SOCIO-ECONOMIC AND ENVIRONMENTAL DETERMINANTS TO HOUSEHOLD FOOD SECURITY IN KYANGWITHYA WEST LOCATION, KITUI COUNTY, KENYA

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DECLARATION

I understand that plagiarism is an offence and therefore declare that this thesis is my original work and has not been presented to any other institution for any other award.

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DEDICATION

This work is dedicated to my children Ted Ndambuki and Toby Mbuthia for being patient with my absence when they needed my care and presence most. It is also dedicated to my husband David Ndambuki for providing moral and financial support and to my brother in law, Dr. Patrick Daniel Kisangau for initiating the process of my academic journey.

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ABBREVIATION AND ACRONYMS

DCK	District Commissioner of Kitui
FAO	Food and Agriculture Organization
FDG	Focus Group Discussion
FEWS	Famine Early Warning System
GoK	Government of Kenya
IFAD	International Fund for Agricultural Development
ICF	Interdisciplinary Centre for Food Security
KNBS	Kenya National Bureau of Statistics
SSA	Sub- Saharan Africa
SDGs	Sustainable Development Goals
UNEP	United Nation Environment Programme

OPERATIONAL DEFINATION OF TERMS

Household Food security: A situation where a household gets enough food all year round (in this study).

Food insecurity: Lack of access to three meals a day all year around.

Household: Refer to a person or persons normally living together under one roof or several roofs within the same compound or homestead area and sharing a community of life by their dependence on a common holding as a source of income and food, which normally, but not necessarily, involves them in eating from a common pot.

Hunger: Refer to an individual's inability to eat sufficient food to lead a healthy and active life.

Household head: is the most responsible member of the household who makes key decisions on the household on a day to day basis and whose authority is recognized by all members of the household. It could be the father, the Mother or an elder child, or any other responsible member of the household.

Farm size: is the total area of land cultivated to food and cash crop by households and measured in acres.

Muguka: is a khat-like plant which is a stimulant crop.

Bodaboda: is a motorcycle taxi.

Muswaa- is a type of food made of maize flour that is semi porridge and semi ugali, it can only be eaten using a spoon and cannot be drunk in a cup like porridge. It is normally consumed when there is nothing else to eat.

Utaa*:* is a kitchen grain storage space.

ABSTRACT

Food security is a multifaceted global issue that impacts almost all aspects of life. Globally food insecurity affect 842 million people with Africa being the most affected. Socio-economic and environmental determinants have the potential to influence food security in Africa and other parts of the world. Empirical studies in Kenya and Kitui County indicate that these socio-economic and environmental factors play significant roles in household food security. However, research and discourse in Kyangwithya West location have not considered the analysis of the socio-economic and environmental determinants to food security but have focused on perceptions of drought and their impact on rural development. Consequently, this study sought to examine the socio-economic and environmental determinants to household food security in the study area. The specific objectives of this study were to: assess the influence of socio-cultural factors on household food security; analyze the economic determinants to household food security; and, to assess the influence of environmental factors on household food security. The study was guided by cultural ecology theory propounded by Julian Steward (1955). The study used a cross-sectional descriptive research design. The study focused on households in Kyangwithya West location with a target population of 3,198 households. Consequently, a sample size of 344 was determined using the Raosoft software. Primary data were collected using triangulated methods which included semi-structured questionnaires administered to 344 households that were systematically sampled; two key informants and four focus group discussions all of whom were purposively sampled. Quantitative data were analyzed with Statistical Packages for Social Science (SPSS) version 24 to generate descriptive statistics in frequencies and percentages which were presented in tables. Qualitative data were analyzed thematically and presented in form of narratives and verbatim reports. Findings on the study revealed that 73% of households in the study area were food insecure. Social cultural factors (gender, age, level of education and food sharing) were observed to influence household food security. Economic factors like land size and source of livelihood also influenced household food security. However access to market had negative effect since households that had access were more food insecure (73%) than those who had no market access (71%). The study further noted that local markets were exploitative to the farmers. The results revealed that environmental factors influence household food security. Majority of the respondents indicated that they had perceived a changing climate in the study area and that inadequate rainfall contributed the most to household food insecurity. The study therefore recommends that policies aimed at controlling the use of m*uguka* be implemented. Secondly, increased access to external markets will reduce exploitation of local households. Further, timely communication of weather changes will inform farmers on expected rainfall for better planning of farming activities which will promote household food security.

CHAPTER ONE

1.0 INTRODUCTION

This chapter presents the universal understanding of food security. It highlights the variations in food security levels in various regions in the globe. The chapter examines how households perceive food security and the factors that influence food security levels. Further, the chapter covers the statement of the problem, objectives, research questions, scope and significance of the study.

1.1 Background of the Study

Food security is an issue of concern to many developing countries. In these countries, the national level depict a picture of food secure population but the converse is true at household level where individual families suffer from lack of adequate food (Mwaniki, 2012). Food security is a multifaceted phenomenon in many regions of the world that touch on almost all aspects of life (Abdulkadyrova, Dikinov, Tajmashanov, Shidaev, & Shidaeva, 2016; Braun, Teklu, & Webb, 1993; Shaw & Elmendorf, 1994). In many countries in the developing world, especially in Africa and South Asia, it has proved hard evading the trap of food insecurity and understanding the factors that cause widespread hunger and food vulnerability to famines. Approximately 500 million people who are food insecure are in Africa and Southern Asia (Food &Organization, 2015).

The mechanisms available to alleviate the impacts of food insecurity have remained an important area of study by many scholars interested in the welfare of societies (Braun et al., 1993). Food and Agricultural Organization of the United Nations, International Fund for Agricultural Development, & World Food Program, (2013) noted that 842 million people, around one in eight, suffered from hunger with Africa being the most affected where one in four people suffered from chronic hunger in 2012. In Asia, home of three-

fifths of the world's undernourished people, more than 900 million survive on less than $1.25 per day (Mander & Parulkar, 2016). In India, 230 million undernourished people constituted 21% of the national population in 2003-2005 (FAO, 2009). These statistics indicate that large populations face food shortages that compromise a healthy life and calls for urgent measures in dealing with issues of food security in the globe.

In Haiti, there has been a marked increase in the number and proportion of undernourished people in the recent past by around 2 million constituting 25 to 31%. An additional 2.7 million (6%) increase in the undernourished population in the previous decade has also been reported making the food insecurity situation of Haiti's comparable to some African countries (Forrester et al., 2017). Similarly in Africa, the state of food security has been worsening since 1970s and the proportion of the malnourished population has remained within the 33 to 35% range in sub-Saharan Africa (Rosegrant, Cline, Li, Sulser, & Valmonte-Santos, 2005). The reviewed literature therefore reveals the urgency in unearthing the determinants to household food security that could aid in mitigating the food insecurity situation in the region.

In Northern Africa, the situation of food insecurity is at 4% which is lower than that of Central Africa ranking at 40% (Mwaniki, 2012). Sources in Uganda shows that households were self-sufficient in food production in the past 30 years but this changed year by year since the late 80s with population growing by about 109 %, while total food production at about 17% (Government of Uganda, 1998). In Kenya, over 10 million people are food insecure especially those living in the ASALs (Pelletier, Menon, Ngo, Frongillo, & Frongillo, 2011). Kitui County being an ASAL region experience food shortages since adequate rainfall for crop production is a constant challenge (FAO, 2003; FAO, 2006). Similar studies conducted to assess the influence of socio economic and environmental factor on household food security in Kyangwithya West location were

lacking. Available studies conducted in the study area by Simitu, (2016) focused on marginalization of women in politics and made no mention of household food security. A closely related study was conducted in Kyuso sub county(Stephen, 2015) to assess the effect of social and economic factors on food security. The sub county is however not closely situated to the study area and variation in agro ecology and geography does not allow for generalization that factors assessed also have similar effects on household food security in Kyangwithya West location. The study also failed to focus on household food security but on the food security in general for the small scale producers irrespective of the availability of large producers in Kyuso Sub County. This study was therefore important since it provides an understanding of household food security in Kyangwithya West location and the influence of various socio economic and environmental factors.

1.1.1 Social Cultural Determinants to Household Food Security

Sanusi, Badejo, & Yusuf, (2006), points out that socio-cultural characteristics and resources of individuals are basic factors that influence the state of households' food security. Gender of the household head is one of the socio cultural factors that contribute to food security. According to Doss, (2014), women have a notable impact on national food availability and certainly affect domestic food availability as well. They are actively involved in food production where they are engaged in growing crops and rearing animals and often control the marketing and trade of the produce (Development, 2009; Doss, 2014). Other researchers indicate that women tend to dedicate most of their income to household food and the general wellbeing of their families (Hoddinott & Haddad, 1995; Hopkins, Levin, & Haddad, 1994) and therefore play a significant role in promoting food security. Specifically, Hopkins et al., (1994) in Niger established that changes in female annual income for both earned and non-labor income while controlling for male income impacted positively on household food expenditures.

In Asia and African countries, adult male members of the household are often privileged in terms of food intake (Dodson & Chiweza, 2016)). This makes it possible to have both food secure and food insecure individuals within the same household. In studies conducted in rural Andhra Pradesh in India, children of women who participate more in the household decision-making process were less underweight and wasted (Shroff et al., 2011).

Important to note however, is that gender has implications on ownership of, access to and control of livelihood assets (such as land, water, energy, credit, knowledge, and labor) and in most cases women are negatively affected especially in food production (Food & Agriculture Organization, 2006; Johnson, Kovarik, Meinzen-Dick, Njuki, & Quisumbing, 2016). In many developing countries of Africa and Asia, gender inequality in access to labor markets, financial services and productive resources such as land still constraints on the productive capacity of women, who in many societies play an important role in the provision of food through direct production or income generation (FAO, 2011).

In regard to land ownership, Deere & Doss, (2006) noted that in Ghana, women held land in only 10% households while men held land in 16-23% of households. In Kenya, women held 5% of registered landholders, 22.4% in the Mexican ejidos (communal farming lands), and 15.5% in Nicaragua. The disparity in control and ownership of land puts women in a subordinate position despite their major role in food production. This makes women make suboptimal decisions despite the role they play in food preparation, food processing and food provision which hinder improved households food status (Ibnouf, 2009).

Studies conducted by Kimani, E., Holding, P., Fotso, J.-C., Ezeh, A. C., Madise, N. J., Kahurani, E. N., & Zulu, E. M. (2011) in Kenya, illustrate that although women constitute 75% of Kenya's agricultural labor force, they are the most vulnerable to food

insecurity. This is due to gender inequalities which undermine their productivity, including limited access to essential resources. Similarly in Kitui County, gender inequalities exist despite the contribution of women in production, they are exempted from politics and other roles that can help them improve their households food security (Mwangi, 2013).

In Kyangwithya West location, Simitu, (2016) observed that women are highly marginalized in the political arena which is associated with cultural beliefs, religion, traditions and low education level. For example, levirate marriages take place and this translate to loss of control of household assets by the widow to the male relative who may not even be involved in providing food for the family. This may continue to impede women in achieving food security when control over land is denied. These studies have focused on assessing the ownership rights of women to land and have not clearly demonstrated the influence of gender on household food security. This study departs from that line of analysis to establish whether gender has an influence on household food security.

Age has been discussed as a social cultural factor that influences household food security. Divergent views have been raised by different scholars on the influence of the age of the household head on household food security. In a descriptive study, Titus & Adetokunbo, (2007) indicated that an increase in the age of the household head subsequently increases the incidence of food insecurity. Similarly, Bashir, Schilizzi, Pandit, & others, (2012) in Punjab Pakistan showed that every year gained by a household head decreases the chances of food security by 4.5%. This is because the ability to perform tougher jobs in the field reduces as one ages and also because in these households retired and elderly persons are dependent on the young since they are unable to fend for themselves. They also depend on family labour and hiring is not an option for the majority due to lack of nonfarm income (Bashir et al., 2012). This may explain the negative effect of this

variable on household food security. Similar relationship was observed by Titus & Adetokunbo, (2007) for Nigeria.

On the contrary, for USA, Onianwa & Wheelock, (2006) found that one year increase in the age of household head decreases the chances of a household to become food insecure by 2%. Other studies have showed that age of household head has a significant positive effect on use of farm inputs, productivity, farming experience in terms of the decision-making process of farmers with respect to risk aversion and adoption of improved agricultural technologies (Rougoor, Trip, Huirne, & Renkema, 1998; Tarawali, Okechukwu, Chianu, & others, 2017). Similar studies found that age determines how active and productive the head of the household would be and the rate of household adoption of innovations, which in turn, affects household productivity and livelihood improvement strategies (Abu & Soom, 2016; Dercon & Krishnan, 1996). This is because majority of the rural farmers depend on own labour to work in the farms since hiring labour is a challenge to their already strained finances (Dercon & Krishnan, 1996). In addition, most elderly people were not as accepting of new innovation compared to the young.

In Kenya, Kibaara, Ariga, Olwande, Jayne, & others, (2009) found that the age of household head had a significant effect on household food security implying that households with older heads are less efficient in food production. This leads to food insecurity as the household head lacks the physical strength needed to engage in agricultural activities. These elderly households also lack the financial ability needed to hire labour that can help improve their food security since remittances from their children was limited and majority lacked own income (Rougoor et al., 1998). In Kitui County, it was noted that the family is the source of labour in the agricultural production system (County Government of Kitui, 2013). Similarly, studies conducted in Kyuso sub-County

of Kitui County reports that the age of household head is significant in promoting food security. In Kyuso Sub county most of the young generation (below 40years) that are of productive age had gone to seek white collar jobs at the urban centers and cities (Stephen, 2015). In this case, majority of the household heads in Kyuso Sub County were found to be aging and thus their productivity in the farms that would enhance food security in the sub county was affected. This therefore demonstrates that age has an influence on household food security since it affects innovativeness, risk aversion, technology adoption and ability to hire labour. However, the available information was not similar to that of Kyangwithya West location. This is because it only highlighted the age distribution in the population (County Government of Kitui, 2013) but the literature on the influence of the age of the respondents on household food security in Kyangwithya West location was unavailable and therefore necessitated the study.

The reviewed literature shows that age has both a positive and negative effect on household food security whereby in Africa, as the age increases productivity decrease. However, there is a point of contention where empirical data illustrate that agricultural production increases with age since the elderly are more knowledgeable on farming methods that can increase household food security (Arene & Anyaeji, 2010). In America, an increase in age is seen to increase household food security. However, Bashir et al., (2012) shows that as the head of the household age, he may resist new innovations that would promote food security. Although a complex analogy, the age of household head does affect the exposure to food security. This study therefore sought to examine whether the age of a household head has implication on household food security in Kyangwithya West location since available literature has no consensus.

Another socio-cultural factor that influences household food security is education. According to Najafi, (2003) the level of formal education attainment by the household

head could lead to awareness of the possible advantages of modernizing agriculture which in turn, would enhance households' food supply by promoting better practices in agricultural production. In Brazil, studies demonstrate that the level of education of the household head has an influence on household food security (Pérez-Escamilla, Shamah-Levy, & Candel, 2017; D. Thomas, 1994). Similarly, in the rural context of Punjab in Pakistan, Bashir et al., (2012) demonstrate that education influences food security through access to information on best agricultural production, nutrition and sanitation; increased efficiency, hence increased production and better decision making as well as the pride that comes with education.

The level of education of the household head thus influences the household's access to and use of information and builds its capacity to enhance food security. Makombe, Lewin, & Fisher, (2010) in Malawi, and Idrisa, Gwary, Shehu, & others, (2008) in Nigeria demonstrate that households with better-educated heads are more likely to receive information and use it in their decisions than those with less-learned heads. The former households are assumed to have better management techniques, which can help them secure a year-round supply of diversified and even preferred food. In addition, Amali, (2012) also in Nigeria found that the level of education influence food security where direct and wider returns to individual and immediate members of their family and society at large in terms of increased income, improved health and better decision making increase with better education.

In Kenya, Mwaniki, (2006) observed that education cannot be ignored in matters of food security since where the household head is educated, there is more food security. In Kyangwithya West location, Kitui County Ministry of Agriculture, Water and Technology facilitated farmers to attain modern farming technologies like green houses, Zhai pits and improved animal breeds and seeds that can improve food security of households (County Government of Kitui, 2016). However, the uptake of such modern farming methods can be affected by the education level of household head. According to

Mwangi, (2013) majority (60.7%) of the population of Kyangwithya West constituency have lower primary and upper primary level education. However, the influence of the level of education reported in a majority of the population in the study area to household food security has not been documented. This study, therefore, sought to establish the influence of education attainment levels to household food security in Kyangwithya as one of the socio-cultural determinants.

Food sharing is another socio-cultural determinant to household food security that was predominantly practiced by hunters and gatherers who would share their game together (Gurven & Jaeggi, 2015a). This was intended at ensuring that every person in the group got some food to eat from what was available. In the United States, studies by Martin, Rogers, Cook, & Joseph, (2004) documents that the application of sharing or receiving free food from relatives or friends by low-income households to protect themselves against hunger in different time periods acts to reduce food insecurity. He further states that the informal food sharing can be used as a substitute for food pantries or the "second-best" choice if households cannot get support from food banks.

In Asia and Africa, food sharing has also been utilized as a coping strategy to maintain an adequate supply of food and avoid food insecurity (Harrower & Hoddinott, 2005). In Northwest Namibia, Dawids et al., (2007) found that food sharing and transfer has also been practiced as a local norm where people can demand food from anyone, and they are typically given food in response to a demand. The sharing norm makes no restrictions on whom to ask, but in practice people often turn to their neighbors. For some, however, the act becomes reciprocal where interpersonal dynamics are taken to account. In many low-income households, eating at relative's or friend's or receiving free food from them either regularly, chronically, or during specific times of needs is most commonly reported (Mabli, Cohen, Potter, Zhao, & others, 2010; Weinfield et al., 2014).

In Africa, reciprocity and hospitality expresses the African sense of communality where societies such as the Asu of Tanzania, the Nupe of Nigeria, the Efe (Pygmy) of the Democratic Republic of Congo, and the Fulani of West Africa are hospitable to one another (Mbiti, 2002). He aptly summarizes the meaning of the ideal hospitality in Africa: It can be made more palatable to avoid the state in which 'a person who eats alone dies alone'. Therefore, when people eat together, they might as well die together happily – whether according to African Religion, Christianity, or other religious traditions. Therefore food reciprocity hinged on hospitality expressions of African communities which can attribute to food security. This is in line with Mbiti's philosophy that underlies the African way of life: "I am, because we are; and since we are, therefore I am" (Mbiti, 1990).

In Kenya, among the Luo community, for instance, people barter the foods they produce or purchase from the market, with friends, relatives and neighbours which help in ensuring a balanced diet in the households in the sense that household members gain access to foods which they do not directly produce (Subbo, 2001). Therefore, food reciprocity can protect households from food insecurity at different periods. In Kitui County, the Akamba communities were hunters at some time pre colonially but later consolidated as a separate people and turned increasingly to agriculture. They also engaged in generalized reciprocity arrangements which served to reduce risk to starvation and to provide mechanisms for coping with drought (Christensen, 2014). However, in Kyangwithya West location, information on the practice of food reciprocity post colonially is wanting and therefore unclear whether the practice was continued since it reduced risks of starvation by promoting food security through mutual reciprocity. This study therefore sought to establish whether the practice is still upheld by the community and whether it has an influence on household food security.

1.1.2 Economic Determinants to Household Food Security

Economic factors determine household food security. Every household has a limited amount of resources (household income) at its disposal, including assets, labor, human capital, and natural resources from which they derive their main source of livelihood (Hoddinott, 2012). Access to these resources including land, water, and fodder for food producers determines household food security. The availability and access to income generating activities determine the ability of families to buy food (Freedman, 2005). In numerous studies, a result that comes through is the strong positive relationship between income level and food security. For example, studies from Mexico, Brazil and Malawi all indicate that household income play an important role on food security and thus require thorough assessment in food related studies (Friel & Ford, 2015; Graeub et al., 2016). The importance of household wealth, such as animal ownership, home value and land ownership, also play a significant role on food security.

Households also engage in multiple sources of income to promote food security. According to Tankou, de Snoo, Persoon, de Iongh, & others, (2017) in Cameroon and Herbert, (1996) in Burundi, there is a tendency towards income diversification through extra-agricultural activities which complement farming and increase food security of the household. Some farmers in Burundi have even adopted the growth of passion fruit following its high market demand to broaden their sources of income and this enhance their food security (Bashangwa Mpozi, Musabanganji, Ndimanya, & Lebailly, 2015). However, Banerjee & Duflo, (2007) presents a dissenter to the view that an increase in household income does not necessarily lead to an increase in the quantity or quality of food consumed, but can be spent on items such as alcohol or fast food. This puts into question whether increased income actually determines food security and therefore, to draw any firm conclusions require further research. In addition, studies by Bouis & Haddad, (1990, 2015) in the Philippines evinced that increased household incomes were a necessary but not sufficient condition for improving food security. This was because

higher income households preferred to spend more of their income on non-food items. This grant authority to Haddad's assertion that increased income does not necessarily denote improved food security.

In Kenya, household income remains a major target in efforts to improve household food security and the well-being of the majority of the rural households (Kibaara et al., 2009). In Kitui County, a study conducted by Stephen, (2015) in Kyuso Sub-County found that household income affect household food security for majority of the households since the availability of income give households the power to purchase food from the market. In Kyangwithya West location, projects to increase crop production and farm income which is aimed at improving food security have been implemented in Ithiani, Itoleka, Masimbani, Kyamathyaka and Kavutha villages (County Government of Kitui, 2016). However, there is no empirical evidence that demonstrate whether the beneficiaries' additional income improved household food security.

In this case, it is unclear in the area of study whether increase in household income increase food security. From some of the reviewed literature, household income is presented as an important determinant to household food security. However, there seems to be no consensus on whether the increase in household income and economic diversification actually lead to food security. In this case, it is difficult to draw a firm conclusion on the role income plays on food security thereby necessitating further study. This study therefore sought to establish the influence of household income on food security.

The household farm size has been reported as the single most important asset to the small-scale farmers and it serve as a determinant to food security. There is a consensus amongst experts that the possible way out of the food crisis in Africa could be in

increasing agricultural and food production (Godfray & Garnett, 2014). This is particularly important because a large number of households depend on agriculture as a major means of livelihood. In East Africa, however, available land is overly subdivided into small and uneconomic units, which have resulted generally in fragmented production systems and low productivity. In Ethiopia, Tanzania, Uganda and Kenya, the size of farms are small and range from as low as 1 to 2.5ha (Jayne, Mather, Mghenyi, & others, 2006).

Despite their small sizes, these East African countries exceed the African average of 1.6 ha, but remain well below those of North America (121 ha), Latin America (67 ha) and Europe (27 ha). In addition to this very low absolute level of landholding, the distribution of available land is highly inequitable. Specifically, households in the highest per capita land quartile in East and Southern Africa control 5 to 15 times more lands than households in the lowest quartile. Jayne et al., (2006) further noted that the mean farm sizes in Kenya for the top and bottom land quartiles were 6.69 and 0.58 hectares, respectively, including rented land. However, despite the key role played by land on household food security, continuous land fragmentation has reduced land size beyond reasonable sizes that can sustain agricultural productivity.

The size of the family land determines the amount of food produced. Households with less land are unable to produce more and therefore become food insecure. Orodho, (1998) in a study conducted in Vihiga district, of Western Kenya, also found that families that had more land were more food secure than those with less land. In Kitui County, food production is carried out on farms that are generally small averaging 0.2-3 ha and without irrigation. This already scarce resource must be subdivided among more people, resulting in over-exploitation and low productivity (KNBS & ICF Macro, 2010). In addition, household farm size in Kitui County determines household food security although the biophysical agricultural potential is mainly a function of soil characteristics and moisture availability, both being largely controlled by elevation and topography (Kasperson,

Kasperson, Turner, & others, 1995).This demonstrates that the soil properties may either hinder or promote food production as one may have large tracts of land whose soils may be unfit for food production.

In Kyangwithya West location, the average size of farmland is 0.2-3 ha and extensively utilized to provide food for families (KNBS & ICF Macro, 2010). However, despite the awareness of the land holdings in the area of study, the influence of these lands to household food security is not documented. This study therefore sought to establish land holdings in the study area and the influence of land size to food security.

The market is an economic factor that is vital to poor rural producers since it promotes increased agricultural production; generate economic growth and reduce hunger and poverty (IFAD, 2013). Access to market also influences the transformation of the agricultural sector from subsistence to commercial production in East Africa by making it possible for smallholder farmers to benefit from efficient markets and local-level value-addition (Salami, Kamara, & Brixiova, 2010). In Malawi, access to markets has generally led to an increase in per capita household incomes, although the greatest benefits have been felt by the better-off households (Jones, Shrinivas, & Bezner-Kerr, 2014). In Kenya, accessible markets encourage farmers to engage more in production which become their source of income.

In Central and Western highlands of Kenya, Grimm, (2012) found that factors causing food insecurity were multi-dimensional and included poor marketing structures and agricultural practices which were not good for smallholder farmers. In Kyangwithya West, access to market has been enhanced by the construction of bridges, culverts and drifts; construction and upgrade of feeder roads and the grading and murraming of roads within the study area (Mwangi, 2013). In addition, there was constructed and introduced

free market shed with the aim of creating market for producers by reducing distance for consumer goods in the study area. The reviewed literature shows that access to markets creates employment opportunities, increase agricultural production and incentive to farmers(IFAD, 2013). However, despite the admirable efforts by the county government to make market accessible to farmers, the influence of market to food security is not documented for the study area. This study therefore sought to establish the influence of market to household food security.

1.1.3 Environmental Determinants to Household Food Security

Climate change resulting to increases in average temperatures have been observed around the globe and there is new and stronger evidence that most of the warming observed in the last 50 years is due to human activities (Field et al., 2007). These changes are as a result of climate change which is a long-term shift in weather conditions identified by changes in temperature, precipitation, winds, and other indicators (Garnett, 2011). These changes have the potential to adversely affect the environment, communities and the economy unless action is taken now (Field et al., 2007). For example, a few days of temperatures above or below a certain threshold can damage cereals and fruit tree yields (Wheeler, Craufurd, Ellis, Porter, & Prasad, 2000). Globally, climate variability has been experienced with the projected change in average temperature likely to be from 0.3 °C to 0.7 °C for the period 2016–2035 relative to the reference period 1986–2005 (Kirtman et al., 2013). In the European heat wave of 2003, temperatures were 6 ºC above long-term means and contributed to a significant drop in crop yields. This reduction was by 36 % for maize in Italy, and by 25 % for fruit and 30 % for forage in France (Change, 2007). This demonstrates that climate variability significantly affects yields expected and Kyangwithya West location is no exemption.

Africa and Southern Asia are thought to be among the regions that will be most affected by climate variability because of high dependence on agriculture for livelihoods (FAO, 2015). In addition, the overall net effect on agricultural production as a result of the changing climate is expected to be negative particularly over the long term since these areas are highly sensitive to changes in rainfall patterns (Krishnamurthy et al., 2013; Rockström et al., 2010). Climate change also affect food security between regions in Southern Africa. It is among the most frequently cited drivers of food insecurity because it acts both as an underlying, ongoing issue and as a short-lived shock (Seaman, Sawdon, Acidri, & Petty, 2014).

In the Indo-Gangetic Plain of India, climate variability has also had an influence on food security leading to a reduction in cereal production from 2000 onwards. The agricultural loss associated with the climatic changes is mainly due to drought which has affected household food security (Nath, Nath, Li, Chen, & Cui, 2017). Globally, the climate variability noted relate to increased temperatures and drought which reduces production. This consequently affects food security especially for regions and households that rely on rain fed agricultural production.

In Kenya, climate change has contributed to food and financial crises resulting from the frequency of droughts and flash floods which is expected to increase both in intensity and spread (Carty, 2017). In Northern Kenya between 2010- 2011, sheep and goats died due to the impact of drought on livestock as a result of a lack of marketing institutions that would have turned the animals to wealth by purchasing them before the situation got worse (Bizimana, Bessler, Angerer, & others, 2016). This greatly affected the economy of the local community together with their food sources.

The projected increase in temperatures and rainfall variability will negatively impact crop and livestock enterprises in most areas and food security will be greatly affected. The

effects of climate change may range from direct effects on crop production, changes in markets, food prices and supply chain infrastructure. These changes will also have effect on consumption patterns because of increasing costs driven by climate change. Households may have to consume unsafe foods which will find their way in the market (Grote, 2014).

In the ASALs, Dalmago., Bergamaschi., Comiran., Bianchi., Bergonci., & Heckler, (2004) indicated that climate change and weather variability has resulted to increased drought episodes, food insecurity, and irreversible decline in herd sizes, and deepening poverty in these areas. In addition, Speranza, Kiteme, & Wiesmann, (2008) in Makueni County observed that climate change has adversely affected the lives and livelihoods of smallholder farmers in ASALs. In Kitui County, Nyandiko, Wakhungu, & Oteng'i, (2014); Wanjiru, (2015) observed that climate change in ASALs particularly of lower Eastern Kenya has greatly affected yields obtained which is to say that food security has been compromised in Kitui and other counties in Eastern Kenya. Kyangwithya West location situated in the Western parts of Kitui County has also experienced variability to the normally experienced high temperatures which range around 16°C to 34°C (Kitui, 2002). Reviewed literature indicates that climate variability has been experienced in many regions of the world (Kirtman et al., 2013). Similar studies conducted in two neighboring wards to the study area (Mutunga, Charles, & Patricia, 2017) noted that farmers were aware of climate change in Mikuyuni and Kaveta villages. Despite experiencing similar agro ecological conditions to that of Kyangwithya West location, the study did not assess the influence of the climate changes noted on household food security. This study was therefore important as it would go beyond establishing the awareness of respondents of climatic changes they had noted but also assess whether the climatic condition influenced their households food security.

The practice of cutting trees is an important environmental factor because of its impact on land that produces food for households. According to UNEP, (1991) about 15% of the world's soils (1,965 million ha) are considered to be moderately to extremely degraded.

The factors responsible for the degradation include water and wind erosion, salinisation, nutrient decline and physical compaction. These factors influence the ability of the environment to provide sustenance to humanity in the long run (Karlen & Rice, 2015). Cutting trees degrades the environment and makes all forms of erosion possible. Changes in tree cover influences regional and global hydrological cycling due to their key role in the water cycle (Avissar & Werth, 2015). It is thus expected that deforestation would influence rainfall distribution as it interferes with the water cycle process.

An analysis of changes in rainfall over Borneo forest in Indonesia reveals that there has been a constant decline in total annual rainfall between 1951 and 2007. The most abrupt decreases occurred in the 1980s, when intensive deforestation activities (primarily logging) occurred in search of timber for garden furniture, paper pulp and chopsticks (Kumagai, Kanamori, & Yasunari, 2013). In Asia, an estimated 453 million ha are considered to be moderately to extremely degraded; 315 million due to water erosion, 90 million ha due to wind erosion, 41 million ha due to chemical degradation and 6 million ha due to physical degradation. The yields reduced in food crops due to these various forms of soil erosion can be significant. In East Africa, yield reduction caused by erosion is estimated at 2-40 % of total production in different areas of the region (Kirui & Mirzabaev, 2014).

Studies conducted in Ethiopia by Gebremedhin, (2004) shows that deforestation is very high and this provides a well-known example of a severely degraded environment together with a decreasing agricultural productivity. The economy of Ethiopia solely depends on agricultural activities and therefore land degradation arising from deforestation is highly affecting the production and productivity of the sector. In Kenya deforestation which involves exploitation of existing forests for charcoal burning, fuel wood, construction materials and fodder leads to food crises (Kieti, Kauti, & Kisangau, 2016). For instance, 64.4 % and 17.0% of Kenyans use firewood and charcoal

respectively while in Kitui County 88.6% individuals use firewood for fuel which does not stand well with environmental protection (Mwangi, 2013).

In Kitui, cutting trees degrades the environment making it unfit for household food production. In Kyangwithya West location, 93.4% of households use and sell firewood while 4.4% cut wood for charcoal burning to supplement farming income (Mwangi, 2013). Therefore, since land degradation arising from cutting trees can easily hamper household food security (Gichuki, 2000), it require attention. However, in Kyangwithya West location, studies conducted noted that households engage in cutting trees (County Government of Kitui, 2013) for firewood, charcoal burning and construction materials. The study however did not assess the influence of cutting trees on household food security but indicated generally that cutting trees degrades the environment and has the potential to influence food security. This study however, focused on Kyangwithya West location, and beyond assessing whether households engage in tree cutting, it also sought to establish the influence of cutting trees on household food security.

1.2 Statement of the Problem

Household food security is determined by myriad factors in the Globe. Despite being the leading economy in East Africa as well as a regional business center, Kenya has still not managed to eradicate extreme poverty and hunger. Kenya's economy enjoys the extensive sector of agriculture and even engages in the export market but nonetheless Kenyans suffer from chronic food insecurity (Urte, 2014). In Kitui County, food insecurity is a constant challenge and the present food crisis is powered by multiple factors which are altering the concept of food affordability in the County (Stephen, 2015).

Socio-cultural factors have been adduced as determinants to household food security from the reviewed literature. Gender of the household head has been reviewed to demonstrate varying rights in decision making, access and ownership of resources in a household. In Kyangwithya West location, studies conducted only indicated the genders of the population but failed to assess the influence of gender on household food security. Since reviewed literature demonstrates the significant role of gender in household food security, it should be taken into account in any food related study.

The reviewed literature also illustrates that age has both a positive and negative effect on household food security where in Africa, as the age increases productivity decreases. However, there was contention in the empirical data that showed that agricultural production increases with the age of household head since the elderly are more knowledgeable on farming methods that can increase food security. It was however also observed that they tend to resist new innovations that would increase their households' food security. This study, therefore, sought to establish the actual role of age of household head in the study area in household food security since available literature is context specific and not consensual. Reviewed literature indicates that the level of education influences household food security. This study sought to establish how factual the consensus is in the study. In Kyangwithya West location, studies conducted sought to establish the level of education of the populace but failed to document the influence the levels of education had on household food security.

Food sharing and its contribution to household food security has not been investigated in the study area. Moreover, studies have focused on the above factors due to their importance on household food security since food is essential in keeping families together and to the maintenance of functioning communities (Noack & Pouw, 2015). However, despite their influence on household food security, they have not been explored fully in Kyangwithya West location.

Economic factors are important determinants to household food security especially the source of income, farm size and access to market by the household (FAO, 2015). However, in the reviewed literature, there seems to be no consensus on whether an increase in household income and economic diversification actually lead to food security. The literature also fails to account for households with ample land who fail to utilize it for food production hence experience food crises. This study therefore sought not to focus on household income level, but on the sources of the income which has not been the focus of these studies and their influence on household food security. It also sought to establish the influence of land owned to household food security since it is not documented in Kyangwithya West location.

Most of the existing studies have focused on the physical environments as a key contributor to food insecurity while this study dealt with the determinants to food security from a farm production perspective. In addition, literature has examined environmental factors from an external perspective of the household and where it has considered the effect of the activities of the farmer on the environment in food security, they have not indicated whether the households understand the implication of their activities to the environment and to household food security. While this study acknowledge the importance of physical factors in addressing the food security problem, the human component also has a role to play towards food security but has not been examined comprehensively. Failure to explore how socio-economic and environmental factors influence household food security hinders exhaustive exploration of determinants that can increase food security.

1.3 Justification

This study was prompted by the fact that food security is a global concern and no such study had been done linking socio economic and environmental factors to food security in Kyangwithya West location. It is therefore; unclear of their contribution to food

security hence, a study on these determinants in Kyangwithya West location was appropriate. This is because it provides insights into the influence of these factors on household food security.

This study was important as it informs the Kenya Food and Nutritional Security Policy (GoK, 2011) of achieving food security for all and the provisions of Article 43 of the Kenyan constitution (2010) which establishes Kenyans' right "to be free from hunger and have adequate food of acceptable quality". The study will assist in highlighting appropriate mitigation measures in line with constitutional provisions which will lead towards promoting food security in the study area. This study further sheds light on the influence of these factors on household food security. The socio economic factors could be very important in informing the national land policy which is very pertinent to food security following continued land fragmentation where 80% of households have small farms of less than 2 ha.

This study is also important since it supports the attainment of the Sustainable Development Goals (SDGs) otherwise known as the Global Goals specifically Goal 2 which aims at ending hunger, achieving food security, improving nutrition and promoting sustainable agriculture. In this respect, this study is aimed at establishing the factors that hinder the attainment of food security and generating strategies to curb hunger in the study area is a contribution towards achieving this goal.

The study also adds to the existing body of knowledge available on the topic of food security. Specifically, it is an important contribution to the scholarly research and literature on the determinants to food security especially since it provides valuable knowledge that has potential to improve the household's food security. The study further

addresses important issues relating to food security among small holder farmers living in low income settings. It therefore forms a referencing framework for students and policy makers in the study of socio economic and environmental factors and food security. This attempts to fill the gap in knowledge by making an in-depth examination of the role played by these factors in influencing household food security.

It is, thus, hoped that the Government, donors and non-governmental organizations may find the generated information useful in initiation of suitable intervention programs in order to enhance food security through policy and practical interventions.

1.4 Objectives of the Study

1.4.1 Overall Objective

The general purpose of the study was to assess the socio-economic and environmental determinants of household food security in Kyangwithya West location of Kitui County, Kenya.

1.4.2 Specific Objectives

Specifically the study endeavored to:

1. Assess socio-cultural factors that determine household food security in Kyangwithya West location.
2. Analyze the economic determinants to household food security in Kyangwithya West location.
3. Assess the environmental influences on household food security in Kyangwithya West location.

1.5 Research Questions

This study was guided by the following questions:

1. Do social cultural factors influence household food security in Kyangwithya West location?
2. Do economic factors influence household food security in Kyangwithya West location?
3. Do environmental factors influence household food security in Kyangwithya West location?

1.6 Assumptions of the Study

The basic assumption of this study is that socio-economic and environmental factors influence household food security either by themselves or in combination with other factors in Kyangwithya West location.

1.7 Scope of the Study

The study was carried out in Kyangwithya West location, of Kitui County. This study recognizes that there are many variables which may influence household food security. The study however focused on socio-economic and environmental determinants to household food security in the study area. The study subjects were household members in the same location since they share similar agro-ecological zone and thus reducing the possible difference due to diverse climatic factors.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter reviews relevant literature on socio economic and environmental determinants to household food security across the world. It highlights the key themes and issues pursued in the study. The chapter also presents the theoretical framework used in this study.

2.2 Social Cultural Determinants to Household Food Security

There is a continuing debate on the implication of social cultural factors to food security amongst policy makers, social scientists, development workers and local people involved in promoting food security in developing countries (FAO, 2014). FAO, (2014) also attest to the multifarious and intricate nature of food security where the growing numbers of food insecure in a world of plenty is morally, socially, and politically wrong. This calls for changes in the perceptions of the concept to cover the diverse areas towards promoting food security. Factoring in all the determinants or forces related to food security that can influence the household food security level.

In their study on food security in rural households of Ethiopia, Feleke, Kilmer, & Gladwin, (2005) and Haile, Alemu, Kudhlande, & others, (2005) noted that socio-economic factors like technology adoption, land ownership, education of head of household and per-capita production of the household increase food security. Iram & Butt, (2004) in Pakistan and Babatunde, Omotesho, & Sholotan, (2007) in Nigeria, identified the major socio-economic characteristics that influence food security to include wealth, assets ownership (e.g. land, livestock, education, farm size and crop output and

income) as good predictor of food security. These scholars stressed that these characteristics should not be ignored because they play significant roles in household food security.

2.2.1 The Role of Gender in Household Food Security

In low- and middle-income countries, agriculture is the source of employment for about 45% of the total labour force (including paid and unpaid workers in formal and informal employment) and women supply approximately 43 % of the total agricultural labour (FAO, 2015). Women play a decisive role in dietary diversity and are responsible for nutrition in the home. In addition, women are involved in the production and domestication of plants and animals; they are knowledgeable in seed selection and vegetative propagation; they understand how plants and animals grow and reproduce; and they plant trees.

Women comprise 20 to 50 % of the agricultural labour force in developing countries (Nelson, Sisto, Crowley, & Villarreal, 2012) and 79 % of women in least developed countries are economically active in agriculture which is their primary economic activity (Doss, 2014). Despite variances in the roles of women in agriculture by region, age, ethnicity and social station, their participation rates in the agricultural labour force in sub-Saharan Africa is the highest in the world. For example, the percentage of women in agricultural activities ranges from 36% in Côte d'Ivoire and Niger to over 60% in Lesotho, Mozambique and Sierra Leone (Nelson et al., 2012). The literature indicate that women are the most actively involved group in agricultural production in majority of areas in both developing (inclusive of Kyangwithya West) and least developed countries.

Research on the role of women in food production according to Hopkins et al., (1994) shows that women account for more than half the labour required to produce the food consumed in the developing world and as high as three quarters of the food consumed in Sub Saharan Africa. However, regardless of their key role in food production, they face many challenges which include unequal access to land, agricultural inputs, and access to technology, extension support and to finances for production (FAO, 2011; Quisumbing et al., 1995). They have traditionally had little or no say in the economic affairs of a household, such as food provision through farming, labour income or other sources, stemming from male dominance.

In most rural areas, men are the decision makers on household economic affairs, while women have the responsibility of preparing food and caring for the vulnerable members of the family, especially children. As a result of this low position of power, women are vulnerable to food insecurity because they lack ownership of productive asset and decision making despite being highly involved in food production. The gender of household head can affect the resources available where in most cases lack of ownership and control to production resources affect women headed households than men headed households. Lack of access to resources like land, inputs and support services limit the capacity of women to contribute significantly to their families' food basket as compared to males. In this regard, male headed households tend to be more food secure than female headed ones (Mallick & Rafi, 2010). Generally, this would then mean that even in Kyangwithya West location the men are the main decision makers in the households while women are carers and follow the leadership of the men in their homes. In this case women have little access to decision-making over agricultural inputs, outputs, and product markets. This however may not be the case everywhere as targeted empowerment on women as the main food producers has given them voice even in decision making in their households Alkire, S., Meinzen-Dick, R., Peterman, A., Quisumbing, A., Seymour, G., & Vaz, A. (2013). The targeted empowerment has also

enabled women to have resources through alternative production methods like poultry rearing to boost their income levels. This however need studying to ascertain whether the empowerment has enabled women to become more involved in decision making or male domination is still the norm.

In addition, the proportion of female headed households ranked as 'very poor' in Kenya were high than those of male-headed households as contrasted to the larger proportion of male-headed households which were ranked as rich (Chant, 2016; Narayan & Nyamwaya, 1995). However, women are more likely to be more rational compared to men in terms of decision making for allocation of relatively scarce resources (income and food) to maximize the utility of their household. They however in most cases lack access to these resource as they still remain in the periphery roles of food preparation and food processing which limit their position in promoting their household's food security status (Ibnouf, 2009).

Gender is a key socio-cultural determinant to household food security. According to the United Nations, (2004) gender disparities systematically disadvantage women with regard to overall economic status as well as access to basic services. Studies conducted in South Africa showed a rise in female headed household and based on the ranking of female headed household as " very poor", their vulnerability to poverty and, hence to food insecurity is urgent and require addressing (Reddy & Moletsane, 2009). Quisumbing & Pandolfelli, (2010) points out that if in Kenya farming women had the same access to farm inputs, education, and experience as their men counterparts, their yields for maize, beans, and cowpeas could increase as much as 22% and that would increase food security. This was tested by Kennedy & Peters, (1992), who indicated that that even among poorer households headed by women, they are able to succeed in providing more

nutritional food for their children than those headed by men when provided with farm inputs.

The role of men in food production is also crucial. They are however faced with fewer constraints than women since productive resources such as land, credit and extension services are more accessible to them (Fletschner & Kenney, 2014). In addition, cultural traditions make it easier for men to leave the farms for greener pastures in the cities when crops fail due to lack of rainfall. In this case, they leave the women behind to struggle to feed their families and make ends meet. In many households, the resources and assets available to women that can help them plan for and potentially avert the next crisis are fewer. In numerous countries in Africa, it has been observed recently that there is a substantial increase in the number of females in the agricultural labour force due to external pressures such as conflict, HIV/AIDS and migration (Fletschner & Kenney, 2014).These studies demonstrate the importance of gender on household food security. Lack of equal opportunities and resources between men and women disadvantage women more than men. Literature reviewed has indicated that women play significant roles in food production and dietary diversity for their households. They are however faced by multiple challenges like unequal access to land, agricultural inputs, access to technology and finances, lack of decision making power, education to name a few. However, the studies have not accounted for the targeted empowerment endeavors towards women that could have altered the disadvantaged position held by women over a long period of time. These initiatives could have altered their position and thus change the perceived contribution of women in food production. This study therefore sought to establish the influence of gender on household food security.

2.2.2 Age and Household Food Security

Empirical studies on the influence of social cultural factors to food security in developing countries have shown varying and sometimes contradicting views on the role of these factors in household food security. While some social cultural characteristics have had positive influence in some areas, the same characteristics have not had any significant implications in other areas. For example, Babatunde et al., (2007a) study in Nigeria, noted that young and energetic household heads cultivated larger farms compared to older and weaker ones, they also sought and obtained off-farm jobs to improve their food security status. They further showed that the age of the head of household has an incidence on the level of food insecurity where expected incomes reduce as the household head gets older. On the contrary, Arene & Anyaeji, (2010) observed that older household heads were more knowledgeable in farming activities and thus more food secure than the younger ones. This means that the implication of the age of the household head is based on the individual perceptions, abilities and opportunities available to them to influence household food security. This explains the varying opinions of researchers in assessing the influence of age on household food security in different regions of the world.

Therefore, the probability of having adequate older people with relatively richer experiences of the social and physical environments as well as greater experience of farming activities and therefore household head's age can positively affect food security of the household (Hofferth, 2004; Obamiro, Doppler, & Kormawa, 2003). However, Nata, Mjelde, & Boadu, (2014) in Ghana studies, observed that age of a household head did not have a significant influence on the adoption of either soil improving practices or household food security.

Age as literature demonstrates may contribute to household food insecurity in some households whereas in the aged household head, they may lose the strength to engage in food production. They may also resist new technological innovations that can increase food security. On the other hand, the age of a household head may increase food security since as the household head age, the knowledge accumulated over the years can be used in engaging in better farm practices that can enhance food security. According to the Kenya population and housing survey, (2009) the nations population-age structure is youthful as individuals aged below 35 years constitute 78 % of the country's total population. In Kitui County, 72% of the population is below the ages of 30 and the proportion of the population in the working ages is 48.2% (Kyangwithya West location included). This indicates that the age structure of the majority of the people in Kyangwithya West location was young and capable of engaging in food production. Studies focusing primarily on household food security in Kyangwithya West were not available and available studies only indicated the age structure. The reviewed literature has demonstrated that age influences household food security and since majority of the people in Kyangwithya West location have been reported to be young, assessing the influence of the age in household food security is important to either concur or disapprove with findings of empirical studies in other region of the world. This study therefore was pertinent in assessing the implication of the age of household head on household food security.

2.2.3 Education and Household Food Security

Food security can also be determined by individual characteristics such as education which has implications on household income generation and food production possibilities because it promotes the development of cognitive skills that are likely to support income generation and food production (World Food Programme & Stanford University Press, 2006). The development of these cognitive skills especially for parents may also raise the income obtained as well as opening multiple doors for employment (Alderman &

Headey, 2017; Mukudi, 2003). This means that education ensures that the nutritional level of a household is heightened as well as the acquisition of more skills which enhances the opportunities to earn and thus household food needs are more catered for.

Studies show that the level of formal education attained helps farmers to use production information efficiently, as a more educated person acquires more information and, to that extent, is a better producer (Abdulkadyrova et al., 2016; Babatunde, Omotesho, & Sholotan, 2007; Mutisya, Ngware, Kabiru, & Kandala, 2016). In addition, Enyedi & Volgyes, (2016) urges that education is important in agricultural transformation where it enhance the farmers' ability to receive, decode, and understand information. The level of farmers' 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. It affects the level of exposure to new ideas and managerial capacity in production and the perception of the household members on how to adopt and integrate innovations into the household's survival strategies. In addition, studies conducted in Brazil by Thomas, (1994); in Nicaragua by Ickes, Wu, Mandel, & Roberts, (2017) and in Jamaica by Ferguson, Muzaffar, Iturbide, Chu, & Meeks Gardner, (2017) showed that the level of education of the mother has a positive influence on the nutrition of children in a household and more so where the women controlled their income.

A household whose members are educated may obtain employment or skills to help them earn an income which resultantly can be used to promote household food access. Additionally, the capacity of the caregiver - usually a woman - to meet the needs of different household members depends on resource availability, but also on her knowledge of what appropriate care is. In general, education plays a crucial role in the dispersion of

information concerning food security, health, and hygiene (Robeyns, 2006). An individual's personal level of education will matter for his own choice of nutrient intake, but this mostly applies from the moment an individual can decide independently what he/she will consume.

Research on food security indicate that educational attainment by the household head leads to awareness of the possible advantages of modernizing agriculture by means of technological inputs; enable them to read instructions on fertilizer packs and diversification of household incomes which, in turn, would enhance households' food supply by promoting better practices in agricultural production (Najafi, 2003).Yang et al., (2016) findings noted that education helps the household head to use production information efficiently since as a more educated person acquires more information he becomes a better producer. The level of education is believed to influence the use of improved technology in agriculture and, hence, farm productivity.

Mwaniki, (2006) observed that education of women is known to produce more powerful effects on nearly every dimension of development, from lowering fertility rates to raising productivity, to improving environmental management. In this case, ignoring education attainment levels is a serious oversight. This is because studies conducted indicate that where the household head is educated, there is more food security and this can inform intervention strategies where household head gets educated on better farm practices and nutrition for their families. Women as indicated above produce powerful effects on all aspects of development and should therefore be empowered to own and manage resources that would enable them to produce more since they are major producers who are limited by a lack of education and control to production resources. Education, access and control by women to this resource could be explored in hunger reduction initiatives.

In a study of Kitui County by Simitu, (2016) Kyangwithya West sampled, women were found to be highly marginalized which is associated with cultural beliefs, religion, traditions and low education level. Finding from the study shows that the level of minimum basic education attained by women in Kitui County is at 20% as compared to male counterparts who have attained 60% of minimum basic education. This indicates that education attainment for the majority of producers (women) was low. It should be noted that the studies mentioned have not examined the influence of education on household food security. From the reviewed literature, it is evident that the level of education for women is lower than that of men. Since women constitute 70% of the labour force in agricultural production in sub Saharan Africa, their literacy levels has the potential to either compromise or promote household food security. Studies highlighting the education levels of individuals in Kyangwithya West location noted that women had low educational level; however, they did not indicate the influence of the education level on household food security. There was need, therefore, to assess the influence of farmers' level of education on household food security in Kyangwithya West location.

2.2.4 Food Sharing and Household Food Security

Food transfers have widely been practiced among people who meet their daily food needs from consuming wild foods and cultigens, with little access to modern markets. These are hunter-gatherers and small-scale forager-agriculturalists. However, it is increasingly being seen among people practicing a subsistence economy in the past twenty years. It has been explicitly modeled as an efficient means of reducing the high daily variance in acquisition of food (Gurven, 2004). Food transfers also serve a social purpose where giving acts as an honest signal of donor quality or intent (Kaplan, Gurven, Hill, & Hurtado, 2005).

There are four main types of food transfer. First is kin selection-based nepotism which involves favor biased transfers toward kin. This may not be seen merely as nepotism since the kin might be the immediate neighbor. The second type is reciprocal altruism where one may give portions of food to individuals with whom one has shared in the past, and from whom one is likely to receive shares in the future (Gurven & Jaeggi, 2015b; Trivers, 1971). Thirdly, we have tolerated scrounging or theft where food flows from haves to have-nots, when food given away is not contingent on shares received. Finally we have costly signaling which relate to sharing as an honest signal of intent, either to initiate or maintain cooperative relations with other individuals.

Four terms have been used by Gurven, Allen-Arave, Hill, & Hurtado, (2001) to describe different aspects of sharing. Sharing depth refers to the percentage of food production given to members of other nuclear families (e.g., 33 % of all maize obtained is given to other families). Breadth has been used to refer to the number of other individuals or different families who receive from a given distribution, or alternatively, over a given sample period (e.g., on average 4.3 families receive a portion after every harvest). Equality reflects any disparities in amounts given to different individuals or families in the population (e.g., family B received 6.7% of the food produced by family A, but family C received only 1.2% of A's total food production). The long-term differences in amounts transferred between pairs of individuals or families (e.g., family X gave 47kg of beans but received back only 12 kg of beans from family Y over a 3-month observation period) has been described as balance. Each of these measures describes a separate domain of giving or receiving. They give *ceteris paribus* conditions that predict when sharing should occur. The difference is observed in the kinds of benefits returned to donors, and the manner in which these benefits are paid.

For the purpose of this study, the term 'food reciprocity' implies either willingness or reluctance on the part of the possessor to relinquish the food item. Small scale farmers with their limited resources have informal support from personal social networks through reciprocal food gifts which enable household's to have easy access to food. In many developing countries, food reciprocity has been systematically and widely studied (Fafchamps & Lund, 2003; Harrower & Hoddinott, 2005), as a coping strategy to maintain an adequate supply of food and avoid food insecurity. In the United States, a number of studies document sharing and receiving food from relatives, friends and neighbors especially among low-income households to protect themselves against hunger in different time periods (Ahluwalia, Dodds, & Baligh, 1998; Swanson, Olson, Miller, & Lawrence, 2008). These low-income households eat at relative's or friend's or receive free food from them either regularly, chronically, or during specific times of needs (Mabli et al., 2010; Wimer, Wright, & Fong, 2013).

Academic literature has however paid less attention to food reciprocity behavior and instead focused on food assistance programs provided by both the public sector and voluntary organizations. Sharing of food has a number of advantages in dealing with short term food problems since it is culturally acceptable and provides emotional support from people one knows well. According to Winne, (2008) informal food reciprocity includes getting food (raw material and/or fully cooked meals) from friends or relatives for home consumption, eating at someone else's home, and sending children to someone else's house to eat. Family members were reported to be the first line of assistance in which mothers played an especially important role, followed by friends and neighbors (Ahluwalia et al., 1998; Swanson et al., 2008; Wimer et al., 2013). Important to note however is the fact that food reciprocity and food security have a complex relations since its expected that as households share they become food secure which is not always the case since the sharing household may not have sustained food to share.

Food security at the household level can be enhanced by the traditional practices of sharing in the production and consumption processes. In Kenya, among the Luo community, for instance, people exchange the foods they produce or purchase from the market, with friends, relatives and neighbors which help in ensuring a balanced diet in the households in the sense that household members gain access to foods which they do not directly produce (Subbo, 2001). Sen, (1981) points out that an individual's food entitlement would be influenced by the exchange entitlements, which include his/her ability to exchange food and other resources. He goes on to emphasize that a person's exchange entitlement would be influenced by the purchasing power of the individual, the ability to exchange with others, or through seeking and receiving assistance and transfers (Sen, 1981). The sharing and exchange of food also enables neighbors, friends and relatives to foster harmony in the community (Gurven & Jaeggi, 2015b) which in turn, helps to reduce anti-social behaviour such as food thefts. According to Subbo, (2001) in his study of Siaya District, the system of food sharing and exchange enhances food security in the households by ensuring surplus food production and equitable distribution of available nutritious foods among household members.

Food reciprocity has important function of supporting households with food but the purpose for sharing may not necessarily be to promote food security. For instance, some people may engage in food reciprocity for social interaction between participants regardless of food security status (Swanson et al., 2008). This makes it difficult to claim any cause relationship between food reciprocity and food security as the purpose may differ and the duration of sharing may not warrant promoting household food security. Reciprocal altruism is found to be an important factor in food reciprocity. Those families who share with others also tend to be given when in need compared to those who don’t share. Reciprocal altruism is founded on a simple premise from Trivers, (1971) that givers and receivers should reverse positions on a systematic basis such that the amounts received and given should be correlated.

Literature on food reciprocity illustrates that food security of a household can be promoted by mutual food sharing. Although the intention for sharing might not necessarily translate to promoting household food security, the fact that it provides food to a family in need lender its significance and call for further study. This study therefore sought to establish whether the practice is carried out in Kyangwithya West location towards promoting household food security since literature on the same is inadequate in our Kenyan context.

2.3 Economic Determinants to Household Food Security

2.3.1 Sources of Income and Household Food Security

Empirical evidence in South Africa shows that poor rural households spend a huge proportion of their income on food (Aliber, 2009; Jacobs, 2010). Similarly in Afghanistan households spend 75% of their income on food (World Food Programme & Stanford University Press, 2006). Food security research in Kenya and Malawi also found that child nutritional status is influenced by the interaction of income and gender of household head rather than just one or the other and household food security is influenced by total household income and the proportion of income controlled by women has a positive and significant influence on household caloric intake (Kennedy & Peters, 1992). This shows that the income of a household plays a significant role in food security. This is because it influences household consumption behavior and nutrition.

Income accrued in a household can be invested in agriculture allowing the farmer to tend to the production needs which increases yields and food availability at the household level (Simatele, 2006). Households in rural areas no longer engage in crop cultivation and livestock keeping alone because these two are no longer enough to support their survival

(Lacy & Lacy, 2016; Pinstrup-Andersen & Pandya-Lorch, 1998). Therefore, they engage in other sources of income which allow them to have access to non-farm wage income which increases food security. Studies by Guinand, (1999) shows that economic diversification provides a household with something to fall back on when crops fail. This can be obtained from off farm activities and can increase household income (Barrett, Reardon, & Webb, 2001). These economic resources from off farm activities allow the use of necessary inputs which result to a reduction in the risk of food shortages. This would go a long way in supplementing food produced since money needed for non food items is obtained. The farmer therefore doesn't necessarily have to sell some of the farm produce which will allow the food produced to last longer. As a result, the household stay food secure longer compared to when the income from off farm occupation was unavailable.

Studies conducted in Limpopo, South Africa revealed that although smallholder farmers are engaged in household food production, usually they are left with food deficits to carry them to the next harvest and would require off-farm income to buy food for the household (Aliber & Hart, 2009). In addition, those off-farm income are essentially part of being a smallholder farmer in South Africa since they help to diversify their incomes and hence their livelihood sources. These off farm activities act as a survival strategy for these farmers to help them in case of crop failure or poor harvest. Similar studies conducted in Kenya indicate that those with diverse sources of income are likely to be more food secure than those who solely depend on agriculture (Orodho, 1998).

Important to note however, is that food produced from a household's farm allows the family to be food secure compared to food bought from the market. This is because cash money is allocated towards purchasing a lot of items that may not be food that a household need (Kabutha, 1999). It is therefore clear that even though income play a

significant role in food consumption pattern, own production allows a household to be more food secure than other source of income.

In Kyangwithya West location, the County Government of Kitui, (2016) has come up with initiatives aimed at increasing farmer's income and improving household food security. Reviewed literature has highlighted that poor rural households spend a huge proportion of their income on food which has the potential to influence their nutritional status. Income accrued can be invested to meet production costs which increase yields and food availability. It also allows the use of necessary inputs which result to a reduction in the risk of food shortages. The literature has concentrated on highlighting the influence of income on household food security but has not demonstrated the different sources available to Kyangwithya West location and the influence of these sources on household food security. This study therefore sought to assess the sources of income available to respondents and the influence of these sources on household food security.

2.3.2 Farm size and Household Food Security

The majority of smallholder farmers are the poor. Matshe, (2009) indicates that 50% of the worlds' hungry are smallholder farmers, with the landless rural population making up 20% of these. There is increased attention over the past few decades on studies that attempt to link household characteristics to household food security. This attention arose upon the realization that components of economic and social status that distinguish and characterize people are significant indicators of food security (Dauda, 2010). The size of a household farm is an important characteristic in understanding household food security (Orodho, 1998). It is the total area of land cultivated to food and cash crop by households, measured in hectares. Deininger & others, (2003); Jayne et al., (2006) demonstrates that there is a positive relationship between farm size and improvement in households' income and food security.

Orodho, (1998) states that the quantity of food produced is significantly influenced by the size of land at the disposal of the household. In sub-Saharan Africa and Asia, Salami et al., (2010) indicated that eighty percent (80%) of the farmland is managed by smallholders who work on up to 10 hectares. The influence of farm size in Ethiopia was observed as positively and significantly related to the probability of a household being food secure and that this probability increased by 6% for every increase of one hectare of farm size (Haile et al., 2005).

In Kenya, the mean land owned per household has declined over the past decade, from 6.1 to 5.8 acres. This is attributed to increasing rural population pressures and land fragmentation (Kibaara et al., 2008). He further states that household farm size in Kenya has a significant relationship on household food security. Where households with smaller lands tend to intensify labor input because smaller field size tends to be correlated with increased labor/land ratios hence increase food production. Smaller farms have higher adult equivalent per acre for example compared with bigger size farms explaining the high labor input. In addition, smaller fields tend to be more mixed cropped than larger fields and these mixed crops tend to include horticultural crops and other relatively high-value crops. This view contradicts that raised by Haile et al., (2005) in the paragraph above as every increase of one hectare of farm size increased the chances of food security.

In the Teso farming systems, Esenu, (2006) observed that the farm size owned by households had a positive impact on food security. The bigger the farmland the more food secure the family was. In Kisii County, the average farm size dedicated to food production has been decreasing and this has serious implication on household food security. Some of the factors contributing to this situation are diminishing land resource due to high population density (1056 persons per square kilometer by 2012), continued

sub-division of arable land resulting in reduced average land holdings (about 0.5 hectares), and a poverty level of about 54.2% which is associated with negative influence on agricultural production and income levels (Kisii County, 2013).This poses a problem to the ability of household to secure enough food and require addressing.

Orodho, (1998) in a study conducted in Vihiga district using household food production as the criterion for determining food situation, found that farm size influence food production. In Kitui County, the average landholding among farmers is 0.2-3 hectares with the vast majority of land holdings falling close to this size and only a handful being significantly larger or smaller (GoK, 2011). The average farm holding in Kyuso Sub-county of Kitui County is about 2 ha per household which is within the range indicated by the government (Masila, Udoto, Obara, & others, 2015). The influence on the farm size in Kyuso on household food security was however not assessed.

The reviewed literature indicates that smallholder farmers are poor and tend to have less land holding. The quantity of food produced is significantly influenced by the size of land at the disposal of the household. Therefore, the declining land holding due to increased fragmentation is demonstrated as negatively influencing household food security. From most of the reviewed literature, households with larger farm sizes are presented as more food secure than those with smaller farms. However, studies have also indicated that small farms tend to receive intensive labour input than the large farms and therefore tend to be food secure as well. The significance of land size in household food security require further research since the literature seems not to show much difference in terms of food security.

2.3.3 Market and Household Food Security

Markets influence food security by securing a suitable price and a system by way of which the farmer can market his produce. At the same time the farmer receive the highest possible share of the price paid by the consumer for that produce leading to improvements in household food security (Godfray et al., 2010). Strong links to markets are therefore very important for poor rural producers in increasing agricultural production, generating economic growth and in reducing hunger and poverty. Improving these links creates a virtuous circle by boosting productivity, increasing incomes and strengthening food security. Better access by small holder producers to domestic and international markets means that they can reliably sell more produce at higher prices (IFAD, 2013). Furthermore, there is evidence to suggest that the poor small scale farmers can turn their surpluses into income only if they have the ability to access markets since their livelihood derive from agriculture and 80 % of all the farms are less than 2 acres in size (Markelova, Meinzen-Dick, Hellin, & Dohrn, 2009).

However, studies by Mason, Jayne, & Myers, (2012) in Zambia observed that a lack of access to regional and global markets exposes the rural poor to exploitation and unfair prices which discourage them from increasing production. The longer the distance to the market, the less frequently the farmer visits the market and, hence, the less likely they are to get market information (Feleke et al., 2005). The distance to the market also deny households of adequate information about prices and therefore farmers may sell their produce at times where prices are low and buy when prices are high. It is expected that food security is negatively related to distance to the market. In addition, the quality of roads is a critical factor in determining access to markets, both for inputs and outputs, and merits consideration in food security debate.

According to Salami et al., (2010) in his study of Tunisia, efficient input markets are also crucially important in order to deliver the right product, at the right time, in the right

amounts, at a convenient place, and for an affordable price. Moreover, access to input and output markets are a key precondition for the transformation of the agricultural sector from subsistence to commercial production, therefore, smallholder farmers must be able to benefit more from efficient markets and local-level value-addition, and be more exposed to competition (Salami et al., 2010). However, it has been reported that more than half of the population in most East African countries lives five hours distance or more from a market center as a result market access and input use is generally low (Salami et al., 2010).

Distances to tarmac roads is also very important in promoting access to food in Kenya where Kibaara et al., (2008) shows that households in Central highlands and Western lowlands have between 5km and 6km away from tarmac roads which is considered the shortest. In the highlands of Kenya, where agriculture thrives most, the distances to tarmac roads range between 7km and 8km. The marginal rain shadow and Eastern Lowlands are considered the most disadvantaged regions in terms of distance to the tarmac road which range between 11km and 16km to the tarmac roads. Kitui County and Kyangwithya West are situated in Eastern Lowlands where access to tarmac and resultantly to good markets is a challenge.

FAO further argues that in Kenya, there is a lack of coordinated decision-making whereby both production and marketing are not well-linked. Furthermore, the pricing system often favors consumers more than food producers precipitating disincentive to farmers (Nyangito, 1999). As a result of this economic force, farmers abandon agriculture or produce just for subsistence. To that end, without reliable access to fair, transparent markets, the poor in developing countries stand little chance of escaping poverty and hunger. In Central and Western highlands of Kenya, Grimm, (2012) found that factors causing food insecurity were multi-dimensional and included high prices of agricultural inputs, poor marketing structures and agricultural practices where prices for smallholder farmers produces were still low.

Nyangito, (1999) observed that the market play 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. Along similar lines, FEWS, (2009) argue compellingly in favor of this point of view. They believe that an in-depth understanding of the market systems including, their degree of market integration, and the characteristics of market participants, state of infrastructure, available services and relationships should be the target of governments and policy makers.

The relationship between marketing and household food security is dynamic and involves first the aspects of suitable prices where farmers are able to convert their surpluses into income which can be used to buy food items not locally produced. Secondly, marketing relate to food security in terms of accessibility to domestic and international markets which means that they can reliably sell more produce at higher prices as well as reduce exploitation and unfair prices which discourage them from increasing production. Increasing production to satisfy accessible market also means that households have adequate reserves to meet their food needs. Accessible market also relate to the distance to the markets where the longer the distance to the market, the less frequently the farmer visits the market and, hence, the less likely they are to get market information. Perishable goods also go bad before they reach the market which acts against promoting food security as income that would have been gained is lost. Finally, market relate to food security in terms of the level of food distribution from surplus to deficit regions.

There is consensus in the literature reviewed that access to markets support not only agricultural production, but also household food security by making food accessible and motivating producers to increase production when prices for their produces are favorable. However, there is no empirical evidence available in Kyangwithya West location that show the role of market, both in terms of access and prices for farmers produce to household food security. According to the County Government of Kitui, (2016) efforts

made through the construction of honey processing factory in Kyangwithya West as well as providing markets for the same supports just but a few people in the location. The construction of 40 people capacity market shed has been a bold move; however, the influence of the market to household food security for these farmers is unclear. These efforts towards creating markets for small scale producers notwithstanding, their contribution towards promoting household food security have not been stated. This study therefore sought to establish how market proximity and prices determine household food security.

2.4 Environmental Determinants to Household Food Security

2.4.1 Climate Changes and Household Food Security

Climate change exerts a major role in household food security especially among one-third of the people living in drought-prone areas in Africa which are very vulnerable to the impacts of drought (Boko et al., 2007). Small holder farmers are the most vulnerable to weather variability with multiple stresses occurring at many levels, limiting their adaptive capacity (Boko et al., 2007). The same views are echoed by Baez, Kronick, & Mason, (2012) who assert that the poor households have limited choice for their livelihoods and restricted faculty to deal with climate variability and natural disasters. In addition, Aerts et al., (2007), asserts that extreme climate variability is expected in East Africa in the future where the annual precipitation is expected to increase. He further states that temperatures will rise and potential evaporation will increase as well and hence net water availability is projected to decrease (Aerts et al., 2007). It is likely that in many African regions, agricultural production and food security will be severely compromised by climate change and climate variability. At the present, there is already a high mortality risk because of food insecurity in many African regions including Kitui County (Boko et al., 2007).

Serious repercussions arising from climate changes face Kenyan farming households (Okumu, 2013) who in many areas of the country are experiencing increased seasonal mean temperature. Considering the pivotal role that agriculture plays in the Kenyan economy, an understanding of how climate change affects food security is important so that smallholder farmers can be guided appropriately. According to the GoK, (2009) the agricultural sector employs the majority of the populace with own production providing food for households. Furthermore, areas considered arid or semi-arid which are not suitable for rain fed agriculture due to low and inconsistent rainfall has mass of smallholder farmers (GoK, 2010). They therefore exhibit frequent crop failures and low crop and animal productivity.

These areas also have a high population and producing sufficient food poses an environmental dilemma. To sustain food security, food production need to be increased but growing more food damages the environment which reduces our chances of increasing food production in the future (Raven, Berge, & Johnson, 1993cited in Wolman, 1993). In addition, increasing food production may not translate to food security if the weather pattern and seasons continue to change as a result of climate change. These changes can disrupt food availability and quality whereby, as temperatures increase and precipitation changes and human activities that support desertification in arid and semi arid lands (ASALs) increase, the effect is evidenced in reduced agricultural productivity (GoK, 2010).

Climatic changes that have been reported are intensified by global warming and since the small holder farmers depends on rain fed agriculture, any slight changes in weather from what they are used to has the ability to affect their livelihood. Agricultural producers are hard hit by these changes and household food security is compromised. This is because

weather patterns and seasons are affected by climate variability and change which resultantly impinge on households' capability to secure food.

In the ASALs, Miano, David, Rose, & Lawrence, (2010) indicate that climate change has become more pronounced in recent years adversely affecting the lives and livelihoods of smallholder farmers. Kitui County being an ASALs area receives erratic and unreliable rainfall and is mostly hot and dry resulting to high evaporation rates (GoK, 2009). Kyangwithya West location is situated in the Western parts of Kitui County and experience high temperatures throughout the year, ranging from 16°C to 34°C (District Commissioner Kitui, 2002). In semi-arid eastern Kenya which includes Machakos, Makueni and Kitui counties, Ongeko, (2011) reported that the climate variability is characterized by cyclical and persistent drought, now and then going for two to three years at a stretch.

Due to the gravity of the issue of climate change and its implication on rural livelihoods, adaptation to climate change is important especially for rural producers. Adaptation refers to the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (Intergovernmental Panel on Climate Change (IPCC), 2001).The adaptation strategies in the agricultural sector include use of new crop varieties, crop diversification, adoption of mixed crop and livestock farming systems, changing planting dates and irrigation (Ndambiri, Ritho, Mbogoh, Nganga, & Muiruri, 2012). Maddison, (2006) reported that farmers will first perceive a changing climate and then device practices in response to the perceived change. The perception of local farmers on climate change is therefore an important aspect towards successful climate change adaptation strategies. It was thus necessary to assess whether respondents in Kyangwithya West location had perceived a

changing climate in order to assess the influence of the perceived change on household food security

2.4.2 Cutting Trees and Household Food Security

The environment faces many challenges arising from human activities by cutting existing forests, releasing materials that harm the environment like the spillage of pollutants like pesticides, soil exhaustion and poor land use methods. All these challenges to the environment must be addressed and constructive solutions to the problem sought if small scale farmers are to realize food security. Land degradation is a serious problem which has effect on land that provides goods and services for livelihood at the individuals and the national level (Bach et al., 2011). There is a decrease in agricultural production due to land degradation which results from human activities. These human activities compromise soil fertility which leads to a reduction in returns to be accrued by the farmer from the field as well as the integrity of the environment (Erkossa, Wudneh, Desalegn, & Taye, 2015).

Changes in forest or tree cover influences regional and global hydrological cycling due to their key role in the water cycle (Avissar & Werth, 2015). It is thus expected that deforestation would influence rainfall distribution as it interferes with the water cycle process. An analysis of changes in rainfall over Borneo forest in Indonesia reveals that there has been a constant decline in total annual rainfall between 1951 and 2007. The most abrupt decreases occurred in the 1980s, when intensive deforestation activities (primarily logging) occurred in search of timber for garden furniture, paper pulp and chopsticks (Kumagai et al., 2013). This trend can also aggravate the possibility of extreme drought and forest fires, principal to even more deforestation.

Similarly, a modeling experiment in the Indochina peninsula reveals that deforestation is coupled to changes in hydrological course both close by and regionally. At the local level, the effects include higher temperatures and lower rainfall. At the regional level, it has been observed that there is a weakening of the monsoonal flow over east China, near the Tibetan Plateau, and a strengthening over the neighboring South China Sea (Sen, Wang, & Wang, 2004). This trend suggests that deforestation may be one of the key drivers of climatic change in the region that has a serious effect on food security.

Studies by UNEP, (2006) indicate that Africa is faced with a lot of environmental degradation and considering that 70 % of its population depends on the land for its survival, land damage is a serious issue. In addition, there is a lot of strain on agricultural productivity and food security in Africa arising from environmental degradation. For instance, the current threat of desertification observed on dry lands which constitute the home to about a third of the world's population. This reduces the adaptive capacity of these dry lands which affect the productivity of the lands and thus food insecurity become rampant.

Human activities tend to create or worsen the environment through increased soil erosion and mineral depletion of the soil both of which occur globally. Water and wind are particularly effective in removing soil in the sense that rainfall loosens soil particles which is later transported away by moving water. Wind on the other hand loosens soil and blows it away especially if the soil is barren and dry. Because soil erosion reduces the amount of soil available for cultivation, it limits the growth of crops planted (UNEP, 2006).

Erosion causes a loss in soil fertility because important minerals and organic matter that are important components of the soil are removed (García-Díaz et al., 2017). As a result

of these losses, the productivity of eroded agricultural soils drops, and restoration of the fertility by using fertilizer or manure has to be done to replace the lost nutrients. Therefore, Soil erosion is one of the greatest causes of land degradation in Africa (Thomas, 1997). Deforestation enhances soil erosion by reducing the vegetation that would otherwise protect the soils. In addition, Ongwenyi, Kithiia, & Denga, (1993) states that soil erosion is mainly due to surface water run-off from "bare" soil surface with the problem being more pronounced in the marginal lands, as a result of sparse vegetation cover, intensive deforestation, cultivation and overstocking.

These human activities often accelerates soil erosion with poor soil management practices where removal of natural plants during construction of roads or buildings and cutting trees for charcoal or brick burning increase erosion. The world forest is therefore being cut down with little replacing. Tropical low lands, or rain forest- biologically the richest areas on earth- have so far been reduced to half their original size. In Asia, Africa and Latin America, what remains is two thirds of the original forest cover and if the trend continues, most will be gone in the next coming years. Inefficient or short term exploitation with disorganized logging and clearing (often by burning) results in irreversible damage of the productivity of these lands (Raven et al., 1993). Tree planting as a determinant to household food security ensures that agricultural land is protected from soil fertility losses and thus increasing or retaining the productivity of the land.

According to GOK (2002), rapid population growth, high poverty levels, land use changes/ poor land use systems and deforestation (increase of farm lands and exploitation of existing forests for charcoal burning, fuel wood, construction materials and fodder), has worsened the state of land contributing to food crises. Furthermore, it has also been observed by Erkossa et al., (2015) that food security is affected by land degradation where habitat is lost a result of soil erosion and siltation which further led to land

denudation and the reduction of agricultural potency of the land. Similarly in Makueni County, Kieti et al., (2016) observed that bio-physical changes which affect agricultural production and eventual food security are mainly as a result of land use practices which degrade the environment. These practices also include cutting trees and clearing of vegetation for crop production and livestock pasturage, with consequent heavy losses of soil, have caused serious degradation of most areas in Kitui (Makenzi, 2000). Kironchi, Liniger, & Mbuvi, (2000) further argue that depletion of soil cover due to cutting trees has adversely affected the soil physical properties.

In Kenya, the total forest resources comprise about 3 million ha of land which is equivalent to 6% of the total land area (Smith, 2001). Kenya has previously witnessed a high rate of forest cover loss. For example, satellite image analysis of forest cover changes for 2000 to 2003 revealed a forest loss of more than 7000 ha of indigenous cover (Aktosi & Gachanja, 2004). According to Mugo & Ong, (2006) in most areas such as Taita Taveta and Kitui districts where land is managed for livestock production in ranches, squatters clear trees, shrubs and bushes to free up the land for pasture production. The practice of cutting trees has thus been witnessed in Kitui County. In Kyangwithya West, the ministry is committed to improving the environment and protecting it from degradation by promoting tree growing to increase tree cover from the current 7% to 10% (County Government of Kitui, 2016). The actualization of this commitment and its implication to environmental restoration towards enhancing food security is not clear.

Studies have noted that 70 % of the population in Kitui County depends on the land for its survival. The reduction of vegetation that would otherwise protect the soils particles is reduced as a result of cutting trees. Makenzi, (2000), indicated that cutting trees and clearing of vegetation for crop production is one of the practices in Kitui County that

affect livelihoods of farmers in the area. Studies reviewed have not examined the influence of cutting trees on household food security but has concentrated more on deforestation. Therefore, the study sought to establish the influence of cutting trees on household food security in Kyangwithya West location.

2.5 Theoretical Framework

2.5.1 Cultural Ecological Theory

The study was guided by the cultural ecological theory which arose from a long series of thoughts and publications concerning environmental problems. The most influential figure in its development was Julian Steward (Steward, 1955). The theory is presupposed on a culture core, which Steward elucidates as "the constellation of features which are most closely related to subsistence activities and economic arrangements" (Steward 1955). He stipulated that all aspects of a culture are interrelated and dependent on each other thus require a holistic view.

The cultural ecology theory includes three fundamental procedures. The first one is premised on the material culture which focuses on the productive technology and the relation of technology to the environment. Steward specified that in investigating the cultural ecology of a society, one need to describe the natural resources and the technology used to extract and process them. For example, a pre-agricultural society makes use of different technologies than an industrial society. The relevance of the environment depends on the particular society. “In primitive societies, subsistence devices are basic like the weapons and instruments for hunting and fishing. In more developed societies, agriculture and herding techniques and manufacturing of crucial implements must be considered. In an industrial world, capital and credit arrangements, trade systems and the like are crucial (Steward 1955)”. Therefore, the cultural core encloses social, political, and religious features, “which are closely related to subsistence

activities and economic arrangements" (Steward 1955). Moreover, there exist many other features which are connected to the core.

The second fundamental procedure is premised on co-operation and social organization which develops from the first procedure. Steward, (1955) indicated that a cultural ecology of a society require an outlining of the social organization of work for the subsistence and economic activities. Certain behaviour patterns and social organization result from the utilization of natural resources to secure subsistence. In other words, the second procedure describes the co-operation and social organization concerning the production. "Some subsistence patterns impose very narrow limits on the general mode of life of the people, while others allow considerable latitude" (Steward 1955). Gatherers are more likely to live in competition, hunters and agrarians tend to organize a collective or work as individuals. For Steward, more complex and 'co-operative' subsistence activities do not depend on the cultural evolution but on the natural environment.

The third fundamental procedure is premised on the immaterial culture. The ideology and ethics of a society are part of the cultural core as they affect and are affected by the subsistence and production. Religion and behavior patterns and the way of life of a society influence production and relations towards nature as well as the social behavior and organization. This premise ascertains the extent to which the behaviour patterns entailed in exploiting the environment affect other aspects of culture (Steward 1955). In this procedure, a holistic view is required as many cultural features like "demography, settlement pattern, kinship structures, land tenure, land use …" (Steward 1955) are seen separately but have to be understood interdependently.

The cultural core which is the main focus of the cultural theory is not a constellation of isolated and unattached components. It describes the interaction of the material culture, social organization and cooperation and the immaterial culture to their biological and social environment. The interaction of man with his environment is determined by all

different social factors. Household food security is thus influenced by the use of technology which is often influenced by cultural and social patterns and affects the natural environment as a complex system. This means that the employment of technologies is closely connected to the social context.

Steward, (1955) focused more on particular cultural patterns which characterize particular cultural areas. He has been criticized for this view since he failed to derive general principles applicable to any cultural-environmental situation. Vayda & Rappaport, (1968) argued that he did not consider unique cultures histories but only emphasized on the study of the particulars of local environments. This however did not have implication on this study as specific variables in this particular study area were explored.

Secondly, the theory is critiqued for its image of environment as an external, discrete, and essentially static entity, to be subdued by culture in the course of human progress. Culture must be seen as a system linked to the environment in continuous and dynamic feedback (Buckley, 1967). This study however leaned more on Stewards view of the relationship between culture and environment by considering the implication of the variables under investigation on the environment for subsistence. In Kenya, this theoretical framework was utilized by Leslie & Little, (1999) in examining how the Ngisonyoka Turkana managed to cope or maintain their pastoralism in the face of poor rainy seasons and extensive droughts that are synonymous to their ecology. It was also utilized by Odegi-Awuondo & others, (1990) in his study of food systems in Turkana; it was also equally used by Njiro, (1994) whose studies of the Atharaka documented many coping mechanisms that the people use to survive periods of food shortages through the knowledge of their environment to survive even during periods of famine.

This theory was relevant in informing the study since the majority of households are farmers and dependent on the environment for their subsistence. Material culture is dependent on factors like education level which may shed light on appropriate technology that can increase subsistence production. Certain elements like gender and age may also be impeded by the ideology of the society as highlighted in the third procedure. This in turn can impede the use of technology or more so encourage the use of technology which has an effect on subsistence and economic arrangements of a society.

In this study, the social organizations and cooperation of the households may have implications on food security. This social organization may be based on gender and behaviors of reciprocity practiced which may enable increased or decreased utilization of the natural resources for subsistence. The organization of the institutions like markets, economic activities available to households may as well affect the subsistence of households. The prescribed behaviors for certain sexes can work in favor or against subsistence activities of the household. Cooperation within the household can promote food security where all members utilize resources towards a common goal of promoting subsistence activities.

In this study, the cultural ecology theory informs by providing a holistic understanding on how aspects like land size and other social cultural, economic and environmental factors affect the subsistence of a household. This premise shows that in order to understand the three procedures, they should be seen as interactive and interdependent elements.

This theory facilitates the understanding of socio-economic and environmental factors that influence household food security in Kyangwithya West location. Therefore, the theory was relevant in understanding issues of food security in Kyangwithya and the interplay between culture and environment and how this influence household food security. This theory informed the study by providing an understanding of how human-

environment interactions lead to food security/insecurity. Since ideology, technology and non-material culture determine the institutions of the human society, they also have an influence on the food security of households.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter provides the explanation on how the study was conducted. It shows the design that was used to conduct the study, describes the study site including the people's economic activities, the study population, techniques used to derive study sample, how the data were validated, research methods, research instruments, ethical considerations, data presentation and analysis.

3.2 Research Design

The study employed a cross sectional descriptive research design. The design aided in providing a general picture of the socio-economic and environmental determinants to household food security. Cross-sectional studies represent a subcategory included within the class of descriptive designs (Creswell, 2003; Yin, 2003). Cross- sectional studies are carried out at one point in time or over a short period (Bernard, 2006). This design was found appropriate for the study since it is less expensive as it facilitates collection of a snapshot of the features of a particular phenomenon within a specific time (Bernard, 2006).

The design allowed the incorporation of elements of both quantitative and qualitative research methodologies within the same study. The study engaged respondents within a period of one month to investigate the influence of their socio-economic and environmental determinants to household food security in Kyangwithya West location.

3.3 Study Area

The study on socio-economic and environmental determinants to household food security was carried out in Kyangwithya West location of Kitui County which lies between latitudes 0°10' and 3°0' south and longitudes 37°50' and 39°0'east and therefore within the tropical region. It is located in the Kyangwithya West ward in the Central Division of Kitui County which covers an area of 809 km^2 and borders Kithumula kwa Mutonga, Township, Kwa Vonza/Vonza and Mulango wards (County Government of Kitui, 2016). Kitui County can be divided into two climatic zones (Okumu, 2013). The Western part of the County has a semi-arid climate while the Eastern and Southern parts of the District have lower average rainfall and higher temperatures (approximately 4°C higher compared to the western parts); and fall within the arid climatic zone.

Kyangwithya West location is situated in the Western parts of the county and experiences high temperatures throughout the year, ranging from 16°C to 34°C with mean maxima of $28^{O}C$ and mean minima of $22^{O}C$ (District Commissioner of Kitui (DCK), 2002). The warmest periods are between June and September and January and February. These overall high temperatures in combination with the low and erratic rainfall, result in high rates of evaporation estimated around 1552 mm/yr (Borst & De Haas, 2006) to 1800 mm/yr (DCK, 2002).

The rainfall pattern is bimodal. The 'long rains' namely *Uua* fall in April-May; the 'short rains' namely *Nthwa,* last from October to December, and are more reliable. Annual precipitation ranges from 500 to 1050 mm/yr, but is highly erratic and unreliable, both spatially and temporally (District Commissioner of Kitui, 2002). Overall, approximately 90% of the annual precipitation falls during the rain seasons (Hoogmoed, 2007).

Elevation and topographical features of the landscape strongly influence the amount of rainfall at a regional scale: the higher areas and hill masses in the West receive most rainfall (700-1050 mm/yr), these amounts decline to the South and East where the annual rainfall is less than 500 mm (DCK, 2002). It is not uncommon for rains to fail, causing long periods of drought that often result in crop failure and food shortage.

3.4 Local Livelihood Activities

The majority of the residents of Kyangwithya West location are farmers who depend on farming as the main economic activity. They mainly practice subsistence agriculture and grow crops like pigeon peas, maize, cowpeas, green grams, sorghum, beans, millet, cassava and sweet potatoes. They also keep livestock such as cows, goats, sheep, poultry and donkeys. Kyangwithya West location is inhabited by the majority Kamba people, with a few different Kenyan dialects. Some residents are self-employed working as artisans, shopkeepers, and *bodaboda* operators.

3.5 Study Population, Sample Size and Sampling Procedures

3.5.1 Study Population

The target population of the study was households resident in Kyangwithya West location. According to KNBS (2010), Kyangwithya West location has a population of 17,223 people with four sub location Tiva, Mulutu, Ndumoni and Utooni. The accessible population was adult individuals available in the households at the time of the study that were selected from the four sub locations. The population of Kyangwithya West location is approximately 3,198 households. The unit of analysis was household respondents, key informants and focus group discussants.

3.5.2 Sample Size

The sample size was derived using Raosoft$_{(R)}$ software with a 95% confidence level for social sciences and a margin error of 5%. The Raosoft$_{(R)}$ sample calculator is an automated software program that basically generates the sample size of a research or survey. Sample size was 344 households. Once the researcher has identified the total population to be studied, the software provides a field where you feed the figures. The sample size doesn't change much for populations larger than 20,000. The software provides a margin error which is the amount of error that you can tolerate. If 90% of respondents answer *yes*, while 10% answer *no*, you may be able to tolerate a larger amount of error than if the respondents are split 50-50 or 45-55. It also provides the confidence level which is the amount of uncertainty you can tolerate. Higher confidence level requires a larger sample size. The sample size is automatically calculated once you input the target population. It thus provides the researcher with the minimum recommended size for the survey(Raosoft$_{(R)}$, 2004)

3.5.3 Sampling Procedures

The study utilized systematic sampling to select 344 households. The households were selected proportionate to the population from each sub-location. A sampling frame comprising of a complete listing of all the households (study population) in each sub-location from number 1 to 3,198 was compiled. Thereafter, every 9th household in each sub-location was selected up to the 3,198 households until a sample of 344 was attained. The 9th household was reached at by calculating the total study population divided by the sample size. To identify the 9th household from where an adult respondent was interviewed, village elders were involved in the entire data collection stage as respondents were unknown to the researcher. The elders took the researcher to the households for the duration of the study. For each sub location, every 9th household was

then proportionately selected with the first household being randomly selected between respondents 1 and 9 for each sub location.

In households where no adult respondent was available, the research moved, to the next household to cater for the absent one. To cater for gender representation, the research alternated in interviewing adult respondents in the households by gender where applicable.

Table 3.1: Proportionate Sampling Frame for Households

Sub location	Number of households	Sample size
Mulutu	922	99
Tiva	494	53
Ndumoni	508	55
Utooni	1274	137
Total	**3198**	**344**

Strata sample sizes for this study were determined by the following equation:
$n_p = (N_p / N) * n$. Where n_p is the sample size for stratum *p*, N_p is the population size for stratum *p*, N is total population size, and n is total sample size.

For qualitative data, the study used purposive sampling to obtain respondents. In this study, purposive sampling is a method where participants are selected because of them being knowledgeable about the factor influencing their household food security. According to Patton (2002), the useful of purposive sampling in qualitative research is that it can ensure selection of a wide range of variation on dimensions of interest, information-rich cases that manifest the phenomenon intensely and, homogenously.

The study employed purposive sampling to select two key informants. One was an agricultural extension officer actively involved in the study area with households'

agricultural activities and a Catholic Diocese of Kitui field officer in charge of several projects in the study area aimed at promoting food security and improving the overall livelihoods of households. These officials were selected purposively because they were regarded to be knowledgeable about issues of household food security among the local residents.

Four (4) focus group discussion (1 male, 1 female group, 1 with a combination of both male and females and one (1) with village elders in the location) consisting of 10 discussants were also selected purposively because they were well informed about the research topic and interaction among them stimulated expression of feelings, knowledge and beliefs they would not express if interviewed individually (Gall, Gall & Borg, 2007).

3.6 Data Collection Methods

The study utilized both quantitative and qualitative data collection methods. These were semi- structured questionnaires, focus group discussions and key informant interviews. These methods were used for triangulation purposes in order to achieve the objectives of the study. The use of more than one method enabled a greater understanding of the socio-economic and environmental factors that influence household food security in the study area. The varied methods ensured that the limitations of one type of data collection method were balanced by the strengths of another (Bernard, 2006; Turner, 2010). The use of multiple methods was also significant in increasing accuracy of data collected.

The researcher was assisted by two (2) research assistants who were trained on how to collect data. Data was collected in two phases. Phase one (1) took one month and mainly dealt with collecting data using semi-structured questionnaires which were administered by the researcher and 2 research assistants to the sampled respondents in Kyangwithya West location. Phase two was mainly used to collect data from the sampled key informants and focus group discussants from the location.

3.6.1 Semi- structured Questionnaires

The semi-structured questionnaires were administered to adult respondents within the 344 households in Kyangwithya West location. The questionnaire was administered by the researcher and/or assistants and included both closed-ended and open-ended questions. According to Bernard (2006), semi-structured questions yield both qualitative and quantitative data which provide room for flexibility, follow up to original questions and pursuing of new lines of questioning. Each item in the questionnaire addressed a specific objective. The questionnaires had been carefully formulated to avoid confusing the respondents. The questionnaire used for data collection is found in Appendix 1.

3.6.2 Focus Group Discussions (FGDs)

The study conducted four (4) focus group discussions with separate groups of males, females, both males and females and village elders. Kruger and Casey, (2000) indicate that a focus group discussion is a carefully planned data collection technique meant to obtain perceptions on a defined area of interest in a permissive, non-threatening environment. Participants in the focus group discussions were purposively selected from among the residents of Kyangwithya West location. Members who were willing and able to attend focus group discussion upon agreed venue and time were the only ones who participated in the study. The focus group discussions were held separately, one in each sub location. Homogeneity of the participants made it possible for the focus group discussants to be comfortable, discuss more freely and get rich information that was not captured during the interviews. Using FGD guide, these groups were given the opportunity to give their perceptions and opinion on the socio-economic and environmental determinants to household food security. The researcher moderated the discussion, while the note taker (who was a research assistant) recorded the discussions and wrote down notes on important incidents and comments made by participants on the study area. The FGDs guide for the study is shown in Appendix 2

3.6.3 Key Informant Interviews:

Finally, oral interviews were also utilized to gather information from key informants to capture the socio economic and environmental determinants to household food security in the study area. Appointments were made and later on discussions held with each key informant. These informants included: Ms Elizabeth from the Catholic Diocese of Kitui who manages the climate and resilience agriculture programme which deals with projects in the location on soil and water conservation, irrigation groups, poultry group and tree planting groups all aimed at improving food security of the farmers and Mr. Kamau who is the agricultural extension officer for Kyangwithya West ward who was quite knowledgeable on the subject. The key informants provided reliable in-depth information essential to triangulate data obtained from household survey. The interview schedule that was used to collect data from key informants is presented in Appendix 3

3.7 Validity and Reliability of Instruments

According to Orodho, (2009) the concept of validity in research deals with the question of how the findings of the study adequately represent reality. Validity is measured by experts. In this research, the researcher ensured validity of the study by using randomization and use of multiple data generation strategies that included semi-structured questionnaires, focus group discussions and key informant interviews. Data analysis was also done using both qualitative and quantitative methods for triangulation purposes. These strategies were held in a free atmosphere which encouraged open sharing of ideas, views and opinions. The study used cross-sectional descriptive research design which was carried out within one month thus extraneous factors which could have influenced the subjects were reduced.

Simon, (2011) defines reliability as the extent to which results are consistent over time and an accurate representation of the total population under study. To create an effective

survey and test reliability, the following steps were followed; the developed questionnaire was given to a few identical respondents subjects not included in the main study who filled the questionnaire manually. After a week the same questionnaire was administered to the same group of subjects'. Thus, test - retest method was used, the consistency in the answers provided assurance of reliability of the instrument. The researcher also made sure that data collection process was systematic, and data were recorded accurately and kept securely as part of an "audit trail" that can enhance reliability of the results of this study (Babbie, 2010). In addition, the researcher followed a systematic coding and recording technique in analysing data that could adequately guide a different researcher in carrying out a similar analysis.

3.8 Data Analysis

Data analysis entails the examination of what has been collected in a survey and making deductions and inferences. The qualitative data was analyzed using thematic analysis. This involved categorizing generated interview data into themes in accordance with research objectives and reported in narrative form along with quantitative presentation (Kombo & Tromp, 2006). Qualitative data were coded and organized into themes and sub-themes to generate the respondent's assessment of the socio economic and environmental determinants to household food security. Verbatim quotes and narratives by the informants are presented, to provide actual feelings and views on the issues under investigation. The qualitative data was used to compliment the quantitative data and was presented using verbatim narrations and direct quotations.

Data collected through questionnaires was checked for completeness, cleaned, coded, and entered into a computer system ready for analysis. Quantitative data was analyzed through the aid of Statistical Package for Social Sciences (SPSS) version 20.0 to run data. SPSS package was settled upon because it is able to handle a large amount of data and

given its wide spectrum in the array of statistical procedure which is purposefully designed for social sciences. This programme therefore, was preferred for the task. Analyzed data was presented in frequency tables, and interpretations and discussions of the findings followed the sequence of the study objectives.

3.9 Ethical Considerations

This research activity received clearance from South Eastern Kenya University Board of Postgraduate Studies. Permit was also obtained from Kyangwithya West gate keepers. Notification letter was sent to the assistant chiefs in the sub locations who permitted the study to go on. Research participants were informed of the nature of the study and participation in the study was completely voluntary. To this end, a consent form was presented to respondents to be signed prior to the commencement of data collection exercise. Confidentiality was maintained throughout the data collection and analysis process by keeping any confidential information secure and ensuring that no personal identifiers were used.

CHAPTER FOUR

4.0 RESULTS

4.1 Introduction

The chapter presents results of the study on the socio-economic and environmental determinants to household food security. The socio-economic and environmental factors included in the analysis were mainly the ones related to household characteristics in a small scale rural setting. Key social cultural factors examined included, gender; age; level of education, and food reciprocity habits of households and the influence of these variables on household food security. Economic factors examined included household source of income, farm size and access to markets and the influence these factors have on household food security. Environmental factors relating to climate change and cutting trees were also examined and their influence to household food security.

4.2 Demographic Profile of Respondents

The research findings presented in this section relate to the demographic profile of the respondents. This was considered to be necessary because it assist the researcher to understand the targeted group in details. The information pertaining to respondents is shown in **Table 4.1**

Table 4.1: Demographic Profile of Participants

Category		**Frequency**	**Percent**
Gender	Male	163	47
	Female	181	53
Age group	39 years and below	146	42
	40-59 Years	121	35
	60 years and above	77	23
Religious affiliation	Catholics	173	50.3
	Protestants	170	49.41
	Muslims	1	0.29
Marital status	Married	240	70

	Separated	38	11
	Widowed	66	19
Education level of respondents	None	36	10
	Primary level	197	52
	Secondary	73	21
	Tertiary and above	38	7

Source: Field survey data (2017)

A total of 344 participants participated in this study. Of these, 181(53%) were female and 163(47%) males, consistent with the current pattern of Kitui County statistics. This is because female were more available in the homesteads than men. These findings implied that women population was higher than that of men in the study area. The study requested the respondents to indicate their age category, from the findings; it is clear the respondents were both young and old. Most of the respondents were in the age group 39 years and below (42%), respondents within 40-59 years (35%) and 23% were 60 years and above. This is an indication that respondents were well distributed in term of their age. In the study area, none of the respondents lacked a religious affiliation and the field survey has revealed two dominant religious affiliations. That was Catholic and Protestant religions. They constitute the two categories of the variable 'Religious Affiliation'. Majority 173(50.3%) were protestants. More than half 240(70%) were married, 197(52%) had primary level of education. This generally means that the levels of education in the study area are low

4.3 Social Cultural Factors and their Influence on Household Food Security

4.3.1 Household Food Security Status of Kyangwithya West location

Respondents were first and foremost requested to describe their household's food security status, whether secure- that they get enough food all year round- or insecure- that they struggle to secure three meals a day all year round. Based on this question, it was found that a majority of the respondents (73%) indicated they were food insecure and most times could not afford three meals in a day all year around while 27% were food

secure. Some were compelled to forego lunch while others breakfast and lunch. This is presented in **Table 4.2.**

Table 4.2: Household Food Security Status

Household Food Security Status	**Frequency**	**Percentage**
Secure	94	27
Insecure	250	73
Total	**344**	**100**

Source: Field survey data (2017)

A village elder FGD discussant narrated that:

> "Nowadays getting enough food to eat is a challenge and people are consuming *muswaa* (not ugali, not porridge) its somewhere in between. With five children and 1/2 kg of flour you cook something to lie to the mouth and tummy that you have eaten and thus, we cannot say we are food secure."

Households that were food secure indicated that they were able to afford three meals a day and most times different food varieties. Muthokoi, ugali and rice were the main food types that food secure households ate. This was not the case for the food insecure households as they indicated that they had good days where they would have three meals a day but this was not on a day to day basis. Most of the time, two meals a day would

suffice and on the worst of days, Muswaa or porridge and a meal at the end of the day was all they could afford.

The key informant from the Catholic Diocese of Kitui climate resilient agriculture project coordinator also noted that households had inadequate food following subsequent failed harvest and therefore most of the households were food insecure. Respondents indicated that for most of them, granaries and *utaa* (kitchen grain storage space) in the households contained no food reserves.

4.3.2 Gender and Household Food Security

Kyangwithya West location constitute of men and women actively involved in food production. The findings indicate that majority (53%) of the respondents involved in the study were women. Using descriptive statistics, the study sought to establish the influence of the gender of the respondents on household food security. The results as reflected in **Table 4.3** reveal that among respondents that were food secure, the percentage of male respondents was lower (25%) compared to that of female respondents at 29%.

Table 1.3: Gender and Household Food Security

Distribution by gender	**Frequency**	**Percentage**	**Food secure**		**Food insecure**	
			F	%	F	%
Male	163	47	40	25	123	75
Female	181	53	53	29	128	71
Total	**344**	**100**				

Source: Field survey data (2017)

The variation in the gender of respondents was due to the ease in the availability of women within the homes. It was also due to substance abuse where some men were in shopping centers chewing *muguka* as explained by a leader FGD discussant.

> "It is hard to find men in the homes, some of those who did not leave for the city, leave the house very early for the shopping centre to get *Miraa (muguka)* since it arrives early. After they buy their *muguka*, they sit close to the bus stop playing drafts with bottle tops as they chew their *muguka*. They go home at night to sleep and wake up early in the morning for the same".

Respondents indicated that most men were not present in their homesteads but could be easily located at the shopping centers in small circles either talking, playing draft while a significant number were chewing *muguka*. This was further supported by a female focus group discussant who narrated that:

> "Most of us women stay close to home because of the children, when they come home from school, we have to be there. The household chores and farm work compels the women to stay at home and take care of things while the men have moved to the cities in search of employment while others loiter in the shopping centers."

To further explain the high number of women available in the households, an informant from the Catholic Diocese of Kitui engaged with community projects with the residents further reported that women are involved in the farm to a higher percent than men and therefore their availability in the household was also higher.

One of the male focus group discussants had this to say:

> "How can we be at home when the family needs have gone too high, the produce from the farm are low and we therefore have to secure food and other family need outside the home while the women stay home and take care of the children."

The findings of descriptive statistics indicated that female respondents were more food secure than male respondents. The findings were further confirmed by male focus group discussants from Tiva sub location. For instance, he remarked that:

> "Women work in the field and other odd jobs to provide food for the family while some men are loitering around due to addiction to *muguka*. They can't stay a day without it. We actually prefer them taking beer because they can stay even a whole week without it, but *muguka* they must take it daily"

A female focus group discussant stated that:

> "Women are concerned with food needs since they are the ones left with the children most of the time. The tradition in the area is: during working period, men 'die' but during harvesting they 'resurrect' same case applies to educating children. The area tradition is that men 'die' and come back to life when everything is fine. This has brought a big conflict."

Another discussant had this to say:

> "In around 25% of homes, men depend fully on their wives for everything and every work in the farm. They claim that they are the owners of everything in the homestead including the food brought to the house and so the woman should not complain since the head of the family has given her permission to get food."

The agricultural extension informant however indicated that majority of the men were the heads of their households and transferred income earned in the cities or in the neighborhood back to their families and thus making it possible for the female respondents who were the majority food secure. He indicated that in a significant number of households men are still responsible for providing food for the family and only a few have abdicated their role as providers.

4.3.3 Age of Respondents and Household Food Security

Generally, households in the study area were of different age groups. The following three age groups were adopted in the study since it is most recommended for categories that cut across decades for large sample: 39 years and below; 40-59 years and above 60 years. Results of the age of household heads are summarized in **Table 4.4.** Most of the respondents (42%) were within the age group of 39 years and below, respondents within 40-59 years constituted 35% while respondents over 60 years constituted 23%. Results on the distribution of household food security by age indicated that household respondents aged 39 years and below were more food secure (32%) than other age groups, they were followed by age group 40-59 years at 26% and 25% of household heads over 60 were food secure.

Table 4.4: Age and Household Food Security

Distribution by age	Frequency	Percent	Food secure		Food insecure	
			Frequency	Percent	Frequency	Percent
39 years and below	146	42	46	32	100	68
40-59 years	121	35	31	26	90	74
60 years and above	77	23	19	25	58	75
Total	**344**	**100**				

Source: Field survey data (2017)

The findings of the descriptive statistics indicate that a majority of the respondents were young and most food secure. The more food secure young respondents were attributed to their involvement in off farm activities which allowed them to have alternative sources of income to supplement own production since they have the strength to do so. This included sand harvesting in the river beds and the income was used to support the households buy food during times of shock and thus promoted household food security. A 35 year old female discussant during FGDs also narrated that:

> "Young people are able to fetch and sell water from the river which they sell to households in the market centers and construction sites; one gallon of water goes for Ksh 20 and a donkey carry's four gallons. They have the energy to go for four trips to the river and get Ksh 240 shillings by midday which they can use to buy food and thus promote their households food security. This is because water is a basic need and customers are always available."

A 72 year old male discussant indicated:

> "The way young people cultivate their parcels of land is different from the way the elderly do. They dig deep in the soils and are even able to push the plough deep and thus the land is well tilled. During planting, the seeds go deeper and take longer to experience the low rainfall compared to those planted on shallow ground and thus the harvest is also higher."

Households above 60 years were the least food secure and this was attributed to their reduced ability to work in the farm and having dependants that have to be provided for. This was aggravated by the inability of majority of these households to secure labour since they lack the money needed to pay the laborers.

One 76 years old female household head narrated that:

> "My son and his wife died four years ago when their two children were in upper primary school. None of my other children took them in and therefore I took them in. They are now in high school and look up to me to till the land and provide food for them. Even though my back is painful, I have to go to the farm because these children have to eat when they come home. However, I don't manage to produce much since it's impossible to leave the house sometimes due to my arthritic legs"

This narration demonstrate that dependants following the demise of parents due to HIV and other diseases/ causes increase the burden to provide food by the elderly. This influences household food security as resources to hire labour to work the land are few and the physical ability of the elderly to work in the farms is also low.

The Catholic diocese climate resilient agriculture project coordinator indicated that young people are engaged in the *boda boda* business, construction and other casual jobs which

assist them in securing food when crops fail. This provides an avenue for off farm activities that generate income for households. The income obtained caters for household needs; food resource included. These young households can therefore manage to purchase food for their households which promotes household food security.

4.3.4 Education of Respondents and Household Food Security

The respondents' level of education ranged from none to university education. The findings shown in **Table 4.5** indicate that majority of the respondents (52%) and 21 % had attained primary education and secondary education, respectively. Respondents who had no formal education were few at 10% and some of them could neither read nor write. This was observed where household heads were unable to read and sign the consent but instead relied solely on us to read for them and a family member to sign for them. It was also noted that 7% of the respondents had tertiary and above level of education. This is to say that they had completed secondary school education, joined college or university for higher learning.

Table 4.5: Education and Household Food Security

Distribution of education level	**Frequency**	**Percent**	**Food secure**		**Food insecure**	
			F	**%**	**F**	**%**
None	36	10	4	11	32	89
Primary	197	52	44	22	153	88
Secondary	73	21	34	47	39	53
Tertiary and above	38	7	12	32	26	68
Total	**344**	**100**				

Source: Field survey data (2017)

Findings of the study indicate that majority of the respondents (47%) that attained secondary education were food secure while 34% of those with tertiary and above level of education were also food secure. A significant number of respondents (22%) that attained primary level education were food secure compared to those who had no formal education (11%). These findings indicate that respondents in these households that had attained higher formal educational level were more food secure than those who attained primary level education or none. The results were confirmed by a discussant regarding the large number of primary level educational attainment by a majority of the respondents. A female discussant narrated that:

> "Most parents were and some are still ignorant on the benefits of education and believe class 8 is the epitome. They don't want to struggle in paying fees. Someone schooled up to class 7 and married a class 6 drop out and now have a very hard time providing for their children since they have no skills apart from farming. This contribute to food insecurity especially with the failing rains since they don't have any other way to make money for food"

From such narrative, the study found that although the less educated household heads engage actively in their farms, they generally lack skills that can help them improve their food production. Below is a relevant narrative from a former civil servant discussant who is a farmer:

> "When I got sick, I was working for the government and had a good salary. My leg was amputated which made it difficult for me to work and therefore I came back home. Since I have college education, I researched on improved poultry farming and I now see that I wasted many years working for the government since the poultry now feed my family and take care of all my family's' needs."

The above narration implies that as the educational level increased the adoption of improved farming methods to promote food security also increase. Variation in food security level observed from the descriptive statistics was ascribed to high earning opportunities available to respondents with higher formal education that those with primary level or none. The agricultural extension informant indicated that households with secondary education and above paid attention to planting quality seeds, primary tillage and weather forecast information disseminated by the agricultural extension officer from the meteorological department. They did not require much follow up and this enabled them to get the most from their lands and thus enhance their food security level.

A discussant also indicated that in some respondents homes that had secondary level education and above, it was more common to see Zai pits being implemented and bananas and maize nearly ready for harvesting. These households would have extra food from the farm and income to meet the food requirements of their household. Formal education attained helped them put to practice while using the available resources new farming methods elaborated in the chief *barazas.* The confidence to explore Zai pit farming was mostly found in households with secondary level education and above and their food security level was also found to be higher.

A male discussant also indicated that education created innovativeness. He narrated of his neighbor who is a graduate who harvests grass during the rainy seasons along the roads without incurring any fee. He binds the grass up and stores it and continues working in the farm like everyone else. During the dry period, he sells the grass to the residents. The discussant further indicated that neighbors also started harvesting grass but would tire so easily and just get enough to take their livestock's a few months. The graduate however always got enough for his livestock and to sell and that household never cried hunger when others did.

4.3.5 Food Sharing and Food Security

Food sharing for purposes of influencing household food security was assessed. Results on food sharing are presented in **Table 4.6.** In a majority of the households (65%), food sharing was practiced compared to 35% of the households. Findings on the influence of food sharing habits on household food security indicate that a significant number of respondents (32%) who engage in the practice are food secure compared to 20% who didn't.

Table 4.6: Food Sharing and Household Food Security

Distribution of Food Sharing	**Frequency**	**Percent**	**Food Secure**		**Food Insecure**	
			F	%	F	%
Yes	222	6	70	32	152	68
No	122	35	24	20	98	80
Total	**344**	**100**				

Source: Field survey data (2017)

A female focus group discussant indicated that most times the sharing is reciprocal. However, the discussant indicated that the sharing was not conducted on a daily basis since the economy was hard and families could not afford to support another family. However, they shared what they had for the sake of the children. This narrative showed that the practice is reciprocal; households tend to share with those who are willing to share with them in their time of need.

A male discussant reiterated that they share even food relief since most times it's not enough even for the very needy in the community. The few who receive the relief food also share either from the same pot or small portions of the grains. The agricultural

extension informant narrated that he had witnessed the food sharing behavior in the area since even when they offered farmers seeds; the farmers were willing to share amongst themselves and also among those farmers not in the groups that the officer oversees.

Respondents reported that they share amongst neighbors and friends even cooked meals and that even during harvest, they share what the other didn't produce. This promoted household food security as households could share even meals even though the sharing was temporal. From such narratives, the study found that food sharing promotes household food security even though the time frame is not clear, the households do share food during harvests and daily meals with family and friend and also with those who are in dire need in the community.

4.4 Economic Determinants to Household Food Security

This section presents results on the economic determinants to household food security. These are; the source of household income, land size and the accessibility of markets and their influence on household food security.

4.4.1 Source of Income and Household Food Security

The influence of households' source of income was assessed. Results as presented in **Table 4.7** reflecting multiple responses indicated that the main source of income for the majority (65.4%) of households was farming. A significant number of households (26.4%) derived their income from nonfarm sources like fetching water for sale, construction and other casual jobs. A small percentage (8.2%) of respondents identified formal employment as their main source of income. Descriptive statistics established that the source of income influence household food security. Majority of the households (51%) obtaining income from formal employment were more food secure compared to farming (28%) and nonfarm sources of income (26%).

Table 4.7: Source of Income and Household Food Security

Distribution of source of income	**Frequency**	**Percent**	**Food secure**		**Food insecure**	
			F	**%**	F	%
Farming	342	65.4	95	28	247	72
Non-farm sources	138	26.4	36	26	102	74
Formal employment	43	8.2	22	51	21	49
Total	**523**	**100**				

Source: Field survey data (2017)

The findings of this study indicate that the source of income for household in the study were multiple. There were a few households who were in formal employment and were the most food secure. Formal employment had few respondents since Kyangwithya West location is a rural area and farming is the main occupation. Teachers and nurses were some of the respondents in formal employment. The slightly high level of household food security for formal employment was thus explained by a focus group discussant:

> Formal employment helps maintain a steady flow of income which is unaffected by the rains. These households comfortably obtain food for their families without depending on the farm. They buy the foods in bulk during the harvest season if they have not harvested well which take them through to the next harvest. Majority of them don't sell their produce because they can source money to cater for other needs from their salaries. But for the majority of us who depend on the farm for food and cash, we have to sell some of our food stuff to take care of family needs like school fees and when the produce is no more, we cannot afford to provide three meals a day when other casual jobs are not available.

The above narration demonstrate that majority of the respondents relied on farming for their income. The agricultural extension informant reported that since the area is rural, majority depends on farming for their livelihood and that explains the high level of food insecurity since the farming is rain fed. One of the male discussants indicated that the main source of income was farming, but households also engage in casual work because the rain keeps failing. The *boda boda* business had also been very helpful to young people some of whom help support the family.

Households obtaining income from formal employment had food reserves some of which were from a year past. This was unlike the households solely depending on farming who in most cases did not even have any food reserves in the granaries but relied on small purchases from the markets. This shows that farming is the main source of income; however, the unpredictability of rains has made food production low and thus diminished the level of household food security.

4.4.2 Sizes of Farm and Household Food Security

Farm size was hypothesized as a determinant to household food security. Findings showed that a majority of respondents (48%) owned up to 2 acres of farm land as presented in **Table 4.8.** A significant number of respondents (31%) owned between 2.1- 4 acres of land. Households with more than 4 acres were the least (21%). The mean household farm size was 1.9 acres. The farm holdings were utilized as farmlands for crop cultivation and as pasture land for livestock. Descriptive data on the influence of farm size on household food security indicated that households with above 4 acres were the most food secure (32%), followed by households that owned 2.1-4 acres at 28%. Results indicate that the least food secure (25%) household's had farm size of up to 2 acres.

Table 4.8: Household Farm Size and Household Food Security

Distribution of Farm Size	Frequency	Percent	Food Secure		Food Insecure	
			F	%	F	%
Up to 2 acres	165	48	41	25	124	75
2.1- 4 acres	106	31	30	28	76	72
Above 4 acres	73	21	23	32	50	68
Total	344	100				

Source: Field survey data (2017)

The results demonstrate that food security for households in Kyangwithya west location was influenced by farm size. One factor which threatened household food security in relation to farm holdings was increased sub division of land among family members and selling. One female focus group discussant indicated that most of the households owned very small parcels of land due to increased subdivision among the children and selling. Each son wanted to have his own piece and if the parents land was small, they ended up getting a small portion which was not enough for growing enough crops for the family.

A male discussant reiterated that, "majority of the households have small parcels of land. In my family, we are five brothers and each one of us is married with children. Our father left us with 4 acres of land and we have not managed to buy more. When our mother divided the land into 6 portions - one for self -, we all got less than an acre. We intensively cultivate this land with my family and only my eldest brother gets enough food for his family from one harvest to the next. This is because he leases two acres from his wife's family. For the rest of us, we harvest just enough to last a few months and then depend on purchases from the market."

From the verbatim narratives, it was evident that owning small parcels of land which then had to be divided amongst the family members affected household food security negatively as it reduced the land available to the household for agricultural production.

Households with large farm sizes also had the leeway of diversifying in crop production and livestock rearing. Some could also lease the land out to neighbors who gave them extra income to support their families. This was evident from a male focus group discussant that indicated that he owned 12 acres of land and his children had moved to the city and supported him financially. He therefore didn't need to cultivate the whole parcel since he didn't have many people to feed apart from his two grandchildren. His neighbor however had less than 2 acres and a large family. The neighbours leased out the land and the money obtained from the lease helped him in buying seeds for planting and some shopping.

The agricultural extension informant indicated that:

> "In this area, the value of land has gone high due to new institutions coming up which is transforming the people's lives since they get jobs. They therefore don't mind selling land since they can get household income from off farm activities and the failing rains aren't helping the situation."

The above assertion confirms the findings of this study where increased numbers of households are losing their land not only from subdivision, but also from sale of land which resultantly affect the amount of produce obtained for these rural families. FDGs confirmed that most households had small parcels of land. Some were smaller than an

eighth and thus households with no ability to lease out land had to find off farm activities to afford daily meals. This exacerbated the household food insecurity in these homes.

4.4.3 Access to Market and Household Food Security

The final economic variable that was considered relevant in household food security was access to markets. The results of the influence of access to market on household food security are presented in **Table 4.9**.The findings indicate that majority (89%) of the respondents had access to market both to sell and purchase food while very few (11%) did not. Results of the descriptive statistics on the influence of access to markets on household food security indicate that a significant number (27%) of respondents that had access to markets were food secure compared to an almost similar number (29%) of households who had no access. The proportion of food insecure respondents was higher for households with access to market compared to households without access.

Table 4.9: Access to Market and Household Food Security

Distribution on access to market	**Frequency**	**Percent**	**Food secure**		**Food insecure**	
			F	**%**	**F**	**%**
Yes	306	89	84	27	222	73
No	38	11	11	29	27	71
Total	**344**	**100**				

Source: Field survey data (2017)

The findings are inconsistent with what would be expected for households with accessible markets since those with market access were found to be more insecure. Some of the reasons that were provided to explain the lack of positive effect access to market had on household food security are poor prices and exploitation of local people by

middlemen. The agricultural extension informant explained that buyers offer low and exploitative prices to local farmers. He further mentioned that once the harvest season is over, the prices sometimes double from what producers sold.

A focus group discussant narrated that prices were very low when selling at the local market. Shop keepers and brokers bought a kilogram of maize at KSh.20 which was very low considering the intensive labor invested to produce. When purchasing the same product from the shops, the consumer bought the same kilogram of maize at KSh.50. These sentiments were also echoed by a village elder focus group discussant who narrated that the prices are low when selling farm produces but high for the same produce when they are buying. They therefore are forced to sell everything because of low prices to meet a single need.

Middle men (brokers) were also explained for the lack of effect access to market had on household food security. A female focus group discussant indicated that brokers availed themselves door to door asking whether one is selling, they would tell respondents in the households to inform them when ready to sell. This tempted household heads until eventually they gave in and sold to this ready market. Brokers were also seen to contribute largely to theft of cereals reserved for food whenever they went door to door especially when one of the spouses was away. The spouse in the home would easily sell food reserves at his home without agreement from the other partner to get some personal cash. This resulted to conflict and disagreements and sometimes competition in selling secretly which encouraged food insecurity in the household.

From the above explanation, the nature of the market is exploitative for the households as they are denied good prices for their produce and in return purchase consumer goods at

high prices. This means that the market does not favor the local residents and thus fail to contribute towards fighting household food insecurity.

Discussants indicated that the local market sheds in the shopping centers were many but they were empty or with few sellers. Shops selling cereals were also few and in most cases, only one in the shopping areas was active. This revealed that despite markets being accessible to the farmer; few individuals had monopoly over the shopping center making price control difficult since there was little competition.

Accessibility to markets relate to household food security in that farmers are able to access the right inputs for planting, accessible food outlets, less or no transport needed to travel to the market and thus all the money can be used to purchase the required food item, and access to market also means access to market information which promote household food security. In Kyangwithya West location however, discussants indicated that high prices due to monopoly of traders made input prices high as well as other food items. This compelled farmers to plant uncertified seeds and thus low produce which promoted food insecurity.

From the narratives above, middle men contributed to household food insecurity by exploitative prices despite providing a ready market which seduced farmers to sell even when it was unnecessary and thus food reserves were used up before the next harvest.

4.5 Environmental Influences on Household Food Security

To demonstrate the influence of environmental factors on household food security, physical and human variables were accessed.

4.5.1 Climate Change and Household Food Security

The study further examined the influence of climate change on household food security. The assumption that farmers have perceived climate changes because it has been the talk of the day which has implications on livelihoods is misleading since people perceive issues differently. Many farmers have continued to suffer losses from the inherent effects of climate change in the grassroots. Findings of this study as presented in **Table 4.10** showed that most farmers (89%) had perceived a changing climate while only a few (11%) had not. The findings that respondents perceived climatic changes in the study area are indicator that there are variations in the climatic conditions of the area. These changes, inter alia, have implications for household food security.

Table 4.10: Climate Change and Household Food Security

Distribution on Climate change	**Frequency**	**Percent**	**Food Secure**		**Food insecure**	
			F	**%**	**F**	**%**
Yes	305	89	83	27	222	73
No	39	11	11	28	28	78
Total	**344**	**100**				

Source: Field survey data (2017)

The study also sought to establish the influence the climate change experienced by individual households had on their household food security. The findings of the study indicated that 28% of the respondents who did not experience the climate change were food secure although they were very few. A significant number (27%) of respondents were food secure despite observing changes in climate. This shows that majority of the households who had observed climatic change were significantly affected by the change since only 27% out of the total were food secure. These findings show that majority of the respondents had observed climate changes in the recent past which has had a

significant effect on their food situation. Very few households had not experienced the climatic change but the majority whether they experienced the change or not were still food insecure. These findings demonstrate that most respondent were aware of the changes and it was imperative that the study further assess the perceived climatic changes.

4.5.2 Climatic Changes Experienced and Household Food Security

As earlier demonstrated, majority of the respondents in the study area had perceived a changing climate. The study thus assessed the changes in climate that respondents perceived and their implications on household food security. These climatic changes are presented in **Table 4.11.** Results indicate that majority of the respondents (82%) noted that there was inadequate rainfall in the two rainy seasons normally received in the area. High temperatures were reported by 12% of the sampled respondents who had perceived the change. A small number (6%) of respondents observed that the droughts are recurring more often than before.

Table 4.11: Climate Change Perceived and Household Food Security

Distribution of climate changes perceived	**Frequency**	**Percent**	**Food Secure**		**Food Insecure**	
			F	**%**	**F**	**%**
High temperatures	39	12	11	28	28	72
Recurrent drought	20	6	6	30	14	70
Inadequate rainfall	267	82	70	26	197	74
Total	**326**	**100**				

Source: Field survey data (2017)

To further establish the influence of the climatic change perceived on household food security, descriptive statistics indicate that the highest cause of food insecurity (74%) was

inadequate rainfall followed by high temperatures at 72% while the least cause of food insecurity resulted from recurrent drought at 70%.The findings of this study indicate that certain climatic changes had taken place in the study area and each change perceived had implication on household food security. The respondents emphasized that seasons had changed from what they were before. In particular, a discussant stated that rainfall was often late and it took too long before it could rain again and due to these climate changes all that had been planted dried out and never grew.

A male discussant had this to say;

Ten (10) years ago going back, we were slightly food secure than we are now, we would plant and the crops especially maize would flower and produce corn before the rainy season was over. In that case, we still managed to harvest since after the flowering stage, the maize didn't need much rainfall as the moisture in the ground would support the crop to maturity. These days however, we have planted for more than two seasons and the rains would be very promising at first but go away even before the maize flower. The crop utilized the ground moisture but it's not sufficient to take the crop to maturity due to high temperatures and thus all we get sometimes is fodder.

A focus group discussant observed that they would get a good harvest for at most three seasons and then the rains failed. For instance, people harvested well on October 2015 and since then up to February 2017, the climatic conditions have not been good. This observation was reinforced by responses from focus group discussions as shown in the excerpt below:

> "The temperatures are so high, it is very hot than before. Walking or even working in the sun has been hard. These high temperatures even cause abortion in cattle especially for expectant livestock which tend to miscarry. This translate to loss of livestock which affect our asset base which assist in improving our families food security"

The overreliance on maize production was reported as an issue considering the changing climate as rainfall was no longer adequate. Respondents indicated that previously, an acre of land could produce even eight (8) to (10) 90kg bags of maize. A few years to date, obtaining five (5) of the same bags only happened to few households and would not get the family through to the next harvest season. Household food security was thus mainly affected by inadequate rainfall and high temperatures which also affected domestic animals which were depended upon as they would be sold to buy food for households.

The agricultural extension informant also indicated that the climate had changed by a large extent since households would go for two to three seasons without rainfall. The rains were unpredictable which affected household food security because when farmers invested in the farms and didn't realize any returns, at the end of the day they feel disappointed and that affected their morale to plant the next season.

In view of that, agricultural production relies on the practical reading and interpretation of the local climatic conditions. The meteorological department prepares ward based weather advisories before the start of the rainy season to prepare farmers on the expected rainfall with the intention of helping farmers know how to cope with the climate in collaboration with the agricultural extension office. Selected farmers receive messages on the predicted rainfall pattern which they shared with other farmers so that they know how to manage their farming activities.

Climatic changes had affected farming seasons in the study area and expected yields by the farmers had reduced significantly for some farmers while for others they obtained zero yields. FDGs reported that the lands were dry and had produced little or nothing. Respondents attested that in most farms the maize stalks had no corn and was already drying and that the same had happened two seasons prior. The motivation for planting

despite failed past harvests was to obtain pasture for livestock if the rains failed. Respondents indicated that the stalks would be stored in a shed and would later be used to feed the livestock to protect them from dying as they were the asset that was often sold to meet household's food needs.

4.5.3 Cutting Trees and Household Food Security

The study examined the influence of cutting trees on household food security. Results of the distribution of respondents that indicated their households engaged in cutting trees are as presented in **Table 4.12.** A small proportion of households (18%) engaged in cutting trees while the majority (82%) did not. Further, descriptive data demonstrated that 20% of households that cut trees were less food secure compared to a significantly higher number (29%) of those households that did not cut trees.

Table 4.12: Cutting trees and Household Food Security

Distribution of respondents who cut trees	**Frequency**	**Percent**	**Food secure**		**Food Insecure**	
			F	%	F	%
Yes	61	18	12	20	49	80
No	283	82	82	29	201	71
Total	**344**	**100**				

Source: Field survey data (2017)

These findings indicate that cutting trees has an influence on household food security for the households engaged in it. Households may cut trees for many reasons but the main one is survival. One discussant indicated that:

> "Household needs compel some households to cut trees. Individuals that still cut trees suffer because they even cut their mango trees which are a great asset especially during their productive season. They cut the mango trees for charcoal burning and growing the trees again takes years. Mango trees promote household food security since we sell mangoes for cash which we use to purchase maize. The mangoes even serve as food as we can munch on them during the day such that when food is prepared, people only consume a small portion which means the food reserves are sparingly used during the duration of the mango fruits"

The agricultural extension informant indicated that few households engaged in cutting trees for majority did not even have the trees to support a charcoal kiln. He stated that most of the households also recognize the harm the practice has on their lands. A discussant indicated that the reason they don't like cutting trees is because the ground is left bare which also makes it difficult for the grass to grow. When the grass doesn't grow because the shrubs and trees have been cut down, their animals suffer from lack of fodder and animal products like milk fails. They become emaciated and when taken to the market, they attract few buyers and very low prices. This makes it difficult to buy the maize or other food stuffs needed as the returns from selling livestock are low. One is even compelled to sell more than one livestock to buy a 90kg bag of maize due to their low value.

From the narratives, households in the study area seem to recognize the need for conserving the environment. The unpredictability of rainfall also seems to hinder the growth of trees and efforts of households to plant trees.

CHAPTER FIVE

5.0 DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion of Findings

The chapter discusses data on the socio-economic and environmental determinants to household food security. Specifically, the chapter addresses these themes according to the following sub-headings: social cultural factors including gender, age, education and food reciprocity within households. Economic factors include household source of income, farm size and access to markets while environmental factors discussed include weather changes, and cutting trees and their influence on household food security.

5.1.1 Social - Cultural Factors and Household Food Security

This section is in line with the first objective of the study which sought to assess the influence of social cultural factors on household food security.

5.1.1.1 Food Security Status of Kyangwithya West location

Food insecurity was reported in a majority of households and this was mainly attributed to failed harvest as a result of unpredictable rainfall. Households were forced to share the little that was available and in some homes m*uswaa* (semi porridge, semi ugali) was what they could sometime manage to get. Many households had empty granaries and some had pulled down their granaries after long periods of none use. Food reserves were indicated as a thing of the past for the majority of households.

The findings of this study correspond to a closer margin to those of (Alem, 2007) in Tehuludere Woreda of Ethiopia which observed that 69% of households in the study area were food insecure while 31% of the households were not. The study also concurs with a study by Keino, Plasqui, & van den Borne, (2014) in the Rift Valley region of Kenya who found that over 70% of the 656 households in the sample were severely food insecure. The concurrence with reviewed studies demonstrates that households are struggling to provide food resource and this was attributed to myriad factors including socio-economic and environmental factors.

5.1.1.2 Gender and Household Food Security

Men are usually the dominant household heads in agricultural decision making which may be attributed to the patriarchal nature of society and power relations as well as access to resources that has been structured in a way to favor men. The exclusion of women from household decision-making could impact negatively on household food security.

Men are normally responsible for heavy tasks of land preparation and ridging while women carry out the lighter tasks of weeding and crop processing. Increased agricultural productivity depends on increased access by both men and women to productive resources for household's food security to be enhanced. In Kyangwithya West location, majority of the respondents were females. The slightly lower incidence of male respondents in farming households in the study area was explained as due to the fact that many male heads had left the villages for the urban areas to seek employment opportunities in order to provide for their families. This explanation compare favorably with that of FAO, (2003) in sub Saharan Africa, where it was noted that women were found in the homes where the males head to the cities to look for employment.

This is consistent with the findings of Ndegwa & others, (2015) in Wenje Division, Tana River County whose findings showed that over half (54%) of the respondents in the study were females. This was also consistent with the findings of Ong'ayo & Akoten, (2007) who stated that the percentage of females was larger than that of male gender.

Data analysis also demonstrated that in households where the respondent was a female, food security was higher that where the respondent was a male. Most of the women that were interviewed were relatively autonomous in the decision-making process in nearly all matters pertaining to food production and distribution within their households. One major reason for this autonomy is the high rate of male-out migration in search of wage employment and leaving their wives behind in the rural area as heads of households. This contributed a great deal to the high level of women's autonomy in the decision-making process and ultimate household food security. According to Quisumbing et al., (1995) women are the key to food security for their households. This can arguably explain why where they were available, food security was more pronounced.

The food insecurity situation for households where respondents were males was explained as due to the abdication of responsibilities by some men who had become overly involved in substance abuse (*muguka*) while others disappeared in the cities and some even remarried. This translated to labour deployment as the contribution of the men in the farms was diverted elsewhere thus influencing household food security.

The findings of this study do not concur with the study carried out by Kumba, Wegulo, & Otieno, (2015) in Kisii, Kenya who found that majority (68.8%) of the male respondents households were food secure as compared to female respondents (53.8%). This imply that the likelihood of being food secure was higher in households where the respondent was a man than in households where the respondent was a woman. The non consonance to the state in Kyangwithya West location can be explained to the ecological zones. Kisii

County rarely experiences dry spells and is not an ASAL region. Men are therefore able to stay home and work in the farms since the certainty that they will put food on the table obtained from the farms is almost guaranteed. In the study area, labour mobility has to take place since there is no guarantee that they will get any harvest to last them to the next harvest. It is thus evident that majority of the residents of Kyangwithya West location felt that the men were not actively involved in agricultural production. In a patriarchal society like that of the study area, men take over in the main responsibilities of the households including food procurement. This was however, not the case in majority of the households.

According to Stewards', (1955) perspective, a cultural ecology of a society requires an outlining of the social organization of work for the subsistence and economic activities. Certain behavior patterns and social organization result from the utilization of natural resources to secure subsistence. In other words, co-operation and social organization concerning production in a household may influence food security. In Kyangwithya West location cooperation in the household was biased and women were to a large extent involved in the energetic procurement processes of food more than men and thus household food security was affected.

5.1.1.3 Age of Household Head and Household Food Security

The age of the household head was considered to be an important determinant to household food security since it influenced food production (Arene & Anyaeji, 2010). Findings from quantitative data analysis showed that majority of the respondents were young. This implies that majority of the smallholder farmers in Kyangwithya West location were young and capable of engaging in crop production and other earning activities to provide enough food to feed their families. These findings fail to concur fully with those conducted among smallholder farmers in Kyuso Sub-County which found that

most of the respondents in the household (62%) were within the age of 41-50 years (Stephen, 2015). The variance may be attributed to the categorization employed as the sample size used in this study was higher.

Findings revealed that the younger respondents were the most food secure than households in the older categories. The high percentage of younger food secure households was attributed to ability to engage in tedious jobs in the fields and ability to engage in nonfarm income activities which supplemented the main source of livelihood (farming). This indicates that increase in the age of respondents decreases the likelihood of household being food secure.

This was also observed by Bashir et al., (2012) in Punjab province where the younger people were stronger than the elders and could handle tougher jobs better. Moreover, households with an older person as head of the household are the multigenerational households having more retired and/ or older persons to feed in the family. This may explain the negative effect of this variable on household food security. Findings of this study are in consonance with Babatunde et al., (2007) in Nigeria who observed that increase in age decreased food security.

5.1.1.4 Education and Household Food Security

Education provides people with skills required to sustain and improve the quality of life. It has therefore direct or indirect impact on the quality of life. The level of education of the respondents is regarded as a determinant to household food security since it influences the ability of households to access information as well as affect different aspects of innovation and technology which ultimately influence production decision and household food security (Ayuk, 1997; Rahman, 2003). Majority of the respondents had

attained primary level of education. The importance of formal education cannot be overstressed since it increases household food production and adoption of new behaviours. In addition, the process of information flow is catalyzed by education which enables an individual to explore as wide as possible, different pathways of getting information about agriculture and food security (Ersado, 2006). The application of improved farming methods like zai pits in households where the respondents level of education was above primary schooling demonstrate the use of information to boast household food security. Poultry farming using improved breeds by a respondent who left formal employment also demonstrates the use of education to improve a family's' livelihood.

The influence of educational level of the respondent on household food security was assessed. Results indicated that majority of the respondents that had attained secondary level education and tertiary and above were relatively more food secure than others.This was an indication that as educational level increased the level of household food security increased. Further, the study found that as the educational level reduced from secondary level down wards, the level of food security also decreased.

The findings of this study further indicated that those with higher educational attainment had skills that they could exploit to secure food as well as engage in improved farming. Respondents indicated that securing employment was easier for individual with tertiary and above level of education, increasing their likelihood to secure food for their households. These findings are supported by a study conducted by Kirimi, Gikunda, Obara, & Kibett, (2013) in Kenya who found that education enhances skills and ability to make decisions which can enable access to better economic opportunities or better employment of information including use of technology and farming practices to get

better agricultural returns hence household food security. The findings of this study are also consistent with previous studies by Chowa, Garforth, & Cardey, (2013) in Malawi.

This study is supported by one of Steward's, (1955) tenets which opined that technology is the "window" through which people look at their environment. Our adaptations are mainly technological, and how we interact with any given environment depends first of all on the tools we bring to that environment. Those with limited educational attainment may have limited ability to use modern tools and technology which impact their household food security.

5.1.1.5 Food Sharing and Household Food Security

Food sharing was practiced in the study area since it assists households to meet their food needs. A majority of the households engaged in food sharing and were more food secure compared to households that didn't. Deducing from the findings of this study, the practice of food sharing promoted household food security.

Food sharing as demonstrated in the study findings concurs with Mbiti, (2002) who indicated that when people share what they have, they can support each other for survival during times of hardship. Findings of this study concur with Subbo, (2001) in his study in Siaya District. He found that households that engaged in food sharing were more food secure since food sharing ensured surplus food production and equitable distribution of available nutritious foods among household members. Findings of this study also concur with those of Winne, (2008) in the United States where food sharing and receiving food from relatives, friends helped protect themselves against hunger in different time periods.

These studies demonstrate that the practice of food sharing has been taking place in many regions of the world and served in enhancing household food security. The time frame in which the practice help improve households food security may be limited, however, that may be the only intervention needed at the time to save the family from starvation. The study findings are supported by Stewards, (1955) tenets which show that cultural beliefs and practices help human populations adapt to their environments and live within the means of their ecosystem. In this regard, food sharing practices of the households help them live within the means of their ecosystem and hence enhance household food security.

5.1.2 Economic Determinants to Household Food Security

This section is in line with the second objective of the study which sought to assess the influence of economic factors on household food security.

5.1.2.1 Main Source of Income and Household Food Security

The respondents' main source of income was assessed in the study. It was found that the majority of the respondents were subsistence farmers. Farming, therefore, was the main source of income for more than half of the households. The findings are comparable with those of the County Government of Kitui, (2013) which indicated that the majority of residents derived their incomes from farming. The County government estimated that 87.3% of the population in the County depends on farming.

Despite a majority of the respondents obtaining their income from farming, respondents that indicated they obtained their income from formal employment superseded farming in regard to household food security. This was attributed to the subsistence nature of

farming those respondents engaged in which incorporates very few modern farming techniques which thus lead to low food production. Also the subsistent wage accrued from agriculture is insufficient to meet adequately the food needs of the family including the need for enough nutritious food. . A fall in agricultural production therefore not only jeopardizes the family's self sufficiency in food supply but also affect their income. Respondents indicated that despite obtaining less yields due to failing rains, households that were in formal employment could comfortably supplement with their incomes and thus were less food insecure.

The study found that only a small percentage (28%) of respondents obtaining their income from farming were food secure. The findings collaborates those of Kuwornu, Ohene-Ntow, & Asuming-Brempong, (2012) which showed that farming was not a guarantee of household food security. In their study, Kuwornu et al. (2012), in Central Ghana found that the majority (68.8%) of food crop producers were food insecure. The findings that respondents in the study area obtaining their income from nonfarm activities were the least food secure does not concur with studies by Alem, (2007) in Ethiopia. His study found that a large proportion of households (84.8%) engaged in off-farm income earning activities were food secure. This non concurrence is attributed to the nature of off farm activities available to the residents in Kyangwithya West location. For instance, the water vendors have to go long distances to fetch water. This means that they can only go for a few trips which may not translate to sufficient income to cater for the daily family needs. Most of the off farm activities are also not readily available.

According to Steward, (1955) the way people earn their living in the world is what places them directly in the context of nature. Like any other organism, they have to acquire resources from the environment to survive and reproduce. The main source of income for

a majority of households in Kyangwithya west location was farming, but due to other factors, the ability to maximize production and sustain food security was affected.

5.1.2.2 Farm Size and Household Food Security

The farm size that a household utilizes for food production determines the output they obtain from the same parcel of land. In Kyangwithya West location, majority of the respondents indicated that they had up to 2 acres of land with a mean household farm size of 1.9 acres for all households. The farm holdings were utilized as farmlands for crop cultivation and as pasture land for livestock. Respondents indicated that the reason the farm sizes were small was due to increased subdivision of land either due to selling or subdividing to give each son his share.

Household food security was high among respondents with large parcels of land than those who owned small parcels. This concurs with a study by Kumba et al., (2015) in Kisii Central Sub-County which found that a fairly large proportion of respondents were food insecure due to small farm sizes. They also corresponds with earlier studies by Alem, (2007) in Amhara Region of Ethiopia and Kirimi et al., (2013) in Kenya who found that the size of the farm influenced household food security where output obtained after harvest reduces with less land thereby increasing the chances of the household being food insecure (when all variables are held constant).

Findings of this study are supported by Stewards', (1955) premise of subsistence pattern in studies of land use and the development of agriculture. This relate to the aspects of carrying capacity of particular environments to provide subsistence to those dependent on it. In Kyangwithya West location where the respondents farm sizes were small (average

of 1.9 acres), the households were more food insecure and this is due to the inability of the land to produce enough food to support the members of that household.

5.1.2.3 Access to Market and Household Food Security

Access to market relates to the infrastructure that links the market to other markets, production areas and to consumers (FAO, 2008). It is critical to note that markets contribute to the dimension (availability, access, stability/vulnerability and utilization) of household food security. Accessibility of markets by farmers enhances household food security in two main ways. First, access to markets by farmers makes it possible for them to obtain the right inputs for planting. When the right inputs are utilized, the probability that a household will get high yields also goes up unlike when they plant which ever seed is available. Secondly, access to market caters for food availability by bringing food outlets to the reach of households. In this case, households can purchase foods stuff like maize from the market and thus household food security is enhanced.

The infrastructure linking producers to the markets in Kyangwithya West location were in good shape and majority of the respondents indicate they had accessible markets. However, the influence of access to markets on household food security indicated that households that had no accessible market were more food secure. These findings demonstrate that despite the majority having access to market, these households were still less food secure compared to those with no access. Respondents indicated that middle men exploited them by offering very low prices for their produces while the local traders provided respondents with deceptive market information which led them to sell their produce at poor prices and thus compromised their households' food security.

The influence of market on household food security for the majority of the respondents with access was negative. This concur with studies by Tembo & Simtowe, (2009) evaluating the effect of market accessibility on household food security in Malawi. Their study found that rural households with limited access to market were more food secure because they consumed a larger part of their production than purchases

5.1.3 Environment and Food Security

This section is in line with the third objective of the study which sought to assess the influence of environmental factors on household food security.

5.1.3.1 Climate Change and Household Food Security

Climate change and variability exerts a major role in household food security by creating multiple stresses which compromises households' adaptive capacity (Boko et al., 2007). In Kyangwithya West location, majority of the respondents had perceived that the climate was changing and for the majority who perceived the changes, they were food insecure. A small percentage did not perceive a changing climatic despite living in the same physical environment with respondents who perceived the changes. This is because people vary substantially in the extent to which they view climate change since it is difficult for people to experience directly or even detect on a purely perceptual or sensory level.

The findings that respondents experienced climatic changes in the area were indications that there are variations in the climatic conditions of the area. These changes, inter alia, have implications on household food security. Majority felt that the weather had changed

from the way it used to be. Based on their experiences as residents of Kyangwithya West location, they were able to ascertain the changes they had witnessed.

Findings demonstrated that the difference in household food security level for all households despite perceiving a changing climate change was close. The findings of this study concur with those of Mutunga, Charles, & Patricia, (2017) in Kaveta and Mikuyuni villages in Kitui who found that respondents were aware of climatic changes in their locality which had an implication in household food production. It was thus imperative that the study then assess the climatic changes perceived by the respondents.

5.1.3..2 Climatic Changes Perceived and Household Food Security

Based on the fact that majority of the respondents had perceived a changing climate in Kyangwithya West location which influenced their households' food security, it was imperative to probe further on the perceived changes. Burke & Lobell, (2010) suggest that the nature of farmers' responses to climate change will depend on their recognition that climate is changing. Majority of the respondents indicated that rainfall was inadequate and affected their households food security the most, followed by high temperature and recurring droughts

Findings of this study are in line with those of Ndegwa & others, (2015) in Wenje Division, Tana River County who found that majority of households noted that there is a decline in the amount of rainfall received compared to the past. The timing or onset of rains had also changed and this had resulted to a shift in the farming season. This is similar to what was also observed by Dhaka, Chayal, Poonia, & Kendra, (2010) in their findings that variability in climate disturbs the farming calendar since it results to either

an early or delayed onset of rains. Their findings also indicate that the frequency, intensity and duration of dry spells and droughts were alarming.

In a government report, it was projected that the frequency of droughts and flash floods would increase both in intensity and spread as a result of climate change (GoK, 2011). Drought has an implication for the state of food availability in an area and is thus a critical indicator of climate change (Shauri, 2011). Increase in temperature was also observed in a similar study in Kaveta and Mikuyuni villages of Kitui County by Mutunga et al., (2017) who noted that there was an increase in temperature over the years and this increase had effect on local livelihoods of the residents.

The findings of this study reflects a similar study by Kusakari et al., (2014) in Wa West District of the Upper West Region of Ghana who noted that perceptions of farmers on climate changes were significantly different within and across different localities. Findings of this study deduced that households in Kyangwithya West location were conscious of climate changes, thus, the difference in their perceptions of climate changes that affected their food security the most in the four sub–locations.

In Kenya, Kabubo-Mariara & Karanja, (2007) also found that most Kenyans were aware of climate changes in their locality and that these changes influenced their household food security situation. The findings of this study are supported by Steward's (1955) premise that adaptation of a culture to its environment may entail certain changes; the adaptation in a larger sense determines whether similar adjustments occur in similar patterns. It is therefore pertinent to note that a majority of household noted the changing climate in their locality and thus have to find ways of adaptation to mitigate the changes for their survival.

5.1.3.3 Influence of Cutting Trees on Household Food Security

The removal of natural plants through cutting trees results to irreversible damage to the productivity of land. Majority of the respondents in the study area did not engage in cutting trees and were more food secure compared to households that cut trees. Individual household food security was affected by cutting trees because respondents indicated that these households also cut down fruit trees for charcoal burning. Fruits serve the food needs of the households especially during the day as household members can munch on the fruits all day and eventually take small bites of food than they would when the fruits are not available. The mango fruit especially serve the community well since they sell the fruits and the income accrued is used to purchase food which can last the family until the next harvesting season.

Households that engaged in cutting trees also affected their food security by exposing their land to the elements which made it bare and hindered the growth of vegetation. The vegetation served as fodder for livestock which they depended on for animal products and when sold to provide income for purchasing food stuff. Cutting trees also left households without trees which they would prune and sell as firewood to neighboring schools and thus compromising their long term income avenues.

The findings of this study are in line with GoK, (2002) where cutting trees for charcoal burning, fuel wood, and construction materials leads to food crises. Households that engaged in cutting trees despite being the minority in the study area faced food crises to a higher margin that the rest of the households. This study is supported by Steward's, (1955) third fundamental procedure on the extent to which the behavior patterns entailed in the exploitation of the environment affect other aspects of culture. Households that cut

trees for food may find it difficult to secure food and this may require certain adjustments to the changing environment through a change of their dependence on the trees. This would call for adaptation to the new environment and also require latitude for a certain range of possible behavior patterns.

5.2 Conclusions

In conclusion, the study established that majority of households in Kyangwithya West location were food insecure and social cultural factors that were reviewed have an influence on household food security. Majority of the respondents were women as men were unavailable in the homes during the study period. This was mainly attributed to them working in the cities to supplement farming income and engagement in substance abuse which made them dependent on women and inactive in food production and other income generating activities. They were also found to be more food secure than in households where the respondent was male. According to Steward (1955) second tenet, cooperation and the social organization of work for subsistence and economic activities promotes household food security in households where both men and women are actively involved.

Despite younger respondents being few in the study area, it was found that their households were more food secure and this was attributed to their ability to engage in nonfarm activities to obtain income which enabled them to provide sufficient food for the households. The behavior patterns and the way of life of a society influence the production and relations towards nature (Steward, (1955). Younger respondents have the ability to aggressively source out means of providing for their households unlike older respondents. However, there is compelling evidence of ageing population in Kyangwithya West location which ought to be explored to facilitate sustainability household food security for all.

Similarly, education also had an underpinning on household food security where households that were more educated were few compared to the majority who had primary level education. The outcome reflects the culture where rural households are often associated with the less educated and the poor. However, those more educated with tertiary and above level of education were more food secure. Therefore, high education increases household food security. In line with the cultural ecology theory, they are able to use technology and improved farming methods to extract and process natural resources towards promoting their households food security. Findings also indicated that food sharing was practiced in the study area and households felt that the practice helped improve food security since they could share what the other had not produced thus; it is an important determinant to household food security by providing an avenue of securing food among households. Certain practices are cultural and characterize particular cultural areas. Cooperation for subsistence and economic activities (Steward, 1955) among households to share surplus or exchange one surplus commodity with another as well as daily meal sharing promoted household food security.

Secondly, in economic determinants to household food security, the study found that, source of income and farm size increased household food security. Sources of household incomes were many but majority of the respondents derived their living (Steward, 1955) from farming while nonfarm activities supplemented. However, formal employment which had the least number of respondents also had the most food secure households. This indicates that despite the majority being farmers, their ability to secure food was compromised. Steward third premise provide latitude for a holistic view of cultural features like land use and demography. The carrying capacity of land for majority of the respondents was low as they had on average 1.9 hectares per households. Respondents that indicated their households had large farms were more food secure as the carrying capacity of their lands was also high. Market access was not a predictor of household

food security as a majority had access but were more food insecure compared to the few who had no access. The influence of market access in household food security was therefore negative.

Thirdly, the study assessed the environmental factors that influence household food security. The study found that respondents had perceived a changing climate Majority of the respondents that perceived a change in climate were food insecure. Inadequate rainfall was the main climatic change perceived that affected household food security the most. Human activities that contributed to degradation of the environment were reported to affect household food security. Respondents indicated that some households were engaged in cutting trees and their food security was also low. According to the cultural ecology theory, the extents to which the behavior patterns entail exploiting the environment affect other aspects of culture. Households that cut trees sought to derive their livelihood from cutting trees but this exploited their environment and affected household food security.

5.3 Recommendations

1. The study recommend that the Ministries of Education Science and Technology together with the Ministry of Sports and Youth affairs in collaboration with all stakeholders should intensify advocacy campaigns against muguka chewing in Kyangwithya West location.
2. It is the recommendation of this study that household should be protected from exploitation by middlemen through opening of local cooperative societies that purchase farmers produce and offer them timely pay.

5.4 Suggestions for Further Research

First, a study should be done to assess the impact of relief food on households' food security in Kyangwithya West location.

Secondly, a similar study should be replicated in the entire sub county to establish whether the determinants to household food security are peculiar to Kyangwithya West location.

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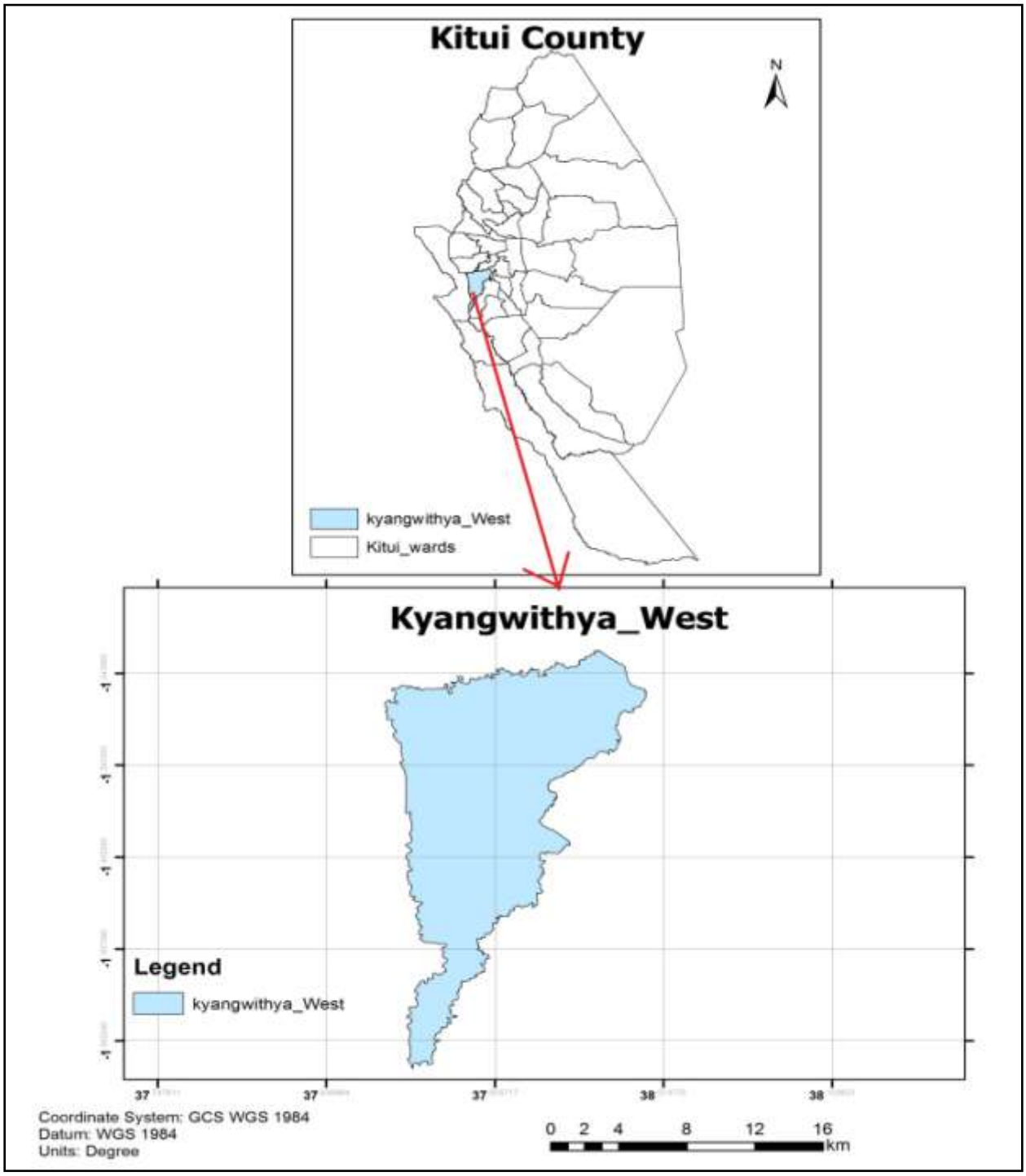


Source: Kitui County; GIS Office

Figure 1: Map of Kyangwithya West location

APPENDICES

Appendix1: Questionnaire Schedule

Introduction

I am Kezia Mbuthia, a Master of Arts student at South Eastern Kenya University and currently undertaking a research study on the Socio-economic and environmental determinants to household food security in Kyangwithya West location of Kitui County as part of my course work. I would like to ask you some questions about those factors that determine food security in your home as the head of the household. The questions won't take more than fifteen minutes of your time. I will greatly appreciate your consent.

You may decide not to be interviewed as this exercise is voluntary. You also have the right to withdraw your consent or data or both at any point of the interview. The information that you provide will be kept confidential, and used for study purposes only. Your name will not appear in any report that comes out of this study, unless you authorize after understanding the possible implications and benefits.

Interviewee agreed to be interviewed Yes [ ] No [ ]

Location.....

Village.....

Signature of interviewee: .....

Date of Interview.....

Carefully listen to the question and respond. Thank you for your co-operation.

1. Social cultural characteristics

1. Gender of household head: Male [ ] Female [ ]
2. Age: Below 39 years [ ] 40 – 59 years [ ] Over 60 years [ ]
3. Religious affiliation: Catholic [ ] Pentecostal [ ] Muslim [ ] Any other (specify) [ ]
4. Level of education: None [ ] Primary [ ] Secondary[ ] Tertiary and above [ ]
5. Does the gender of the household head influence household food security? Yes [ ] No [ ]
6. Do you think age of the household head influence household food security in the home?

Yes [ ] No [ ]

7. Does religion influence food security? Yes [ ] No [ ]
8. Does the level of education influence the ability to secure food for your family? Yes [ ] No [ ]
9. Do you share food with others when you have extra? Yes [ ] No [ ]
10. Do they share with you when they have extra? Yes [ ] No [ ]
11. Does food sharing influence your households' food security Yes [ ] No [ ]

2. Economic determinants

12. What is your main source of income? Farming [ ] Nonfarm activities (specify)…….. Formal employment [ ].
13. Is the market locally available to you? Yes [ ] No [ ]
14. How far do you have to go to access a market where you can buy or sell food?

5- 10 kms [ ] 11- 15 kms [ ] 16- 20 kms [ ] 21-25 kms [ ] Above 26 kms

15. What is the size of your land? Up to 2acres [ ] 2.1-4 acres [ ] above 4acres [ ]
16. How many acres of your land do you use for food related activities.....?

3.0 Environmental factors

17. Do you cut trees? Yes[ ], No [ ]
18. Do you replace trees whenever you cut them? Yes [ ] No [ ]
19. Does cutting trees affect household food security? Yes [ ] No [ ]
20. Have you noticed weather changes in the area? Yes [ ] No [ ]
21. If yes, which ones ……
22. In your own view, which weather change had the greatest effect on your food security status? …….

4.0 Food security

23. In your opinion, how would you describe the food security of your household?

Secure [ ] Insecure [ ]

24. What are the determinants of the food security situation? .....

Thank you for your assistance and valuable time

Appendix 2: Guidelines for Focus Group Discussions

Date of Interview.....

Name of Facilitator.....

Venue of Interview.....

Name of Note Taker.....

S. No	Name of Participant	Gender	Contact (Phone no)
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			

1. How do you perceive the food security situation of this community?
2. How and when do you thing food become insecure in this locality?
3. What do you think are the main factors to food insecurity in this area?

4. How do you think these factors cause the problems?
5. Who provide food for the family?
6. Specifically, what are the role of the gender of household head in food security
7. Where do households derive their income?
8. Do the markets determine food security? If yes, how…….
9. How far do community members have to go to access a market where they can buy or sell food?
10. Where do they prefer selling their produce to?
11. What is the average household farm land in the community?
12. What role does the size of the farm has on household food security?
13. Do community members cut trees for sale to buy food?
14. How do they recover the lost trees?
15. Are there weather changes in the locality in the resent past?
16. Which weather changes have been experienced that were not there previously?
17. Did the weather changes affect means of livelihood?

Thank you for your assistance and valuable time

Appendix 3: Key Informant Interview Schedule

Date of Interview.....

Name of Interviewer.....

Venue of Interview.....

Name of Key Informant.....

Contact of Key Informant.....

Sex of Key Informant: Female [ ] Male [ ]

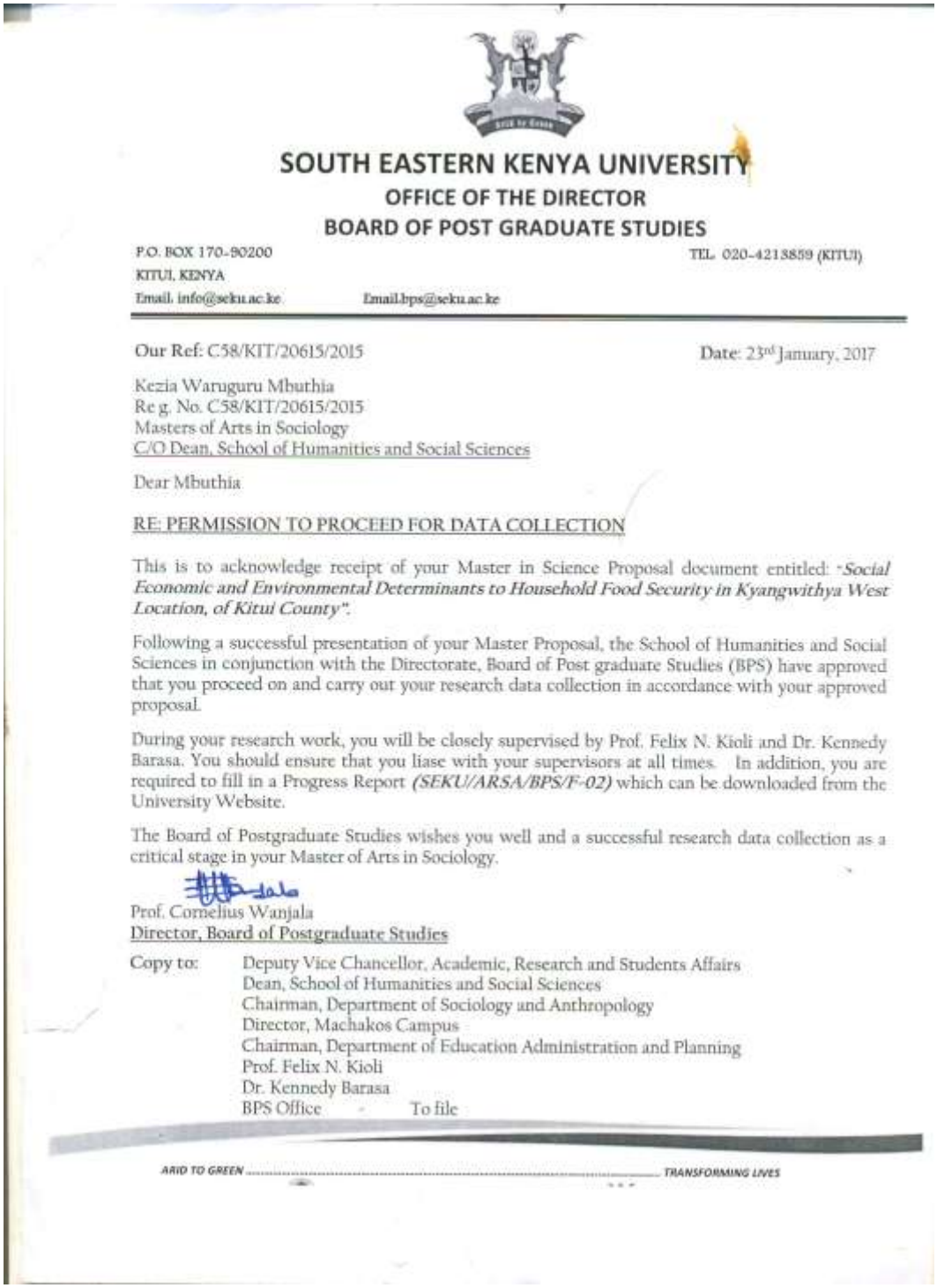
1. What do you think is the food situation in Kyangwithya West location?
2. Does gender of household head influence food security?
3. Do you think the age of the head of the family influence food security status of a household
4. What are the main religions in the area and do they affect food security?
5. What is the education attainment level of residents of Kyangwithya West location and does the level of education influence household food security?
6. Is generalized food sharing practiced in the area? if yes, does it affect household food security?
7. Are markets accessible to farmers in Kyangwithya West location?
8. Do markets have an influence on households' food security?
9. What is the average farm land of residents of this area and do the sizes of the farms influence household food security?

10. Has weather changes been observed in the area?

11. Does the weather change affect means of livelihood for the community?

Thank you for your assistance and valuable time

Appendix 5: University Data collection Authorization letter



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Our Ref: C58/KIT/20615/2015 Date: 23rd January, 2017

Kezia Waruguru Mbuthia
Reg. No. C58/KIT/20615/2015
Masters of Arts in Sociology
C/O Dean, School of Humanities and Social Sciences

Dear Mbuthia

RE: PERMISSION TO PROCEED FOR DATA COLLECTION

This is to acknowledge receipt of your Master in Science Proposal document entitled: "*Social Economic and Environmental Determinants to Household Food Security in Kyangwithya West Location, of Kitui County*".

Following a successful presentation of your Master Proposal, the School of Humanities and Social Sciences in conjunction with the Directorate, Board of Post graduate Studies (BPS) have approved that you proceed on and carry out your research data collection in accordance with your approved proposal.

During your research work, you will be closely supervised by Prof. Felix N. Kioli and Dr. Kennedy Barasa. You should ensure that you liase with your supervisors at all times. In addition, you are required to fill in a Progress Report *(SEKU/ARSA/BPS/F-02)* which can be downloaded from the University Website.

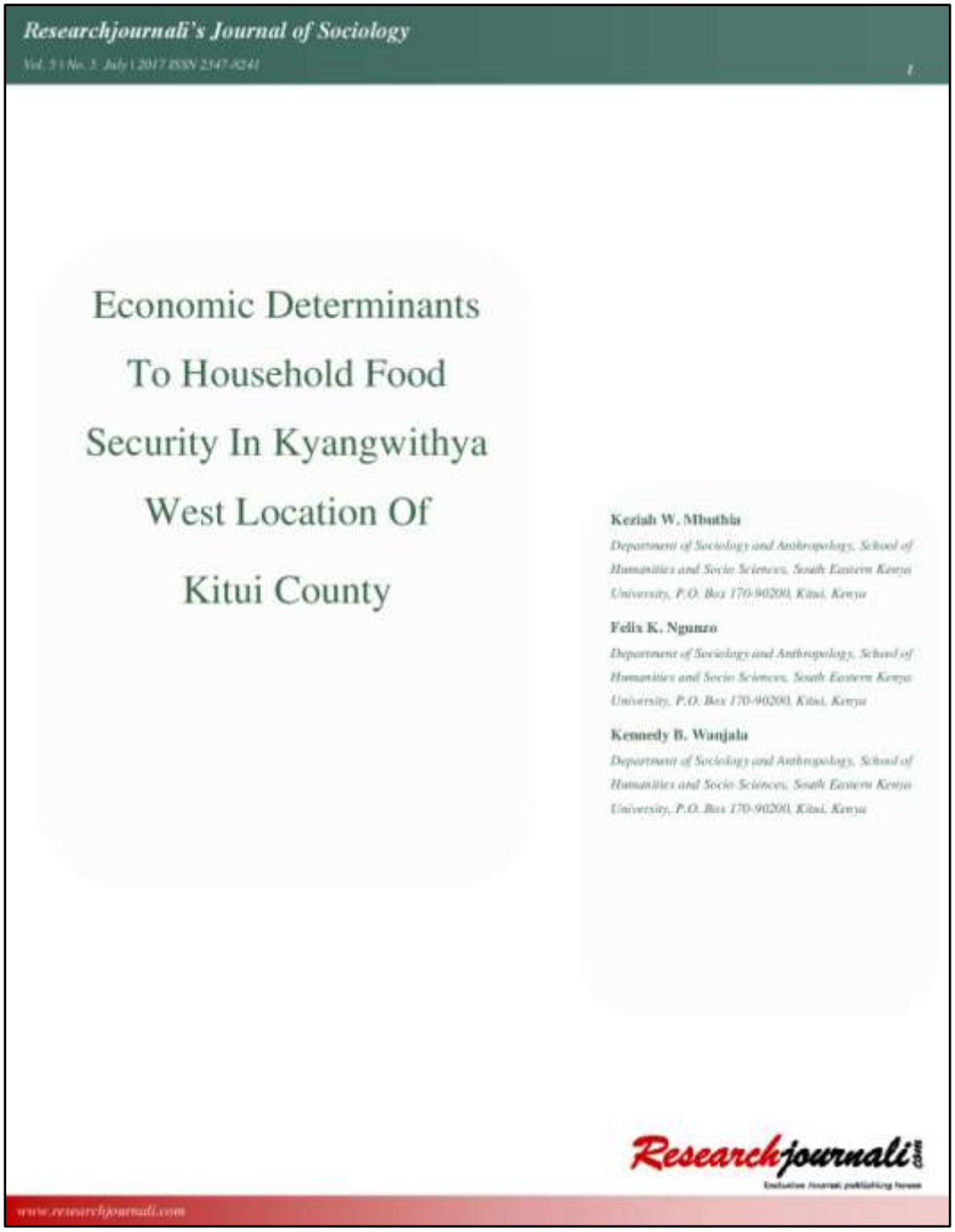
The Board of Postgraduate Studies wishes you well and a successful research data collection as a critical stage in your Master of Arts in Sociology.

Prof. Cornelius Wanjala
Director, Board of Postgraduate Studies

Copy to: Deputy Vice Chancellor, Academic, Research and Students Affairs
Dean, School of Humanities and Social Sciences
Chairman, Department of Sociology and Anthropology
Director, Machakos Campus
Chairman, Department of Education Administration and Planning
Prof. Felix N. Kioli
Dr. Kennedy Barasa
BPS Office - To file

ARID TO GREEN ..... TRANSFORMING LIVES

Appendix 6: Published Papers



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Economic Determinants To Household Food Security In Kyangwithya West Location Of Kitui County

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Environmental Determinants to Household Food Security in Kyangwithya West Location of Kitui County

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Abstract This study analyzed the environmental determinants to household food security in Kyangwithya West location of Kitui County. Quantitative data were collected using systematic sampling method to select 344 households with the aid of a structured questionnaire. Qualitative data was obtained from key informants and focus group discussants that were purposively sampled. The data were subjected to descriptive statistics and presented using tables and verbatim narratives. The findings revealed that majority (89%) of the participants had experienced weather changes in the study area and a significant number (27%) were food secure. Few households (11%) had not observed any weather change and (28%) of them were food secure. The weather changes observed were assessed and inadequate rainfall was observed by majority (82%) of the respondents (26%) of whom were food secure. High temperatures were reported by (12%) of the respondents (28%) of whom were food secure. Recurrent drought was reported by the least number of respondents (6%) that were the most food secure (30%). Influence of cutting trees on household food security revealed that majority (82%) of the respondents do not cut tree and are more food secure (29) compared to the few (18%) who cut trees. The results reveal that majority of the households observed changes in weather patterns although the percentage of the food secure was low. Inadequate rainfall was the most observed weather change with the most influence on household food security followed by high temperatures and recurrent droughts. Majority of the households did not cut trees and are more food secure than those that cut trees. Environmental factors are thus significant determinants to household food security. The study recommended that regular updates on weather forecast be made available to households to enable them make informed plans during planting seasons.

Keywords: *household food security, households, Kyangwithya West location, environmental determinants*

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1. Introduction

Weather changes resulting to increases in average temperatures have been observed around the globe and there is new and stronger evidence that most of the warming observed in the last 50 years is due to human activities [12]. These changes are as a result of climate change which is a long-term shift in weather conditions identified by changes in temperature, precipitation, winds, and other indicators [2]. These changes have the potential to adversely affect the environment, communities and the economy unless action is taken now [12]. For example, a few days of temperatures above or below a certain threshold can damage cereals and fruit tree yields [33]. Globally, weather variability has been experienced with the projected change in average temperature likely to be from 0.3 °C to 0.7 °C for the period 2016–2035 relative to the reference period 1986–2005 [22]. In the European heat wave of 2003, when temperatures were 6 °C above long-term means and contributed to a significant drop in crop yields. This reduction was by 36 percent for maize in Italy, and by 25 percent for fruit and 30 percent for forage in France [18].

Africa and Southern Asia are thought to be among the regions that will be most affected by climate variability because of high dependence on agriculture for livelihoods [10]. In addition, the overall net effect on agricultural production as a result of the changing climate is expected to be negative particularly over the long term since these areas are highly sensitive to changes in rainfall patterns [17,24]. Climate change also affect food security between regions in Southern Africa. It is among the most frequently cited drivers of food insecurity because it acts both as an underlying, ongoing issue and as a short-lived shock [16]. In the Indo-Gangetic Plain of India, weather variability has also been reported to have an influence on food security [5].

In Kenya, climate change has contributed to food and financial crises resulting from the frequency of droughts and flash floods which is expected to increase both in intensity and spread [14]. Previously in 1991 in Northern Kenya, 28 percent of cattle; 18 percent of sheep and goats died due to the impact of drought on livestock [30]. This greatly affected the economy of the local community.