measured using the Simmons Index (SI) formulated by Simmons (1964) as follows:

F.I. (Fragmentation Index)

$$= \sum a^2 / A^2$$

The index can better be expressed as

$$SI = \sum_i A_i^2 / A_j^2$$

A_{ij} is the area of the i th parcel of the farm j ;

$A_j = \sum_i A_{ij}$ is the total farm size for farm j ,

The SI index is calculated for each household. It considers the following parameters: Total number of land parcels, the size of land parcels and the total farm size. The results of the calculation will be between zero and one. The interpretation of SI results is that a value of one will mean a consolidated farm i.e a household owns a single parcel of land. A value near zero shows higher level of fragmentation i.e as SI values moves towards zero, number of land parcels owned by individual increases.

3.6.2 Impact of uneconomical land subdivision and land fragmentation on out migration

In the household questionnaire, respondents were asked to make an inventory of the members who have moved out of the family between the year 2000 and 2012. Data concerning age, sex, education level, relationship to households head, and reason for

migration was gathered for each migrant. Emphasis was placed on investigating the economic status of households from which members migrated, the level of farm size and land fragmentation of the household that experience higher rates of migration, and individual characteristics of migrants. This was to enable in predicting who is likely to choose to migrate in the future. As highlighted by Markos (2001), migration surveys usually face methodological difficulties. If they are conducted in destination areas, they can collect information only on in-migrants and non-migrants in areas to which others have moved. If surveys are conducted in migrants' areas of origin, information about them can be collected only from non-migrant family members or relatives who remained behind. This study was done in place of origin. This is because it is the interest of the study to understand the effects of origin characteristics on out-migration.

3.6.3 Household economic impact of land fragmentation and uneconomical land subdivision

The study considered on-farm activities, off-farm activities, crop diversification and other coping mechanisms to challenges posed by land fragmentation and uneconomical land subdivision. Income from on-farm activities was considered under the following categories:

- Agriculture -crop farming, animal husbandry and
- Non-agricultural

Income from off-farm activities: Variables considered included their location, type and number of such activities.

3.6.4 Environmental impact of uneconomical land subdivision and land fragmentation

Possible effect of Land fragmentation and uneconomical land subdivision on the environment was also looked into. The following were areas of emphasis: Impact on plant and animal diversity, impact on water bodies (e.g. wetlands) and the impact on community cultural values.

3.6.5 Policy interventions that can ensure economical land subdivision

This was achieved by critically reviewing the existing land use policy targeting rural areas, its strength and weakness, literature review on how different countries have dealt with the problem of land fragmentation noting both what led to success and possible challenges involved. The questionnaire targeting respondents involved inquiry on possible sustainable ways of stopping or reducing uneconomical land subdivision and land fragmentation. In addition to this, the focus group discussion guide included a question of remedy to land fragmentation and uneconomical land subdivision. Respondent opinions on the best settlement pattern that can help reduce Land fragmentation and uneconomical land subdivision was captured in the questionnaire. The respondent was required to make a sketch of the land use type on his/her farm indicating location of settlement. This was to give an idea on common settlement pattern existing in the community. Another sketch depicting land use arrangement whereby a family is settled at one place and the rest of the farm is utilized for various land uses with boundaries running across the farm was provided. Other sketches depicting linear, clustered and dispersed settlement patterns were provided. The respondents were then required to compare the sketches and give their opinion on

which pattern can help in reducing uneconomical land subdivision. The respondent was then requested to list some of the challenges that may be faced during implementation of the chosen settlement pattern and how they can be overcome.

3.7 Data analysis

Data was analyzed by use of statistical software SPSS, and Microsoft excel. The raw data was first coded and entered into SPSS and Microsoft excel. In some cases, interpretation was required as some of the responses were written in the local vernacular language. Descriptive statistics were used in the analysis of the data collected. Results have been presented in form of tables, charts, photographs and text description.

CHAPTER FOUR

4.0 FINDINGS

4.1 Introduction

This chapter presents analyzed and summarized information from respondents. The information is captured and presented in form of tables, pie charts, photos and text. The chapter is organized into three sections: The existing situation, the impact of land fragmentation and uneconomical land subdivision and the proposed solution to the problem of land fragmentation and uneconomical land subdivision.

4.2 Existing situation

From the of persons interviewed, 75% of respondents had lived in Vihiga County since birth, 5% had come to Vihiga as a result of marriage, 8% were in the area of study because of business, 6% had bought land in the study area and another 6% had come to work in Vihiga.

4.2.1 Findings on land fragmentation with the Simmons Index

Respondents who admitted that they owned other pieces of land besides the one they reside on were 44%. Table 3 summaries the findings while the pie chart gives feedback to why they purchased additional land parcels.

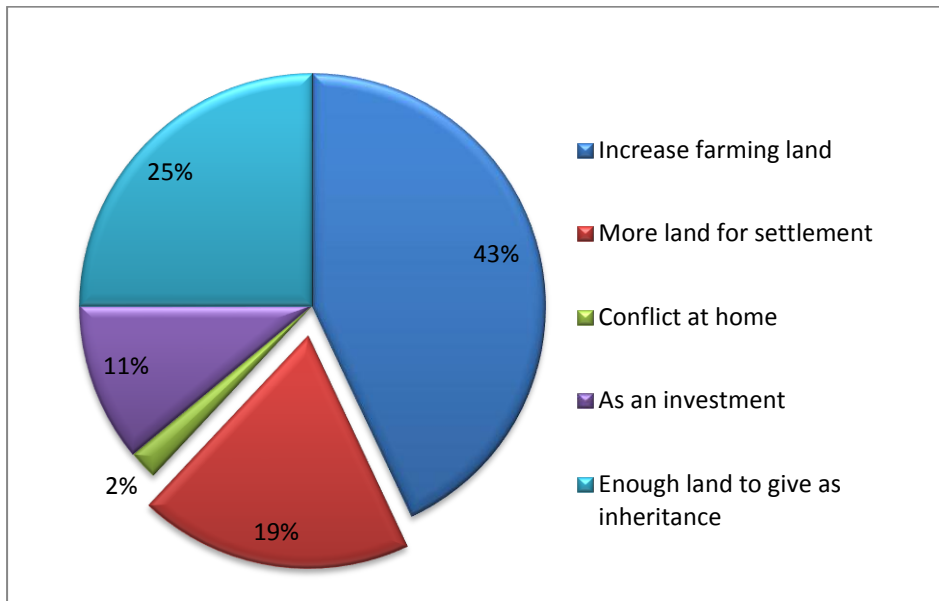
Table 3 Simmons Index (SI) and land size findings

Location Variables	Lusengeli Sublocation	Esianda Sublocation	Average
Simmons Index (SI)	0.50	0.80	0.65
Minimum land size (ha) {land household reside on}	0.38	0.45	0.415
Maximum land size (ha) {land household reside on}	4.00	3.00	3.50
Minimum land size (ha) {land owned elsewhere}	2.00	1.00	1.50
Maximum land size (ha) {land owned elsewhere}	12.50	10.00	11.25
Households with 1 farm only (%)	34.00	78.00	56.00
Households with 2-3 farms (%)	64.00	21.00	42.50
Households with 4-5 farms (%)	2.00	1.00	1.50

4.2.2 Opinion on reason for owning other land parcels

Respondents were asked why they had preferred to own additional land. Their response is as given in Figure 8.

Figure 8 Reason for owning other land parcel



4.2.3 Opinion on method of acquiring additional land

The respondents were asked to give information on how they had acquired the additional land they own other than the one they reside on. Their feedback indicates that the method of acquiring additional land was mainly by purchasing (81%), inheritance (17%) and by leasing (2%).

4.2.4 Location of the additional land

Respondents were asked to indicate the location of their additional land. The answers given are summarized in the Table 4.

Table 4 Location of the additional land

Location	% of respondents	% of respondents	Average (%)
	Lusengeli Sublocation	Esianda Sublocation	
Vihiga County	31.0	41.0	36.0
Uasin Gishu County	9.0	6.0	7.5
Trans Nzoia County	30.0	22.0	26.0
Kakamega County	8.0	12.0	10.0
Nandi County	18.0	17.0	17.5
Kisumu County	3.0	2.0	2.5
Migori County	1.0	0.0	0.5

4.2.5 Opinion whether the land parcel on which the household reside on was part of the larger parcel that had undergone subdivision

An inquiry into whether the land parcel on which the household resides on was part of the larger parcel that had undergone subdivision attracted 97% ‘Yes’ answers from the respondents. The reason of subdivision was mainly as a result of land purchase or need to pass land to new owners as part of inheritance requirement.

Upon subdivision, new land owners included 91% male and only 9% female. The 9% land acquired by women was mainly through purchase (8%) while only 1% was through inheritance. Fifty seven percent (57%) of respondents reported that they owned the land parcels they reside on with details regarding methods of acquisition and form of ownership as given bellow.

4.2.6 Methods of acquiring the land households resides on

How the land that the household own revealed the following as summarized in the Table 5.

Table 5 Methods of acquiring the land

Method of acquisition	% of respondents Lusengeli	% of respondents Esianda	% of respondents Average
Inheritance	62.0	78.0	70.0
Lease	2.0	1.0	1.5
Allocation by Central government	0.0	0.0	0.0
Allocation by County Government/Local Authority	0.0	0.0	0.0
Cooperative shares	5.0	3.0	4.0
Purchased	31.0	18.0	24.5
Others	0.0	0.0	0.0

4.2.7 Form of land ownership

The table below summarizes the findings regarding the form of land ownership that the households have.

Table 6 Form of ownership of the land

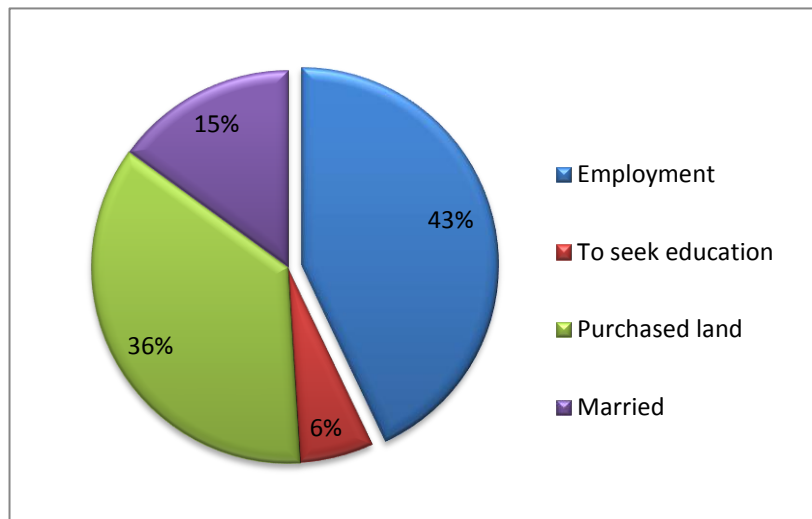
Document type	Respondents from Lusengeli (%)	Respondents from Esianda (%)	% of respondents Average
Freehold	32.0	24.0	28.0
Lease	2.0	1.0	1.5
Temporary Occupation License	17.0	11.0	14.0
None	49.0	64.0	56.5
Total	100%	100%	100%

4.3 Impact of uneconomical land subdivision and land fragmentation

4.3.1 Impact of uneconomical land subdivision and land fragmentation on out migration household

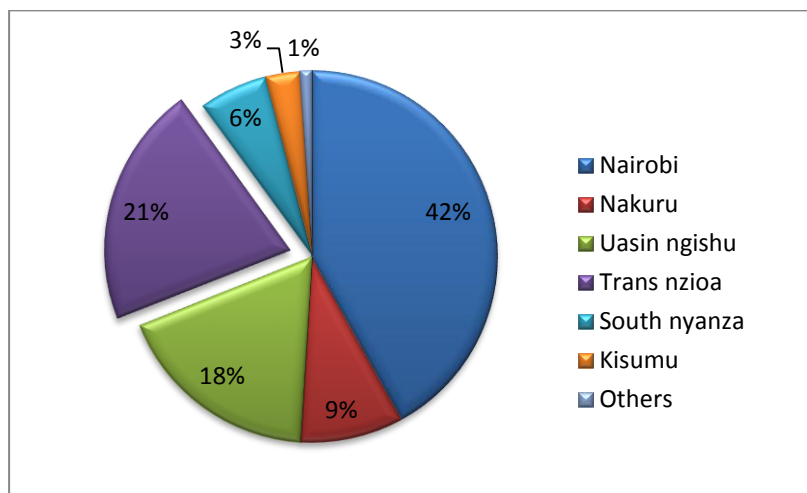
The study found that one of the effects of land fragmentation was the net migration out of the study area to other places. Several reasons were given as to why a family member had moved as indicated in the Figure 9.

Figure 9 The reason why a family member had moved to another place



The question of where they had moved to attracted varied answers as shown in Figure 10.

Figure 10 Destination for those who had moved from the family land



4.3.2 Economic impacts of land fragmentation and uneconomical land subdivision

Uneconomic land subdivision has resulted in low farm yield thus affecting household income. On-farm economic activities, through small scale farming were reported by

67%. Both livestock and crop farming is practiced with zebu cattle being local breed largely reared. Output from this type of farming was mainly for subsistence use as low yields were reported. The low yield from farms has resulted into a growing trend of off-farm activities. Off-farm activities as reported by 43% were mainly small scale businesses. Small land sizes have resulted into the clearance of vegetation cover, some of which were a source of wood fuel and also water catchment areas. The community has now to buy charcoal sourced from neighboring county which is usually supplied by vendors on the bicycle. Similarly, cleared wetlands have impacted negatively to the economy of the region. Some of the community members have depended on such ecosystem for livelihood for instance traditional medicinal substances were got from parts of vegetations growing wild or in wetlands. Building materials like reeds for thatching or making poultry cages were also fetched from such wetlands which have now been cleared. Those who used to derive livelihood from such activities have been forced to look for alternative source of livelihood.

Figure 11 Crop farm infected with striga weeds



Maize crop farm infected with striga weeds-a contributor to low farm yields

4.3.3 The impact of land fragmentation and uneconomical land subdivision on the environment

4.3.3.1 Loss of soil fertility

Because of small land size, the ever increasing population pressure has resulted into over cultivation of soil in Vihiga County. As a result, crop yields have decreased over time. The use of commercial fertilizers is encouraged in an effort to increase the yields.

4.3.3.2 Drainage of wetlands

Scarcity of land has led to people draining wetlands and clearing bushes in an effort to increase the land for food cultivation. The wetlands are very important ecosystems whose value is yet to be quantified. Planting of tree species, like Eucalyptus has been done near water sources including swamps and wetlands. This has had an ecological effect as these tree species absorbs a lot of water hence drying up wetlands. As indicated in the diagram below, there is little water noted in the natural springs surrounded with eucalyptus trees.

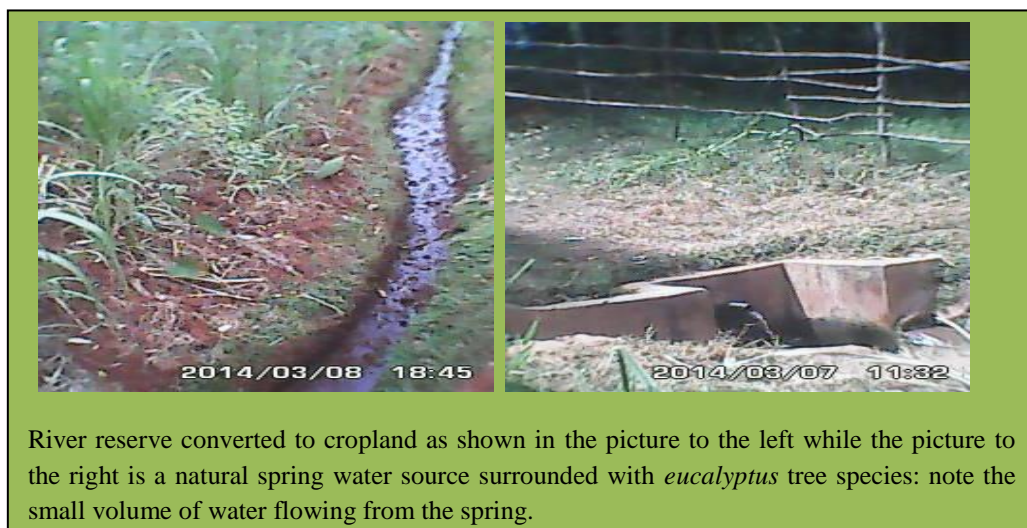


Figure 12 Photo showing drained wetland that has been converted to farm land

4.3.3.3 Loss of biodiversity

Big animals used to be found in this study area some years back. This included Lions, leopards, antelopes, and hippos among others. The rising population and the demand for land have led to disturbance of the once balanced ecosystem. Their habitant and nesting places included vegetation cover; that is now being cleared to create room for farming, and wetland that is being drained to pave way for farming. This has resulted into the reduction of the biodiversity of both flora and fauna in the study area. Wetlands used to be habitats of some birds. Clearing of such important ecosystems renders such bird species endangered.

Figure 13 Indigenous tree species

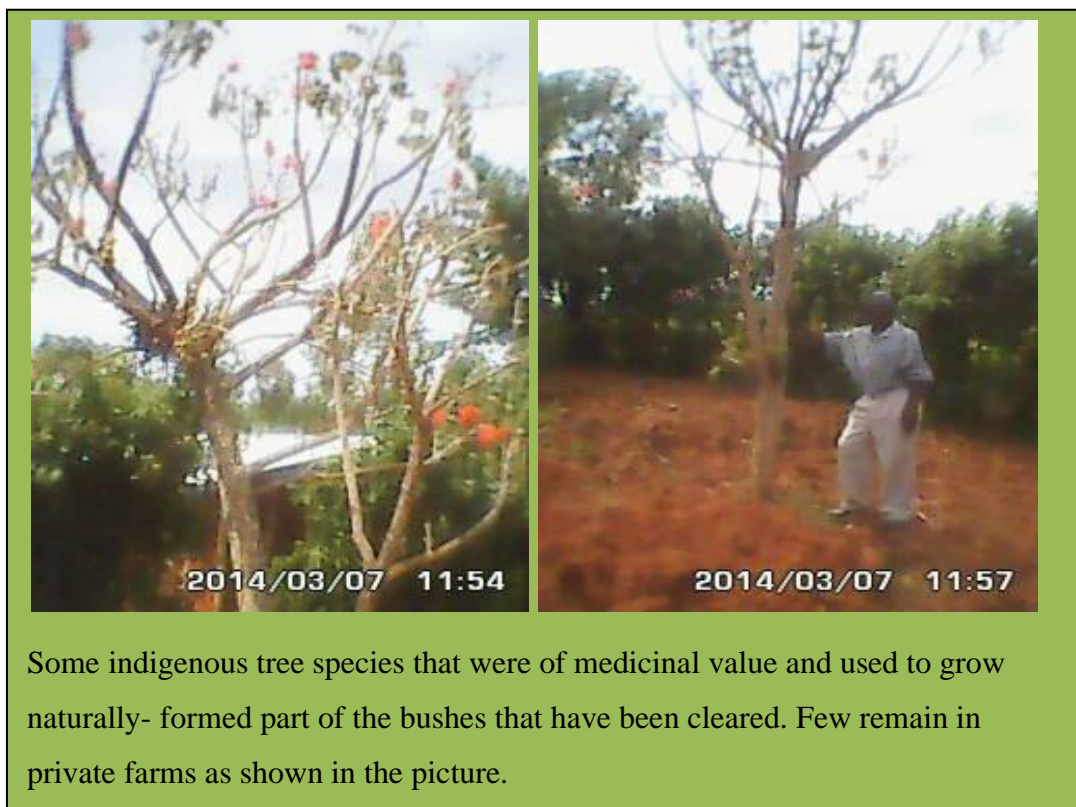


Figure 14 Endangered birds and animals



4.3.4 Land related conflict

4.3.4.1 Opinion on whether there is land related conflict

The respondents admitted that there were land related conflicts both at household level and community level. At household level, 53.6% of respondents indicated that they have witnessed such conflicts related to land. At the same time, 89.5% of the respondents admitted such conflicts happen in their community. A summary of results of the respondents on the question of whether there was land related conflict in the study area is given in the Table 7 below.

Table 7 Land Related conflicts

Sublocation	% of respondents (At household level)		% of respondents (At community level)	
	Yes	No	Yes	No
Lusengeli	56.0	44.0	88.0	12.0
Esianda	51.0	49.0	91.0	9.0
% Respondents	53.5	46.5	89.5	10.5

4.3.4.2 Types of conflicts reported

The question on whether there was a conflict related to land in the study areas had a follow-up question that required the respondent to name the type of conflicts. Analyzing the results revealed the conflicts as reported in Table 8.

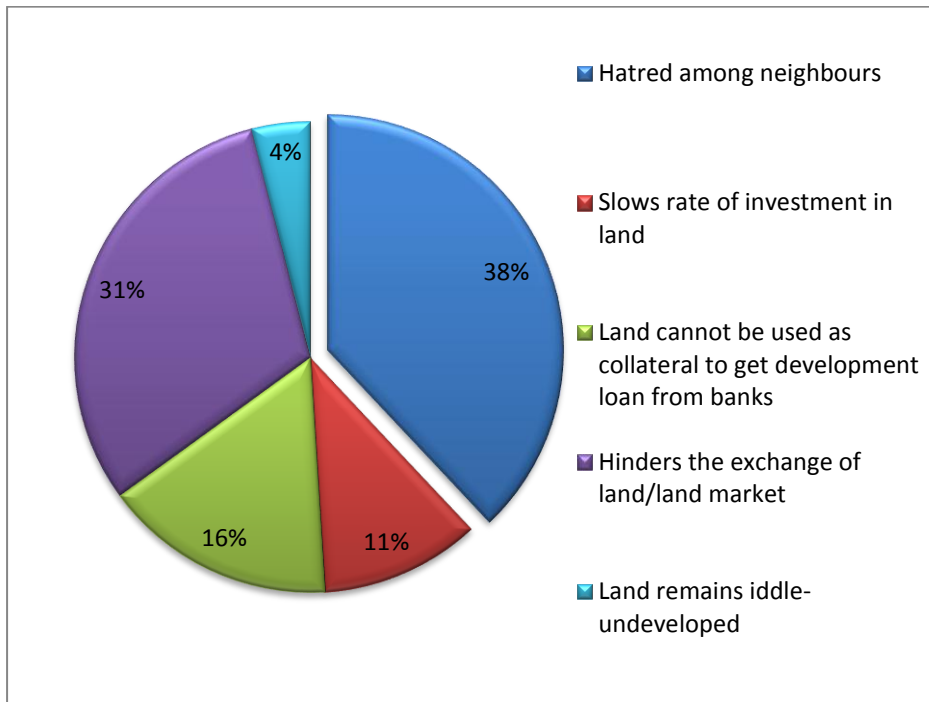
Table 8 Types of land related conflicts

Summary of the conflicts reported	% reported
Boundary disputes-both at household level and community level	57.0
Disputes as it regards how family land will be shared among heirs- both at household level and community level	33.0
Disputes as it regards who is entitled to develop the land- both at household level and community level	10.0

4.3.4.3 How land related conflicts affect development of the area

On whether such conflicts had an effect on the development of the area, respondents gave feedback as indicated in Figure 15.

Figure 15 Effects of land related conflicts on development



4.3.4.4 Institutions that help in settling land related disputes

Local administrative institutions consisted of village elders, sub-chief and chief who were identified as the main persons used in settling land related disputes in the study area. This was noted by 51% of the respondents. Extended family was also recognized in its role of solving disputes at household level with 23% of respondents recommending it. In addition to this, the court and friends' roles in solving land related conflicts were noted. The summary of the results are as shown in Table 9.

Table 9 Institutions that help solve land related conflicts

Institution	% of respondents who identified it
Office of president- Chief’s office (including sub-chief and village elders)	51.0
Extended family	22.0
Court	20.0
Church	6.0
Friends	1.0

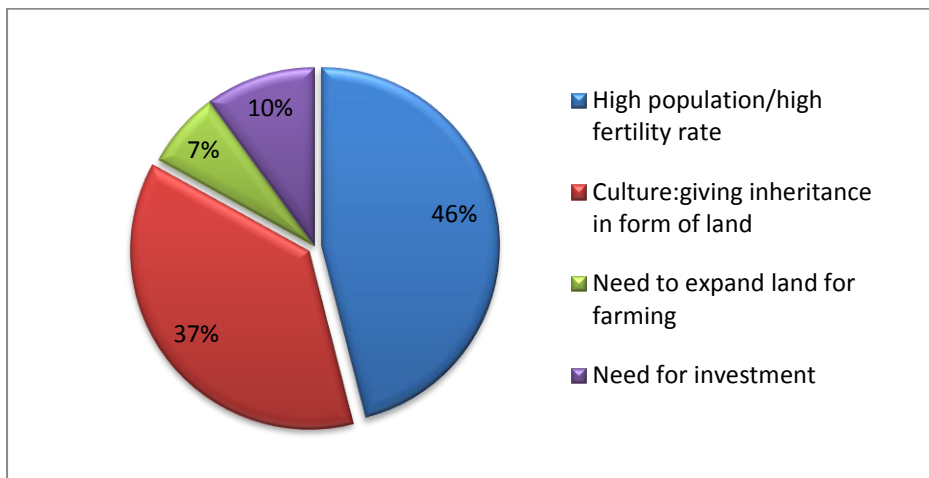
Asked whether such institutions were effective, 67% indicated ‘Yes’ with reason that they were easily accessible. Major reason given for ‘No’ was that court was expensive for a common citizen and it usually takes long time before disputes are settled.

4.4.0 Solution to problems of uneconomical land subdivision and land fragmentation

4.4.1 Opinion on whether there is land fragmentation and uneconomical land subdivision

In effort to find ways of reducing land fragmentation and uneconomic land subdivision, the study started by getting the views of respondents on whether indeed there is land fragmentation and uneconomic land subdivision. A total of 97% of respondents agreed that there is a problem of land fragmentation and uneconomic land subdivision. The main cause, as given by respondents is as shown in the Figure 16.

Figure 16 Cause of land fragmentation

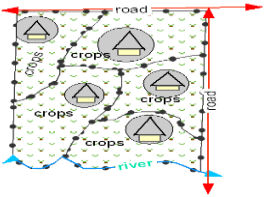
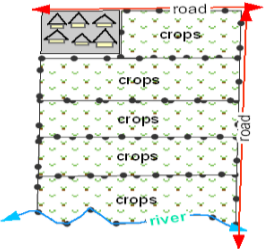
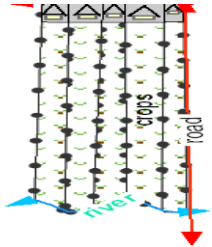
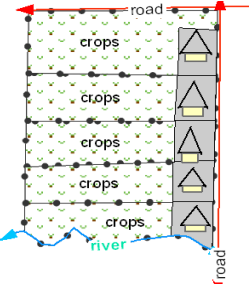


In identifying a lasting solution to the problem of land fragmentation in Vihiga County, several recommendations were given by the respondents: these are both from focus group discussions, key informants interview and household questionnaires.

4.4 .2 Acceptability of the alternative human settlement pattern

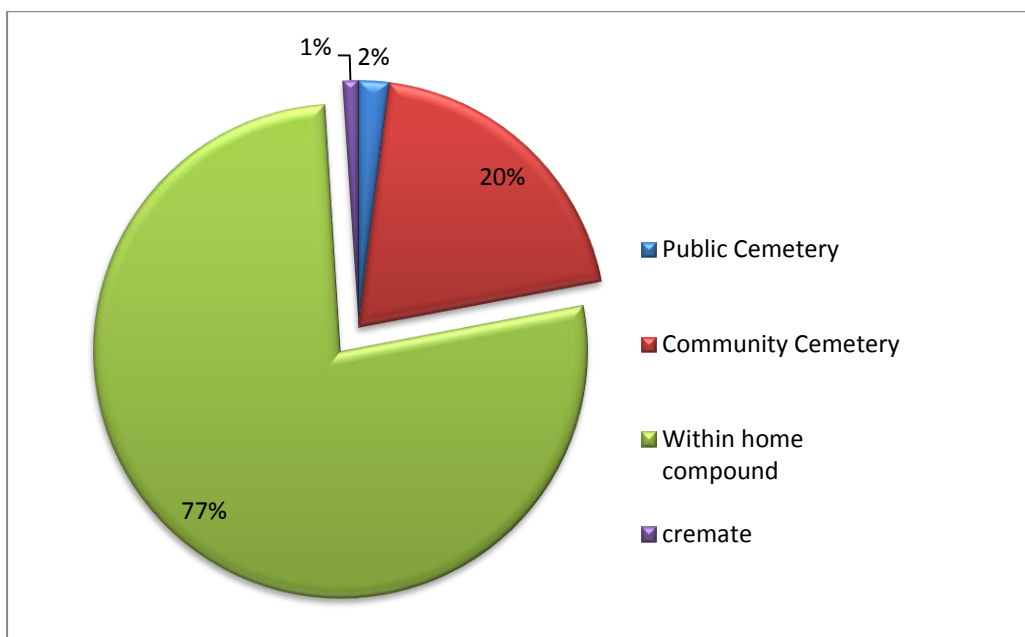
Opinion regarding best settlement pattern at household level revealed preference for dispersed settlement pattern with a larger percentage of respondents (81%) is indicating the existence of dispersed pattern of settlement in the study area. Responses were as summarized in Table 10. The same preference was reported when respondents were asked about the best settlement pattern they would recommend for the community in consideration of the current land production potential of the county. The main reason cited is that, dispersed settlement pattern reduces possible conflicts at the household level. The respondents also noted that the main challenge of implementing this settlement pattern is the ever increasing population that puts pressure on the available land resource.

Table 10 Existing and preferred type of settlement pattern

Type of settlement	Description	Existing pattern (% of respondents)	Recommended Pattern (% of respondents)	Challenges to be encountered in adapting the recommended pattern
	<p>Dispersed Settlement:</p> <p>Houses spread over fertile farmland.</p>	81	67	<p>Small land size</p> <p>Land conflict</p>
	<p>Nucleated or clustered settlements</p> <p>Family houses are built at one place; the rest of the farm is under cultivation</p>	2	20	<p>Encourages conflicts at domestic level-when people stay together</p> <p>Negative attitude towards this pattern</p>
	<p>Linear settlements:</p> <p>Houses build along the road</p> <p>(i)Land divided vertically; long narrow parcels</p>	6	6	<p>Too narrow strips of land unsuitable for development</p>
	<p>Linear settlements:</p> <p>Houses build along the road</p> <p>(ii)Land divided Horizontally</p>	1	8	<p>Every person will prefer to reach water source. Land productivity not uniform-towards stream land is usually steep thus unsuitable for most development.</p>

Asked on the preferred methods of burying their loved ones, majority of the respondents preferred burying them in their home compound. Their responses are as shown in Figure 17.

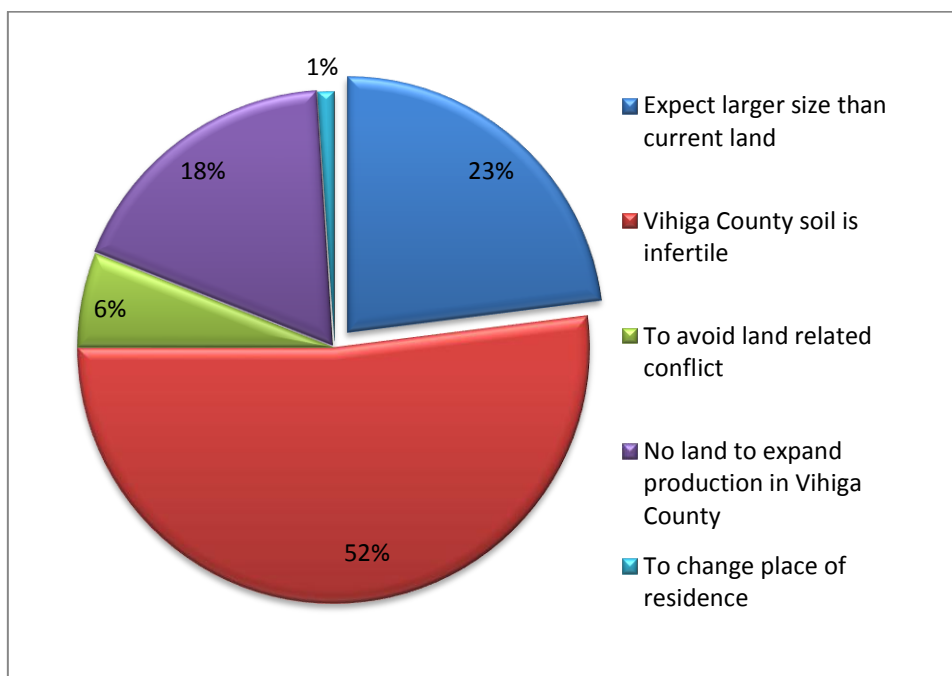
Figure 17 Opinion on how to bury the dead



4.4.3 Opinion on willingness to relocate

The study inquired into the possibility of residents relocating if the County Government could offer them another piece of land to reside on, on condition they surrender to County Government their current land parcel. A total of 72% agreed that they would be willing to relocate in case the county government would offer them another piece of land in exchange with their current piece of land on which they reside. The reason why they were willing to relocate is summarized in Figure 18.

Figure 18 Willingness to relocate



4.4.4 The approach to be adopted in reducing uneconomic land subdivision and land fragmentation

4.4.4.1 Family planning

The solution of family planning was emphasized by the focus group discussions, key informant interviews and information collected using household questionnaires. High fertility rate and the resulting high population were pointed out to be among the leading causes of land fragmentation and uneconomic land subdivision. The need for family planning was best captured by words of the respondents during one of the focus group discussions.

‘..mlitanga Nyasaye yavola mwivulane mwizurize kivala....eyo yali ing’inga rwa vandu vari vadi na milimi minyinge.....kalunu kwizuriza kivala ni kuva na vana vaviri veng’ine....’

‘..in the beginning God said, give birth and fill the earth...that time population was small and land in plenty.....now to fill the earth is to have only two children...’

This is alluding to the biblical verse Genesis 1:28: which Christians believe it meant to increase the world population.

Genesis 1:28 God blessed them and said to them, “Be fruitful and increase in number; fill the earth and subdue it....”

4.4.4.2 Population release from Vihiga County

The respondents from both focus group discussions and key informant interviews in addition to household questionnaires believed that the land carrying capacity in Vihiga County has been exceeded. They revealed that land has been subdivided into small portions to the extent that it is difficult to continue with any further subdivisions. They postulate that such problem of land fragmentation and subdivision can be reduced by releasing population pressure in Vihiga County. Citing the example of the time when the current Vihiga headquarter was being constructed, the inhabitants of the site where the current structure stands were moved to different places as a way of creating space.

The same method was used when Moi girls’ Vokoli Secondary School was established. The residents who used to occupy the site were moved to the current Nandi County. Respondents in the study area believe that the county government can

use the same approach in easing the population in Vihiga County. This can be achieved by purchasing suitable land and relocating people to such places.

4.4.4.3 Change in the settlement pattern and housing typology

Even though dispersed settlement pattern was preferred, the focus group discussions revealed the need to change the existing settlement pattern and housing typology as one of the strategy to tackle challenges posed by land fragmentation and uneconomic land subdivision.

The community should opt for clustered settlement pattern where houses are located at one location based on soil suitability. The rest of the land should be farmed. The focus group discussions noted that one of the shortcomings of dispersed settlement was the wastage of land. This is because each household has to be provided with access road. In addition to this, costly provision of infrastructure and other services were noted.

On housing typology, focus group discussion foresaw the need to make best use of space by making best use of vertical space. The idea was that three sons can live under one roof each occupying one floor instead of spreading houses on the farm. It was noted that the idea may take time to be embraced for it will require a major attitude change. Slowly, the idea will be adopted by the rest of the communities as they learn its benefit from those who will be willing to pioneer.

4.4.4.4 Proper functioning and dynamic land market

The focus group discussion revealed that a proper structured land market can help reduce the problem of land fragmentation and uneconomical land subdivision. In the

first place, existing land market is hindered by lack of land title deeds. A very large proportion of the population lacks legal documents of the land they own. In some cases, land was found to be in ownership of grandparents.

This is despite grandchildren owning the piece of land acquired through inheritance. Because of this, they cannot pass land to any other person as they lack the land title deed. Land market can help reduce level of land fragmentation by being structured in such a way that individuals willing to sell their piece of land should first approach their neighbors and offer to sell to them. If the neighbors are in position to buy the land, then he/she can combine the land and increase its size. This will lead to a market based land consolidation as a solution to land fragmentation. However, lack of land title deed hinders the exchange of land property as it is the required legal document to prove the ownership of the land.

4.4.4.5 Replace land inheritance with other forms of inheritance

Land fragmentation and uneconomic land subdivision has come about as a result of the tradition of inheritance. Tradition holds that family land has to be passed to the next generation through inheritance. Available land must be divided among the heirs. At times, available land is not enough for the number of heirs. As a result, the family head prefers to increase land available from which he can give out as inheritance. Unfortunately, land available for purchase is not adjacent to the current land. He gets land that is separated from his land by other land parcels. This results into land fragmentation. If the household head is unable to purchase additional land for this purpose, he is left with no option but to divide the small land available equally among

the heirs. This results into small sized land units which are usually uneconomic for exploitation basing on existing systems of production.

The focus group discussion held the view that such cause of land fragmentation and uneconomical land subdivision can be avoided by replacing land as a form of inheritance with other forms of inheritance. They propose education as the best alternative. This will require a major attitude change. Parents should invest in education of their children while children of current and future generations should take education given by parents seriously. They ought to look at it as a form of inheritance.

The respondents noted that the required average land size suitable for Vihiga County should be 15 acres per household. Among the actors who can help reduce land fragmentation as noted by respondents includes family household head, village elders, local administration authorities (chief and Assistant chief), the church and large scale land consolidation government programmes.

CHAPTER FIVE

5.0 DISCUSSION OF THE FINDINGS

5.1 Introduction

This chapter discusses in details the findings from household questionnaires, focus group discussions and interview of the key informants. The discussion is structured and presented in three sections: the situation as it is on the ground regarding size and ownership of land in addition to the causes of land fragmentation; the land fragmentation and uneconomical land subdivision emphasizing the socio-economic and demographic impacts together with reported environment related effects and possible working solution to the problem of land fragmentation and uneconomical land subdivision.

5.2 Land ownership and the causes of land fragmentation and uneconomical land subdivision

Simmons Index (SI) is an index that has been used by several researchers in trying to find out the level of land fragmentation in their study areas. The interpretation of the index is that a value close to zero (0) indicates a higher level of land fragmentation while a value close to 1 indicates less fragmented land. Value of unit 1 indicates a consolidated piece of land. Using Simmons Index (SI), the study indicates that there is land fragmentation in Vihiga County. However, the level of fragmentation is higher in Lusengeli Sublocation (0.5) when compared to Esianda Sublocation (0.8) with the average for the two sub locations given as 0.65. This argument is backed by the 44% percent of respondents who accepted that they own another piece of land besides the

one they reside on. A proportion of 42.5% of respondents owning between 2-3 farm parcels and the remaining 1.5% own between 4-5 parcels of land. From the findings, it is clear that land in Lusengeli Sublocation is more fragmented compared to Esianda with the percentage of those with only one parcel of land (on which they reside) being reported as 34% and 78% respectively. The study confirms the problem of small land size in Vihiga County. The minimum land size is 0.415 hectares, maximum is 3.5 hectares and average is 0.415 hectares. Efforts to expand the agriculture frontier seemed to be the major force behind the ever increasing land fragmentation. Other forces include the existing tradition of inheritance. This is because the head of household tries to increase the land available for distribution among his heirs. In addition to being seen as a form of investment, the residents of the study area reported that the land available in Vihiga County is not enough for economically beneficial farming and settlement. Even though Vihiga County is highly populated and has limited land, the study indicates that those seeking additional land first consider Vihiga County if there is any land to purchase. This is evidenced by a higher percentage of additional land that households have being found in Vihiga County. However, Trans Nzoia County appears to attract more inhabitants of Vihiga County especially those seeking additional land. This finding answers the existing knowledge gap regarding the destination of those who move from Vihiga County by looking for additional land to settle on (Vihiga Environment Action Plan 2009-2013). Nandi County also attracts the inhabitants of Vihiga County in need of additional land.

The households in Vihiga County acquired their current piece of land mainly through inheritance. This is after 70% of respondents indicated that they hold their land

courtesy of land inheritance. However, a peculiar thing is that most of them (56.5%) do not have title deeds for the land they claim to own. Only 28% of households reported to have title deeds. This hinders free land market given that purchase of land was reported as one of the ways of acquiring land by 24.5% of respondents. A land title deed is a vital legal document required in any land transaction that involves change of ownership. Their absence means hindrance to land transactions hence complicating the land market.

5.3 Impacts of land fragmentation and uneconomic land subdivision

5.3.1 Socio-economic and demographic impacts of land fragmentation and uneconomical land subdivision

Land subdivisions into small sizes that are uneconomical seem to be one of the major problems of residents of Vihiga County as far as socio-economic development is concerned. The respondents clearly pointed out that high population in Vihiga County, the tradition of land inheritance, need for land as a means of investment and the need to expand the area of agricultural production as the main reasons for continued land fragmentation and uneconomical land subdivision.

Some of the impacts of land fragmentation and uneconomical land subdivision (pointed out by the respondents) ranged from social to economic effects. In summary, land fragmentation and uneconomical land subdivision has resulted into low farm yields, environmental degradation and loss of biodiversity in form of flora and fauna, economic deterioration of rural Vihiga County, demographic change in addition to increasing conflicts related to land as a resource. Small land sizes have led to over

cultivation of soil. To maximize farm output, land in Vihiga County is cultivated all year round. The soil nutrients are exhausted to such a level that there is low farm yield in the County. This is evidenced by current production of four (4) bags of maize against the average potential of fifteen (15) bags per acre (Vihiga County). This is only 27 percent of the potential. To help address the problem of infertile soil, residents reported that there is need for use of fertilizers when planting. However, the cost of fertilizer is too high for most of the small scale farmers. Solution to this has been the use of organic fertilizer. This approach-use of organic fertilizer-is facing another challenge: because of reducing land size, what used to be open fields for grazing have been converted into crop land. As a result, fodder for livestock has reduced. This is accompanied with a reduction in the number of animals kept per household. Animal fodder is grown on the small piece of land, usually competing for space with other land uses like the need for growing food crops. Land allocated for fodder like nappier grass is usually small and such forage can sustain only a small number of livestock.

Figure 19 competing land uses: food crops with fodder crops



The end result is reduction in organic manure as animal waste is usually utilized in the making of this manure. On the same note, crop remains that used to be green manure are being used as source of fuel. An example is maize stalk, which initially was left in the field to decompose and add to soil fertility now it is dried and used for cooking fuel. This is after the bushes and trees that were used for cooking fuel have been cleared to create space for crop farming. The result is low soil nutrients hence low crop yields. In addition to this, cost of adopting modern farming technologies like greenhouse farming and challenge posed by climate change that leads to unpredictable weather that affects farmers. Fear to adopt new farming methods among farmers and limited extension services by agriculture experts to farmers in Vihiga County have also contributed to continued low farm yields. To complement the low farm output, residents of Vihiga County engage in off-farm activities. Others have decided to move out of Vihiga County. Among the reasons given is the need for employment (43% of respondents) and the purchase of land-a reason given by 36% of respondents. This is because agriculture can no longer absorb all the existing labor force because of small scale subsistence farming that is being practiced and the large population that surpass available employment opportunities in the county.

The County's total labour force (15-64) years were 282,761 which represents 49 per cent of the total population in 2012. Labour participation rate for population aged 15-64 years is 81.9 per cent while the percentage of economically active population in wage employment is 29.2 per cent. The total employed population is 118,893. (Source: Vihiga County, First County Integrated Development Plan 2013-2017).

Related to same topic, asked whether the respondent could be willing to move to a new land that is at a different location given by the County Government and surrender

the one they reside on, 72% of respondents agreed and varied reasons were given for this response; 52% claimed Vihiga County soil is infertile, 23% believed they will get a bigger portion of land than the current land size they reside on (the point is that land value in Vihiga County is higher and that the value of a given land size in Vihiga county can equal to larger sized land elsewhere), no land to expand production in Vihiga County (18%) and avoid land related conflicts.

Respondents believe that there are land related conflicts in the study area. They acknowledged the occurrence of such conflicts both at household level and community level. Some of the conflicts included: Boundary disputes-both at household level and community level. Disputes as it regards how family land will be shared among heirs-both at household level and community level and disputes as it regards who is entitled to develop the land-both at household level and community level. It was noted that such conflicts affect development of the area in different ways including hatred among the conflicting parties, slows the rate of investment in land and inability of land to secure loan for development as it cannot be used as collateral. Those involved in solving these disputes included Office of president- Chief's Office (including sub-chief and village elders), Extended family, Court, Church and Friends.

5.3.2 Environmental impact of land fragmentation and uneconomic land subdivision

Land subdivision has also impacted negatively on the environment. With limited land resource to meet the demands of the ever increasing population in Vihiga County, wetlands have been drained and bushes cleared to create space for both crop farming

and human settlement. Wetlands are very important for their contribution to a balanced ecosystem. Wetlands act as a filter to most water flowing through them removing bacteria and other heavy metals. They act as the nesting place for most birds and a habitat for both birds and other animals. Plants found in wetlands have been used traditionally as medicinal substances not forgetting the making of furniture and as building materials. Clearing such important resources has greatly affected the usual balanced ecosystem in addition to affecting the community both economically and socially. Wood fuel was reported to be the major source of energy in the study area. The clearing of bushes has to a greater extent reduced the quantity of wood fuel available. Charcoal is supplied to the county from the neighboring Nandi County. On several occasions, charcoal vendors use bicycles to supply clients with charcoal which is sourced from Nandi County. A remedy to the shortage of wood fuel has been achieved by households planting trees on their small farms. They try doing this carefully by rearranging various land uses on their small farms. In some cases, Eucalyptus trees have been planted near water sources including wetlands.

Figure 20 Examples of uses of wetland plants



Figure 21 Trees planted on a drained wetland



Figure 21 Shows *Eucalyptus spp* tree that have been planted in an area that was once a wetland. The *Eucalyptus spp* is known to use a lot of water. Thus locating them near water bodies reduces the quantity available which may affect the hydrological cycle.

5.4 Solutions to the problem of land fragmentation and uneconomical land subdivision

Among the strategies to be adopted (as identified by the community) include family planning to reduce population, change land tenure system, have a functional and dynamic land market, land consolidation at household level, neighborhood land consolidation and land use planning.

5.4.1 Encourage Family Planning

There was a call for the community to reduce the current high population by increasing the use of and accessibility to family planning devices. This is after linking high population that is brought about by high fertility rates to be the main reason to why land subdivision into small uneconomical units and land fragmentation occurs in the county. The emphasis for the need of family planning was well captured by the following contribution during the focus group discussion.

'..mlitanga Nyasaye yavola mwivulane mwizurize kivala....eyo yali ing'inga rwa vandu vari vadi na milimi minyinge....kalunu kwizuriza kivala ni kuva na vana vaviri veng'ine....'

Interpretation; English version-

'...in the beginning God said, multiply and fill the earth...that time population was small and land in plenty.....now to fill the earth is to have only two children...'

Alluding to the biblical verse Genesis 1:28: which Christians believe it meant to increase the world population.

Genesis 1:28 ‘God blessed them and said to them, “Be fruitful and increase in number; fill the earth and subdue it...”

Family planning seems to have attracted the attention of the County Government even before the study commenced. This is evidenced by more than 90 percent of community awareness of family planning services and a 47 percent prevalence of contraceptive in the County. The County Government recognizes the need to advocate and provide more family planning services to married women of age brackets 15-49 as statistics indicates that a total of 25.8 percent of these group have unmet family planning need. Equally important is the need to emphasize the role of male in health education (Vihiga VCounty, 2013)

5.4.2 Replace land inheritance with other form of inheritance

The existing tradition of land inheritance holds that family land has to be passed to the next generation through inheritance. Available land must be divided among the heirs. At times, available land is not enough for the number of heirs. As a result, family head prefers to increase land available from which he can give out as inheritance. Unfortunately, land available for purchase is not adjacent to the current land. He gets land that is separated from his land. This results into land fragmentation. If the head of the family is not financially able to purchase additional land with the aim of ensuring enough land to give out as inheritance, he has no option other than subdivide the existing land into small portions on equal basis, not considering the productivity of the land. The result has been too small, at times too narrow strips of land that are not

suitable for economic production considering the systems of production in the society. From focus group discussions, the view that such cause of land fragmentation and uneconomical land subdivision can be avoided by replacing land as a form of inheritance with other forms of inheritance emerging. Education as an alternative was proposed. As it was noted, this will require a major attitude change. Parents should invest in education of their children while children of current and future generations should take education given by parents seriously. They ought to look at it as a form of inheritance. This line of thought finds a stable ground for its implementation. There is a strong education and literacy base on which such a noble idea can be grounded as indicated in the extract that follows.

Primary Education

The county reported a 103 percent gross and 78 percent net enrolment in primary education in the year 2012. Statistics further show a ratio of 0.9:1 boys to girls which indicates more girls joining primary schools when compared to boys. On same note, more boys drop out of school estimated at 3 percent compared to 1 percent in girls. With teacher pupil ratio of 1:42, there is a need for hiring more teachers as some schools are reported to be grossly understaffed.

Secondary Education

Secondary schools in the county by the year 2012 were 114 with gross enrolment of 67 percent and net enrolment rate of 58.3 percent. There is need to increase number of teachers in the secondary schools as teacher student ratio was 1:28. Information regarding accessibility by distance indicates communities that are within 0-1 Km of secondary schools are 31 percent, within 1.1-4.9 are 36.1 percent and 43.6 percent are within 5Km and above. These disparities need to be addressed so as to ensure equitable access to these facilities within the County.

Tertiary Education

The county has several learning institutions at major urban areas. These include three teachers training colleges, 21 youth polytechnics, medical training college at Mbale, a university at Kaimosi and several unaccredited commercial and ECD colleges spread across the county. The enrolment in these has been lower with most of them operating under capacity. Efforts have to be increased to change career mind set of the community from teaching to other disciplines (Vihiga County, 2013)

Looking at the education sector in the County, what is worrying is the current level of enrolment in primary school by boys. It is unfortunate that the rate of dropout among boys is very high (3% for boys and 1% for girls). The same high rate of drop out among boys compared to girls is reported at secondary level of education. The tradition of inheritance of land favors boys than girls and it has been noted as one of the contributors of uneconomical land subdivision and the existing land fragmentation. Tackling the problem of land fragmentation and uneconomic land subdivision using this approach will require addressing the real problem causing this high drop out among boys. There is also a need of increasing both the enrolment and transition from one level to another till the highest level of education is reached. It is noted that there is underutilization of tertiary learning institution due to low enrolment.

5.4.3 Functional and dynamic land market

5.4.3.1 Facilitate acquisition of land title deeds

The focus group discussion revealed that proper structured land market can help reduce the problem of land fragmentation and uneconomic land subdivision. In the

first place, existing land market is hindered by lack of land title deed. A very large proportion of the population lacks legal documents of land ownership. Only 28% of households own a title deed to their land. In some cases, land is still in ownership of grandparents. This is despite grandchildren owning the piece of land acquired through inheritance. Because of this, they cannot pass land to any other person as they lack land title deed. Proper functioning of the land market can be achieved by helping residents of the County to acquire title deed for their land properties. One of the factors hindering the residents to acquire title deeds is the cost involved. Information from key informants revealed that most households cannot meet the cost required to get land title deeds while others don't even know the process of achieving the same. The County Government can help on this by subsidizing the cost of the process involved. Similarly, it can help achieve this by offering free or subsidize the process of survey that will be required. Equally important is the need to sensitize the community on the need to apply for title deeds in addition to reducing the bureaucracy involved and make the process less tedious and easy to understand. These are some of the proposed best strategies that can help solve the problem of land fragmentation and uneconomic land subdivision. Proper functioning of the land market has been identified as one of the most important requirement whenever development on land is concerned. Its importance is identified in the Kenyan land policy as indicated in the extract that follows.

CHAPTER 3: THE LAND POLICY FRAMEWORK

3.3.3 Rights of Ownership

3.3.3.3 Access to Rights of Ownership

Land market operations

87. Land markets deal with the value, transfer, lease, and mortgage of interests in land. Efficient land markets can facilitate access to land.

88. The Government shall:

(a) Facilitate the commercialization of land rights subject to principles of equity, sustainability and public policy considerations such as security;

(b) Develop structures and instruments that will make the land market operations more efficient and effective,

SOURCE: Sessional Paper No. 3 of 2009 on National Land Policy

5.4.3.2 Adopt ‘Sell to neighbor’ approach

This approach will involve encouragement any of the community members who wants to sell their piece of land to first consider their neighbors’. They should prefer selling the land to their neighbors who can later merge their plots, thus increase its size. In a situation where the neighbor to the plot being sold is not in a position to raise the amount required, then the county government can assist. This can happen if the County Government can direct its energy to address the problem of land fragmentation and uneconomic land subdivision in Vihiga County. One of the approaches can be setting up a special loan kitty aimed for dealing with land fragmentation and uneconomic land subdivision. From such financial sources, individuals whose neighbor’s land is on market can be in a position to raise the funds required to

purchase it even if his/her own financial source is not enough at that particular moment.

5.4.3.3 Land bank programme

The County Government should initiate a land bank programme. The process under this arrangement will involve the County Government encouraging individuals who are offering their land on market to approach the County Government, who will buy the land. The County Government will in the process accumulate several land parcels spread all over the County-hence form a bank of land. It will release such parcels to the market again, but preferring neighbors' to the parcels as potential buyers. Individuals who purchase the land can then merge with his/her original land thus increasing its size at same time reducing the problem of land fragmentation. If the individuals targeted to purchase such piece of land are not in a position to buy it because of financial challenges, the County Government can help by giving them soft loan from a special kitty meant to reduce problems of land fragmentation and uneconomic land subdivision. On the same note, such land can be leased to him/her at a small fee as a strategy to give ample time to organize their financial resources. At the end of the lease period, then such individuals will have the right to purchase that particular parcel. Land banking strategy can as well help the County Government to create space in the urban areas needed for setting up various services to meet demand for the ever increasing urban population. Looking at the projected urban population in the county, it is clear that there is need to create space for the ever increasing urban population. This population increase is caused by individuals who are looking for employment and improved urban services after realizing that, as practiced currently

(on small sized fragmented land holding with production meant for subsistence use) agriculture can no longer absorb all the existing labor force. This has led to unemployment. Rural-urban migration has started to increase at an alarming rate. This calls for the need to improve the existing social amenities including housing, sewerage systems, solid waste disposal system and expansion of the existing road network among others. Proper planning is needed to achieve this. Planning takes place on space thus there is a need to create such space. A proper functioning and dynamic urban area usually acts as a focal point for economic development. This can be understood by evaluating the role it plays including offering market for goods produced in the hinterland, the supply of raw materials and farm inputs required in the hinterland to enhance production and as a centre of information dissemination in addition to other functions.

Table 11 Population projection in the major urban areas

Urban centres	2009			2012			2015			2017		
	M	F	T	M	F	T	M	F	T	M	F	T
Mbale	5,616	6,117	11,733	6,137	6,684	12,821	6,706	7,304	14,010	7,114	7,749	14,863
Luanda	12,824	14,727	27,551	14,013	16,093	30,106	15,313	17,585	32,897	16,245	18,656	34,901
Chavakali	8,856	9,596	18,452	9,677	10,486	20,163	10,575	11,458	22,033	11,219	12,156	23,374
Jeptulu	2,576	3,068	5,644	2,815	3,352	6,167	3,076	3,663	6,739	3,263	3,886	7,150
Vihiga	11,363	12,007	23,370	12,417	13,120	25,537	13,568	14,337	27,905	14,394	15,210	29,604
Total	41,235	45,515	86,750	45,059	47,823	92,881	46,424	52,257	98,681	49,251	57,657	106,908

Source KNBS, Vihiga 2013 in First County Integrated Development Plan 2013-2017

The establishment of land bank can help achieve the needed space in Vihiga County. This can be realized by exchanging part of its land in land bank that is located in different areas with individual parcels that are found in the vicinity of urban areas. The current market price should be the basis for exchange with proper land property valuation being carried out. The need for land bank is not a new concept. This is because the idea is captured in Kenya land policy as indicated in the extract that follows:

CHAPTER 3: THE LAND POLICY FRAMEWORK

3.6 LAND ISSUES REQUIRING SPECIAL INTERVENTION

3.6.1 Mechanisms for Resolving Special Land Issues

172. In the interest of social and economic development, the Government shall put in place measures to resolve land issues requiring special intervention taking into account the land reform principles of redistribution, restitution and resettlement in order to facilitate access to, and utilisation of land and land-based resources.

3.6.1.4 Land Banking

176. Implementation of the principles of redistribution, restitution and resettlement will depend on the availability of land.

177. To avail land for redistribution, restitution and resettlement, the Government shall:

- (a) Establish land banks and make land available for investment and development;
- (b) Formulate and implement a government buy-back policy;
- (c) Procure land for land banks through purchase and donations; and
- (d) Institute a programme for land reclamation, as provided for in section 3.4.2.4 of this Policy.

SOURCE: Sessional Paper No. 3 of 2009 on National Land Policy

The County Government can increase its land bank by purchasing land in other regions where land resource is not strained as it is the case with Vihiga County.

From the study, it has been revealed that most of the residents are relocating to areas where they can seize opportunity through purchase of land. Among the identified destinations include the neighboring Counties of Nandi, Kakamega, and Trans Nzioa among other places. A larger percentage of population, as revealed by sampled households, were willing to relocate and surrender their current piece of land to County Government should such a chance arise that they are given another piece of land elsewhere. This is not a new happening in Vihiga County because relocation of residents on site where current Vihiga District headquarter (at Mbale), Mudete Tea Factory and Vokoli Girls Secondary School was done in order to create space for development. The residents were moved to a new location. The County Government can engage in willing buyer-seller of land in any place that has land on sale, purchase it and add to its land bank. From this, individuals' who are willing to relocate can be given such pieces of land upon surrendering the one they hold. The County Government can then decide to use the surrendered parcel for reducing land fragmentation and uneconomical land subdivision by reselling it to individuals neighboring the parcel or by creating urban space for future expansion of urban infrastructure and services as explained earlier.

5.4.4 Land consolidation at household level

Under this arrangement, the first approach could be the household head not to subdivide the piece of land but encourage the heirs to practice combined farming. This will help address the problem of small land sizes some of which are long narrow strips that are uneconomic to develop. This will also enable adoption of modern technology in addition to commercializing the production process. The other approach could be

the able member of the household to purchase land that is on market and give to one of the household member. The recipients then surrender units holding which are then merged together. Alternatively, he/she can offer to surrender his unit portion to one of the family member and relocate upon agreement on mode of compensation. This process should be encouraged at the household level.

5.4.5 Neighborhood land use consolidation

The immediate stated augment can also be applied at neighborhood level. Neighbors farming the same crop on their land, which can yield more when planted on large scale, can decide to pull their resources together. This approach will take the form of land consolidation at 'use' level maintaining individual entitlement to land. In areas with long narrow strips of land parcels, the concerned may engage in a talk that will help address this problem. This can take a form of agreeing to consolidate their pieces then subdivide their land in a form that will allow economic land use. The final parcel one gets should reflect quality, value and the initial land size before consolidation. Proper property valuation should be adhered to.

5.4.6 Need for land use planning:-Change in settlement pattern and housing typology

Though dispersed settlement pattern has been identified to be undesirable in areas with high population like Vihiga County, it was preferred by the respondents of the study area. However it emerged that there is need to have a proper land use planning in an effort to utilize the scarce land resource in Vihiga County. It was the opinion of some respondents that, because of the limited land in their area, cluster settlement pattern

should be advocated for. In addition to this, the need to utilize vertical space would be of benefit to the community. Other responses that reflected the need for land use planning regarded the way of burying the dead. Burying in the homestead was preferred but some preferred the idea of using community cemetery. All these responses reflect the need for land use planning. To ensure efficient and sustainable extraction of the scarce resource endowment, the county government needs to engage in serious planning of both rural and urban areas. These spatial plans will help in achieving the development goals of the County; emphasizing on the urban and rural economy, maintaining aesthetics and the rural character of the county, the general land use and environmental sustainability. These plans will involve reviewing various policies regarding land uses and the interrelationship between them. This will include how the prevailing settlement relates to the small and medium size urban centers, accessibility in terms of road network and information dissemination through the established communication networks and how to achieve environmental conservation and the rural development. As pointed out by the respondents, the problem of uneconomic land subdivision can be achieved by providing for implementation of cluster settlement patterns in the County. This will help achieve easier public service provision to residence including infrastructural development as well as controlling the rate of land subdivision. This should be in consultation with the community in an effort to ensure they support and embrace rural resettlement planning as a tool meant to achieve sustainable management of the land resource. There is a need to determine the minimum land size for farming in Vihiga County beyond which no subdivision can be allowed. The current policy only points out the need for minimum land size to

discourage uneconomic land subdivision, even though it recognizes the need for rural land use planning as evidenced by this extract that follows, it does not indicate what size it refers to. The need for proper settlement plans that suite the people of Vihiga County will find the legal support not only in the existing land policy but will as well be within the requirement of physical planning guidelines.

CHAPTER 3: THE LAND POLICY FRAMEWORK

3.4 LAND USE MANAGEMENT ISSUES

3.4.1 Land Use Planning Principles

3.4.1.2 Rural Land Use Planning

107. To secure effective rural land use planning, the Government shall:

- (a) Review the current laws related to planning to provide for rural land use planning;
- (b) Recognize rural settlement planning as a tool for sustainable resource management, alignment of infrastructure standards and provision of public sites;
- (d) Make rural land use planning an integral part of land adjudication process.

3.4.2.2 Land Sizes

121. Population growth and the demand for land have resulted in excessive fragmentation of land into uneconomic units. At the same time, a number of people own large tracts of land which are not utilized optimally.

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

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

SOURCE: Sessional Paper No. 3 of 2009 on National Land Policy

Physical Planning Act, 1996.

Part VI—Miscellaneous

Part II—Policy

5. Alternative development patterns including rural development, urban development and interrelations between urban and rural development.

6. Strategies for human settlements in the area including development of service centres, growth centres, transport and communication network and rural development.

Physical Planning CAP. 286 [Rev. 2009 p.32 (www.kenyalaw.org)

THE PHYSICAL PLANNING (SUB-DIVISION)

Physical Planning (Sub-division) Regulations, 1998.

Building Density.

16. In the case of a scheme of subdivision of land within the agricultural land the Director of Physical Planning shall at his discretion prescribe the minimum size of plots therein, the use of such land or building and the maximum number and coverage of buildings per acre to be erected thereon.

Alteration and cancellation of subdivisions.

17. A local authority may on the recommendations of the Director of Physical Planning or respective authorities cancel the whole or any scheme of division or subdivision which has not been carried into effect provided reasons thereof are given to the affected party.

Source: *Physical Planning CAP. 286 [Rev. 2009 (www.kenyalaw.org)*

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

The high population in Vihiga calls for planning intervention. There is a need to strengthen initiatives aimed at advocating for family planning as a way of containing the ever increasing population. Increasing population means continued pressure on land resource as majority of the residence depend on land for livelihood. Advocacy for family planning has been effective with its awareness reported to be 90% while contraceptive prevalence reported to be 47%. Further statistics indicates unmet needs among a total of 25.8% of married women of age brackets between 15-49 years. The role of male members in family planning should be emphasized.

The tradition of land inheritance ought to be reconsidered and if possible abolished in totality. This is because it is one of major contributor to the continued subdivision of land into small and uneconomic units. Education as a form of inheritance has been mentioned best replacement. However, the existing dropout among the boys (3% for boys and 1% for girls) should be addressed. Similarly the enrolment in tertiary institutions should be increased to ensure current and future generation to have specialized skills that will enable earn more income from other sectors other than depending on land as a main source of income. This is in recognition that enrolment in tertiary colleges in the county has been low with most of the learning institutions having less than the capacity enrolment.

Initiating Land Bank programme will be one of successful approaches by the county government to deal with problem of land fragmentation an uneconomic land

subdivision. This will involve encouraging the residence offering land on market to prefer the county government as potential buyer. Eventually, the county government will accumulate several land parcels in the county thus forming a land bank. Land bank program will help address the problem of uneconomic land subdivision and fragmentation in several ways. Firstly, some of land parcels owned by the county government through land bank programme can be released back to the market. This will be a special arrangement whereby the target potential buyer to be the neighbor to that particular parcel on sale enabling the merging of such adjacent small land parcels thus addressing the problem of uneconomical land units. To actualize this process, the county government should form a special and sizeable loan kitty to deal with both land fragmentation and uneconomic land subdivision. Should targeted buyer who happens to be a neighbor to the parcel of land on sale be financially unstable to purchase such land, from such a kitty, he/she can raise the finance required. Alternatively, the county government can allow him/her to utilize the land and pay for it in small installments. This arrangement will also involve encouraging individuals with several land parcels within the county surrender to the county government and later receive one or fewer parcels which are larger in size compared to individual parcels owned and distributed all over the county. Secondly, a look into population changes of the main urban areas of Mbale, Luanda, Chavakali, Jeptulu and Vihiga reveals an increasing urban settlement with a projected total of 395,123 in 2030. More people are moving to urban areas for several reasons including a search for employment. This is after realizing that the hinterland with agriculture as the main system of production (on small sized fragmented land holding with production meant for subsistence use) can no longer

absorb all the existing labor force and offer employment opportunity. This calls for the need to improve the existing social amenities including housing, sewerage systems, solid waste disposal system and expansion of the existing road network among others. Proper planning is needed to achieve this. Planning takes place on space thus there is a need to create such space. This can be realized by exchanging part of its land in land bank that is located in different areas with individual parcels that are found in the vicinity of urban areas. The current market price should be the basis for exchange with proper land property valuation being carried out. County integrated development plan-2013-2014 has identified limited space to be one of the main challenges to the growth of tourism in the county. Through proposed land banking strategy, space can be created to offer the needed urban services and establish a vibrant service sector. Through the proposed land bank process it's possible to create space for modern residential complexes offering accommodation to both rural and the urban population in the urban centers within the county. Though dispersed settlement pattern has been identified to be undesirable in areas with high population like Vihiga County, it was preferred by the respondents of the study area. However it emerged that there is need to have a proper land use planning in an effort to utilize the scarce land resource. It was the opinion of some respondents that, because of the limited land in their area, cluster settlement pattern should be advocated for. In addition to this, the need to utilize vertical space would be of benefit to the community. Basing on this finding, through land bank process, the county government should take the initiatives of addressing the uneconomic land subdivision by starting a housing program in urban areas.

Vihiga County should have a rural land use spatial plan to guide the transformation of its social-economic structure. The plan should inform particular strategic policies that seek to foster a strong sustainable rural economy, the protection and enhancement of the county's rural landscape and environmental protection and eventually managing and fostering the role and growth of strong rural settlement. Considering the economy of Vihiga County, rural spatial plan should in particular aim at achieving the following: Enhancing potential of agriculture land; sustainable quality rural landscapes that will conserve the feel and look of the rural society; conserving the natural environment; supporting and conserving local cultural heritage and providing and maintaining various development infrastructure and a wide choice of social amenities and recreational facilities. One of the approaches to be adopted by the county government to achieve the above is coming up with a rural spatial plan that will zone the county into various land use zones that will direct the various land uses. This should be followed by policy framework to enable realization of this. Spatial rural land use plan is a successful approach as it has been proved viable in developed countries which have managed to safeguard the economy of their rural areas despite the same challenges of demographic explosion in midst of finite land resources as experienced in Vihiga County. A detailed analysis of soil and climatic suitability of various land uses should be carried out that will help realize the zoning of land uses in the county. For instance three zones may emerge: Rural Production Environment zone, Mixed rural production environment Zone and Rural Lifestyle Environment Zone.

Rural Production Environment Zone may generally be characterized by large land holding and low population and housing density. The aim of such zone will be the

need to maintain large land size into production process while taking care of both physical and natural land resources. Uses in such areas should emphasize the need to protect and enhance native biodiversity, natural landscape qualities and the open spaces. Subdivision in this area should be discouraged with large minimum lot size proposed at 40ha being set to discourage land subdivision. It is possible to achieve such large land holding through the earlier proposed land bank programme.

The county government should come up with strategies that will help in preservation of the rural open space, important rural character and some of rural natural resources that are found on private properties in this zone. Limitation of residential development in such regions should be emphasized with a few approvals allowed only in cases where introduction of such land uses will have a zero or reduced impacts on the main production process in this zone, on wildlife areas or on protected ecologically sensitive areas. This is because dispersed settlement has led to low-density residential development, one of the approaches that have negatively impacted the rural character. Furthermore, eco-friendly land use practices should be encouraged through offering incentives to the users of best production methods that are environmentally friendly, educating the residents on important of various resources in rural areas and how different methods of production can affect the balanced ecosystem, rules, monitoring and enforcement policies that aim at protecting such vital resources in the rural areas and the general environment. Such policies should as well aim at discouraging or restricting non rural activities in these zones to ensure that farming activities dominate such zones. This will lead to realization of reduction in the permitted earthworks volumes, modification of water bodies, size and heights of on farm house to ensure

that they are in consistent with the requirement of farming and rural production. A cautious way of monitoring the impact of subdivision activities on rural character and the environment of these places should be taken into consideration. Some of the methods to be used should include the application of Transfer of Development Rights (TDR) or the use of Purchase of Development Right (PDR) Transfer of development rights takes a voluntary approach applying market forces to protect important resources. Under this arrangement, a developer sells his rights to develop his land and limit his utilization in such a way activities on farm do not affect negatively the resource of interest under protection. Those who buy such rights can now use them to develop in region zoned for intensive development. On other hand, Purchase of Development Rights will be a voluntary program through which the county government will approach the land owner and buy the development rights on the land that has important resources which the community or county government desires to preserve. Once agreement is made, there will be a limit of activities that will take place on that land.

These are among the many deliberate efforts that should be encouraged because if the current level of subdivision and fragmentation will be encouraged, rural activities contribution to the county economy will reduce significantly.

Primary production in this region depends on land resource which is finite, valuable and diminishing over time. The large land size proposed in this zone will encourage commercialized farming that will not only offer employment opportunities to the residents of this county but also supply enough food both for the rural population and urban population in the county. This is likely to spring up agro-based industrial

development in the county. For instance Mudete tea factory which is the only tea processing factory located at Mudete market in Sabatia Sub-County currently operates under capacity. Small land sizes have discouraged farmers to plant this crop because it's more profitable when farmed on large scale. Costing the labor requirement, fertilizer etc, farmers are usually discouraged to engage in tea farming. Such efforts can help farmers engage in profitable tea farming. Ensuring Mudete tea factory operates at full capacity will be one way of creating employment opportunities.

Farm yields have reduced over the years and the blame has been the continued subdivision of land into small uneconomical units among other reasons. For instance, continued reduction in grazing land and fodder crops due to competing land uses has meant reduction in livestock kept and low yields. Releasing settlement land for agricultural activity will likely reverse these trends. Through land bank programs, the County Government can create space for large scale commercial dairy farms in this zone. With modern dairy farming, the county is in a position to initiate milk processing firm, taking advantage of the existing high population as potential market. The dairy farm can process milk and produce milk related products that are consumed locally and sold to neighboring counties. This is likely to reduce the prevalence of poverty due to the realization of improved livelihood in the county. The achievements will address the outmigration witnessed in the county. The ever increasing population and scarce resource endowment have hindered developments efforts aimed at ensuring food security and poverty reduction in Vihiga County. This high population density is now forcing some people to migrate to other counties to settle there. Land scarcity, increasing incidence of poverty, limited alternative household income opportunities

and low adoption of modern farming technologies have been blamed for the increase in out migration in the county.

Figure 22 Local livestock breed

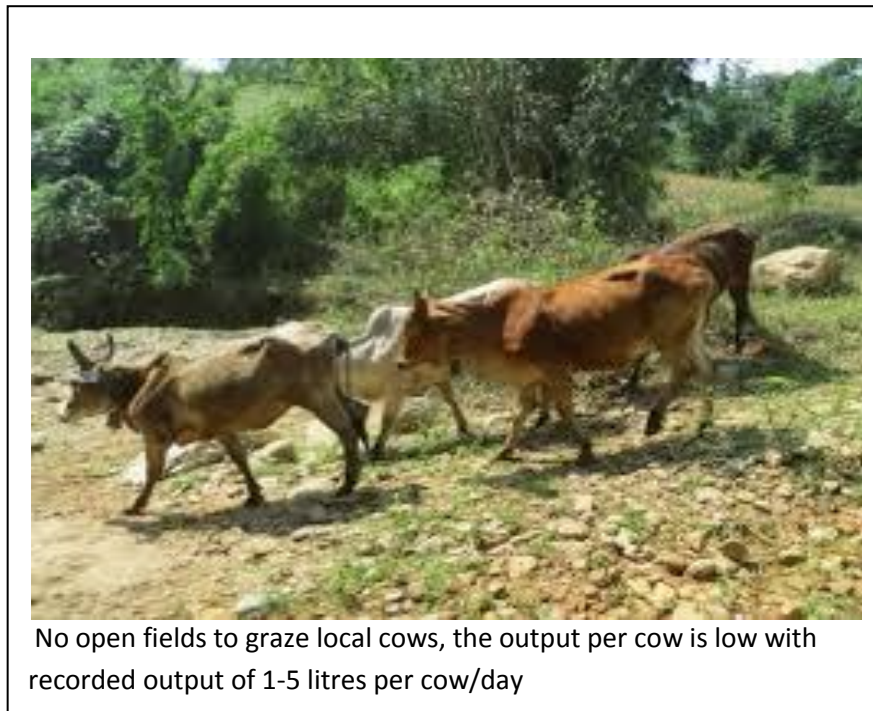


Figure 23 Modern dairy farming



The nature of residential living encouraged in this zone should be one that will not compromise process of production but add value to the general output. This may take a form of houses for laborers who should stay close to farm to monitor dairy activities on farm, farm structures among others of the like. Such a small number of People staying on such land are important for keeping rural character and identity of rural areas.

Mixed Rural Production Environment Such zones will entail a mixed production and some residential settlement on smaller units of land compared to rural production zones. The spatial plan should aim at retaining and enhancing a strong rural appearance in these zones while ensuring the provision for a number of activities enhancing potential for strong and diverse rural production. Such zones will be characterized by farm diversification with a number of activities accommodated including intensive commercial farming of horticulture and viticulture, tourist and visitors related activities, rural services tourist accommodations, small scale engineering, filmmaking, rural schools and leisure facilities, quarrying resources among others.

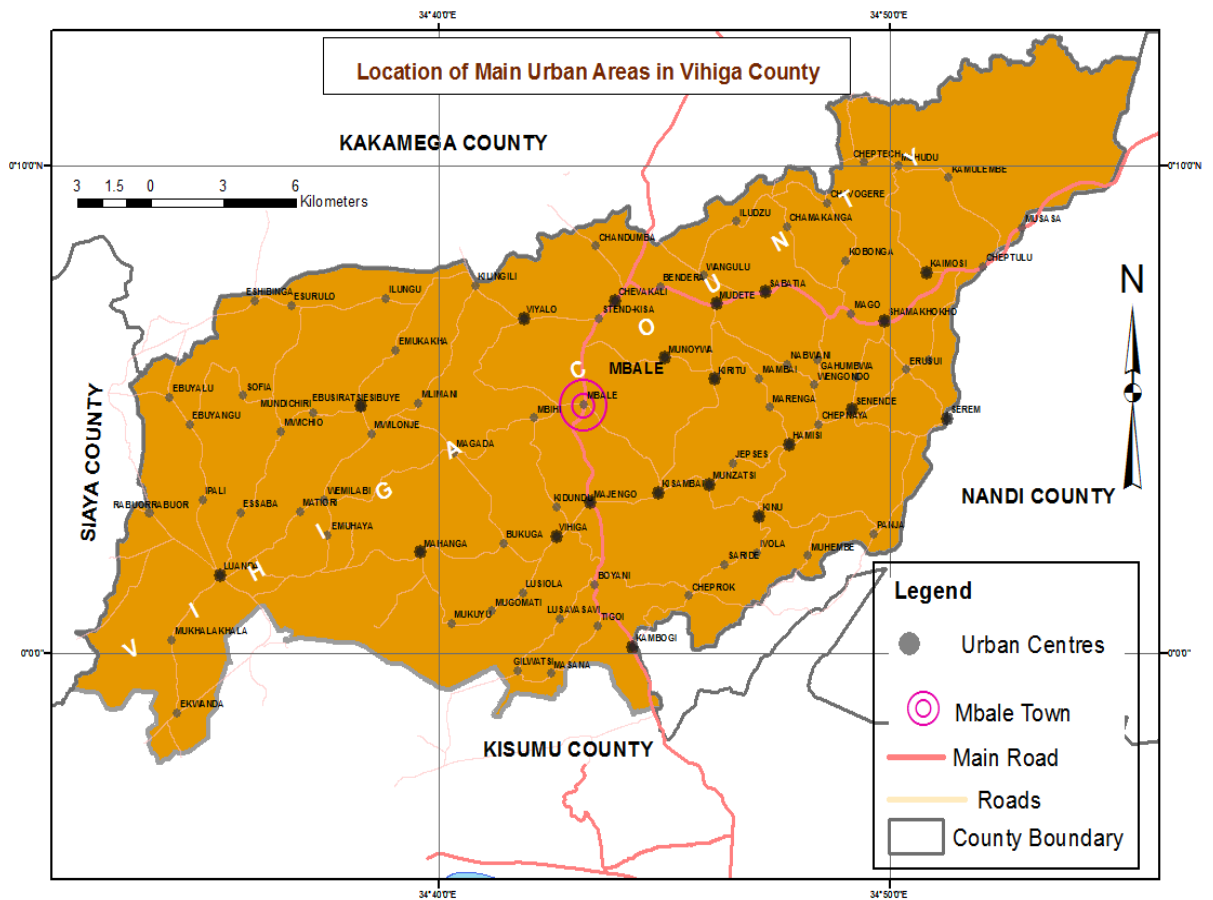
This zone should encourage some subdivisions with a minimum land unit lot being lower than the production zone proposed to be 4hetares. This will help in absorbing the excess subdivision opportunities in the rural areas thus removing development potential from the less appropriate locations. There should be policies that will aim at guiding such subdivision and help in reducing land use conflicts. In effort of ensuring the protection of rural character, the natural landscape and important rural resources, it is proposed that subdivisions in this zone should only be allowed if the intended use

safeguards the environment. This should be verified before development title is given for subdivision to take place. Applying Conservation Subdivision Design (CSD) in this zone will help in rectifying the existing situation. It will be one of the approaches to the regulation of the subdivision process on rural lands in Vihiga County. This approach will involve the clustering of developments within a portion of a site while the remaining land is retained as undeveloped and protected. Under this arrangement, the development potential is not taken away from the developer but allows development to concentrate within a smaller portion of the parcel allowing for the simultaneous preservation of agricultural land and open space. The proposed 4ha as minimum subdivision units is based on the research that has demonstrated lifestyle block of 4ha and above have much greater propensity to have some agricultural use. Increased local economic activity and better protection of rural character will be achieved.

Rural Living Environment This will be the areas close to major towns and market places in the county that are currently characterized with fragmented subdivisions patterns and are primarily utilized for settlement, some productive sites and small scale ‘hobby’ farming. With the help of communities, the county government should commission a study to identify areas appropriate for settlement that will economize on infrastructure and services in addition to avoiding important natural and agricultural area. The study should also consider the hierarchy of such growth centers in the entire county. This should be a basis on which to organize settlement in the county. The selection of such settlement areas should take into consideration future growth projections, the future availability of infrastructure and services, and an appropriate

density of land development then determine the placement of the boundary. This will help in guiding settlement expansion by designating such areas as developable to accommodate future settlement while achieving preservation of rural lands outside the settlement growth boundary. Fig 24 shows some of main areas for study to consider.

Figure 24 Spatial Location of Main Urban Areas



Rural lands outside the settlement growth boundary should remain rural in character preserving the strong agricultural and natural resource presence. Each of this settlement centers should have its own plan that will clearly describe its growth strategy. In addition to this, such growth strategy should incorporate a growth policy

statement that will inform the manner in which the community desires to grow in future. The foundation of such policies should be the values and goals of the community thus compliment the other elements of the directed growth strategy.

The proposal for such zone is a potential to subdivide lots in this zone down to 1 or 2ha minimum average size. The size should be based on a detailed study of the ability in such areas to absorb development at this intensity and achieve the objective for the area.

Modern designs aimed at addressing problem of high population density should be adhered to when coming up with housing typology in such settlements. Included in these approaches will be concepts like co-housing, multiple dwelling, pocket neighborhood and eco-village designs. This will encourage cluster settlement enabling efficient provision of services to such places. With each of these centers having its own development plan that guides how it is growing, provision for very small scale retailing, child care facilities, sports facilities, schools and other rural service activities should be taken into consideration. Also included is the need for infrastructure that will aim at meeting the needs for water, wastewater, storm water, transportation, utilities and leisure in a way that is sensitive to the natural environment.

Figure 25 Example of co-housing housing design



Figure 26 Example of pocket neighborhood design

Cluster settlements bring about more advantages compared to the dispersed settlement pattern that is currently practiced in the county. For instance, it makes it easier to provide infrastructure, the access and its connectivity. This is because the cost involved will be much less as compared to dispersed pattern of settlement. The advantage of this approach will include settling more people on a small place while ensuring sharing of the resources. Farm space that could be utilized for settlement will now be left for farming purposes. This will not only ensure adequate and enough food provision but more job opportunities as more production in farms will likely create more job opportunities. The level of service provision including connecting road network, house hold and street lightening, water provision and the accompanying sewerage connection among others will depend on the size of the settlement with higher hierarchy settlement offering visitors accommodation to emphasize the potential of these areas for more highly capitalized specialist production compatible with lifestyle development. Cluster settlement is not a new idea as it is found in a

number of communities in the world such as the highly productive alluvial plains (Punjab), in the valleys of Shiwaliks (Deheradun) and in north eastern states of India. Such settlements have come about due to various reasons including security and defence reasons (e.g. Madhya Pradesh) or scarcity of water or cultivable land (Rajasthan). The following Figures are Google images extracted to depict an example of dispersed rural settlement in Vihiga County (Figure 27 and Figure 28) and a cluster settlement in Rajasthan in India (Figure 29 and Figure 30). Note that cluster settlement has resulted into more land meant for settlement being released for farming purposes in Rajasthan India as compared to dispersed settlement present in Vihiga County.

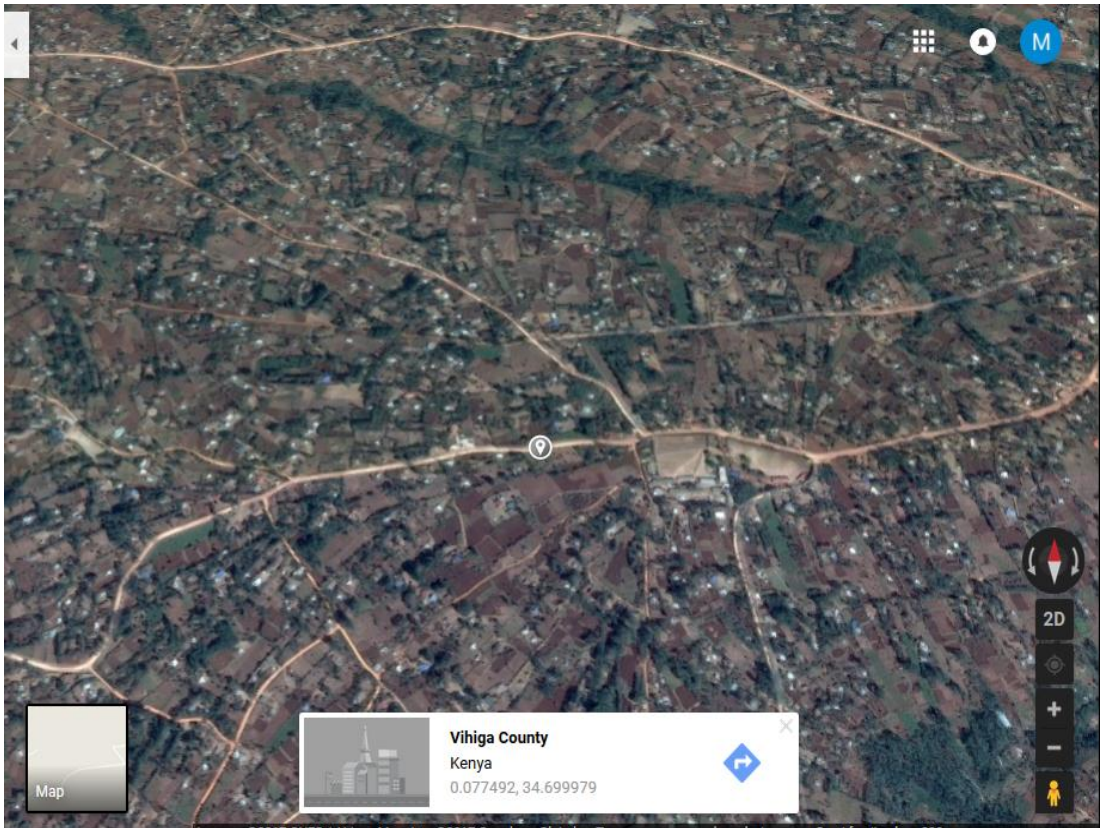


Figure 27 Dispersed settlement in Vihiga:A



Figure 28 Dispersed settlement in Vihiga:B-Note diminishing river line vegetation

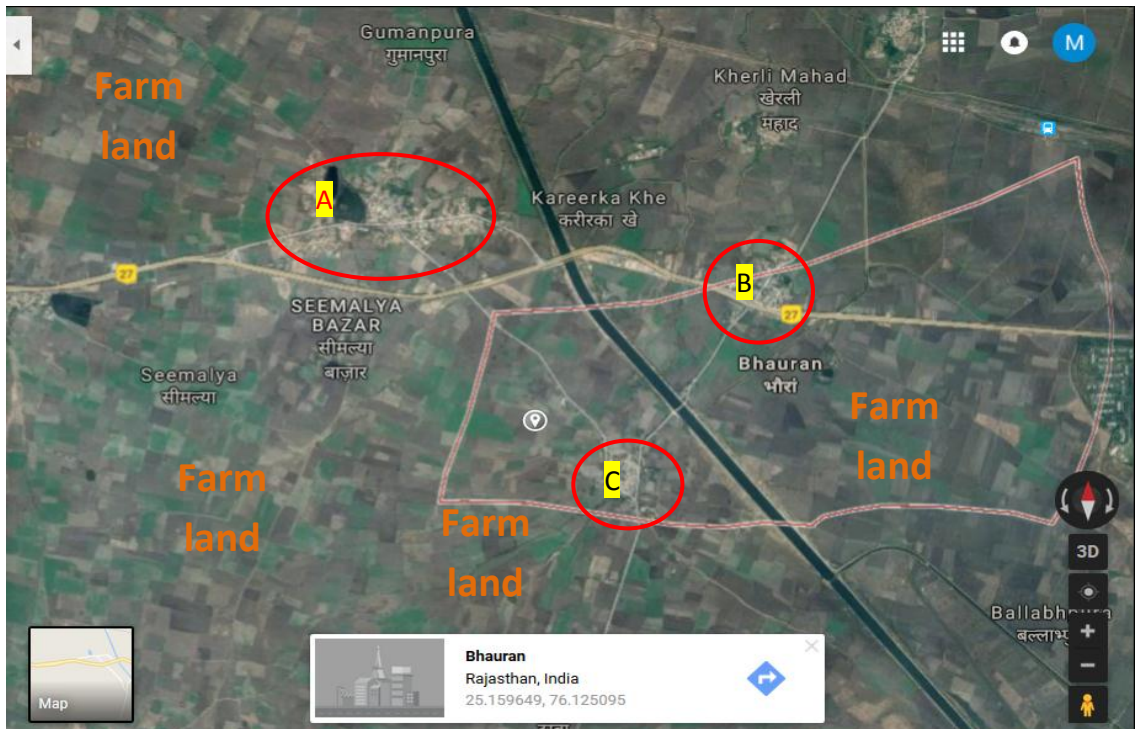


Figure 29 Cluster settlement in Rajasthan A. Location of settlement A, B, C and farms



Figure 30 Cluster settlement in Rajasthan B. A zoom into settlement C.

The county government of Vihiga should come up with rural settlement policy that will offer guidelines on rural settlement in the county. Such policy should advocate for hierarchical approach to cluster settlement pattern development with a view of encouraging settlement growth that is supported by appropriate infrastructure and service provision within the higher order centres. In addition to this, the hierarchy will also provide a framework within which the ordered urban expansion can occur.

Using the land bank program, the county government should direct its efforts at achieving more space in the urban areas to provide housing and other social amenities for the increasing rural-urban migration. County integrated development plan-2013-2014 has identified limited space to be one of the main challenges to the growth of tourism in the county. Through proposed land banking strategy, space can be created to offer the needed urban services and establish a vibrant service sector. There are plenty of photolytic rocks which can produce building murram whose exploitation has been limited by insufficient mining technology. Such stones can offer raw material for construction of modern tourist class hotels. This can help in attracting tourists by branding Vihiga as a County offering good recreational services, conference halls and entertainment center. Surrounded with a growing Kisumu city and Kakamega town, upgrading of Kisumu airport, Kakamega airstrip and Eldoret airport (which has been upgraded to allow international flights) offers Vihiga County an opportunity to develop its tourist potential. In addition to this, the proximity of the County to these towns may make it a 'best alternative residential place' for those in town who will prefer to stay away from the 'noise' of the town. This will increase employment opportunities for the high population in the county thus avoiding the dependency on

land as the only means of production and main source of livelihood. The overdependence on land as a means of earning a livelihood has resulted to everyone demanding a share of land to farm on an act that has led to the subdivision of land into small uneconomic units. Fragmentation has resulted where such individuals try to expand the land for farming or investment through purchasing only to accumulate several small pieces not adjacent to the family land.

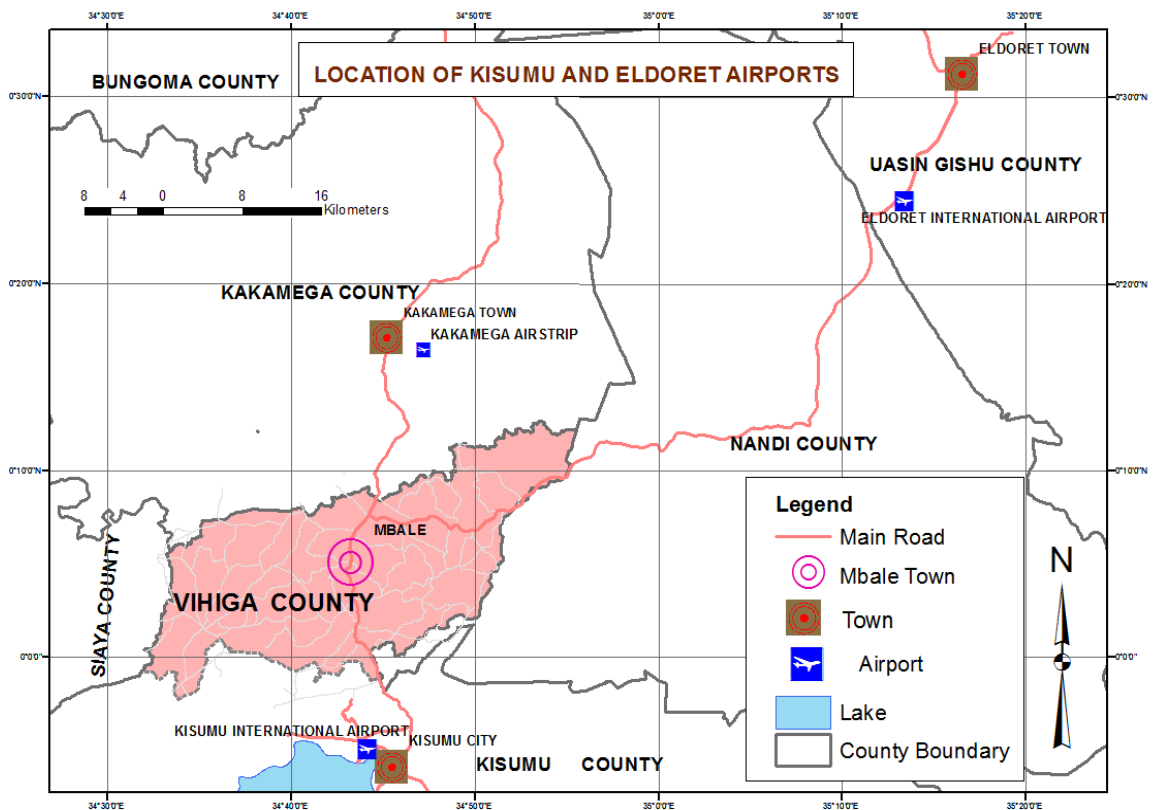


Figure 31 Strategic Location of Vihiga County

Urban Centre	2009	2012	2017	2022	2027	2030
Vihiga Municipal Council	118,696	131,018	148,235	167,714	189,753	209,452
Luanda Town Council	49,346	54,469	61,626	69,725	78,887	87,076
Shamakhokho	7,072	7,806	8,832	9,993	11,306	12,479
Serem	6,789	7,494	8,479	9,593	10,853	11,980
Jeptulu/Kaimosi	5,644	6,230	7,049	7,975	9,023	9,959
Hamisi	7,307	8,066	9,125	10,325	11,681	12,894
Sabatia/Mago	4,646	5,128	5,802	6,565	7,427	8,198
Gambogi	19,055	21,033	23,797	26,924	30,462	33,625
Emuhaya	5,361	5,918	6,695	7,575	8,570	9,460
Total	223,916	247,162	279,640	316,389	357,962	395,123

Table 12 Population Projection of Major Urban Areas in Vihiga County

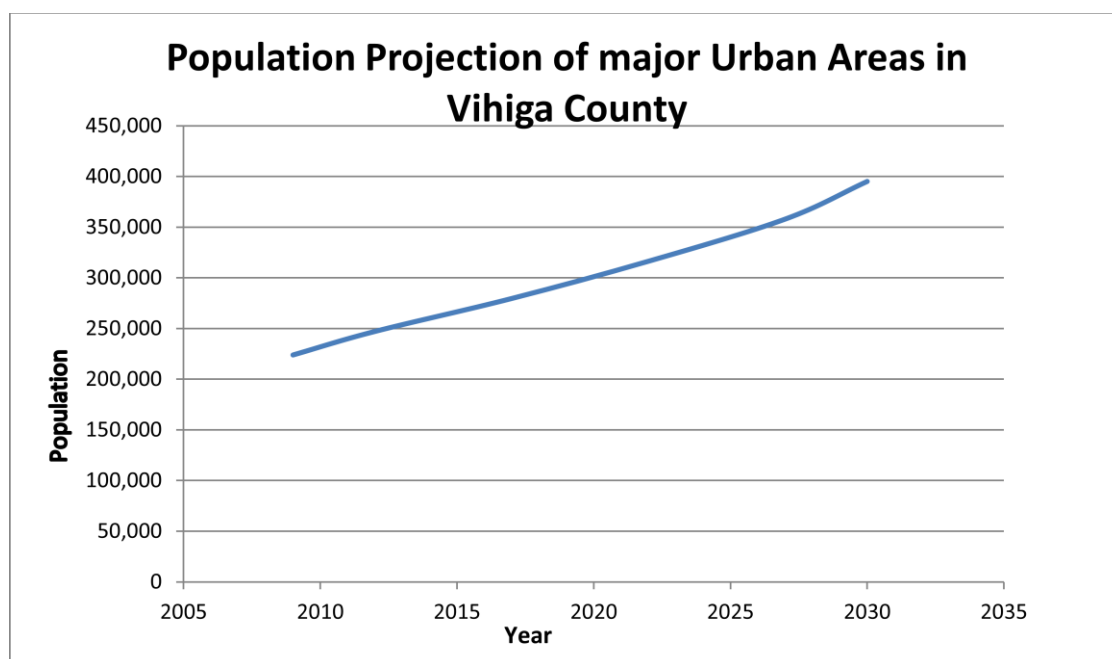
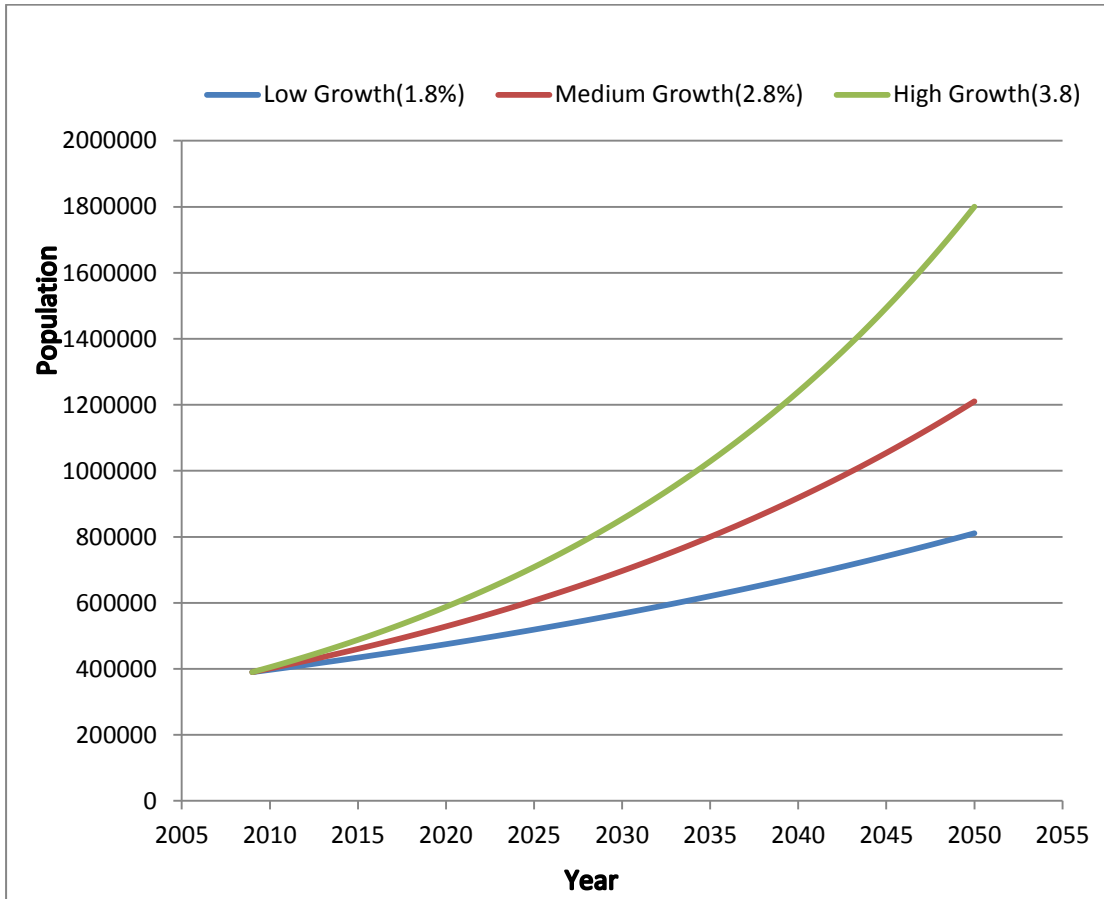


Figure 32 Population Projection of Major Urban Areas in Vihiga County

Source KNBS, Vihiga 2013 in First County Integrated Development Plan 2013-2017

Figure 33 Kisumu City Population Growth Scenario



Source: Projection based on National Housing Population Census, 2009

In an area characterized with scarce resource to satisfy the unlimited man demands, conflicts are likely to occur arising from competition that may take place. The study area is not an exceptional. There is reported land induced conflicts both at household level (53.6% of respondents) and at a community level (89.5% of respondents). Some of the impacts of the scarce land resource have been the rise in the conflicts as it regards sharing and use of the land resource. The nature of conflicts in the area includes boundary disputes-both at household level and community level (57% of

respondents), disputes as it regards how family land will be shared among heirs- both at household level and community level (33% of the respondents) and disputes as it regards who is entitled to develop the land. The results of this has been the hindering of exchange of land thus affecting land market, inability to get loan with land as a collateral and land remaining undeveloped among others.

Proper land demarcation is not only needed to solve such social and economic problem but also achieve proper land market which can help solve the problem of land fragmentation and uneconomic land subdivision. Its worthy noting that majority of households (56.5% of respondents) do not have title deed of the parcel of land they recede on. In some cases, land was found to be in ownership of grandparents. This is despite grandchildren owning the piece of land acquired through inheritance. This simply means that even the land bank programme proposed here cannot be achieved as land title deed is the only legal document to prove ownership of land. On same note, boundary disputes will hinder individuals offering their lands to the county government as encouraged in the land bank programme. Most households cannot meet the cost required to get land title deeds while others don't even know the process of achieving the same. The County Government can help on this by subsidizing the cost of the process involved. Similarly, it can help achieve this by offering free or subsidize the process of survey that will be required. Equally important is the need to sensitize the community on the need to apply for title deeds in addition to reducing the bureaucracy involved and make the process less tedious and easy to understand.

Basing on the stated conclusions and recommendations, the problem of uneconomic land subdivision and fragmentation can be dealt with. Population in Vihiga County

can be housed, provided with enough food from the hinterland and offered with employment opportunities. This is possible to take place within Vihiga County without necessarily having to move to other counties with aim of securing land for farming or settlement. Therefore, Vihiga County can house, feed and offer enough employment opportunities for its own population. All the stakeholders identified to help in resolving land fragmentation and uneconomic subdivision in the study should be engaged. This study recommends a study into the optimal agriculture land size for Vihiga County beyond which further subdivision should not be allowed. This will guide the proposed rural spatial land use plan and land consolidation initiatives. This should be passed in the Vihiga County assembly to become law.

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APPENDICES

APPENDIX 1a Research Authorization letter for Esianda Sublocation

REPUBLIC OF KENYA



OFFICE OF THE PRESIDENT

Telegram: "DISTRICTER", Emuhaya
E-mail: dcemuhaya@kenya.go.ke
Telephone: 020-3529117
Fax 020-3530074
When replying please quote:

DEPUTY COUNTY COMMISSIONER
EMUHAYA
P.O. BOX 74-50314
EMUHAYA


REF: EDU 12/15/(84) 3rd March 2014

Assistant County Commissioner
EMUHAYA DIVISION

RE: RESEARCH AUTHORIZATION - MISE VICKSON KIHIMA

The above named is a student at University of Nairobi Department of Urban and Regional Planning. He has been authorized to undertake a research on "Land Fragmentation and possible Planning Interventions: A case of Vihiga County" his area of study is Esianda Sub Location in Emusenjeli Location, Emuhaya Division from 5th March 2014 to 8th March 2014.

Kindly accord him the necessary assistance.




M. K. BARKUTWO
For: DEPUTY COUNTY COMMISSIONER
EMUHAYA

CC. The Assistant Chief
ESIANDA LOCATION

Mr. Mise Vickson Kihima ✓
ID NO. 24045981

APPENDIX 1b Research Authorization letter for Lusengeli Sublocation

REPUBLIC OF KENYA



THE PRESIDENCY
MINISTRY OF INTERIOR AND CO-ORDINATION OF NATIONAL GOVERNMENT

Telephone: **DISTRICTER, Sabatia**
Telephone: 057-2511168/057-2511616
E-mail: sabdistcom@yahoo.com

DEPUTY COUNTY COMMISSIONER
SABATIA SUB COUNTY
P.O. BOX 34-50311
WODANGA.

When replying please quote:
REF: EDU/12/6 VOL. 1(49),

4th March, 2014


The Chief
WODANGA LOCATION.

RE: RESEARCH AUTHORIZATION – MISE VICKSON KIHIMA

This is to confirm that the above named is a student of University of Nairobi and has been authorized to carry out research by same Institution vide their letter Ref. No. UON/CAF/DURP/6/8 dated 19th February, 2014.

This is also to confirm that he has been granted Research Authorization to carry out research on 'Land Fragmentation and Possible Planning Interventions: A Case Study of Vihiga County' where it will be carried out in your location

Accord him all the necessary support in carrying out the research.


S.K.MUTAI
FOR: DEPUTY COUNTY COMMISSIONER,
SABATIA SUBCOUNTY

Copy to
Mr. Vickson Mise Kihima
ID.NO.24045981

Assistant Chief
Lusengeli Sub Location

APPENDIX II: Household Questionnaire



UNIVERSITY OF NAIROBI

DEPARTMENT OF URBAN AND REGIONAL PLANNING

ANALYSIS OF LAND SUB-DIVISION AND FRAGMENTATION IN VIHIGA

COUNTY

Household Questionnaire

Declaration: *This information is confidential and it will be used purely for academic purpose only*

Ward.....	Constituency.....
Location	Sub-location.....
Date of Interview	Name of interviewer.....
Start time.....	End Time.....

QUESTIONNAIRE NUMBER

SECTION 1: RESPONDENT'S INFORMATION

1. Name of Respondent (Optional)
.....
2. Relationship with
HH.....
3. Age (Over 18 Years).....
4. Sex

Male	<input type="checkbox"/>
Female	<input type="checkbox"/>
5. Marital Status

Married	<input type="checkbox"/>
Single	<input type="checkbox"/>
Divorced/Separated	<input type="checkbox"/>
Widowed/Widower	<input type="checkbox"/>
6. Religion

Protestant	<input type="checkbox"/>
Catholic	<input type="checkbox"/>
Muslim	<input type="checkbox"/>
Other	<input type="checkbox"/>
7. Ethnicity

SECTION 2: DEMOGRAPHIC CHARACTERISTICS OF MEMBERS OF HOUSEHOLD:

2.1 What is the household size?

(Primary level = 1, Secondary level = 2, Tertiary = 3)

Members of HH	Sex	Age	Highest Level of education	Main occupation	Location of main occupation (on farm/off farm)	Other occupation	Location of other occupation (on farm/off farm)	Lives On or Off Farm

- | | | |
|------------------|------------|---------------------------|
| 1=Household head | 4=Daughter | 5=Sons & Daughters in law |
| 2=Wife | | 6=Grandchildren |
| 3=Sons | | 7=other relative |

SECTION 3: MIGRATION TRENDS

Immigration

3.1 Have you lived in Vihiga County since birth?

Yes

No

3.2 (If no, where were you living before you came to Vihiga?.....

3.3 Which year did you relocate to Vihiga?.....

3.4 If No, state the reasons for coming to Vihiga County. (Tick where necessary)

i.	To work	
ii.	Purchased land	
iii.	Allocated land by government	
iv.	Inherited land	
v.	Got married here	
vi.	To do business	
vii.	To farm	
viii.	Other (Specify)	

Emigration

3.5 Have any of your household members left to permanently settle elsewhere?

Yes

No

3.6 If Yes, where to?

Moved to (give district)	Male/Female	Year	Reason

SECTION 4: LAND TENURE & HOUSING CHARACTERISTICS

4.1 What is the size of the land you reside on?

.....

4.2 Do you own the land in which the household resides?

Yes
 No

4.3 If yes to (4.2) above,

a) How did you acquire the land?

Method of acquisition	Tick	Price
Inheritance		
Lease		
Allocation by Central government		
Allocation by county government/local authority		
Cooperative shares		
Purchased		
Others (Specify)		

b) What ownership documents do you have?

Document	Tick
Titles	
Lease	
Temporary Occupation License	
None	

4.4 Do you own other parcels of land besides this one?

Yes
 No

4.5 If yes, state the location and size

Parcel No.	Year of acquisition	Methods of acquisition	Admin. Location of land	Acreage	Price	Reason for acquiring additional land

4.6 Was your land part of a bigger parcel that was subdivided?

Yes
 No

4.7 If yes, provide the following

Initial size of land	Subdivided into how many portions	Size of the portions	Transferred to		Price
			Male	Female	

5.4. Number of animals on the farm?

For quantities: Milk= L, Beef = Kg, Fish = Kg, Eggs = pieces, Honey = Kgs

Livestock		Numbers	Yield	Quantity consumed by HH	Quantity sold	Income earned Yr
Dairy cows	Grade(exotic)					
	Crossbreeds					
	Zebu/local					
Beef cattle	Grade(exotic)					
	Crossbreeds					
	Zebu/local					
Dairy Goats						
Sheep						
Pig						
Poultry	Broilers					
	Layers					
	Local Breeds					
Fish						
Bees						
Others (specify)						

5.5. Other livestock products

Products	Quantity Produced/month	Quantity sold per month
Hides		
Skins		
Others (specify)		

5.6. In which trading centres do you sell your farm produce?

Type of produce	Main centre of sale	Secondary centre of sale	Income/month

5.7. What are the problems do you face in crop production?

Sector	Problems	Current mitigation measures	Proposed mitigation measures

5.8. Do you receive farm training?

1. Yes 2. No

5.9. If yes, which ones

5.10. Frequency

5.11. What are the problems faced in livestock production?

Sector	Problems	Current mitigation measures	Proposed mitigation measures
Livestock			

5.12a. Do you receive livestock extension services?

1. Yes 2. No

5.12b. If yes, which ones and frequency.....

5.13. How is the farm training/extension given?

	On-Farm training	Livestock Extension services
Seminars and workshops		
Onsite training by extension officers		
Universities/ colleges		
Others (specify)		

Marketing

5.14. Which channels do you use for the sale of your **crop produce?**

Channel	Crop products	Reasons/ benefits	Challenges
Co-operatives			
Middle people individually			
Others (specify)			

5.15. Which channels do you use for the sale of your **animal produce**?

Channel	Livestock products	Reasons/ benefits	Challenges
Co-operatives			
Middle people			
individually			
Others (specify)			

SECTION 6: INFRASTRUCTURE FACILITIES AND UTILITY SERVICES

Water

6.1. Where do you get water for your domestic and agricultural uses?

Source	Domestic	Animal consumption	Irrigation	Others (specify)	Distance	Condition
Rain water						
River/stream						
Well						
Borehole						
Natural spring						
Piped						
Other (specify)						

6.2. Where do you get the water used in the household?

Source	Adequacy	Challenges	Suggested solution
Rain water			
Piped			
Well/Borehole			
Spring (s)			
Stream/river			
Water vendors			

6.3. Are there any water conservation measures undertaken by the community/ individuals?.....

6.4 Does subdivision of land into small units affect quantity and quality of water supply?

6.5 If yes, how?.....

Sanitation

6.6. How do you dispose **solid waste** from the house?

Method	Tick as Appropriate
solid waste	Bury
	Burn
	Compost pit
	Garbage collection
	Other (specify)

6.7. How do you dispose **liquid waste**?

Method	Tick as appropriate
Water closet to sewerage system	
Pit latrines	
Septic tank	
Open drain	
Others (specify)	

6.8 Does subdivision of land into small units affect solid and liquid waste disposal as stated above-i.e. (6.6) and (6.7)?

6.9 If yes, how?.....

Energy

6.10. What is the type of energy used?

Type of energy	Source	cooking	lighting	Heating	Other uses	Cost/month
Electricity						
Kerosene						
Charcoal						
LPG Gas						
Bio gas						
Firewood						
Wind						
Solar						
Other (specify)						

6.11. What challenges do you get in accessing and using these sources of energy?

Challenges	Suggested solution

6.12 Does subdivision of land into small units affect the supply of energy stated above? (a)Yes (b) No

6.13 If yes, how?.....

SECTION 7: POLICY INTERVENTIONS THAT COULD ENSURE ECONOMICAL LAND SUBDIVISION

7.1 Is there subdivision of land into small uneconomical units in Vihiga County?

7.2 If Yes,
 What is the main cause of subdividing land into small units in Vihiga County?.....

7.3 What is the impact of subdividing land into small units on:
 (a) agricultural activities
 (b) Environment
 (c) Household income
 (d) Settlement pattern
 (e) Others

7.4 How can such uneconomical land subdivision be reduced/stopped?.....

7.5 Who can contribute towards reducing uneconomical land subdivision in your sub-location?

	Actor	Position	How can they contribute
a)			
b)			
c)			
d)			
e)			

SECTION 8: LAND CONFLICT RESOLUTION

8.1a). Are there any conflicts in this area that are related to land issues

1. Yes..... 2. No.....

8.1b). If yes, of what nature?

.....

8.1c). what effects do these conflicts have on development of this area?

.....

8.1d). who assists you in conflict resolution locally?

Type of conflict	Institution

8.2. Are they effective in resolving conflict?

Yes
 No

8.3. Give reasons.

a.
 .
 b.
 .
 c.

New Constitution, Planning and Public Participation

8.4. Are you aware of planning and resource allocation provisions in the new constitution?

Yes

No

8.5. If yes, what do you know?

.....

SECTION 9: LAND, ENVIRONMENT & RESOURCES

9.1. Environmental change and vulnerability

a.) Over the years, has the rainfall patterns changed in this area? Yes []
No []

If yes, what changes have occurred?

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

b.) Has the planting season changed in the past few years?

c.) 1. Yes 2.No

d.) If yes, how?

.....
.....

e.) Are there new invasive species of weeds that have emerged which were not found in this area in the past?

Species	Year when invasion was noted

f.) Are there new invasive species of insects that have emerged which were not found in this area in the past?

Species	Year when invasion was noted

g.) Are there natural disasters occurring which used not to happen?

h.) Yes [] No []

i.) If yes in above, please specify.....

j.) Are there species of weeds, insect, birds, animal or plant that have disappeared which were found in this area in the past?

(a) Yes () (b) No ()

k.) If yes, name them.

(a)

Weeds.....

(b)

Insect.....

(c)

Birds.....

(d)

Animal.....

(e)

Plant.....

j.)How does change in land size relate to the observed changes in both environment and Resources?

9.2 Does continued subdivision of land into small units contribute to such environmental challenges? Yes [] No []

9.3 If Yes,

how?.....

9.4. What intervention measures as an individual have you put in place to mitigate above environmental challenges?

9.5. What intervention measures has community put in place to mitigate above environmental challenges?

9.6. Are there other agencies/ stakeholders that are involved in environmental conservation in this area? a. Yes ___ b. No. _____

9.7 Agency	9.8 How involved

9.10. Any other comments

.....
.....
THANK YOU

APPENDIX III: Question guide to focus group discussion
Question guide to focus group discussion on impact of uneconomical land
subdivision and land fragmentation

1. What is the current trend in land size available for cultivation and other uses when compared considering the following period of time: 1970s, 1980s, 1990s and 2000s?
2. What is the cause of this trend?
3. How has this trend in land size impacted on:
 - Number and type of plants and animals in this area?
 - Number and size of water bodies(e.g. wetlands)
 - Community cultural values
 - open spaces
 - Agriculture activities
 - Settlement pattern
 - Household income
 - Occurrences and frequency of diseases in the community?

Other area of influence

4. How is community adapting to problem of land scarcity?
5. How can land subdivision into small units be stopped?
6. Who can help in achieving this and how?
7. What are some of the challenges expected when trying to curb the continued land subdivision?
8. How can such challenges be overcome?
9. What values does the community attach to land resource?
Social values, Cultural values
Economical value, others

APPENDIX IV: Interview guide with key informant

1. What is the size of the land that you own?
2. Given the production potential of Vihiga County, what is your opinion regarding sufficient land size for a household?
3. What is the main reason for land subdivision in Vihiga County?
4. How has such land subdivision affected economic development in Vihiga County?
5. What can be done to curb the continued subdivision into small units in Vihiga County?
6. Who can help in achieving the stated recommendations (i.e. No.4) above?
7. In implementing the stated recommendations, what are some of the expected challenges and how can they be overcome?

8. Given the Production potential in this County, what settlement pattern would you recommend per household?
9. Given the Production potential in this County, what settlement pattern would you recommend for the community?
 - (a) Linear settlement
 - (b) Clustered settlement
 - (d) Dispersed Settlement
- 9(b). How would you prefer to utilize land when burying your beloved one?
 - (a) Public cemetery
 - (b) Community cemetery
 - (c) Within home compound
 - (d) Cremate
10. If the County government allocates you a piece of land located at different place from your current land, are you willing to give out your current piece of land in exchange?
11. Give reasons for 10 above.