

**EFFECTS OF CHANGES IN AGRICULTURAL LAND USE PRACTICES ON
HOUSEHOLD FOOD SECURITY IN BURETI SUB-COUNTY, KENYA**

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**A thesis submitted to the Graduate school in partial fulfillment for the Requirements of
the Award of Master degree of Arts in Geography of Egerton University**

EGERTON UNIVERSITY

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DECLARATION AND RECOMMENDATION

Declaration

This research thesis is my original work and has not been presented for award of a Degree in any other University

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DEDICATION

This thesis is dedicated to my parents, husband, children and friends.

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ABSTRACT

Shortage of food in the world today has resulted from changes in agricultural land use practices among other factors including climate change, population growth and urbanization. In Kenya, over the past four decades there has been reducing number of people practicing agriculture in the country. Though agriculture is the main economic activity in the country, the increasing population and human settlement into the agricultural regions has led to the sub-division of the rural agricultural land. The farm sizes became uneconomic and productivity declined. The focus of this study was to analyze changes in agricultural land use practises and their impacts on household food security between 2006 and 2015 in Bureti Sub-county. Cross sectional research designs including qualitative and quantitative approaches were used in the study. Kapkatet and Tebesonik locations were purposely sampled as the study areas in Bureti Sub-county. Multi-stage sampling was used to identify respondents in the study area. The main research instruments were questionnaires for households and key informants. The results from this study showed that there was increased land for farming activities including food crop cultivation (11.9%) and cash crops cultivation (11.4%) between the year 2006 and 2015. Household size was found to be the main cause of changes in food crops and mixed farming land uses (16.0% and 66% respectively). Households in the study area were found to be food accessible (67.5%). In addition, the respondents were of the opinion that the quality of soil (70.7%) and high rainfall (86.1%) in Bureti sub-County influence household food security. The study recommended that there should be intensive household mixed farming, more agricultural extension services and formulation of policies favouring small scale farming.

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LIST OF ABBREVIATIONS AND ACRONYMS

ASALs	–	Arid and Semi-Arid lands
ASDS	–	Agriculture Sector Development Strategy
EIU	–	Economist Intelligence Unit
FAO	–	Food and Agriculture Organization
GDP	–	Gross Domestic Product
GoK	–	Government of Kenya
IFAD	–	International Fund for Agricultural Development
KARI	–	Kenya Agricultural Research Institute
KNBS	–	Kenya National Bureau of Statistics
LH	–	Lower Highland
GoK	–	Government of Kenya
SRA	–	Strategy for Revitalizing Agriculture
SDGs	–	Sustainable Development Goals
UN	–	United Nations
UNEP	–	United Nations Environmental Programme
USAID	–	United States Agency for International Development
WFP	–	World Food Programme
WHO	–	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background Information to the Study

About 795 million people on earth experience hunger and 160 million children under the age of 5 are stunted (FAO, 2015). The vast majority of the hungry live in the developing regions of the world particularly in Southern Asia and Sub-Saharan Africa where progress towards reduction of hunger has been slow and uneven (Kharas *et al.*, 2015). Asia and sub-Saharan Africa now account for substantially larger shares of global undernourishment. In sub-Saharan Africa, about one in every four people is estimated to be undernourished. Within sub-Saharan Africa, the Eastern African region is the sub-region with the highest hunger problem in absolute terms (FAO, 2015).

Kenya has had a high population growth over the last 50 years, experiencing an almost five-fold increase in its population (Dietz *et al.*, 2014). The rapid growth of population has among others impacted on Kenya's food security status. In the 1961 it could feed its 8.4 million people at more than 10% above WHO requirements but after 1970s the situation began to deteriorate (Nyanjom, 2013). By 2009, Kenya's basic food production reached alarmingly low levels and the country could only potentially feed 72% of its population of 39 million at WHO food requirement levels. Research has revealed that production of basic food crops in Kenya in the past 50 years did not keep pace with population growth and for those crops which did so, it was due to area increase rather than through yield increase (Dietz *et al.*, 2014). In the high potential agricultural areas in the Rift Valley and Western part of the country, food crop production is facing competition from non-food crops.

Food deprivation in the rural area was 57 per cent, much higher than 39 percent in the urban areas (GoK, 2008). In light of high burden of malnutrition and its consequences, the Sustainable Development Goals (SDGs) highlight food security as a human right that needs to be addressed with urgency (UN, 2015). Agriculture is an important sector of the Kenyan economy, contributing approximately 25% of the GDP and employing about 75% of the national labour force (GoK, 2005). Currently over 10 million people in Kenya suffer from chronic food insecurity and poor nutrition. Between two and four million people require emergency food assistance at any given time (GoK, 2011).

Most people in the rural areas earn their incomes and food directly or indirectly from agricultural production. Towards this end, transforming agriculture would not only lead to

improved food and nutrition security but would also lead to attainment of other development priorities (Kharas *et al.*, 2015). Research has shown that growth in the agriculture sector is significantly more effective in reducing extreme poverty than growth originating from other sectors of the economy (Christansen, Demery and Khul, 2011). Without substantial progress on food and nutrition security, it will be increasingly difficult to realize other development priorities on health, education, economic growth, and environmental sustainability (Kharas *et al.*, 2015).

Agricultural sector in Kenya has undergone major changes over the past decades (Nyoro and Jayne, 2004). Before 1970 most parts of the rural Kenya was shrub grassland and forested, and the land use was mainly livestock grazing, scattered rural settlements with people practicing rural traditional farming. Between 1970 and 1995, there was relative growth in area for most agricultural commodities in the rural areas as a result of the government support to encourage small scale farming of selected crops (Nyoro and Jayne, 2004). As the country grew and developed, agricultural activities dominated the economy with 17 percent of the total land area (Kenya Land Alliance, 2015). However, the growth rate declined from 1.5% in 1998 to 1.2% in 1999 and further dropped to 0.8% in 2000 (GoK/UNEP, 2001). This may be as a result of the failure in the relationship between good land use land cover practices, good economic benefits and good nutrition of the population. According to Wathika (2014), the rate of population growth, land fragmentations for settlements, culture and norms of land tenure affects land use land cover changes and food production. Nyoro and Jayne (2004) argued that population pressure is the main cause of rural agricultural land use change in high agricultural potential areas in Kenya.

According to Houghton (1994), the purpose of deliberate land-use changes is to increase local capacity of lands to support the human enterprise, but to the contrary many land use practices instead reduces the capacity. For example Kiambu County with a perfect rural – urban interface, the agricultural land at the periphery is rapidly transforming and giving way to residential developments (Gachunia, 2016). Rural agricultural land use changes limit the potential of the peri-urban agriculture and increases the vulnerability of the poor in terms food security and income (Gachunia, 2016).

Bureti sub-County in Kericho County is within the lower highland agro-ecological zone of the rift valley characterized as a high agricultural potential area (GoK, 2013). However, like many agricultural areas of Kenya, small scale farmers in the area faces many challenges

including bio-physical and socio-economic adverse effects including climate change, pests and diseases, poverty and low income which may lead to low farm yields (Waithaka, 2014). The poverty levels in the sub-county stand at 38.7% (GoK, 2013). According to GoK (2010) report the population of the sub-county is 306,763 people and is on the increasing trend. This has led to sub division of land, resulting in reduced land for agricultural activities hence food insecurity. Despite measures to address and eradicate extreme poverty and hunger including programmes such as National Accelerated Programmes, Input Access Programmes, Fish Farming and Livestock Diversification; the county still faces food insecurity (GoK, 2013)

1.2 Statement of the Problem

The Kenyan government has identified agriculture as a central pillar to its economic development. This is reflected in policies such as National Food and Nutrition Security Policy that are supporting rural communities at various stages of agricultural value chain. The current national agricultural policy aims to raise yields of key crops and livestock and transform land use by putting idle land in existing farming areas into productive agricultural land use. The agricultural sector in densely populated rural areas continues to face many development challenges. Among the challenges is the changing agricultural land use pattern that may be attributed to a variety of factors including population growth and increased human settlement. Changes in agricultural land use are likely to affect household food security levels. Against this background, the purpose of this study was to analyze recent changes in agricultural land-use and extent to which such changes have influenced household food security in Bureti sub-county. This makes it necessary to establish the different land uses at household level.

1.3 Objectives of the Study

1.3.1 Broad Objective

The main objective of the study was to analyse the changes in household agricultural land use practices and their impacts on food security between the year 2006 and 2015 in Bureti Sub-County.

1.3.2 Specific Objectives

- i. To evaluate changes on household agricultural land-use practices between 2006 and 2015 in Bureti sub-County

- ii. To establish factors responsible for changes in household agricultural land-use practices between 2006 and 2015 in Bureti sub-County
- iii. To evaluate levels of household food security in Bureti sub-County
- iv. To establish factors responsible for levels of household food security in Bureti sub-County

1.4 Research Questions

- i. What are the changes on household agricultural land use practices between 2006 and 2015 in Bureti sub-County?
- ii. What factors have influenced agricultural land-use practices among households between 2006 and 2015 in Bureti sub-County?
- iii. What are the current levels of household food security in Bureti sub-County?
- iv. What are the factors responsible for levels of household food security in Bureti sub-County?

1.5 Justification of the Study

The renewed focus on food and nutrition security is enshrined in the global sustainable development goals. SDG II is to “End hunger, achieve food security and improved nutrition and promote sustainable agriculture”. Implementing this goal in Kenya would require a thorough understanding on the dynamics associated with small scale agricultural practices in rural areas where close to 75 percent of its population resides. This research is designed among other things to support knowledge base by informing decision-makers on relationship between land use changes, agricultural production and household food and nutrition security in high potential land. The study evaluates how the changes in agricultural land use have impacted food security and income of households over a period of ten years to determine how they relate and to come up with a conclusive trend of the interrelationship.

This study provides information on current agricultural land use in Bureti Sub-County and its impact on food security and levels of income. Such information is useful for agricultural planning purposes both at the County and National levels. Findings from the study also add to the existing body of knowledge on the impact of agricultural land uses on food security and income. The results of the study is also useful in refining national and county policies on agricultural land use and subsequently improvement of food security in line with the Kenya

Vision 2030, that aims at transforming Kenya into a newly industrialized middle income country. In the vision 2030 agriculture is identified as a key sector in achieving economic growth. This was achieved through transforming the small holder agriculture from subsistence to innovative commercial oriented and modern agricultural sector. Research findings would also benefit the county government whose strategic plan is to improve the agricultural sector that employs over 70 per cent of its labour force (GoK, 2008).

1.6 Scope and Limitations of the Study

The study examined changes in agricultural land uses on household food security in Kapkatet location and Tebesonik location, Bureti Sub-county, Kenya. Kapkatet and Tebesonik locations were chosen because they have the highest and lowest population densities compared to other locations within Bureti sub-county and have high concentration of agricultural activities. The study was limited mainly to agricultural land use practices. Although changes in agricultural land use are affected by physical attributes such as climate and soil, the study focused on soci-economic factors influencing agricultural land use. It was limited to self-assessment of farmers on agricultural land use practices for the last ten years, before the survey. Ten years was ideal because one is able to remember the occurrences those years. The study baseline data was on population obtained from 2009 census by KNBS while the projections on population are based on the data maintained by KNBS since census is done after every ten years.

1.7 Operational Definitions of Key Terms and Concepts

Agricultural land use – Refers to how the farmers use their land. This include growing of crops both cash and food crops, fruits, horticultural and keeping of livestock. The farmers were categorized per proportion of land under the above practices.

Cropping system – Refers to how the various types of crops are planted by a given farmer. The cropping system s measured in this study including food crops cultivation, cash crops cultivation and mixed farming

Education level – refers to the stages of the learning experience of an individual. The levels of education assessed include no formal education, primary secondary and tertiary.

Food security – Situation that exists when all people at all times have physical, and economic access to sufficient, safe, and nutritious food that meets their dietary needs for a

healthy and active life (FAO). In this study food security was measured in terms of quality for example how many times do you miss food in a household?

Household – A domestic unit consisting of the members of a family who live together. In this study a household will consist of small scale farmer's family.

Household characteristics – refers to basic information describing members of the selected household. The study assessed gender, marital status, number of people in a household, ages, level of education and occupation of the household members

Household food security – this refers to the situation the farmers family have enough food. In this study household food security is measured by the number of meals taken per day, availability of enough and different variety of food for the family

Land tenure – Legal system in which the land is owned by an individual. It defines how land is granted, controlled and transferred as well as associated responsibilities and restraints.

Land use changes – refers to the changes that have taken place in activities in the farm. The looks at the changes in agricultural activities in the farm asking the farmers questions about what has changed in the farm in the last ten years.

Livelihood - Means of securing the basic necessities - food, water, shelter and clothing- of life.

Small scale farmers: are farmers practicing agriculture on small pieces of land adjacent to their households. In this study, smallholder farmers refer to farmers practicing mixed farming on pieces of land of measuring between - one and two hectares.

Socio-economic factors – refers to the social and economic experiences and realities that defines a person's character, attitude and behaviour; a region and neighbourhood. In this study the characteristics of a household including number of people in a household, occupation marital status and age of members were measured as socio-economic factors.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents an analysis of existing literatures on effects of changes in agricultural land use practices on household food security. It includes findings of related studies undertaken by other researchers.

2.2 Food Security Status in the World

The progress towards food security and nutrition targets requires food to be available, accessible and sufficient in quality and quantity (FAO, 2015). Food security is determined by various factors such as own production, purchase and level of income. Progress towards improved food security continues to be uneven across regions. Some regions have made remarkable rapid progress in reducing hunger notably Caucasus, Central Asia, Eastern Asia, Latin America and Northern Africa. However, in Southern Asia and sub Saharan Africa progress has been slow. While some countries report successes in reducing hunger and undernourishment, other forms of malnutrition remain at overall high levels as shown in the Table 2.1.

In 2015, the annual state of food insecurity in the world report took stock of the progress made towards achieving the internationally established millennium development goals (MDG) and reflected on what needs to be done as we transit to the new post 2015 sustainable development agenda. According to FAO (2017), between the year 2010 and 2015 there was a significant decline in world hunger. However, in the year 2016 world hunger rose up from 777 million to 815 million people. The increased world hunger trend in the year 2016 raised concerns and posed significant challenge on world commitment to end hunger by the year 2030. FAO, IFAD, WFP and WHO in 2014 posed questions on whether the uptrend of food insecurity and hunger in the year 2016 would signal the beginning of upward trends or may have been linked to either famine, drought, floods violence or conflicts that hit rural communities of the specific regions thus driving food insecurity and hunger in the various parts of the world such as sub-Saharan Africa (South Sudan, Somali and Nigeria) and South Eastern and West Asia.

Table 2.1: The changing distribution of hunger in the world numbers and shares of undernourished people by region

Regions	Numbers (millions)		Regional shares %	
	1990-92	2014-16	1990-92	2014-16
Developed Regions	20	15	2.0	1.8
Southern Asia	291	281	28.8	35.4
Sub Saharan Africa	176	220	17.4	27.7
Eastern Asia	295	145	29.2	18.3
South Eastern Asia	138	61	13.6	7.6
Latin America and The Caribbean	66	34	6.5	4.3
Western Africa	8	19	0.8	2.4
Northern Africa	6	4	0.6	0.5
Caucasus and Central Asia	10	6	0.9	0.7
Oceanica	1	1	0.1	0.2
Total	1011	795	100	100

Source: FAO (2015)

Food security improved in most countries with developed countries having the highest level of food security while sub Saharan countries remained at the bottom of the list (FAO Economist intelligence unit, 2014). Developing countries are affected strongly by food insecurity and are characterised by a generalized level of extreme poverty (Hermann, 2003). Out of the 61 countries facing food crisis, 29 were from developing countries.

According to FAO (2017b), the prevalence of stunting in sub-Saharan Africa has reduced by only 7.2 percent from the year 1985 to 2016, and one in three children under the age of five is stunted. Eastern and western Africa host the highest proportions, 44 percent and 36 percent respectively, while the lowest prevalence (3 percent) is observed in southern Africa. Further FAO (2017b) found that from 2015, sub-Saharan Africa has been experiencing climate induced disruptions of droughts and floods due to El Nino and La Nina weather phenomena affecting livelihoods of millions of the poor households (FAO, 2017b). The state of Africa's food security and nutrition has been on focus by the Africa's heads of states and governments and in 2014 Malabo Declaration on "Accelerated Agricultural Growth and Transformation for Shared Prosperity and Improved Livelihoods" was ratified. The declaration covered goals

goals to end hunger in Africa by the year 2025 focusing on increasing production, reducing losses and waste and improving nutrition (FAO, 2017b).

According to Kenya Agricultural Research Institute (2008), over 80% of the Kenyan population living in the rural areas derives their livelihoods mainly from agricultural related activities. Due to that reason the Government of Kenya has continued to give agriculture a high priority as an important tool for promoting national development and food security. In 2008, the government launched vision 2030 which aimed at reforming agricultural policies, fertilizer reduction, branding Kenyan farm produce, establishment of livestock free zones and processing facilities, creation of publicly accessible land registries, developing of agricultural land use master plan and development of irrigation schemes. Currently the Government of Kenya is in the process of implementing its four key pillars “Agenda Four” including food security aimed at expanding food production. Despite the Kenyan government commitment to avail resources to achieve the 2015 target of reducing the incidence of extreme poverty and hunger by half the target was not met. This is attested by estimated over 10 million people in the country who are food insecure with majority of them living on food relief. The current food insecurity problems are attributed to several factors, including the frequent droughts in most parts of the country, high costs of domestic food production, displacement of a large number of farmers in the high potential agricultural areas following the post-election violence which occurred in early 2008, high global food prices and low purchasing power for large proportion of the population due to high level of poverty.

2.3 Agricultural Land- use Change

Land use change is known as the complex process which is caused by the mutual interactions between the environmental and social factors at different spatial and temporal scales (Valbuena *et al.*, 2008). More recently, industrial activities and development, the so called industrialisation, has encouraged the concentration of population within the urban areas. This leads to depopulation of the rural regions along with intensive farming in the most productive lands and the abandonment of marginal lands (Ellis and Pontius, 2006).

Changes in economy and spatial distribution of population can occur through conversion from one land use to another, for instance, converting farming lands into residential, industrial, commercial or recreational use. The land owners play a key role in whatever will take place at the land and therefore, their decisions identify the direction and quantity of changes (Etterma *et al.*, 2007). Therefore, the different land owners: farmers, developers,

private individuals and government decide in a different ways the land use according to their type and their parameters. The owners have to supply the financial investment of the land change, thus their awareness of economic situation can control the speed of the changes. A land owner can decide to; leave the land at current state, develop the land by changing the land usage and exploit it, develop the land by changing the land usage and sell it or sell the land to another owner. Eventually, the decision, which will be most likely made, totally depends on the expected value of each of the option to the owner. In case of commercial owners, utility will match with profitability the action that will be taken will deliver the highest profit. In the case of government social benefits will play a significant role, whereas in the farmer's case, personal and emotional reasons may influence the decision.

Agricultural land use change is the conversion and/or modification of a land cover primarily for agricultural purposes, often entails environmentally unfriendly practices such as clearing natural forestlands and intensifying agricultural production on environmentally sensitive lands for example highly sloped lands, floodplains and wetlands (Foley *et al.*, 2005). The pattern of agricultural land use changes are attributed by complex interaction between the biophysical and societal (economic, social, political and technological) process at local, regional and global scale. In Senegal, the principal drives of agriculture land use change are climate, population growth, development projects; land ownership, cash crop production and forestry practices (Wood, Tappan & Hadj 2004). Water factors, soil conditions and government policy were also influencing land use changes in Ethiopia (Etsay, Negash, & Aregay, 2019). This complex interaction creates pressure on land.

Before the land area of Kenya was penetrated by Europeans the land use was a combination of pastoralism and subsistence agriculture (Tengnäs, 1994). This subsistence farming was based on shifting cultivation and since the population was low, fallow periods were long. Radical changes occurred after independence in 196 (Tengnäs, 1994). Majority of white settlers gradually left and more development efforts was directed towards small-scale African agriculture; many large-scale farms were sub-divide, although few remain to present time.

In Kenya, agricultural land use change differed from place to place depending on the driving factors. According to Waitthaka (2014), Keumbu region of Kisii County was once a rich and agricultural productive area. The soil of the area was deep, well drained and fertile supporting the production of cash crops mainly tea, food crops including maize, beans and sweet potatoes and livestock keeping. However, over use of agricultural land and numerous

challenges faced by the farmers slowed crops and animals productivity. In addition, the continuous increasing rural population density as per the 1989, 1999 and 2009 Kenya National Bureau of Statistics population census increased pressure on land. As a result farm sizes shranked, there was increased agricultural land degradation and agricultural intensity reduced leading to poverty.

According to Gachunia (2016), Kiambu County is a perfect demonstration of rural agricultural land use change. As a result of the rural – urban interface, the rural agricultural land is quickly giving way to blocks of flats and other residential land uses. As a result of the close proximity of Kiambu County to Nairobi city, there is pressure on the traditional coffee and subsistence farms in the rural areas to give way to growth and development. There evidenced sub-division and conversion of the arable land from agricultural uses impacting food security, cultural, ecology and increasing vulnerability of the rural people of Kiambu County.

Land use changes have been influenced by many factors among them, increase in population which has put pressure on the land leading to land fragmentation thus reducing land for agriculture (Waithaka, 2014). Land tenure is important in decision making process about land use. In Kenya, most farmers in Kenya have no legal title for land on which they farm (USAID, 2014) therefore they are not able to use title deeds to borrow loans to improve on their farming in order to increase yields. In August 2009, the government of Kenya approved a new National Land Policy (NLP), as a step towards addressing current laws ensuring sustainable and equitable use of land (Sessional Paper No.3 on National Land Policy, 2009).

Land use changes can be caused by multiple driving factors that control some environmental, social and economic variables (Li, Wang, Li & Lei 2016). These driving forces can contain any factors which influence human activities, including local culture, economic and financial matters, environmental circumstances, current land policy and development plans and also interactions between these factors. Land use change is frequently addressed through various selected biophysical and socio economic variables (Sacande, Parfondry & Martucci, 2018).

2.3.1 Biophysical Factors Influencing Agricultural Land-use

Biophysical environment is a biotic and abiotic surrounding of an organism or population and includes the factors that have an influence in their survival, development and evolution. Agricultural land use changes results from a continuous interaction between local conditions of climate, soils and topography.

Climate is perhaps the most influential factor which determines the distribution of agricultural activities all over the world (Tobey, Reilly, Kane & 1992). According to Taylor *et al.* (2004), climatic fluctuations will be most pronounced in semi-arid and humid regions leading to reduced crop yields, livestock numbers and productivity. The situation is mostly common within sub-Saharan Africa and South Asia which form part of the poorest regions with the highest levels of chronic undernourishment and exposed to the highest degree of instability.

Despite great advances that have been made in technological development, people still have no control over climate (Brewer, 2008). Crop growing and livestock rearing is influenced by temperature variations and the amount and distribution of rainfall (Smith and Gregory, 2013). Differences in altitude also determine the type of crops that can be grown and the animals to be reared in a region because altitude influences temperature, rainfall and soils. Relief of an area also affects the type of crops to be grown. There are those that do well in lowlands, this is because altitude influences temperature, precipitation and drainage. For this reason it is possible to grow temperate crops such as apples, pears and plums within the tropical highlands where climatic condition is similar to that of the temperate lands (Griesbach, 2007).

Terrain, which refers to surface configuration, determines drainage (Reddy, Maji and Gajbhiye, 2004). Most crops do well in land that has a slope since the soils there are well drained. For example, tea and coffee are grown in the Kenya highlands where there are hills and slopes which facilitate proper soil drainage (Ndegwa, 1999). Wet rice is grown in water logged soils during growing period, but has to be drained from the fields when the rice is mature, for the crop to ripen and dry properly (Bhuiyan and Undan, 1986). Different soils also determine agricultural land use. Soil in different areas differs in characteristics with some areas having acidic soil while others are alkaline (Ndegwa, 1999). Some crops do well in acidic soils such as coffee and tea while others do well in alkaline soil.

Kenya is characterised by a highly diverse climate that varies from a tropical temperate, climatic inland to a dry climate in the north (Herrero *et. al.*, 2010). Recurrent drought is widespread and it is one of the major causes of vulnerability at household level. Climate change is considered to pose the greatest threat to agricultural production and as a result food security in the 21st century, particularly in many of the poor agricultural based countries of sub Saharan African, due to their low capacity to effectively cope with a possible decrease in

yields (Shah *et al.*, 2008). Intensity of the direct effects of climate change on yield, land use and cropping patterns remains uncertain. Climate affects food production directly through changes in agro-ecological conditions and indirectly by affecting growth and distribution of shifts in availability of suitable land for agriculture. Shifts in land suitability are likely to lead to increase in suitable crop land in higher latitudes and declines of potential crop land in lower latitudes (Shah *et al.*, 2008).

Crop production is co-determined by the biophysical potential of land and the level of factor inputs per unit of cultivated land (Shah *et al.*, 2008). The potential outputs are derived from an agro-ecological zone assessment of agro-climatic and biophysical conditions. Sustainable agriculture must have a stable supply of land and water resources, however the land and water resources of the world are and some like soil are non-renewable.

2.3.2 Socio-economic Determinants of Agricultural Land-use

There are various factors that cause agricultural land use change but human induced conditions are the major cause (Meyer and Turner, 1994). According to Briassoulis (2000), societal factors relating to population structure and dynamics, income and affluence, technology, socio-economic organization, culture, institutions, and political systems shape demand for land, land-use patterns and their change. Further she argued that the future land-use and cover change depend on the dynamic relationships among the factors influencing land use change and the resulting land-use patterns, from the individual to higher spatial levels and, on the other, on national and international, direct and indirect policies instituted to mitigate the adverse environmental and socio-economic impacts of land-use and land cover change.

The unequal distribution of wealth between households, countries, and regions also determines who is able to develop, use, and profit from new technologies that increase profits from land management, such as the adoption of mechanized large scale agriculture (Lambin *et al.* 2001). Agricultural subsidies are influenced by global factors drive a trend toward intensive commercial agriculture and away from subsistence croplands. For example, giving farmers better access to credit and markets, combined with improved agricultural technology and secure land tenure can encourage forest conversion to cropland, depending on how the new technologies affect labour markets and migration, whether the crops are sold locally or globally, how profitable farming is at the forest frontier, and the capital and labour intensity of the new technologies (Barbier, 1997).

Demographic changes including changes in household structure and dynamics, including labour availability, migration, urbanization, and the breakdown of extended families into multiple nuclear families are some of the causes agricultural land use changes. The growth of urban aspirations, urban-rural population distribution, and rapid urban expansion are increasingly important factors in regional land-use change, within major urban centers, in peri-urban areas, and even in remote hinterland areas (Angelsen et. al. 1999). Many new urban dwellers in developing countries still own rural landholdings so that growth of urban areas not only creates new local and regional markets for livestock, timber, and agricultural products, it also increases urban remittances to the countryside.

Numerous cultural factors also influence decision making on agricultural land use. The motivations, collective memories, personal histories, attitudes, values, beliefs, and individual perceptions of land managers influence land-use decisions, sometimes profoundly (von Ketteler, 2018). The intended and unintended ecological consequences of land-use decisions all depend on the knowledge, information, and management skills available to land managers and these in turn are often linked to political and economic conditions, e.g., the status of women or ethnic minorities (Leemans et al. 2003).

Agricultural land-use conversions can be influenced directly by political, legal, economic, and traditional institutions and by their interactions with individual decision making (Museleku, 2013). Access to land, labour, capital, technology, and information are structured by local and national policies and institutions, including: property-rights; environmental policies; decision-making systems for resource management (e.g., decentralized, democratized, state-controlled, local communal, legal) and social networks concerning distribution and access to resources. Land degradation and other negative environmental consequences of land-use changes are often the result of ill defined policies and weak institutional enforcement that undermine local adaptation strategies, such as subsidies for road construction, agricultural production and forestry. On the other hand, the recovery or restoration of land is also possible with appropriate land-use policies (Poteete et. al. 2004). It is therefore critical that institutions that influence land management decisions are built around participation by local land managers and concern for the environment.

According Kodiwo (2012), 92% of land use variations and change in Siaya district are as a result of socio-economic factors. The study revealed that demographic characteristics, education, income differentials, farm inputs, and distance and land tenure are the major

social-economic factors that cause agricultural land use change. Further, the study found that agricultural land use intensification in Siaya District hinged upon increased extension services and loan availability.

Waithaka (2014) noted that between the year 1990 and 2010 the largest proportion of forested land, cropland and grassland changed to settlements in Keumbu region. The main driver to agricultural land use change was established as being the increasing population pressure leading to land sub-divisions and conversion of land use. Further as urban areas grow a lot of land use change takes place. According to Njoroge (2013), the process of urbanization involves the extension of urban areas into the rural agricultural land. As a result, irrational behaviors such as sub-division and conversion of agricultural land into urban land use take place. Odera (2015) also found that the urban areas of Kiambu County developed and built up into the rural agricultural areas of the county leading to reduction of agricultural land use.

2.4 Status of Household Food Security

According to Kenya Agricultural Research Institute (2008), the food crisis intensified across most parts of the rural and urban areas of the country as a result of the post election violence in 2007 to 2008. As a result the governments of Kenya, United Nations Agencies and many social movements took positions on mitigate measures and means to address food insecurity. For the first time in history, in 2009, a special high level task force grouping all United Nations Agency heads was set up by the Secretary General with the goal of finding solutions to hunger and malnutrition (FAO, 2014). In 2007, 0.8% of the households with children were found to be in the very low food security level. Children in food insecure households were usually not being completely deprived of food, since the parents or guardians relied on low cost food to feed the children.

A stock taking of where the world stands on reducing hunger and malnutrition shows that progress in hunger reduction at the global level has continued but that food insecurity is still a challenge (International Food Programme, FAO, IFAD and WFP 2014). Latin America and Caribbean are the regions that have shown the greatest progress in hunger reduction, with the prevalence of hunger reduced by almost two thirds since the early 1990s. The year 2015 marked the end of the monitoring period for the Millennium Development Goal targets and the transition to the new post-2015 Sustainable Development Agenda (FAO, IFAD and WFP 2015). Hunger remains an everyday challenge for almost 795million people worldwide, including 780 million in the developing regions (McGuire, 2015). Hence hunger eradication

should remain a key commitment of the decision maker at all levels. The global increase of bio fuel production and demand raises concerns about possible negative impact of this development on food security. Globally agriculture occurs within a context of land scarcity (FAO, 2014). Rising demand for non-food products is putting additional pressure on agricultural production and land use (Gu and Chen, 2014). This could push the need for land significantly higher leading to negative impact particularly on biodiversity.

Various countries in Africa have experienced the diverse effects of household food insecurity (Smith, Alderman and Aduayom, 2006). Egypt produces half of its demand for wheat. In spite of the average food production, the country is exposed to the escalating food prices due to its wheat imports. The country also has a high population growth rate of 2% per annum. Moreover, the desert terrain of Sahara limits crop production. Ethiopia experiences serious household food insecurity (WHO, 2018). Over 7 million people out of its population are classified as food insecure and a further 10 million people identified as prone to drought. High population growth rate in the country increases the food insecurity.

In sub Saharan Africa, one in every four people, 23.2% of the population, is estimated to be under nourished in 2014-16. This is the highest prevalence of undernourishment for any region with about 220 million hungry people (FAO, IFAD and WFP 2015). In fact the number of undernourished people has increased by 44 million between 1990-92 and 2014-16. In rural sub Saharan Africa, the majority of population practice subsistence agriculture, and supplements food stores with purchases from the market (Baiphethi and Jacobs, 2009). There is often a “hungry season” which occurs when food stores are inadequate to carry a household to the next harvest and people are particularly dependent upon market purchases. Households therefore diversify their income by engaging in non-farm activities, such as wage employment (Barrett *et al.*, 2001). Understanding household food security means situating it within the context of livelihoods.

Different parts of Kenya have different food situations. For instance, according to Kumba (2015) majority of the households in Kisii Central are food secure. She found out that the main cause of food shortages were scarcity of land for food production, low crop yields, drought, soil exhaustion and high population. Further the study found that household food shortages are managed by mainly purchases. On the other hand studies by Odera (2015) found that Kiambu County is becoming food insecure considering the increasing population at a high rate.

Household food insecurity in Kenya is caused by among other factors inadequate farming area. It is only 18% of Kenya's territory which is suitable for farming. The 2007/08 United Nations Human Development report noted that almost 24% of Kenyans are living on less than one dollar a day, therefore not food sustaining (CBS, 2009). The government is continuously trying to increase food security levels in Kenya by adopting the trade liberalization policies. This, if advocated, will raise the efficiency and productivity, and subsequently the economic growth. On the other hand, the civil society holds the position that trade liberalization benefits only certain sectors, but not the ones linked with increasing food security, such as farming.

2.4.1 Measurement of Household Food Security

The FAOs' food security pillars – access, availability, utilization and stability – are frequently cited in the literature as organizing principles for food security measurement (Coates, 2013).

Despite their widespread use, however, many authors note that the “pillars” analogy can hamstring improved food security measurement efforts because each one has not been well-defined (Berry, 2015; Coates, 2013). Some authors recommend new efforts to develop a comprehensive suite of food security indicators that do not adhere strictly to these particular pillars. Coates (2013) proposes one of the more specific sets of indicators that encompass five “dimensions” of food security: food sufficiency, nutrition adequacy, cultural acceptability, safety, certainty and stability.

The most commonly discussed measurement levels within the recent food security literature include: Individual-level measurement, household consumption and expenditure surveys and cross national measurements.

2.4.1.1 Individual-Level Measurement

Anthropometry is one of the most popular individual-level approaches to measuring food security and is thought to address the FAO's “utilization” pillar. This broad category includes such measures as wasting, stunting, and body mass index (BMI). Anthropometry also incorporates the issue of weight—both underweight and overweight—that is not typically captured in household-level surveys. However, reports that results vary depending on the economic status of a given country, with higher rates of double health burdens, such as stunted children also with overweight women, in places with a lower economic status. Coates

(2013) argue that anthropometry can be problematic because it may conflate outcomes with causes, as anthropometric measures generally reflect nutritional status which is not only determined by food security status, but also by health, hygiene, and access to clean water and services. Another individual-level approach to measuring food security is through nutritional dietary surveys. However, these are complicated, expensive, and labor-intensive, so it can be challenging to get a large enough sample size to make statistically significant claims.

2.4.1.2 Household Consumption and Expenditure Surveys (HCEs)

Household surveys yield information about household expenditure decisions and take the actual demographic structure of the household into account (De Haen, 2011). However, HCEs do not take into account seasonal fluctuations in food availability or that food consumed outside of the home (De Haen, 2011). They are also costly to implement and tend to be infrequently administered (De Haen, 2011). Additionally, they usually only collect food data for a short reference period and inaccurately assume that household food consumption are the same as household food acquisition (De Haen, 2011). Other authors critical of HCE-based approaches to food security measurement note that household surveys typically do not include information on the broader structural determinants of food security like social, economic, and agricultural policies. Furthermore, all households, even low-income ones, produce some amount of food waste that is not accounted for (Moltedo *et al.*, 2014). Experience-based measures are also subject to response bias deriving from unique personal and cultural values, individual responses that may not reflect the opinions of the household, and recall bias of food consumption periods. Perhaps most importantly from a measurement perspective, recent research suggests HCE results can vary significantly based on survey design, with some authors arguing HCEs should be only be used with great caution until more consistent and comparable (“harmonized”) survey data collection can be completed (de Weerdt *et al.*, 2015; Carletto *et al.*, 2012).

2.4.1.3 Cross-National Measures

The FAO prevalence of undernourishment (POU) is one of the most common cross-national measures and is published every three years in “The State of Food Insecurity in the World (SOFI)” to inform the global community about levels and trends of undernourishment. This measure was also used to track progress on the first Millennium Development Goal (De Haen, 2011). Based on the notion of an average individual in a reference population, the POU compares usual food consumption, expressed in terms of dietary energy (kilocalories), with

calorie requirement norms. The POU is an oft-critiqued yet still-valuable measurement because calories available per capita derived from food balance sheets is comparable cross-nationally and measures are available every year because it is not measured at the individual or household level. However, as a stand-alone measure, it does not capture the complexity of all dimensions of food security (Berry, 2015), though it does help evaluate food supply and shortages. In addition, national-level measures do not identify equality issues at the sub-national level and may not represent the food security status of minority groups, women, children or others (De Weerd *et al.*, 2015).

2.6 Factors Responsible for Levels of Household Food Security

Food is a basic human right, and lack of or inadequate food consumption has serious implications for general body health and well-being (Oloo and Mulwa, 2014). This implies that food insecurity is a threat to overall human well-being, as well as efforts geared toward poverty reduction and economic growth. Various factors influence household food security status including household socio-demographic characteristics and Household economic Characteristics.

2.6.1 Household Socio-demographic Characteristics and Food Security

Socio-demographic characteristics influencing the farmers' household food security include gender, marital status, level of education, household membership, ages of household members, and occupation among others. Older people have relatively richer experiences of the social and physical environments as well as greater experience of farming activities. Thus, the higher the age of the household head, the more stable the economy of the farm household (Obamiro *et al.*, 2003). In addition, the older household heads are expected to have better access to land than younger heads, because younger men either have to wait for a land distribution, or have to share land with their families (Hofferth, 2003). On the contrary, Bashir *et al.* (2012) found that an increase of one year in the age of household head decreases the chances of a household to become food secure. They argued that older people might not have the ability to work, thus ensuring increasing strain of the food acquisition of a household.

Gender of the household head plays an important role in agricultural productivity. For instance, a study by IFPRI (2002) found out that farm output increase by more than 20% when women are given the same farm input as men. Women are argued to be important food producers, managers and caretakers of household food security. On the contrary Paddy

(2003) found out that female-headed households are more vulnerable to food insecurity and aspects of poverty. For example, he noted that cultural restrictions on women's ability to participate fully in food production activities in some of the areas left them vulnerable in times of economic crisis.

The level of education helps the household head to use production information efficiently as a more educated person acquires more information he becomes a better producer (Paddy, 2003). Agricultural knowledge, training and education level of the household members can constrain food availability, access and utilization (Mwangi *et al*, 2006; Coates *et al*, 2007). The level of education is believed to influence the use of improved technology in agriculture and, hence, farm productivity. The level of education determines the level of opportunities available to improve livelihood strategies, enhance food security, and reduce the level of poverty (Sabila and Sakaja, 2014). Knowledge on different agricultural technology, policies and inputs forms an important component of the agricultural food system (Najafi, 2003). For example, household decision-making behavior with regard to food is influenced by nutrition knowledge among other factors with regard to food allocation within the household.

Food availability may be constrained by household size (Coates *et al*, 2007). For example, larger household sizes are associated with a negative food security status. Larger household sizes require increase food expenditure and competition for limited resources. This could be as a result of the increase in the dependency ratio in larger households. The more the members of the households, the more likely they will provide larger labour supplies (Mwangi *et al*, 2006). Hence they are better positioned to increase the productivity of their land. Availability of a relatively larger labour force, regardless of farm size, can be an advantage to those households who strive to achieve food security, provided that the excess labour force is engaged in other income generating activities. Thus family size is an important determinant of household productivity and food security, especially in subsistence-oriented households given the necessary landholding and rainfall (Williams and Funk, 2011). Babatunde *et al*. (2007) concluded that the larger household sizes, the more likely it is food insecure compared to smaller size households.

2.6.2 Household Economics Characteristics and Food Security

Diversification of employment into extra-agricultural activities complements farming for farm households thus improvement in their livelihoods (FAO, 2000). Farming households can diversify their incomes by working as daily laborers, petty traders, artisans, and by

working as daily construction laborers (Sabila and Sakaja, 2014). For instance rural off-farm income generating activities enables farmers to modernize their production by giving them opportunity to reduce the risks of food shortage. Income from off-farm activities can be invested in agriculture to increase production and food availability at the household level (Simatele, 2006).

Global rises in food prices and droughts in 2008 drastically affected household food security in Kenya (KFFSG, 2009). The effect was a rise in overall food insecurity to a predicted 70 percent of the population. Per capita aggregate production influences the food security status of households through the price effect (Jayne *et al.*, 2002). For example, the fall in food prices in local markets as a result of increase in per capital aggregate production influences income of households whose income is dependent on the sale of food crops. Increased incomes from agricultural yield motivate farmers to invest in their natural resource base despite the growing enthusiasm about market orientation for increasing domestic food security (Kaari and Ashby, 2004).

The household's ability to purchase inputs, such as fertilizers and improved seeds, crops diversity and enhanced cultivation practices are critical to increased agricultural production (Ellis *et al* 2009). Farm input that augments agricultural productivity boosts the overall production. This contributes towards attaining household food security (Brown, 2004). For example, fertilizers in agricultural productivity were found boost agricultural production and influence the food security status of a household.

Livestock contribute to households' economy in different ways, e.g. as a source of pulling power, source of cash income, source of supplementary food, and means of transport. Besides, livestock are considered a means of security and means of coping during crop failure and other calamities (Kang'ara *et al* 2001).

In sub-Saharan Africa 70 percent of the population relies on agriculture for their livelihood and 80 percent of all the farms are less than 2 acres in size poor small scale farmers can turn their surpluses into income only if they have the ability to access markets (IFPRI, 2002). Increased incomes increases food security and help alleviate poverty. Therefore in-depth understanding of the market system plays an important role in food security as it determines the level of food distribution from surplus to deficit regions, commodity prices and incomes from sale of productive resources (KFSSG, 2009; Megan and Patricia, 2009). In addition, a household's wealth status forms the other important source of livelihood for farming

households. For instance, households who own livestock were found to have good food security status as well as sustainable farming (Feleke *et al* (2005).

2.7 Gaps in Literature

As indicated in the literature review above, there are various studies that have carried out on factors influencing global, regional and national agricultural land use change and food security. The dimensions from the studies indicate that changes on agricultural land use and food security can be demonstrated by different farming practices. However, no study in the study area has been carried out to measure change in agricultural land use based on the changes in farming practices. In the current study, an attempt was made to fill the knowledge gaps by establishing the agricultural land use change based on changes in food crops growing, cash crops cultivation, livestock keeping and mixed farming within study area.

The social, economic, demographic, political and physical factors are known to influence food security. Studies have been carried on how the specific aspects of social, economic, demographic, political and physical factors influence food security. However, no study has been carried out the effect of changes in agricultural land use on household food security in the study area. This study attempted to establish the effects of the changes on agricultural land use on food security in Bureti sub – County.

2.8 Theoretical Framework

In 1965 Ester Boserup asserted that an increase in population would stimulate technologies to increase food production. As Boserup said any rise in population would increase demand for food and this would act as an incentive to change agrarian technology and produce more food. The theory can be summed up as ‘necessity is the mother of invention’. Therefore, population growth will spark innovators who will solve the problems the increasing population has caused.

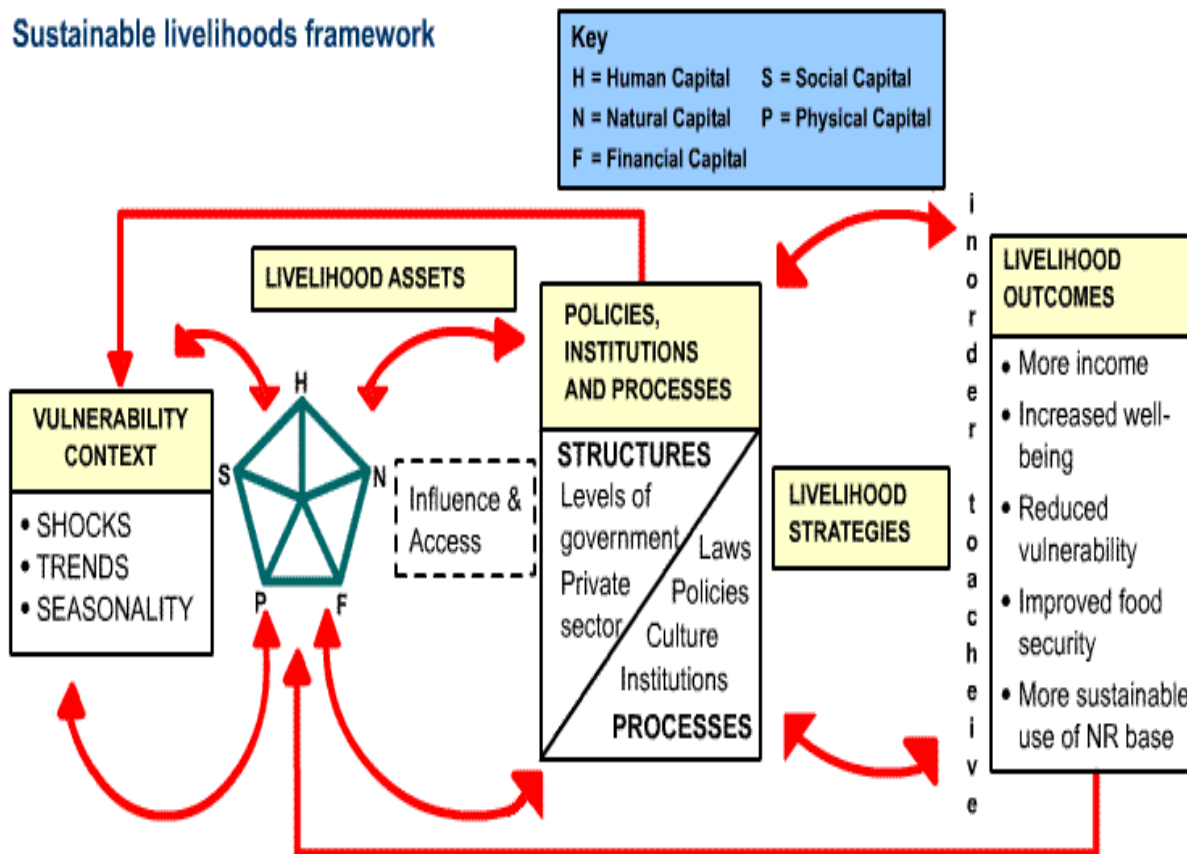
Various other theories explain the relationship between population density and rural farming systems. Hayami and Ruttan (1971) in their theory of induced innovation argue that changes in person-land-ratios cause farmers to adopt farming systems that can be statistically predicted. They postulate that holding other factors constant, rising labor-land ratios cause land values to rise compared to agricultural labor and thereby indirectly inducing farmers to adopt new technologies that are land-saving. Rosenzweig *et al.*, 1988) argues that increase in rural population density should induce a number of changes in tropical agricultural farming systems, including decline in labour, productivity, decreased fallow, increased landlessness,

the development of land, labour and informal financial markets and declining livestock tenancy.

This study adopted “The Sustainable Livelihoods Approach (SLA)” that assesses households’ capacity to respond and adapt to actual and predicted hazards that constrains livelihood construction. Livelihoods underpin food security because they are the means by which people access to resources and assets in their environment in order to meet household needs. An analysis of the livelihoods of households begins with examining the five livelihood assets – physical, financial, natural, social and human capital – followed by the range of livelihood strategies into which people translate them (DFID, 1999). Food security is one outcome of a successful livelihood strategy. This approach facilitates identification of ways in which the population enhances response towards constrains in their livelihoods (Chamber and Conway, 1992).

Chamber and Conway (1992) defined sustainable livelihood based on 1987 Brundtland report as livelihood which can cope with and can recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods, at the local and global levels in the short and long term. Further, they combined capacity, equity and sustainability to create sustainable livelihood approach. In this approach, there must be equity in distribution of assets, capabilities and opportunities without discrimination (Chamber and Conway, 1992).

Sustainable livelihoods framework



Source: DFID (1999)

Figure 2.1: Sustainable Livelihood Approach Framework

The sustainable livelihoods framework presented in Figure 2.1 focuses on the strengths and assets that people own to ensure their food security and livelihoods. According to Ellis (2000) and Brockelesby and Fishers (2003), the Sustainable livelihood framework comprise of household assets and can be discussed as follows. The five capitals including human, natural, financial, social and physical form the assets upon which households draw upon to achieve positive livelihoods such as reduced vulnerability, increased income, well being and improved food security. Diversification of the assets can lead to improved livelihood security for the future. Policies, institutions and processes affect households' vulnerability and how they can access assets and livelihood activities. According to Sustainable Livelihood Approach (1999), the vulnerability context is a household's exposure to risks, seasonality, trends and sudden shocks while livelihood strategies are the choices households make and the activities they partake to make a living (Ellis, 2000). The influence on, and access to various livelihood options are mitigated by transforming structures and processes. All together the aspects influence livelihood strategies and decision making. A livelihood strategy results in a livelihood outcome that can feed back to influence other aspects such as asset pentagon and vulnerability.

Sustainable livelihood approach was developed to fill gaps left by other disciplinary approaches meeting an urgent need for a more effective approach to reduce poverty and urban pressure by improving rural livelihood standards (Chambers and Conway, 1992). It further helps in filling the need to understand rural complexities, creating a well-rounded approach to rural development (Brocklesby and Fisher, 2003; and Chambers and Conway, 1992). Previous development ideas and teachings revolved around production, employment and poverty-lines which are easily measurable but do not encompass the complexities of rural or urban life in developing societies (Chambers and Conway, 1992). In contrast, the sustainable livelihoods approach is argued to be holistic, dynamic, people-centered, and attempts to examine all dimensions of sustainability (Chambers and Conway, 1992).

Understanding the nature of shocks and coping mechanisms used by households is an important aspect of sustainable livelihood and food security. The sustainability of household livelihood depends on the ability to cope with and recover from the stresses and shocks (Scoones 1998). Thus sustainable livelihoods framework provides a powerful tool for analysis of rural livelihoods and decision-making. It is holistic, people-centered, and has a comprehensive definition that has been influential in many spheres of development.

2.9 Conceptual Framework

Miles and Huberman (1994) and Huberman and Miles (2001) say that a conceptual framework explains either graphically or in narrative form, the main dimensions of a study including the key factors, variables and the presumed relationship between them. To better understand the effects of changes in agricultural land use practices on household food security in Bureti sub County a conceptual framework has been presented in figure 2.2 and draws from the theoretical framework discussed in this chapter.

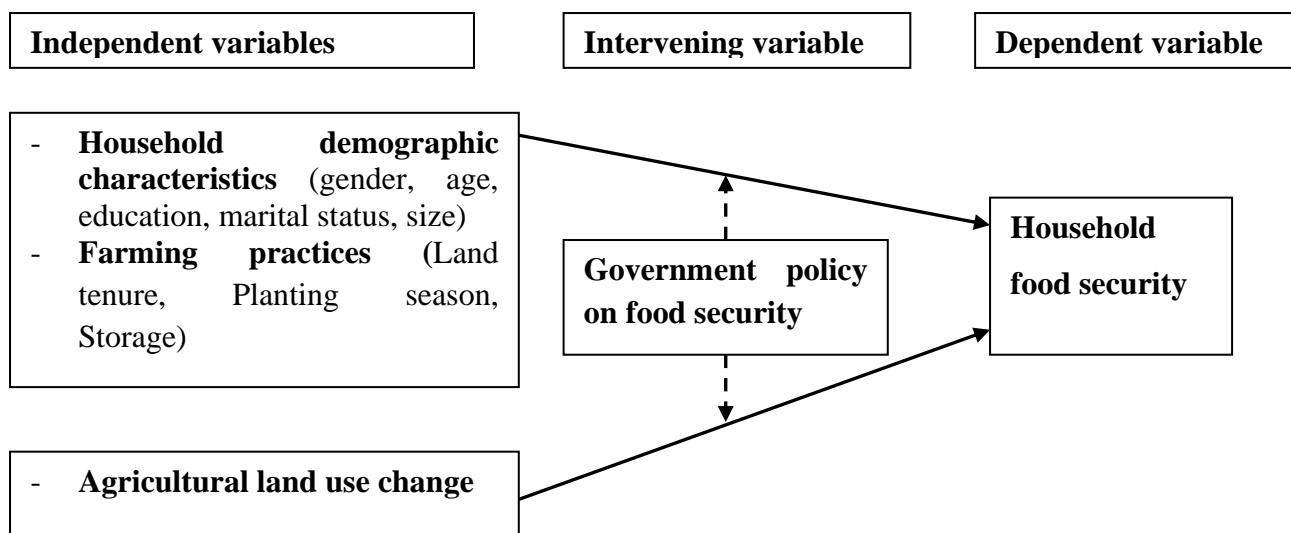


Figure 2.2: Conceptual Frameworks

The independent variables are household demographic characteristics, farming practices and agricultural land use change. These factors have a huge effect on household food security. For example: If farmer is educated on new agricultural innovations, techniques and skills that improve agricultural productivity, he or she will put into practice the new skills, techniques and innovation in his/her farm leading to agricultural land use change with an intention to improve household food security. In addition, household composition, type, and number of persons in a household can directly and indirectly influence agricultural land use change and household food security. For example, households with increasing number of persons will require an increased food. This may influence change in agricultural land use from subsistence production to commercial production.

The intervening variable government policy affects the ability of the households to enhance food security. Formulation of policies by the government on land use tend to affect when the policy specify the agricultural activities to be carried out in an area. Government policies influence prices of farm products when the government control market thus affecting household farm production. When the government subsidize farm inputs such as fertilizers, it boosts the farmers' morale to continue practising agricultural activities thus improving food security.

The dependent variable is household food security because its outcome is determined by the independent variables.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter introduces the study area and discusses the methodology used in the study. The research design, target population, sample size and sampling techniques, research instrument, validity and reliability, data collection procedures, data analysis and presentation methods are discussed.

3.2 Study Area

3.2.1 Location

The study was conducted in Bureti Sub-County within Kericho County (Figure 3.1). It lies between latitudes 0°25" and 1° South and longitude 35° East. Bureti Sub-County has an area of 185 km² and comprised of seven locations and fifty three Sub-locations (GoK, 2013).

3.2.2 Climatic Conditions

The study area has temperatures ranging from 18⁰C to 20⁰C annually. The hottest season starts from December to February with average temperature of 20⁰C. July is the coldest month with an average temperature of 16⁰C. The area receives well distributed rainfall averaging between 1700mm and 2000mm per annum. The Sub-County experiences two rainy seasons, the long rainy season (from April to June) and the short rainy season (from October to December). The driest months are January and February (GoK, 2013).

3.2.3 Physical Features

Bureti sub-county lies within the lower highland agro-ecological zone (LH) west of the Great Rift Valley (Kericho County Development Profile 2012-2013). The area is characterized by hilly topography with ridges and valleys. The geology of the study area is characterized by volcanic as well as igneous and metamorphic complexes; it is predominantly underlain by tertiary lavas (phonolites) and intermediate igneous rocks (GoK, 2013). A section of Bureti sub-county is dominated by undifferentiated basement system rocks (granite), volcanic ash mixture and other pyroclastic rocks. Vegetation covers include forests, tea plantations, bushes and shrubs. Rock formation in the area has enhanced exploitation of ballast, building stones, and sand. It has deep, fertile volcanic soils making it a high agricultural potential area (GoK, 2013).

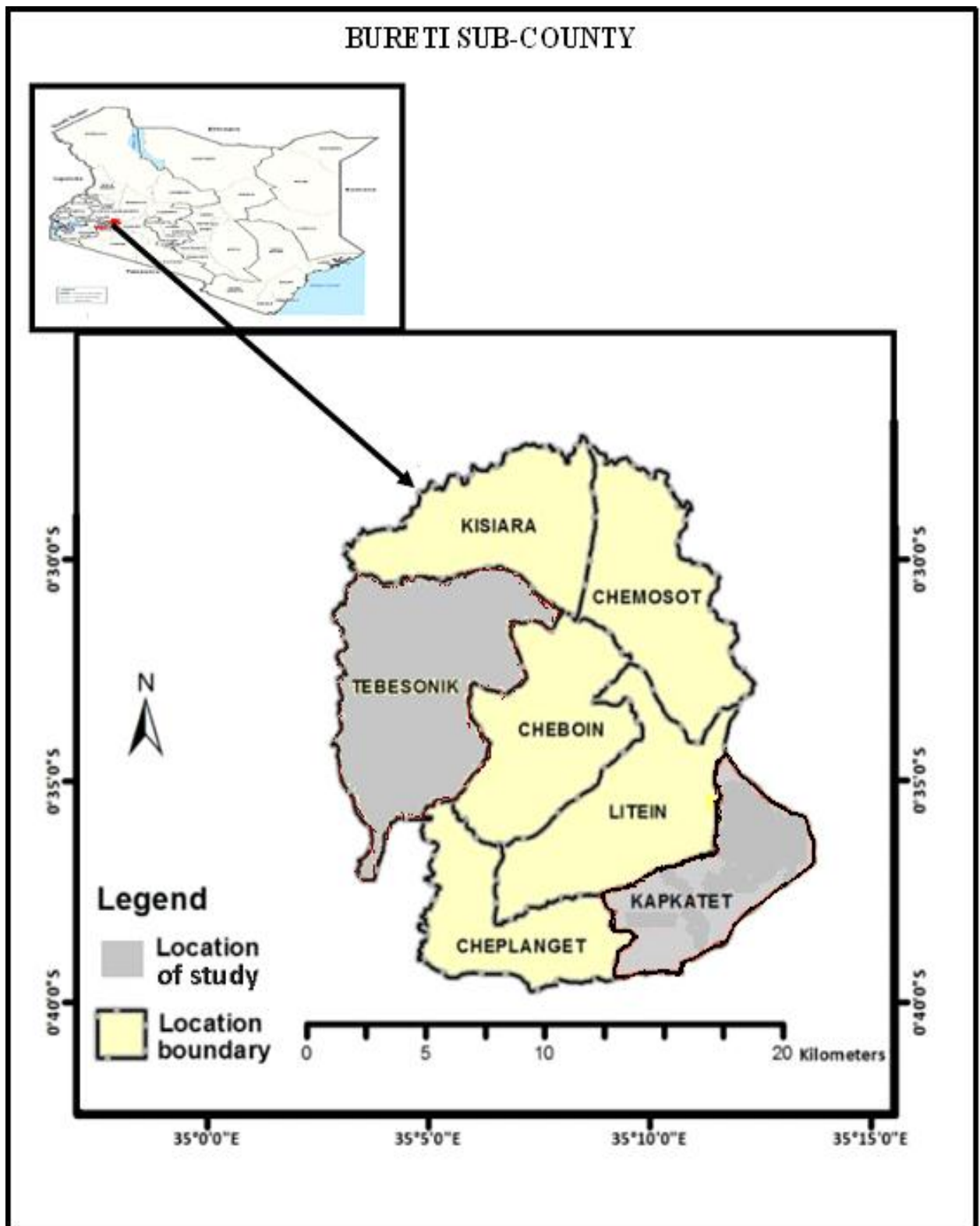


Figure 3.1: Location of the Study Site

Source: GoK (2013)

3.2.4 Demographic Profile

The population for Bureti Sub-County was 204,767 people in 2009. Bureti sub-County has an area of 319 square kilometres with a population density of 642 persons per square kilometre. The population is distributed across seven locations including Kisiara, Litein, Cheplanget, Tebesonik, Cheboin, Chemosot and Kapkatet (GoK, 2010).

Table 3.1 shows the 2017 population distribution and density projection for the locations in Bureti Sub-county (GoK, 2010)

Table 3.1: Population Distribution and Density for the locations in Bureti sub-County

	Area (sq. Km)	Population	Population Density
Kisiara location	38.6	21,402	554
Letein location	40.2	26,275	654
Cheplanget location	44.5	26,940	605
Tebesonik location	66.1	20,912	316
Cheboin location	45.6	22,834	500
Chemosot location	50.6	26,553	524
Kapkatet location	35.5	22,733	640

Source of data: Kenya National Bureau of Statistics (2010)

3.2.5 Land Uses

Bureti sub-County consist of mixed land uses including urban, quarrying, residual, forestry and agro-forestry but farming is the most dominant. Farming is done in small scale and large scale. Small scale farming involves mixed production of crops and livestock rearing on small hectares, usually less than one acre without using advanced technologies while large scale farming involves use of modern technology and large parcels of land. The main crops grown here includes, maize, sorghum, millet, beans, Irish potatoes, tea, coffee and pyrethrum as well as other horticultural crops such as pineapples, bananas, bulb unions, peas, pumpkins, avocados, tomatoes and vegetables. In addition to this there is keeping of sheep, goats and poultry with dairy farming as the leading enterprise in livestock farming (GoK, 2013).

The size of land holding varies across the sub counties. The average farm size for small scale farmers is 0.9 ha while that of large scale farmers is 14 ha (GoK, 2013). Over the years emphasis in production of cash crops has resulted in increase in the cost of farm inputs have

gone up and fewer people have taken up agricultural jobs. This has led to few agricultural extension officers and limited information to farmers leading to a decrease in food production (GoK, 2013). Land fragmentation has also led to farmers owning smaller parcels of land thus reducing the scale of production. Post-harvest losses mainly on grains (maize) due disease has also threatened food security.

3.3 Research Design

This research study used cross sectional research design which is a method of collecting information by interviewing and administering questionnaire to a sample of individuals (Orodho, 2003). This research design is appropriate due to its safeguard against bias and its ability to maximize reliability and concern for completion of research study. The study aimed to use primary data questionnaires, oral interviews from respondents on their opinion, preferences, feelings, judgments and attitudes to describe the effects of agricultural land use change on small scale farmers household food security in Bureti sub-County. The population of interest in the study included rural households practicing small scale farming and key informants concern with agriculture in Bureti sub-county. This design facilitated acquisition of data from a sample of households. Household was considered to be the main unit of decision making in matters concerning land use, food consumption and expenditure. It was relatively cheap and easy to conduct since all the variables are measured at simultaneously. Thus, it made it possible to elicit responses from the respondents on research themes within a short period of time.

3.4 Target Population

Mugenda and Mugenda (2003) describes the target population as complete set of individual cases or objects with some common characteristic to which the research want to generalize the result of the study. The target population for this study was households in Bureti Sub – County. According to Kenya Bureau of Statistics Population Census (2009), the sub County has a total population of 63,656 households spread across the 7 locations Kisiara, Tebesonik, Cheboin, Chemosot, Litein, Cheplanget and Kapkatet (GoK, 2010).

3.5 Sample Size and Procedure

Mugenda and Mugenda, (2003) defines a sample as a smaller group or sub-group obtained from the accessible population. On the other hand sampling is a procedure, process or technique of choosing a sub-group from a population to participate in the study (Ogula, 2005). This subgroup is carefully selected so as to be representative of the whole population

with the relevant/similar characteristics. Each individual member or case in the sample is referred to as subject, respondent or interviewees. Sampling is the process of selecting a number of individuals for a study in such a way that it is fairly representative of the large group from which they were selected.

The sampling procedure was implemented in three phases as explained.

i. Stage one Sampling Method

Stage one involved purposive sampling where the study area was divided into clustered administrative units (locations) to have a clear comparison of agricultural land use practises. The research used purposive sampling to select two locations based on their differences in population density. Population density was used as criteria for clustering the administrative units because it depicts the concentration of people, households and agricultural land uses as depicted by different farming practices within the study area. Kapkatet location with population size of 22,733 and area of 33.5 square kilometres and Tebesonik with population of 20,912 and area of 66.1 square kilometres (GoK, 2010) were chosen since they had the highest and lowest population densities in Bureti sub-County.

Table 3.2: Number of households in Bureti Sub-County

Administrative units	Total population	Area (square kilometres)	Population density	Number of Households
Bureti Sub-county	306,763	319	642	63,656
Kapkatet Location	22,733	35.5	640	3,245
Tebesonik Location	20,912	66.1	316	570

Source: Kenya National Bureau of Statistics (2010)

ii. Stage two Sampling Method

Stage two involved probability sampling to select study households from the study cluster using the formula by Newey and McFadden (1994). Newey and McFadden (1994) formula provides a simplified formula for sample sizes

$$n = \frac{[Z^2 PqN]}{e^2(N - 1) + Z^2}$$

Where: n = sample size

P = population

$$q = 1-p$$

Z = 1.96 of confidence level

e = margin of error

N = size of the population

We take P as 50% to give a representative sample with a minimal error making

$$q = 1-p \text{ i.e. } 0.5$$

$$e = 0.05\%$$

$$N = 3,245 \text{ households}$$

Hence;

$$n = \frac{[1.96^2 \times 0.5 \times 0.5 \times 3245]}{0.05^2(3245 - 1) + 1.96^2}$$

$$n = \frac{3116}{11.95} = 261 \text{ households}$$

iii. Stage Three Sampling Method

At stage three, the 261 households were selected randomly using list of households in census enumeration areas of Kenya National Bureau of Statistics.

3.5 Sampling of Key Informant Interview

Purposive sampling technique was used to select twelve key informants based on their knowledge on agriculture in Tebesonik and Kapkatet locations. The key informants included: 2 agricultural extension officers and agricultural officers respectively with each from Tebesonik and Kapkatet locations, 4 community leaders from the Kapkatet Location and Tebesonik Location, 4 leaders of community based organizations and youth groups associated with agricultural projects.

3.6 Instrumentation

Questionnaires were administered to 261 households. The household heads were responsible for filling in the questionnaire. The questionnaire had both closed and open ended questions. The open ended questions were meant to give more information on the household agricultural land use practices, food security and income levels at household level. Appendix I shows the questionnaire that was administered to the households.

Key Informants Interview Schedules was used for the purposes of collecting information on community level using an interview schedule (Appendix II). One agricultural officer and

extension officer were selected from each location within the study area while one community leader and community based organization leader was picked from each sub-location. Therefore, the total number of key informants was: 2 agricultural extension officer, 2 agricultural offices, 8 community leaders from the sub locations within Kapkatet Location and Kapkarin Location, 8 leaders of community based organizations and youth groups associated with agricultural projects.

Observation is a research method which involves direct observation of ongoing behaviour within the research area at a particular time among others. During the study, observations were used to give a clear picture on household agricultural land use practices by seeing the farming activities within the study area. As a result, it helped in comparing the current agricultural land use practises observed with responses on the previous agricultural land use practises from the respondents.

3.7 Validity and Reliability of Instruments

The pilot study is important for the testing of tools to be used in collection of data. It also helps to familiarize with the area of study. It included testing of reliability and validity.

To test reliability of the instrument the questionnaire was pretested in Litein Locations of Bureti Sub-County which have similar agro ecological conditions with Kapkatet Location. Pilot testing was done on 20 households. The respondents were encouraged to make comments and suggestions concerning the instructions, clarity of questions and their relevance.

Validity is the extent to which one can draw accurate and meaningful inferences, based on the instrument used to collect data (Mugenda, 1999). The research tool (questionnaire) should service the intended purpose and capture the relevant questions on agricultural land use practices, its impact on food security and income. To establish validity, the researcher sought the supervisors' opinion concerning the research instrument.

3.8 Ethical Considerations

The researcher ensured that the rights, privacy and confidentiality of the participants in the research are protected and respected. The participants were informed about the nature of the study and that participation was on a voluntary basis. Necessary permission to carry out this research was sought from Egerton University and from the National Council of Science and Technology. Finally it was made clear that the respondent were free to decline participation and withdraw from the study at any point.

3.9 Data Analysis

Data was coded and keyed into computer for analysis. Descriptive statistics was used for data analysis, using the Statistical Package for Social Sciences (SPSS) computer software version 17.0. Descriptive statistics was used to present the quantitative data in form of Tables based on the major research questions. Subsequent analysis involved assessing the effects of agricultural land use change on household food security.

Table 3.3: Summary of Data Analysis

Objectives	Variables	Method of Analysis
To evaluate changes on household agricultural land-use practices between 2006 and 2015 in Bureti sub-County	Land under cash crop	Descriptive statistics
	Land under food crops	Frequency distribution tables
	Land under livestock	
	Land under mixed farming	
To determine factors responsible for changes in household agricultural land-use practices between 2006 and 2015 in Bureti sub-County	Household characteristics	Descriptive statistics
	Household size	Cross tabulation
	Access to fertilizer	
	Market prices	
	Scarcity of land	
	Labour shortage	
Inadequate extension services		
To evaluate levels of household food security in Bureti sub-County	Source of food (purchase, grow on farm, etc)	Descriptive statistics
	Number of meals	Cross tabulation
	Food accessibility	
To determine factors responsible for levels of household food security in Bureti sub-County	Quality of soil	Descriptive statistics
	Rainfall variability	Cross tabulation
	Household characteristics	

CHAPTER FOUR

RESULTS

4.1 Introduction

This chapter presents results of the findings from the field. The findings are presented according to the objectives of the study. The first part introduces the background characteristics of the respondents and their households. This is because the demographic characteristics were conceptualized to play an important role in determining the dependent variable. The second part of the chapter presents study findings being guided by the specific research objectives and questions.

4.2 Respondents' Demographic Characteristics

This section examines the respondents' demographic characteristics and socio-economic characteristics of the households in Bureti Sub-county. Gender, marital status, level of education, household size, age of the household members and occupation were used to describe the respondents' demographic characteristics and to relate food security with the respondents' characteristics.

The households' demographic characteristics are important in relating the agricultural land use practices, land use changes, factors influencing land use practices and food security in the study area. For instance, households' access to resources, agricultural information and other farming services that would lead to land use change and food security vary by age, gender, marital status and education of the household head who make key decisions.

A summary of statistics on the demographic characteristics of the sampled households is presented in Table 4.1. The table shows that out of the total 261 sampled households in the study, 63.3% households were headed by a male with the remaining 36.7% households headed by female. 70.5% the households are headed by married couples as compared to single (13.3%), divorced (3.4%) and widowed (3.8%) household heads. 42.9% of the sampled households head were having secondary education, followed by those primary education at 26.4%. 27.6% of the sampled households were also relatively large with 5 members per household. On matters age of the household members, 90.4% of the household members were between 20 and 59 years of age. All the respondents (100%) in the study area practiced small scale farming.

Table 4.1: Respondents Demographic Characteristics

Personal characteristics		Frequency	Percentage
Gender			
Male		165	63.3
Female		96	36.7
Total		261	100.0
Marital status			
Married		184	70.5
Single		58	13.3
Divorced		9	3.4
Widowed		10	3.8
Total		261	100.0
Level of education			
No Formal education		24	9.2
Primary		69	26.4
Secondary		112	42.9
Tertiary		56	24.5
Total		261	100.0
Number of people in a household			
One		15	5.7
Two		26	10.0
Three		57	21.8
Four		60	23.0
Five		72	27.6
Others		31	11.9
Total		261	100.0
Age of household members			
< 5 years		75	28.7
5 – 20 years		178	68.2
20 – 59 years		236	90.4
60 years and above		25	9.6
Occupation			
Small scale farming		261	100
Others		90	34.5
Variable	Minimum	Maximum	Mean
Family size	1	10	3

4.3 Changes in Household Agricultural Land Use Practices

The first objective of the study was to evaluate changes in household agricultural land use practices between the year 2006 and 2015 in Bureti Sub-County. To understand the changes in household agricultural land use practices in Bureti Sub-County, household farming activities between the two periods, changes in household agricultural land between 2006 and 2015. The findings are presented in the subsequent sections.

4.3.1 Household Farming Activities between the year 2006 and 2015

The results of the main farming activities in 2006 and 2015 in Bureti Sub-county are as shown in Table 4.2 and Figure 4.1.

Table 4.2: Main Farming Activity in 2006 and in 2015

Main household farming activity	% in 2006	% in 2015	% change in number of respondents practicing the farming activities between 2006 and 2015
Food crop cultivation	13.9% (29)	13.1% (33)	+ 13.8%
Cash crop cultivation	18.8% (40)	17.5% (44)	+ 1%
Livestock keeping	17.7% (37)	13.9% (35)	- 5.4%
Mixed farming	49% (103)	55.6% (140)	+3.6%

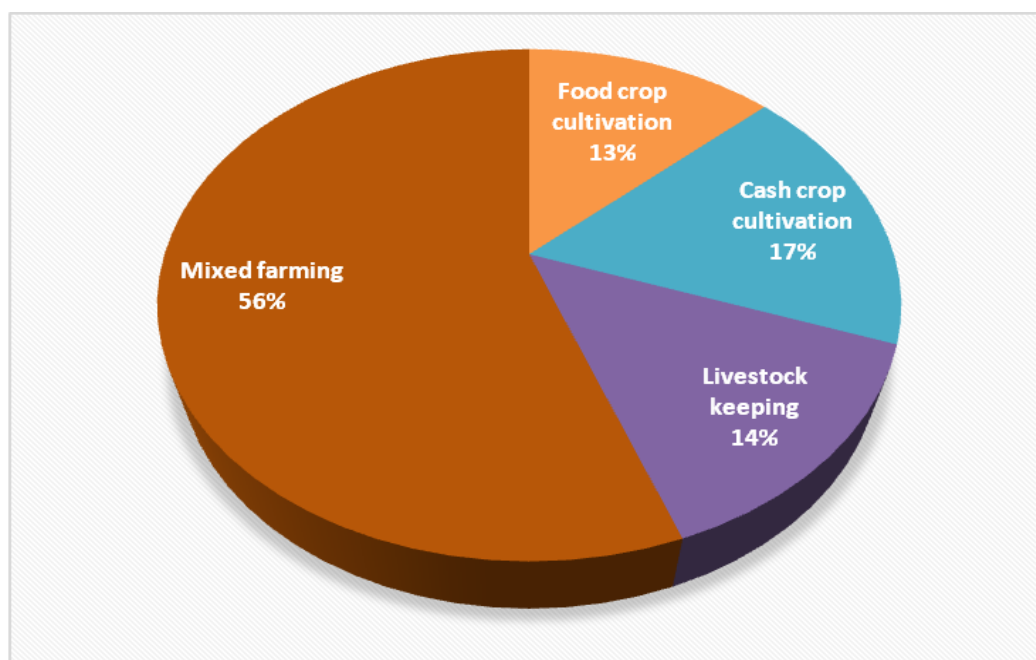


Figure 0.1: Main farming activity in the year 2006

Table 4.2 shows that mixed farming dominated the study area in the year 2006 (49%) and 2015 (55.6%). Food crop cultivation was the least practiced by household in the year 2006 (13.9%) and in 2015 (13.1%). From Table 4.2, there was an increase in number of households practicing food crops cultivation (13.8%), cash crops growing (1%) and mixed farming (3.6%) between the year 2006 and 2015. However there was a decrease in the number of households practicing livestock keeping between the year 2006 and 2015. The

findings imply that in Bureti sub-County, smallholder farmers prefer cultivating food and cash crops in addition to keeping livestock so that they can sustain themselves as well as have income from their farms.

4.3.2 Changes in Households Agricultural Land use between the year 2006 and 2015

Household agricultural land uses like other aspects of the environment are subject to change. As a result of the time difference, smallholder farmers were asked if they noted changes in proportion of land under cash crops and food crops between 2006 and 2015. This was to examine if there were recent changes in agricultural land uses. Figure 4.2 shows the changes in proportion of land under cash crops and food crops.

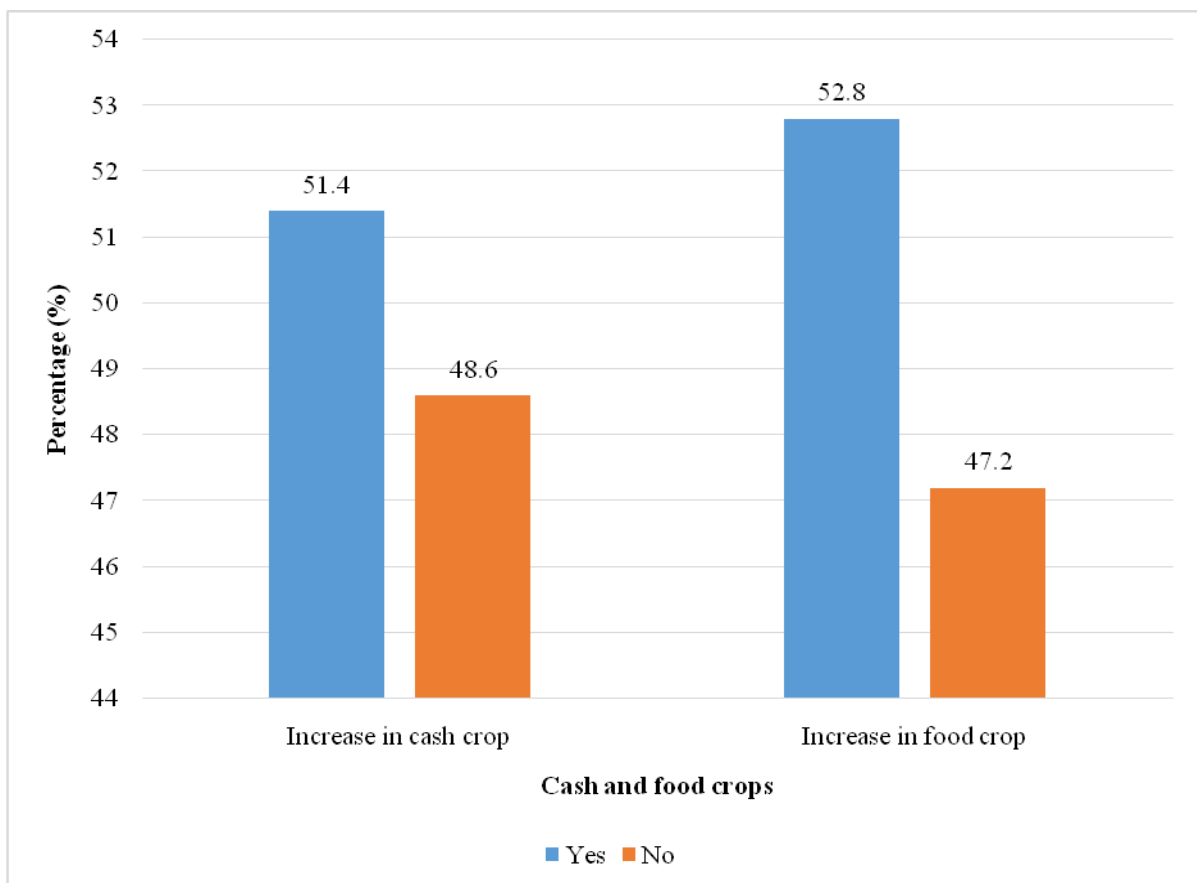


Figure 4.2: Changes in cash and food crops

From Figure 4.2, 51.4% and 52.8% of the respondents were of the opinion that increased land under cash crop and food crop between 2006 and 2015 was respectively. The finding mean that most households in Bureti sub-County apportioned more land for farming than other land use activities such as settlement.

Land under cash crops, food crops, livestock and mixed farming was picked as the most common practice observed between 2006-2015 in Bureti Sub County. Figure 4.2 shows the findings on changes in land use.

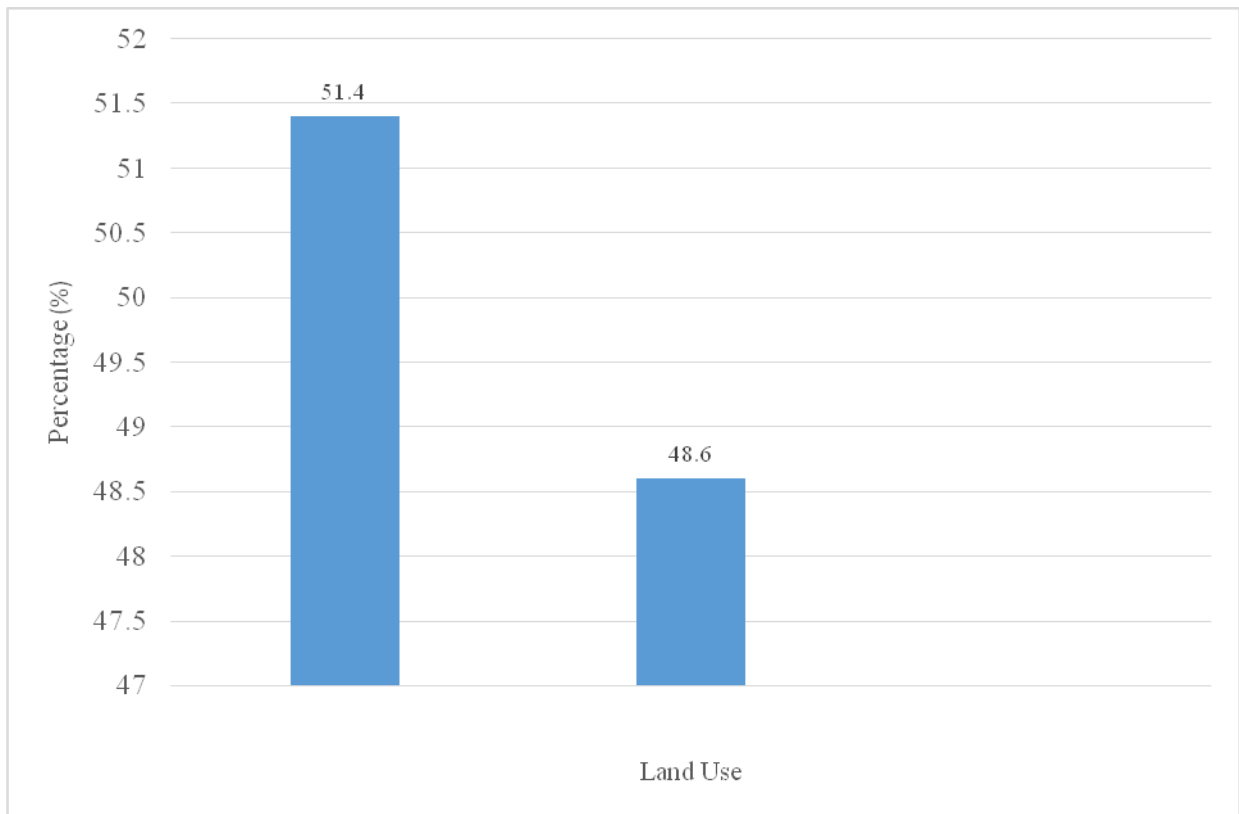


Figure 4.3: Changes in land use

The results in figure 4.3 show that there was major increase land cover under mixed farming (51.4%) and least increased in land under food crop and livestock (48.6%) between 2006 and 2015 in the study area.

4.4 Factors Responsible for Recent Changes in Household Agricultural Land use Practices

The second objective of the study was to establish factors responsible for recent changes in household agricultural land use practices in Bureti sub-County. A relationship between various the factors considered to influence changes agricultural land use between 2006 and 2015 including: household size, access to fertilizers, market prices of farm products, scarcity of land, labour shortage and inadequate extension services were examined in Bureti sub-County as shown in Table 4.3.

Table 4.3: Factors that influence Agricultural Land use

		Factors influencing Agricultural Land use						
		Household size	Access to fertilizer	Market prices	Scarcity of land	Labour shortage	Inadequate extension services	
Agricultural Land Use practices	Food crop cultivation %	Count 8 16.0%	4 13.8%	13 14.4%	6 10.2%	0 0.0%	1 11.1%	
	Cash crop cultivation %	Count 4 8.0%	5 17.2%	14 15.6%	15 25.4%	2 16.7%	4 44.4%	
	Livestock keeping %	Count 5 10.0%	4 13.8%	12 13.3%	9 15.3%	3 25.0%	2 22.2%	
	Mixed farming %	Count 33 66.0%	16 55.2%	51 56.7%	29 49.2%	7 58.3%	2 22.2%	
Total	Count 50 100.0%	29 100.0%	90 100.0%	59 100.0%	12 100.0%	9 100.0%		

Table 4.4 shows that household size (16.0%) and market prices (14.4%) were the major factors influencing food crops cultivation between 2006 and 2015. Cash crop cultivation land uses are on the other hand influenced by majorly by extension services (44.4%) and scarcity of land (25.4%). Labour shortage (25%) and extension services (22.2%) were found to be the major factors that led to livestock keeping land use in Bureti sub-County. In addition, household size (66%) and labour shortage (58.3%) were the major factors that influenced mixed farming agricultural land use in Bureti sub-county.

According to the majority interviewed, land was a scarce resource which hindered farming in the study area. This resulted in farmers engaging in mixed farming to balance between cash crops and food crop for the family needs and market needs. Farmers who produce crops and keep animals for commercial purposes heavily rely on market conditions in order to realize desirable returns.

4.4.1 Distribution of the respondents, Household Characteristics and Agricultural Land uses

This section assesses the relationship between the households' characteristics and the agricultural land uses in the year 2006 and 2015. The results are as summarized in Table 4.4.

Table 4.4: Distribution of the respondents' Household Characteristics and the Main Farming Activities in 2006 and 2015

Variable		Main farming activity in 2006 and 2015							
		Food crop		Cash crop		Livestock		Mixed farming	
		2006	2015	2006	2015	2006	2015	2006	2015
Gender of household head	Male	9.6%	13.9%	21.7%	25.5%	20.8%	7.9%	47.8%	52.7%
	Female	47.8%	42.7%	9.7%	12.5%	13.4%	7.3%	29.1%	37.5%
Marital status	Single	14.9%	8.6%	41.0%	56.9%	21.6%	13.8%	22.5%	20.7%
	Married	33.6%	15.2%	19.8%	11.4%	7.7%	12.5%	38.9%	60.9%
	Divorced	28.1%	22.2%	31.6%	33.3%	18.6%	11.1%	21.7%	33.3%
	Widowed	17.2%	30%	38.5%	10%	4.6%	20%	39.7%	40%
Level of education	No education	14.6%	8.3%	9.9%	4.2%	47.1%	20.8%	28.4%	66.7%
	Primary	21.7%	17.4%	9.2%	4.3%	14.7%	8.8%	55.4%	69.5%
	Secondary	36.4%	40.2%	46.7%	34.8%	12.4%	8.0%	4.5%	17.0%
	Tertiary	19.3%	25.0%	44.5%	38.9%	13.3%	4.0%	22.9%	32.1%
Household membership /size	1	21.6%	18.2%	23.3%	36.4%	18.4%	18.2%	36.7%	27.3%
	2	23.9%	23.1%	14.7%	21.7%	27.4%	19.2%	39.7%	34.6%
	3	27.9%	16.4%	11.2%	14.5%	15.2%	5.5%	45.7%	63.6%
	4	28.1%	11.9%	18.7%	20.3%	9.1%	11.9%	44.1%	55.9%
	5	19.7%	12.9%	15.6%	11.4%	10.9%	12.9%	53.8%	62.9%
	>5	14.4%	0%	21.5%	17.9%	22.4%	32.1%	41.7%	50.0%

Table 4.4, majority of male headed households practiced mixed farming in the year 2006 and 2015 47.8% and (52.7%) respectively while majority of the female headed households practice food crops 47.8% (2006) and 42.7% (2015). On the other hand, majority of the married

(38.9%, 60.9%) and widowed (39.7%, 40%) household heads were found to be mixed crops farmers in Bureti sub-County in 2006 and 2015 while single and divorced household heads (41%, 56.9%) and (31.6%, 33.3%) respectively mainly practice cash crop farming in 2006 and 2015. Table 4.4 shows that majority of the households with the head having no formal education and with primary level of education practiced mixed agricultural activities within their farms (28.4%, 66.7% and 55.4%, 69.5%) respectively in 2006 and 2015 while household heads with secondary and tertiary levels of education tend to specialize on food crops (36.4%, and 40.2%) and cash crops (44.5%, 38.9%) in 2006 and 2015. Further, land under food crops cultivation increased as the household increased from 1 to 4 individuals (21.6%, 23.9%, 27.9%, and 28.1%) then reduced from 19.7% to 14.4% as the number increased from 5 to more than 5 individuals in 2006. On the other hand food crop cultivation reduced as the number of household members increased from two to four members (23.1%, 16.4%, and 11.9%) in 2015. Cash crop cultivation reduced as the number of members of the household increased from 1 to 3 in 2006 and 2015 (18.2%, 23.1% and 16.4%) and (23.3%, 14.7% and 11.2%) respectively. Livestock keeping increased as family size increased from three members of a household to more than five members in 2006 (5.5%, 11.9%, 12.9% and 32.1%) and 2015 (5.5%, 11.9%, 12.9% and 32.1% respectively). Thus the findings imply that demographic characteristics play a role in influencing the decision of the households on the type of agricultural activities that they should undertake within their farms.

Table 4.5: Change in Agricultural Land use between 2006 and 2015 in regard to selected Socio-economic Characteristics

Variables			Change in agricultural land use between 2006 and 2015			
			Food crops only	Cash crops only	Livestock only	Mixed farming
Gender of household head	Male		13.2%	14.2%	7.7%	21.8%
	Female		15.6%	9.9%	5.0%	24.2%
Marital status	Single		3.2%	1.7%	3.1%	7.9%
	Married		10.8%	3.3%	4.4%	18.1%
	Divorced		6.7%	2.6%	2.9%	10.7%
	Widowed		8.9%	2.2%	2.9%	13.7%
Level of education	No education		11.1%	5.1%	3.2%	17.8%
	Primary		13.0%	11.7%	4.9%	23.6%
	Secondary		13.6%	18.4%	10.7%	17.5%
	Tertiary		12.3%	14.6%	8.8%	13.6%
Number of people in household	One		7.5%	6.8%	4.7%	17.7%
	Two		9.9%	11.1%	5.6%	17.5%
	Three		16.6%	9.3%	7.9%	17.5%
	Four		15.1%	5.7%	4.4%	17.8%

	Five	13.7%	6.2%	4.9%	17.3%
	≥ Five	11.6%	13.2%	5.9%	17.0%
Occupation	Farming	19.9%	14.4%	7.7%	24.6%
	Formal employment	12.2%	10.9%	5.6%	18.2%
Size of farm	Business	14.6%	13.3%	7.2%	21.8%
	1-2 ha	8.9%	6.5%	5.3%	16.6%
	3-5 ha	7.2%	6.1%	4.8%	12.8%
	6-10 ha	6.1%	5.5%	4.4%	12.1%
	> 10	7.8%	4.7%	6.3%	9.7%
Land tenure	Owned	13.6%	5.8%	7.7%	19.6%
	Leased	8.7%	7.2%	4.5%	16.1%
Type of labour used	Mechanized	14.1%	17.9%	5.2%	12.7%
	Manual	7.2%	14.0%	2.8%	9.2%

Table 4.5 there was a positive change on land under food crops, cash crops, livestock and mixed arming between 2006 and 2015. Land under mixed farming had the highest change while land under livestock only had the lowest change between 2006 and 2015. Food crops farming (15.6%) and mixed farming (24.2%) had the most change in land use within female headed households compared to male headed households. Married respondents experienced the most change in agricultural land use (food – 10.8%, cash – 3.3%, livestock keeping – 4.4% and mixed farming – 18.1%) between 2006 and 2015 compared to single, divorced and widowed respondents. The respondents with secondary level of education changed the most their land under food crops (13.6%), cash crops (18.4%) and livestock (10.7%) while those with primary education changed their land under mixed farming (23.6%) the most. There was almost equal change in land under mixed farming in households with 1 member (17.7%), 2 members (17.5%), 3 members (17.5%), 4 members (17.8 members), and 5 members (17.3%). Households with household heads practicing farming only as their occupation had the highest change in agricultural land use (food crops-19.9%, cash crops-14.4%, livestock-7.7% and mixed farming-24.6%) compared to households where the heads were in formal employment and businesses. The respondents with 1-2 hectares of farms had the most change in food crops (8.9%), cash crops (6.5%), livestock keeping (5.3%) and mixed farming (16.6%) compared to the respondents with 3-5 hectares, 6-10 hectares and more than 10 hectares. Households with freehold farms had the most change in food crops (13.6%), livestock keeping (7.7%) and mixed farming (19.6%) while leased farms had the most change in cash crop farming (7.2%). The respondents who mechanized their farms had the most change in food crops (14.1%), cash crops (17.9%), livestock keeping (5.2%) and mixed farming (12.7%) compared to those who used manual labour. Therefore, the findings imply that

changes in agricultural land use between 2006 and 2015 in Bureti sub – County are positively influenced by the demographic characteristics of the farmers in the study area.

4.4.2 Size of Farmland

The size of the farm land is one of the factors that dictate changes in agricultural land use practices. Figure 4.4 shows the findings on the farms sizes in Bureti Sub – County.

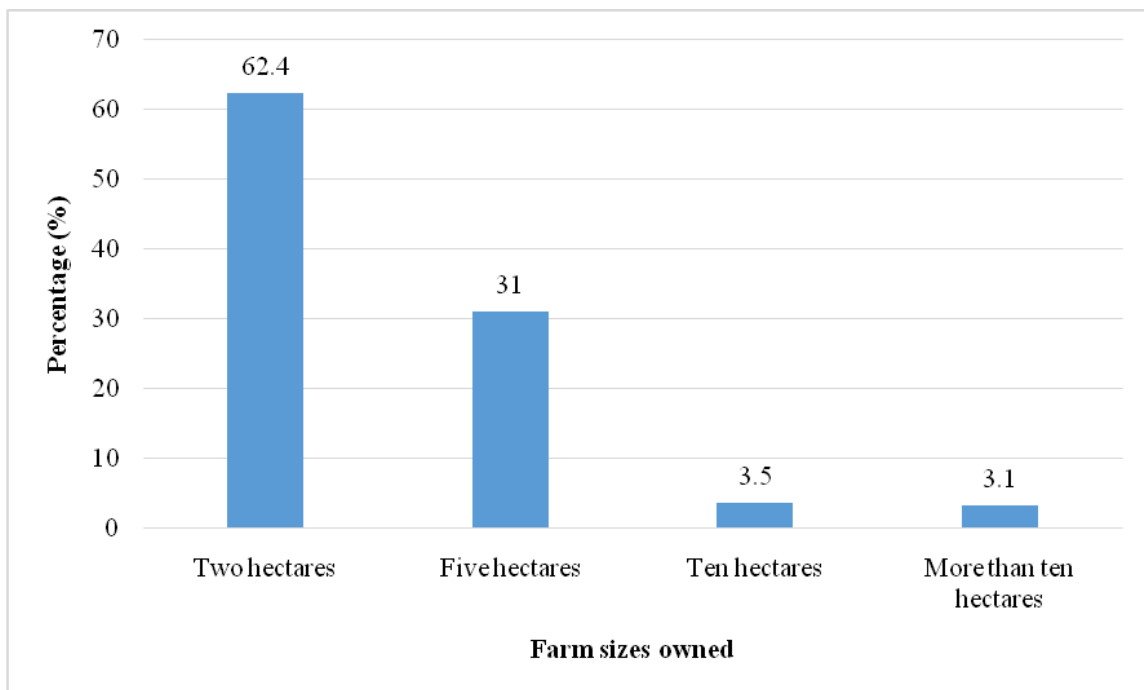


Figure 4.4: Farm sizes

Most of the respondents have two hectare of farms (62.4%) while very few (3.1%) have more than ten hectares.

4.4.3 Land ownership

There was almost an equal balance between the number of respondents who leased land for agriculture and those who owned it. Majority of the farmers (58%) in Bureti Sub-County own their farms while 42% lease agricultural land.

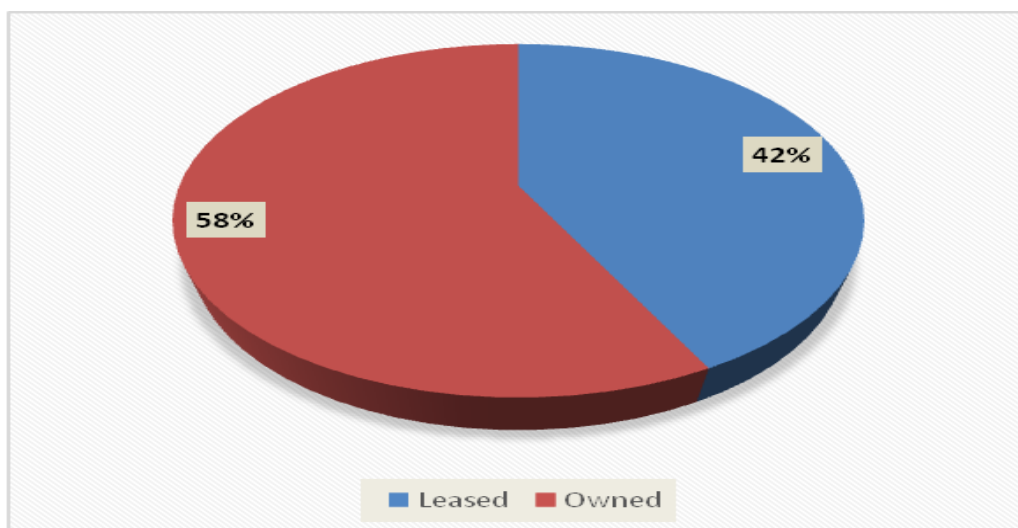


Figure 0.5: Land ownership

4.4.4 Sources of Labor

The quality and quantity of labor available to the agricultural household in terms of numbers, educational level, skills, and health constitute the human capital that becomes the basis for constructing household livelihood strategies (Takane, 2008). Labor is a key factor of production in the agricultural sector. From Table 4.6 it's evident that the most common source of labor was manual labor (91.7%) either hired or from family members in Bureti Sub – County.

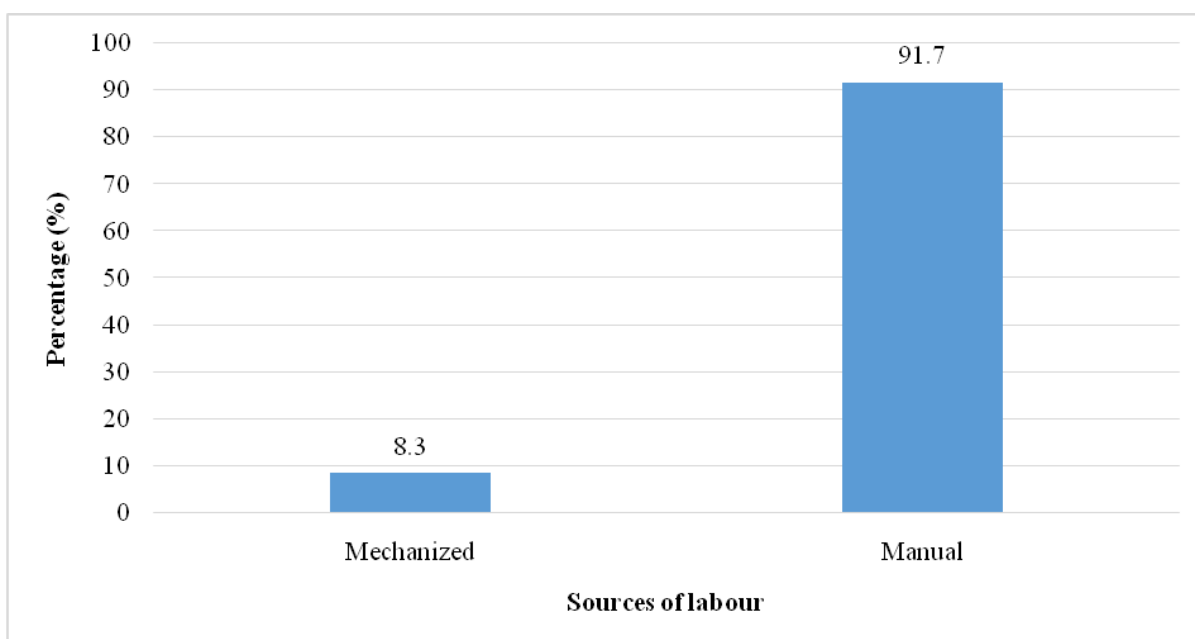


Figure 4.6: Sources of labour

4.5 Household Food Security

To find out the state of food security in Bureti Sub County, the study investigated household food situations including sources of food, number of meals, number of bags of maize harvested, purchase of food and food accessibility. The findings are presented in the subsequent sections.

4.5.1 Household Source of Food

Source of food in a household is an important measure of food security (FAO, 2017). This can be either in terms of household food production or through food purchases. In this study a comparison between food purchase and self-production of food was carried out. The study found that majority of the households rely on self-produced food substances (81.5%) as opposed to purchased food stuffs (18.5%).

Table 4.6: Main Source of Food

Food source	Frequency	Percent
Purchased food stuff	47	18.5
Self-produced	207	81.5
Total	254	100.0

Findings presented in Table 4.6 shows the distribution of the respondents according to gender, marital status, level of education, household size, occupation, size of the farm, land tenure and type of labour showed that majority of the respondents self produce food in Bureti sub-County. However, table 4.6 further revealed that majority of households with land over ten hectares (66.7%) and those that depended on manual labour (51.7%) purchased food more than self producing food.

Table 4.7: Percentage distribution of the respondents in the distribution of Household source of food and selected Demographic Characteristics

Variable		Source of food		
		Purchased	Self-produced	Total
Gender of household head	Male	18.3%	81.7%	100%
	Female	18.8%	81.2%	100%
Marital status	Single	19.0%	81.0%	100%
	Married	18.6%	81.4%	100%
	Divorced	22.2%	77.8%	100%
	Widowed	20%	80%	100%
Level of education	No education	33.1%	66.9%	100%
	Primary	36.8%	63.2%	100%
	Secondary	45.4%	54.6%	100%
	Tertiary	57.4%	42.6%	100%
Household membership /size	1	20%	80%	100%
	2	19.2%	79.7%	100%
	3	19.3%	80.7%	100%
	4	18.3%	81.7%	100%
	5	18.1%	81.9%	100%
	>5	19.4%	80.6%	100%
Occupation of household head	Farming	18.5%	81.5%	100%
	Formal employment	34.3%	65.7%	100%
	Business	22.1%	77.9%	100%
Size of farm	1-2 ha	36.9%	63.1%	100%
	3-5 ha	47.0%	53.0%	100%
	6-10 ha	58.1%	41.9%	100%
	>10 ha	66.7%	33.3%	100%
Land tenure	Owned	11.3%	88.7%	100%
	Leased	48.7%	51.3%	100%
Type of labour used	Mechanized	45.8%	54.2%	100%
	Manual	51.7%	48.3%	100%

4.5.2 Household Meal Characteristics

According to FAO (2007), households are considered to be food secure when they have a year-round access to the amount and variety of safe foods their members need to lead active and healthy lives.

i. Number of meals per day:

The study found out that most of the households (62.3%) take three meals daily whose nutritional components were proteins and carbohydrates. This indicates that majority (62.3%) of the households in Bureti Sub- County are food secure. Some households had only two meals (29.2%) which were lunch and supper. Nonetheless, there were families who could only afford only one meal per day (8.3%) indicating inadequate food supply and limited variety.

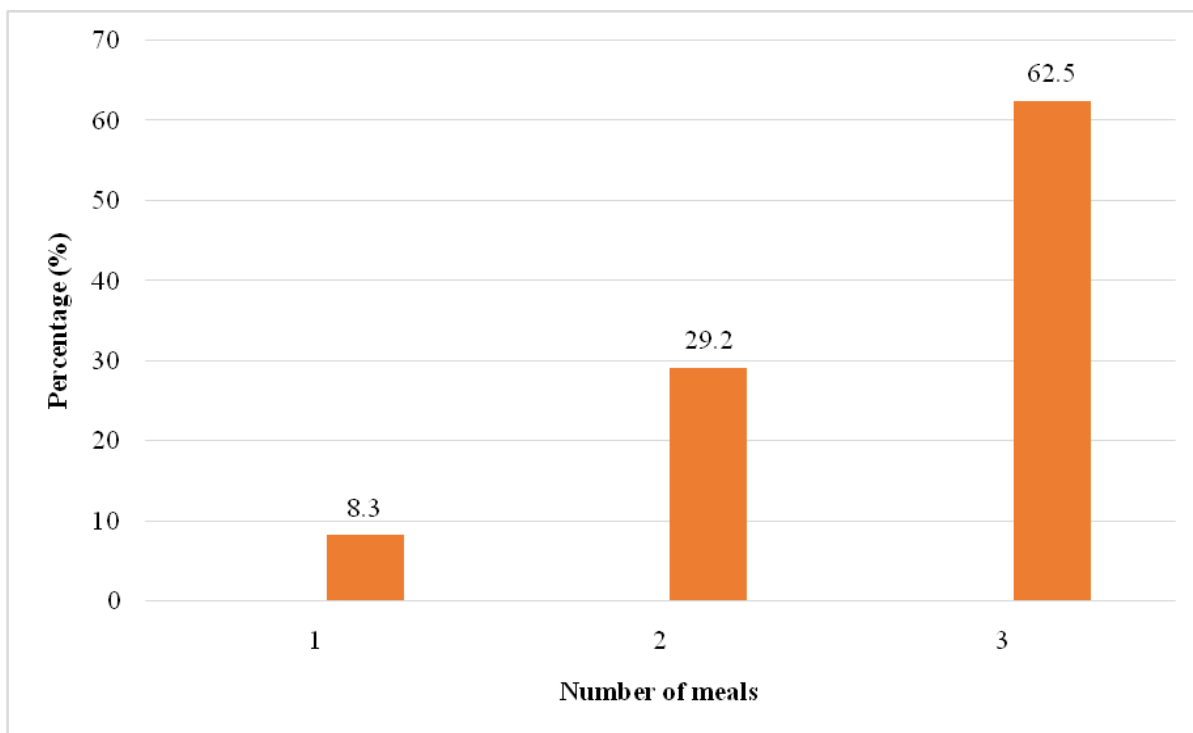


Figure 4.7: Number of meals per day

The analysis on the percentage distribution of the respondents in the distribution of the number of meals further revealed that in Bureti sub-County majority of the households take three meals in a day. Thus it can be inferred that within Bureti sub-county most households are food secure.

ii. Food Purchase:

The findings from the field survey in Table 4.8 shows that households purchased food stuffs throughout the year. Majority (44.9%) of the respondents purchased food more than four times a year implying that the food produced at household level was not enough to fully meet the family's needs or food is purchased to supplement food produced at the household.

Table 4.8: Food Purchase

Food Purchase(No. of times)	Frequency	Percent
Once	47	18.5
Two times	55	21.7
Three times	38	15.0
More than 4 times	114	44.9
Total	254	100.0

Table 4.8 shows that the distribution of the household heads according to the number of times food is purchased within the study area. Majority of the respondents were in agreement that

food in the study area is purchased more than four times annually. Female headed households (71.3%), single respondents (81.6%), households with the head having tertiary education (41.4%), households with four members (74.2%), respondents engaged in business (74.1%), households with 6-10 hectares (59.1%), households that lease land for farming (45.1%) and households that rely on manual labour (78.2%) were found to purchase food more than four times in a year.

4.5.3 Household Food Accessibility

Food accessibility is the capacity to have sufficient resources - physical and economic - to obtain appropriate foods for a nutritious diet, is another determinant of food security.

The study found out that a bigger proportion (67.5%) of the people living in Bureti Sub County had adequate food but limited in variety. 0.4% of the households often did not have enough food as shown in Figure 4.8.

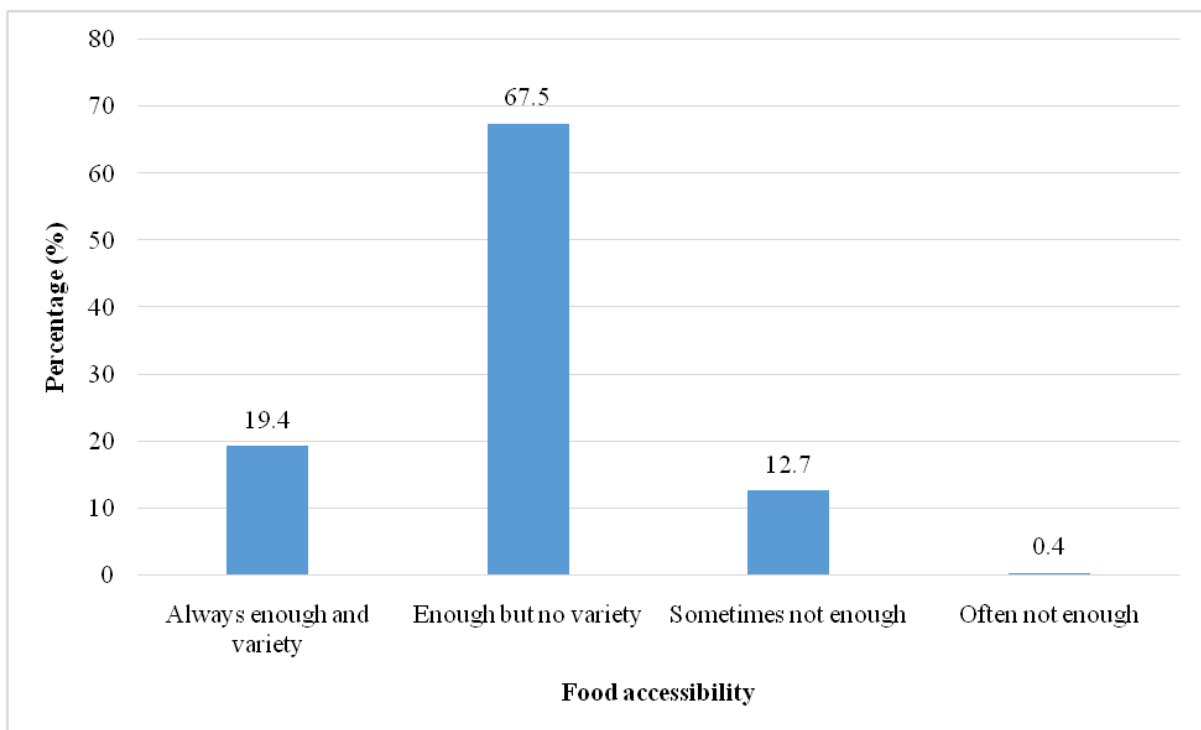


Figure 4.8: Food accessibility

According to Table 4.9, in the study area food is enough but not variety. Majority of male headed households (67.3%), divorced households (55.1%), widowed households (71.2%), household with the head having primary education (46.9%), households with 2 (63.1%) and 5 (78.9%) members, households with head in formal employment (70.1%) and business (77.2%), households with 1-2 hectares of farms (66.7%) and 6-10 hectares of farms (59.1%),

own farms (56.2%) and use manual labour (58.1%) have enough but not variety food. On the other hand, majority single household heads (66.1%), households with household head having secondary education (47.5%) and tertiary education (54.3%), households with 1 member (54.8%), household heads practicing farming (68.1%) and households where farming have been mechanized (72.4%) were found to be always having enough and variety of food.

Table 4.9: Percentage Distribution of the respondents in the Distribution Food Accessibility and Selected Demographic Characteristics

Variable		Food accessibility				Total
		Always enough and variety	Enough but no variety	Sometimes not enough	Often not enough	
Gender of household head	Male	19.1%	67.3%	12.4%	1.2	100%
	Female	23.6%	55.4%	21%	0	100%
Marital status	Single	66.1%	31.2%	2.1%	0.6	100%
	Married	43.2%	37.7	7.7%	11.4%	100%
	Divorced	38.3%	55.1%	0.5%	6.1	100%
	Widowed	9.3%	71.2%	11.1%	8.4%	100%
Level of education	No formal education	6.1%	34.6%	51.1%	8.2%	100%
	Primary	14.7%	46.9%	20.8%	17.6%	100%
	Secondary	47.5%	31.4%	13.9%	7.2%	100%
	Tertiary	54.3%	21.6%	14.2%	9.9%	100%
Household membership/size	1	54.8%	38.3%	5.3%	1.6%	100%
	2	24.5%	63.1%	12.1%	0.3%	100%
	3	23.1%	12.0%	64.8%	0.1%	100%
	4	34.1%	9.2%	56.1%	0.6%	100%
	5	17.2%	78.9%	2.8%	1.1%	100%
	>5	5.3%	13.7%	78.1%	2.9%	100%
Occupation of household head	Farming	68.1%	28.9%	2.8%	0.2%	100%
	Formal employment	21.4%	70.1%	6.3%	2.2%	100%
Size of farm	Business	19.9%	77.2%	2.1%	0.8%	100%
	1-2 ha	27.1%	66.7%	6.2%	0%	100%
	3-5 ha	52.1%	37.2%	9.6%	1.1%	100%
	6-10 ha	24.3%	59.1%	15.4%	1.2%	100%
Land tenure	>10 ha	45.4%	33.2%	19.3%	2.1%	100%
	Owned	32.6%	56.2%	10.3%	0.9%	100%
Type of labour used	Leased	38.7%	31.9%	26.5%	2.9%	100%
	Mechanized	72.4%	21.5%	5.4%	0.7%	100%
	Manual	36.2%	58.1%	3.8%	1.9%	100%

4.6 Factors Responsible for levels of Households' Food Security in Bureti sub-County

The fourth objective was to establish factors responsible for the levels of household food security in Bureti sub-county. The quality of soil at the farm, change in quality of soil between 2006 and 2015 and rainfall variability and agricultural land use were assessed as the major determinants of yields of various farm products in the study area.

4.6.1 Quality of Soil and its Effects on Farming

i. Quality of the Soil

Good soils registered the highest number (70.7%) of responses in rating the quality of soil for agriculture in Bureti Sub County. Most respondents observed that the type of soils within their area were good in supporting agricultural activities. However, it can be noted that some areas have very good soils for agriculture while others are fairly good.

Table 4.10: Quality of soil

	Frequency	Percent
Very good	24	9.4
Good	181	70.7
Fair	49	19.1
Poor	2	0.8
Total	256	100.0

ii. Influence of the Soil on Farming

The study also sought to establish whether the soil quality had influenced the farming activities between 2006 and 2015. From the responses collected during the study in Bureti sub-County, a larger portion of the feedback indicates that soil quality had greatly impacted on farming activities during the aforementioned period. The survey results indicate that soil was a major factor which influenced the farming activities in the area between 2006 and 2015. This is deduced from the larger proportion (83.3%) of respondents who agreed to the argument that soil had affected agriculture during that given period. However, others (16.7%) still felt that soils had no influence in farming activities which had taken place during that decade.

Table 4.11: Influence of Soil on Farming

	Frequency	Percent
Yes	210	83.3
No	42	16.7
Total	252	100.0

4.6.2 Rainfall Variability and its Effect on Farming

Rain-fed agriculture is the most dominant type of agriculture practiced in the study area. Therefore, variation in rainfall characteristics like amount and intensity has impacts on farming. The survey revealed that there has been variability in rainfall which the majority (86.1%) residents felt that the variation was average as compared to a few groups of respondents which felt the variation was high while the rest argued that it was low. This variation in rainfall had its effects in farming which the residents confirmed had been witnessed during that period.

Table 4.12: Rainfall Variability

	Frequency	Percent
High	23	8.9
Low	13	5.0
Average	223	86.1
Total	259	100.0

4.6.3 Relationship between Land use and Food Security

Land is an important determinant of food production thus food security of insecurity (Waithaka, 2014). According to findings in regard to household number of meals per day and on food accessibility, household in Bureti Sub County are food secure. However, some of the households are not guaranteed food availability throughout the year. Figure 4.9 shows that food uncertainty dominates the four main land uses food crops cultivation (6), cash crop cultivation (5), livestock keeping (3) and mixed farming (12). Nevertheless, mixed farming seemed to be the most appropriate activity that improves food security in the region. Individuals who practiced cash crop farming faced the highest risk of food insecurity.

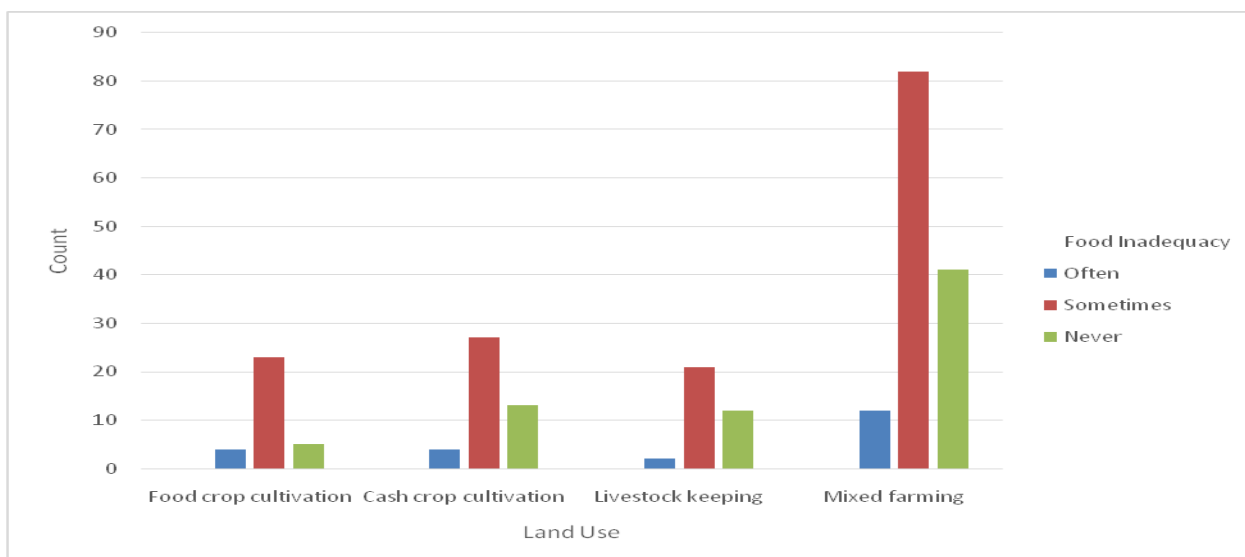


Figure 4.9: Relationship between Land use and Food Security

CHAPTER FIVE

DISCUSSION

5.1 Respondents' Demographic Characteristics

5.1.1 Gender of the respondents

The study results showed that more male (63.3%) were involved in agricultural land use change and food security and nutrition for their household than the female household heads. The findings are in agreement with Sabila and Sakaja (2014) that male heads household are crucial in the changing agricultural land use which can translate into food and nutritional security for their households than the female household heads. However, the results are contrary to Quisumbing *et al*, 1995 who found out that female household heads are the ones who rear cultivate food crops thus key to food security for their households.

5.1.2 Marital Status of the household head

The results indicate that majority of the households comprise of both husband and wife (70.5%). Thus this implies that change agricultural land use and food security are influenced by households made of husband and wife. Marital status of the household heads is a significant factor in determining land use and food security. For instance, females may put in a lot of energy and time in agricultural production but their agricultural output remains low due to factors including land, labour, farm equipment, technical assistance and information resulting in decrease in agricultural land leading to food insecurity (Njuki *et al.*, 2004).

5.1.3 Level of education of the respondents

The results showed that majority of the respondents have formal education 90.8% (primary – 26.4%, secondary-42.9% and tertiary education-24.5%). Basic education is important as can enable one to read and understand the world around him. Educational attainment by the household head could influence their desire for household agricultural land use. Further, education enhances critical decision making and use of information sources. Thus, household heads with higher level of education are likely to diversify agricultural production within their farms as they practice other occupations (Najafi, 2003).

5.1.4 Household size of the respondents

The results indicate that majority of the households have 5 members (27.6%) the mean family size in the study area is 3 members. Household family size tends to insert pressure on agricultural land and food consumption. Paddy (2003) found out that there is a negative correlation between household size and food security as food requirements increase in relation to the number of persons in a household.

5.1.5 Age of the household members

It is also evident that the respondents' households are composed of the active population. That is ages between 20 to 59 years (90.4%). Hofferth (2003) found out that the ages of the household members influences food security and agricultural land use change. The more the number of the older family members, the higher the farm labour to work on increased agricultural farms. Thus this will be an advantage to households who strive to achieve food security.

5.1.6 Occupation of Respondents

All the respondents were small scale farmers. This result justifies reports that agriculture is the backbone of the country's economy (GoK, 2009). Though 34.5% were involved in other occupations this was probably supplement on subsistence farming which may be insufficient to meet adequately the food needs of the family including the need for enough nutritious food

5.2 Changes in Household Agricultural Land Use Practices

5.2.1 Household Farming Activities between the year 2006 and 2015

From the finding, it can be observed that the respondents practiced food crops cultivation; cash crop growing, livestock keeping and mixed farming at different extents. However mixed farming dominated in both the years 2006 and 2015 at 49% and 55.6% respectively. This

implies that most households prefer having food crops, cash crops and rearing livestock. The findings that mixed farming was dominated by most farmers in Bureti sub-county in the year 2006 and 2015 contradict a study on land use in Keumbu in Kisii County by Waithaka (2014) which revealed that most of the farmers practice food crops cultivation. However, the finding agrees with Raul *et al.* (2013) that smallholder farmers mix range of crops including food crops, cash crops, semi-cash crops (banana) and horticultural crops depending on individual situations. The finding can be explained with Chapman and Tripp (2004) research on the contribution of farming. They were of the opinion that diversification of agricultural activities should be understood in the context of increased household access to food, reduced dependency of purchasing food and increased income from the surplus agricultural products.

From the finding there was a decrease in only the number households keeping livestock (-5.4%) between the 2006 and 2015. The findings on the difference in number of farmers practicing food crop cultivation, cash crop cultivation and livestock keeping in the year 2006 and 2015 are in agreement with Butt and Olson (2002) view that the number of households practicing different farming activities varies in within different agricultural regions than livestock farming.

5.2.2 Changes in Households Agricultural Land use between the year 2006 and 2015

5.2.2.1 Change in land under cash and food crops

Slightly below 50% of the respondents noted that the proportion of land under cash and food crops changed between the years 2006 and 2015 at 48.6% and 47.2% respectively. This implies that the farm sizes of the households were the same in the year 2006 and 2015. These findings contradict the views of Kiio and Achola (2015) on agricultural land use change in Kiambu County showed that agricultural land in the area reduced over a period of ten years from 39.7% to 15.8% thus reducing cash and food crops production.

5.2.2.2 Changes in land use for food, cash crops, livestock and mixed farming

The analysis of the responses revealed that land used for mixed farming (51.4%) exhibited a significant increase in size as compared to the other three practices. This could mean that farmers opted for mixed farming to improve the ability of their households to access a variety of foods throughout the year. There were notable increments in land under cash crops though the magnitude of change was beyond the study's scope.

5.3 Factors Responsible for Recent Changes in Household Agricultural Land use Practices

The respondents were of the opinion that household sizes, access to fertilizers, market prices of farm products, scarcity of land, labour shortage and inadequate extension services influenced land used practices (food crop, cash crop, livestock rearing and mixed farming) at different percentages between 2006 and 2015. The findings concur with Waithaka (2014) study that agricultural land uses are affected by various factors including population change and land fragmentation.

The study showed that during that decade most land use practices in terms of the type of agriculture carried out depended on the existing market prices which determined the type of agricultural land use. This confirms that most people relied on farming as a source of direct income. Labor source and demand for food and other resources may be dictated by the size of households. With other factors being constant, the size of the household determines the consumption of resources which in turn determines which activity is practiced on a piece of land in order to cater for the family demands. Therefore, household size stood out as one of the major factors that influenced the type of land use that was witnessed in the study area. Being a farming village, Bureti Sub County's productivity depends on farmers' access to farm inputs like fertilizer, labor and extension services. Availability of these inputs affects the activities that are practiced on a piece of land.

An aggregate of all the factors that influence land use shows that market prices on the farm products and the availability of land for agriculture cut across all the four land uses discussed in this study. These two factors largely influence the type of activity land is put under.

The results on the factors influencing land use concur with Stokes and Schutjer (1984) that household size also significantly changed the age trajectory for farm size, particularly at younger ages and that larger household was a disadvantage through middle age, and an advantage by age 60, even when controlling for the age and sex composition of the household, as well as region and year. Family labor has historically been a key aspect of farm life, legitimizing a labor-oriented approach that views household composition and land use as closely link (Stokes and Schutjer, 1984). Moreover, agricultural work and rewards tend to be age and gender specific.

In addition, the availability of extension services plays a role in determining agricultural land use change. According to the Key informants from the Ministry of Agriculture smallholder

farmers in Bureti sub-County offered various extension services. They identified that the major areas of support they offer small scale farmers include preparation and maintenance of tea nurseries, tea picking techniques, use of agro-chemicals and soil conservation measures. The frequency of the services depended on seasons and local arrangements with some being weekly while others depended on the farmers' demand and availability. From the key informants' findings, it can be concluded that 11.4% in cash crops cultivation between 2006 and 2015 may have been influenced by the extension services offered to smallholder tea farmers. However, the extension services offered by the Key informants from the Ministry of Agriculture never touched on livestock keeping. Thus, the extension services in the study area have no influence on the change in land under livestock keeping.

The findings further revealed that the respondents' Household Characteristics influenced the Main Farming Activities in 2006 and 2015. This findings concur with Adikwu (2014) findings that household population influence on agricultural systems. He found out that family size influenced the proportion of family farmland cultivated, frequency of cultivation, crop combination pattern and intensity of agricultural land use in Obagaji area. This was because the agricultural farm land cultivation increased as the number of family members increased and vice versa.

The finding on land sizes may be used to explain the agricultural land use change situation in Bureti sub - county as the findings agree with the views of Sanctus (2011) that the land sizes owned by the farmers determined agricultural land use and diversification. As a result farm sizes reflects the socio-economic conditions of farmers which results in the farms' capabilities. In the study by Sanctus (2011) smallholder farmers tend to have small pieces of farms practicing subsistence farming while large scale farmers have large parcels of land for commercial farming.

Privately owned land dominates in the study area. This can be used to explain land ownership as a factor that influence agricultural land use. This finding that privately owned agricultural land dominate is in agreement with Idoma and Ismael (2013) that there are three categories of land ownership among the farmers: freeholders (50%), lease (30%) and communal (20%). The study further found out that it is majorly on freehold land that smallholder farmers grow tree crops because of land security; arable farming is done on leased farms while livestock is predominantly on communal land. They further found out that more than 50% of the smallholder farmers acquire land by inheritance.

The major sources of labour in the study area are mechanical and manual labour. This study concurs with Tanaka (2008) that family labor accounted for 74% of total labor used in tobacco production and 88% of that in maize production in Malawi. In the study villages, there were two types of farm tasks in which hired labor was most commonly used. According to Uzeh et al. (2008) and Boserup (1965), household population has significant influence on farming systems and practices. The influence of household population is mainly on the relationship between farm labour and agriculture production as well as farm labour and agricultural land use pattern in relation to individual farm family. Mechanization of agriculture increases labour productivity, land productivity, enhance the quality of the produce and decreases the cost of agricultural production. However, agricultural production system in Kenya rely mostly on human labour (70%). The study finding concurs with FAO that mechanization of smallholder agricultural system include farm power, draught animal power, hand-tool technology, use of machinery, equipment and tools in rural farming systems. The report further confirmed that the farm power situation is deficient almost everywhere, and that urgent measures are needed to correct it if the widely promoted goals of raising the productivity of the sector, reducing poverty, and achieving food security are to be achieved.

5.4 Household Food Security

The finding on the study results revealed that households in the study area mostly self production food (81.5%) while very few purchase food. This may imply that households believe in farming as a source of food security and nutrition. However, purchase of food may be assumed to imply that the household purchase for to substitute the food they self produce. This agrees with FAO (2000) findings that farmers purchase of food to compliment their farm product. Besides, Kang'ara *et al* (2001) noted that farmers purchase during drought that lead to crops failure and calamities to ensure food security and means of coping during crop failure and other calamities.

The study findings on table 4.8 agrees with Kakwani and Son (2015) that in some parts of the world, having three meals a day or even two is a sign of food security. Further Kakwani and Son (2015) noted that people do not know their next meal will come, and those who are not being able to afford the food they want to eat are always food insecure.

In addition the findings show that majority (44.9%) of the households purchase food more than 4 times in a year. The finding concurs with Kakwami and Son (2015) that food security can be ensured if people can always buy the basic food they are accustomed to. They proposed an approach to measuring food insecurity by estimating the per capita monetary

cost of a food basket that provides a balanced diet through adequate nutrients including calories, protein, fat and carbohydrates to maintain good health. The finding implies that the households have financial ability to purchase food. The per capita monetary cost of food is calculated in terms of US dollars based on the 2011 Purchasing Power Parity to compare estimates across countries. Their findings reveal that in just one decade, the percentage of people suffering from hunger notably decreased from 23.05% in 2002 to 10.01% in 2012, with more than 576 million people lifted out of food insecurity. Despite such progress, some 557 million people in the globe still face food insecurity.

According to FAO (2016) report on food security in Africa, it was found out that access to food is limited by lower average per capita income by the majority (US\$3 400 in 2014) and food prices are high thus the vulnerable household are out of reach from food.

According to Kenya Food Security Report (2015), starting from 2008, the country has been facing severe food insecurity problems depicted by a high proportion of the population having no access to food in the right amounts and quality. Households are incurring huge food bills due to the high food prices. Maize being staple food due to the food preferences is in short supply and most households have limited choices of other food stuffs.

The finding that majority of the household have enough but limited food (67.5%) imply that though food is accessible, food security and nutrition is not guaranteed in the study area. This concurs with FAO (2017) that for households to be food secure there must be quality and quantity food that meets the dietary needs of an individual.

The study findings on table 4.15 agrees with Kakwani and Son (2015) that in some parts of the world, having three meals a day or even two is a sign of food security. Further Kakwani and Son (2015) noted that people do not know their next meal will come, and those who are not being able to afford the food they want to eat are always food insecure.

5.5 Factors Responsible for levels of Households' Food Security in Bureti sub-County

The study findings quality of soil revealed that good soils (70.7%) influence agriculture. This implies that good soils in the study area influence self production that leads to food security. In addition the household respondents had opinion that soil had effect on farming 83.3%. This finding implies that good soils can cause high yields while poor quality of soil can lead to low farm yields. The finding on good soils and effect of soils on farming are in agreement with Vlek (1990) finding that soil nutrients influence sustainability of farming systems. Nutrient balances are a reflection of management practices that influence movement (flows) of nutrients into, within and out of a given farming system and therefore reflect aggregated

management decisions of different farm types in response to prevailing policy-institutional environments (Defoer and Budelman 2000).

From the findings the respondents had an opinion that the study area has average rainfall (86.1%). This implies that there the area receive rainfall that is capable of sustaining farming. Irregularity in timing and/or fluctuation in amount of rainfall results in adverse agricultural production. Rainfall variations with respect to historical rainfall trends can be harmful for crop production, in particular for farmers producing maize and other crops under rain-fed conditions (-1% for maize and -0.7% for other crops) and for farmers with small plots (0.7% and -0.8%, respectively) as in the findings of the study (Ochoa *et al.*, 2015)

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter covers summary of the study, conclusion and recommendations. The summary of the study entails the study findings based on the objectives while conclusion and recommendations of the study are based on the study findings.

6.2 Summary of Findings

Objective 1: Agricultural land use change between 2006 and 2015 was more pronounced in food crops cultivation (11.9%) and least on livestock keeping (2.9%). Mixed farming was found to be the main agricultural activity in the year 2006 and in the year 2015 in Bureti Sub-County. Further agricultural land use change between 2006 and 2015 was more pronounced in food crops cultivation and least on livestock keeping. It was also found out that there was an increase in land under cash crops and food crops in the study area between the year 2006 and 2015.

Objective 2: Food crop cultivation (19.9%) and mixed farming (24.6%) experienced the highest changed between 2006 and 2015 as a result of improved farming (occupation) in Bureti sub-county. On the other hand the change in cash crop (18.4%) and livestock farming (10.7%) were highly influenced by the level of education (secondary) between 2006 and 2015

Household size, inadequate extension services, Labour shortage were the major factor influencing food crops cultivation (16.0%), mixed farming (66.0%), cash crop cultivation (44.4%) and livestock keeping (25.0%) agricultural land uses between 2006 and 2015 respectively in Bureti sub-County .

Objective 3: According to the study finding most of the households in Bureti sub-county self-produce their food). In addition to small scale farming, foodstuffs are also purchased though in a small extent. Majority of the respondents noted that they purchased foodstuffs for their households more than five times in a year to supplement food produced from their farms. Further majority of the household in the study area take three meals daily. Though the accessibility of food varies across the households in Bureti sub-County, it was found out that majority of the households have enough food but no variety.

Objective 4: From the study, it was found out that food production in Bureti sub-county are as a result of the high quality soil in different parts of the sub-county that favour most agricultural products thus high farm yields. Rainfall in the study area was found to be average and irregular in timing during the year. As a result of the good quality of soils and average rainfall most of the foodstuffs produced in Bureti sub-county are favoured thus high yields that boost food security in the study area.

6.3 Conclusions

Objective 1: The finding implies that food crop, cash crop and mixed agricultural land use practices increased between 2006 and 2015. This is as a result of increasing demand for food by the increasing population in Bureti sub-county

Objective 2: Farming as an occupation led to increased cash and food crops agricultural land use. Thus, this implied that majority in Bureti sub-county are unemployed and are shifting to agriculture as an occupation which will lead to increased agricultural land use.

Objective 3: The respondents in the study area are able to self produce and purchase enough food hence Bureti sub-county is food secure.

Objective 4: The findings imply that Bureti sub-county with good soil and average rainfall variability is conducive for agriculture. Therefore high farm yields are expected in the area

6.4 Recommendations

There is need for intensive household mixed farming incorporating food crops, cash crops and livestock keeping, and sustainable farming inputs since it is the most preferred farming system in Bureti sub-County. Therefore, smallholder farmers in the study area should use higher inputs in cash and food crops cultivation such as certified seeds and inorganic fertilizers, and practice dairy farming. As a result, there will be increased farm output within the limited reducing farm sized. This will in the long run make household in the area food secure and financially stable due to the sales of the surplus household farm output.

There is need for more agricultural extension services. With the changing agricultural land use practices, smallholder farmers require advice on how to utilize their small pieces of land to realized high output and how to use new technologies like improved seeds and use of inorganic fertilizers.

The national and county government should ensure that policies and regulations promoting agriculture are formulated. The policies should ensure that the small scale farmers easily

access vital farm inputs like certified seeds and fertilizers, are made aware of the new agricultural technologies, are provided with extension services through increased personnel and funding.

6.5 Suggestion for Further Research

There is need for further research on the importance of introduction of agricultural programs such as use of technology by smallholder farmers in enhancing food security of the farmers in Bureti Sub-County.

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APPENDIX I: QUESTIONNAIRE FOR HOUSEHOLD

Dear respondent,

I am Nancy Terer, a student from Geography Department Egerton University pursuing masters of Arts degree in Geography. In order to satisfy the requirements for my degree programme I am required to carry out a research in my area of study. My research topic is on an analysis on change in agricultural land use practices and their effects on food security and income in Bureti Sub-County.

You have been selected as one of the research respondents. Kindly answer the questions below as sincerely as possible. The information you give will be highly appreciated and used for academic purposes only.

Questionnaire No..... Location Date

SECTION A: PERSONAL DETAILS

Respondent's Personal Information

Please tick (✓) the appropriate response or give a brief comment where applicable.

1. Name (optional):

2. Gender

Male Female

3. Current marital status

Single Married Divorced Separated Widowed

4. Highest Level of Education

No formal education Primary
Secondary Tertiary

5. Household membership in terms of number of people.

1 2 3 4 5

Others specify

6. Ages of household members

< 5 years

5 – 20 years

20 - 59 years

60 years and above

7. Occupation:

Small holder farmer Others (Specify)

SECTION B: LAND USE

1. What was the main farming activity in 2006?

Food crop cultivation	<input type="checkbox"/>	Livestock keeping	<input type="checkbox"/>
Cash crop growing	<input type="checkbox"/>	Mixed farming	<input type="checkbox"/>

2. What is the main farming activity that you are involved in?

Food crop cultivation	<input type="checkbox"/>	Livestock keeping	<input type="checkbox"/>
Cash crop growing	<input type="checkbox"/>	Mixed farming	<input type="checkbox"/>

3. How have your farming activities changed between 2006 -2015?

Increased land under food crops	<input type="checkbox"/>
Increased land cash crops	<input type="checkbox"/>
Increased land under livestock	<input type="checkbox"/>
Increased land under mixed farming	<input type="checkbox"/>

4. Did you change the proportion of land under:

a. Cash crop production between 2006 and 2015

YES NO

b. Under food crop production between 2006 and 2015

YES NO

5. What is the size of your farm?

1-2 ha 3-5 ha 6-10 ha over 10 ha

6. What is your main source of food for the household?

Purchase food stuffs Self-produced

7. Give reasons for your preferred agricultural activity you are engaged in?

Land Size Income

8. What are the sources of income apart from farming?

Business Employment

9. Is the land leased or you own it?

Yes No

10. When do you plant your crops? Specify the month of the year.

11. What are the main types of livestock reared?

Cattle Sheep Goat Poultry

12. What kind of labour do you use on your farm?

Mechanized Manual

SECTION C: Factors responsible for changes in agricultural land use practises

1. Rate the quality of soil on your farm?
Very good Good
Fair Poor
2. Did the quality of soil in your farm influenced farming activities between 2006 and 2015
YES NO
3. Rate rainfall variability between 2006 and 2015?
High Low Average
4. Has rainfall variability influenced your decisions on farming activities
YES NO
5. Which of the following factors influenced your land use practices between 2006 and 2015?
Household size
Access to fertilizers
Market prices of the farm products
Scarcity of land
Labour shortage
Inadequate extension service
Others specify _____

SECTION D: Household food security

1. How many meals do you eat in a day?
1 2 3
2. Specify types of food in the household diet?

3. How many bags do you harvest a year for the following crops?
Maize Beans
4. How many times do you purchase food stuffs in a year?
1 2 3 > 4
5. How do you store your harvest? Do you use pesticides?
Yes No
6. Which of these statements best describe the food eaten by your household in the last 12 months



We always have enough to eat and the kinds of food we want

We have enough to eat but not always the kinds of food we want

Sometimes we don't have enough to eat

Often we don't have enough to eat

7. Now I'm going to read you several statements that people have made about their food situations. Please tell me whether the statement was often, sometimes or never true in the last 12 months

"I was worried whether our food would run out before we got money to buy more". Was that often, sometimes, or never true for you in the last 12 months?

Often

Sometimes

Never true

8. The children were not eating enough because we just could not afford enough food". Was that often, sometimes, or never true for you in the last 12 months?

Often

Sometimes

Never true

9. In the last 12 months, did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?

Yes No Not sure

10. How often did this happen?

Almost every month

Some months but not every month

In only one or two months

11. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?

APPENDIX II: INTERVIEW GUIDE FOR KEY INFORMANTS

Part I: Interview with officers from the Ministry of Agriculture.

I am Nancy Terer, a student from Geography Department in Egerton University pursuing Masters of Arts degree in Geography. I am involved in conducting a research on changes in household agriculture land use practices and their effects on food security and income in Bureti Sub-County. This questionnaire contains a number of questions that will assist me to get the required information. I request that you kindly provide the necessary answers. May I take this opportunity to assure you that all the information that you volunteer will be treated with utmost confidentiality and will be used for academic purposes only.

Your assistance will be highly appreciated.

Questionnaire Number----- Location----- Date.....

1. Is there any assistance that you give the farmers?

Yes No

2. If yes what kind of support.

3. How often do you visit the farmers to give advice?

4. How many officers are there per location?

1 2 3