



FACTORS AFFECTING FOOD SECURITY IN RURAL HOUSEHOLDS IN KENYA; A CASE OF MUCHONOKE SUB-LOCATION, EMBU COUNTY

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Accepted: June 16, 2022

ABSTRACT

Food security is tied to a combination of factors that include climatic conditions, extreme weather and climate shocks, natural resource management, and access to appropriate inputs. Through descriptive research design and convenience sampling technique, this study describes factors affecting food security in rural households in Kenya a case of Muchonoke Sub Location. By use of questionnaires, primary data was collected from 72 households adult representative within Muchoneke Sub-Location identified through convenience sampling. Secondary data was obtained from the internet, journals and other forms of publications. The data was statistically analysed by Statistical Package for Social Science (version 23) with respect to the research objectives. The study found out that inadequate rainfall and lack of consistent rainfall pattern have greatly affected availability of food throughout the year. Other factors identified were poor infrastructure, low levels of income and lack of agriculture mechanization. The study recommended adoption of irrigation so as to deal with the challenge of inadequate rainfall. There is need to invest in agricultural modernization by promoting mechanized agriculture so as to enhance food stability.

Keywords: Food security; nutrition; food access; food availability; food utilization; food stability

CITATION: Nyabuto, W. (2022). Factors affecting food security in rural households in Kenya; A case of Muchonoke Sub-Location, Embu County. *The Strategic Journal of Business & Change Management*, 9 (3), 349 -367.

INTRODUCTION

Food security historically referred to the overall regional, national, or even global food supply and shortfalls in supply compared to requirements. But, with increased observation of inadequate food intake by certain groups, the term has more recently been applied mostly at a community, local, household or individual level (Foster 1992). Further, the term has been widened beyond notions of food supply to include elements of access (determined by food entitlements, Sen 1981), vulnerability (Watts and Bohle 1993), and sustainability (Chambers 1989). However, food security is a concept that has evolved over time. The most common definitions vary around that proposed by the World Bank (1986) and were summed up by Maxwell and Frankenberger as "secure access at all times to sufficient food for a healthy life" (1992, p.8). According to a currently accepted definition (FAO 2000), 'Food Security' is achieved when it is ensured that "all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life". Food is here defined as any substance that people eat and drink to maintain life and growth. The nutrition focus adds the aspects of caring practices and health services & healthy environments to this definition and concept. This aims at what is more precisely called 'Nutrition Security', which can be defined as adequate nutritional status in terms of protein, energy, vitamins, and minerals for all household members at all times (Quisumbing 1995 p. 12)

Amartya Sen in his seminal work on food entitlements and deprivation, (Sen, 1981), sought to characterize food security as access to food (demand side) rather than food availability. He argued that food availability at the national level does not directly translate to food security both at household and individual levels. This brought to the head the central indicator of food insecurity as the inability of the households to access food. This necessitates for new model of approaches that the

policy makers need to adopt to contain hunger among the affected in the population.

In Kenya, food security interventions have been directed towards improving the supply side through food production in pursuit by the government to ensure food availability primarily at the national level (GoK, 2007). The government has employed enormous resources in enhancing productivity through technological advances such as improved farm inputs including seeds, fertilizers etc, and improving access to credit and market information to enhance production. Unexpectedly, these efforts have not been successful in ensuring food security for all citizens. The country continues to bear large proportion of the hungry afflicted population especially in arid and semi-arid areas which are characterized by low and inefficient production systems. Many households are continuously supported by the government and development partners through relief aid.

This study was conducted to investigate factors affecting food security among households in Muchonoke Sub-Location, Embu County in order to add knowledge and come up with recommendations on the way forward of handling food security.

Statement of the Problem

According to a current accepted definition (FAO 2000), 'Food Security' is achieved when it is ensured that "all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life".

Food security is a major challenge facing the world today. New determining factors of food security, climate conditions, are combining with previously identified namely; poverty, inequality and weak governance to expose ever-growing numbers of hungry people to an all-time high (WFP, 2010). Whereas millennium Development Goals (MDGs) have boosted drive towards improving food security, (UNICEF, 2005; United Nations, 2006) their accomplishment is progressively showing difficulty

especially in developing countries. The situation is further worsened by lack of comprehensive data to quantify and monitor progress.

In spite of the importance of Agriculture, an estimated 20% of the household are considered food insecure. Food insecurity peaks between the months of April and June when harvested stocks have been depleted. This is mostly experienced in the hot and dry semi-arid lower zones of Mbeere North and South (Ministry of Agriculture, Livestock and Fisheries of Kenya - Climate Risk Profile for Embu County 2016 series).

In view of the above, this research intended to find out factors that affect food security in rural households in Muchonoke Sub-Location, Embu County, Kenya.

Objectives of the study

The general objective of the study was to establish the factors affecting food security among rural households in Muchonoke Sub-Location, Embu County.

Specific Objectives

- To establish how climate conditions, affect food availability in Muchonoke Sub-Location.
- To find out how infrastructure affects food accessibility in Muchonoke Sub-Location.
- To determine how technology affects food stability in Muchonoke Sub-Location.
- To assess how income affects food utilization in Muchonoke Sub-Location.

Research Questions

In order to achieve the specific objectives, the following questions were used as guidelines for the study:

- What are the effects of climate conditions on food availability in Muchonoke Sub-Location?
- How does infrastructure affect food accessibility in Muchonoke Sub-Location?
- How is food stability affected by technology in Muchonoke Sub-Location?
- What influence does the level of income have on food utilization in Muchonoke Sub-Location?

LITERATURE REVIEW

Theoretical Literature

It has been noted that the definition of food security is a broad concept that is more than just food production and food accessibility. Kenya, like most other sub-Saharan African countries, is faced with a challenge for maintaining sustainable food security to all the people at all times. General causes of food insecurity in Tanzania which are also the same in most other developing countries are little acreage; dependency on rainfall; use of low level technologies for tillage, crop and livestock husbandry, processing of crop and livestock products; financial inability to use improved seeds, fertilizers, pesticides and herbicides; poor markets for agricultural and livestock products; poor division of labour at the household level; climate change; and poor transport means that constrain inputs supply and products delivery to market places (URT, 2010).

While the above factors are well known, the extent to which theoretical contentions on determinants of food security explain insecurity in Muchonoke sub-location is not known. Therefore, the research from which this study is based was to analyse, among other things, the extent to which the entitlement to food approach by Sen (1981), Woldemeskel (1990) contentions, and Malthusian and Anti-Malthusian theories explain food insecurity in Muchonoke sub-location.

Malthusians and Anti Malthusians Contentions

Malthusians contend that food insecurity is due to the presence of too many people compared to the amount of food produced. He states in his first essay titled *Essay on the principle of population* Malthus, (1991), "Population when unchecked increases in a geometrical ratio while subsistence food production increases only in an arithmetical ratio".

By virtue of the law of nature which makes food necessary to the life of man, he believed that the effects of the two unequal powers (Population and food) must be kept equal. "This difficulty (of

providing sufficient food) must fall somewhere and must necessarily be severely felt by a large portion of mankind” (Malthus, 1991).

The core principle of Malthus was that food is necessary for human existence even if human population tends to grow faster than the power on the earth to produce subsistence. Malthus was specific on the negative impact of population growth on food production. People who believed in the above contentions were classic Malthusians; those who believe so until today are Neo-Malthusians; and those who have contrary beliefs are Anti- Malthusians.

The Entitlement to Food Security Theory

Unlike the above pessimistic (Malthusian) and optimistic (anti-Malthusian) theories that focus almost exclusively on food supply, the entitlement to food theory focuses more on possession of wealth materials which can be exchanged for food or can be used to get food through other means.

The pessimistic and optimistic contentions about the relations between population growth and food security reviewed above have been challenged by Sen (1981) who argues as follows: “People do not usually starve because of insufficient supply of food at local, national or international level, but because of insufficient resources, including money („entitlements“) to acquire it.” Sen classified entitlements into three categories: (i) endowments, which are all legal resources that can be used to obtain food, including money, land, machinery and animals, but also more abstract resources such as labour power, „know-how“, kinship and citizenship; (ii) entitlement mapping (or E-mapping), which includes terms of trade between endowments and food, goods, and the ratio between money wages and the price of food, or the input output ratios in farm production; and (iii) entitlement-set, which represents the basket of food, goods, and services that a person can obtain using his/her endowments. Food security is more pronounced when some or all of the above entitlement categories are attainable to the individual or household.

Empirical Literature

Food security has many dimensions ranging from global, regional, national, local, and household to the individual level. The determinants of food security differ at different levels i.e. from global to regional, national to household and individual levels because food security is deemed to be a multidimensional phenomenon encompassing climate change, civil conflicts, natural disasters and social norms. The (WB, 2001) has recognized three significant factors which affect food security; availability of food, accessibility of food and utilization of food.

“The world is in a very different place to where it was six years ago when it committed to the goal of ending hunger, food insecurity and all forms of malnutrition by 2030” (FAO, 2021. The state of Food Security and Nutrition in the World). This is a statement captioned from the latest FAO report. This gives a sorry state of food security worldwide. It is worth noting that the world is not doing well towards ensuring access to safe, nutritious and sufficient food for all people all year round, or to eradicating all forms of malnutrition. The major drivers to these conditions are mainly; Conflict, Climate variability and extremes and economic slowdowns and downturns. The COVID-19 pandemic made the situation even worse.

So, if the world is at a critical juncture, where do we stand now? And what can be done to help us build forward better and put us on track to achieving Zero Hunger?

Research has established that achieving food security remains a challenge in many rural areas of Sub-Saharan Africa (FAO, 2017). FAO further defines food security as; “*a situation that exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life*”. This definition rests on four main pillars of food security namely: availability, accessibility, stability and utilization. A food system is said to be vulnerable

when one or more of the four components of food security are uncertain and insecure (FAO, 2008).

Kenya, like other Sub-Saharan countries, faces food insecurity with approximately 3.4 million people in 2017 being acutely food insecure and in need of humanitarian assistance. This is a significant increase of 67% from the 2.6 million identified in 2016 (Long Rains Assessment Report, GoK 2017). According to the government, this increase was because of below-average crop production in 2016 due to poor rains, increases in food prices and reduced regional imports from neighboring countries that also faced below-average production. Food security therefore poses a great challenge to the entire Kenyan population given that all the four components in the definition must be met.

Climate Conditions and its Effects on Food Availability

Availability of food means, ample food available through personal production.

Availability further means physical presence of adequate food in so far as the component or pillar of availability is concerned. This however is a great challenge in rural households particularly in the developing world Kenya being not an exception.

Climate change over the years has led to increased number of people at risk of food insecurity all over the world. This is according to a report of the Inter-Governmental Panel on Climate Change, (FAO, 2021). It further states that climate change has led to and will continue leading to, increases in the frequency and intensity of natural disasters and extreme weather events, such as droughts, floods, changes in rainfall patterns; and decline in water quality and availability in arid and semi-arid regions, with expected reduction in agricultural productivity, especially in sub-Saharan Africa.

Kenya is characterized by low and declining crop productivity and like many other developing countries, is particularly susceptible to climate change due to its over-reliance on rain-fed agriculture, aridity, inadequate water supply and

degradation of many of its natural resources (Mariara, 2015).

Most previous studies on Kenya have concentrated on the impact of climate change on crop and livestock productivity, and on adaptation to climate change. There is, however, a gap in knowledge on the relationship between climate change and food security in Kenya. According to the United Nations Food and Agriculture Organization (2008) framework on climate change and food security, "high rainfall is crucial for increased crop productivity and thus food security, but that excessive rainfall is harmful. The results further suggest differential impacts of temperature – high temperatures during the planting period slow down or destroy crop growth, while moderately high winter temperatures are crucial for crop maturity."

In her paper on Climate Change and Food Security, Mariara, (2015) states, "Different food crops respond differently to climate change variables in Kenya."

From the foregoing reviews, it is imperative therefore to highlight that there is indeed a relationship between climate change and availability of food (production)

Effects of Infrastructure on Food Accessibility

Infrastructure, refers to physical structures such as roads, electricity, water and agricultural establishments such as irrigation systems. On the other hand, "Accessibility of food means a reduction in poverty, merely the availability is not enough, and the poor household should have the ability to purchase it." (Doppler, 2002). Accessibility also denotes access by individuals to adequate resources for obtaining suitable foods for a nutritious diet (FAO, 2006).

"Food security means the provision and access to nutritionally sufficient and culturally accepted food by each member of the household for healthy life obtained through socially acceptable ways (Canali, 2010). Food insecurity, on the other hand, is the uncertain or limited access to nutritionally adequate and safe food (FAO, 2006)." However,

food security means “consistent, dependable access to enough food for active, healthy living,” (Coleman Jensen et al 2011)

While the global prevalence of moderate or severe food insecurity has been slowly on the rise since 2014, the estimated increase in 2020 was equal to that of the previous five years combined. Nearly one in three people in the world (2.37 billion) did not have access to adequate food in 2020 – that’s an increase of almost 320 million people in just one year. (FAO Report 2021).

Some studies have shown that indeed poor infrastructure has a negative impact on food accessibility. Temu, (2020) in his Final Donor Report in Tanzania on ‘Assessing Rural Services, Infrastructure and Their Impact On Agricultural Production, Marketing And Food Security In Tanzania’ paraphrased it this way; “Notwithstanding the current debate on the relationship between investment in infrastructure and agricultural productivity, the study joins in its premise, Gibson and Rozelle (2003), Fan et al. (1999), and Wanmali and Islam (1995), who have shown positive relationships between public investment (Infrastructure) and agricultural growth.”

Effects of Technology on Food Stability

Encyclopedia Britannica defines Agricultural technology as an application of techniques to control the growth and harvesting of animal and vegetable products. On the other hand, New World Encyclopedia defines it as technology for the production of machines used on a farm to help with farming. Agricultural machines have been designed for practically every stage of the agricultural process.

Sustainability focusses on access to food at all times and not losing such access, (FAO, 2006)

Newer technologies with applications in food and agricultural production have emerged from advances in information technology and biotechnology. These technologies have the potential to boost agricultural production, improve

food security, raise rural lifestyles and competitiveness of livelihoods and deliver food quality. Thus, collectively these technologies can help mitigate the impact of natural resource constraints such as land and water, feed the hungry and avert or alleviate impending crisis such as starvation and famine in various countries, (Technology and Food Security article: Kasturi, 2009).

In order to raise crops productivity within their constrained environment (e.g. risks), farmers adopt multiple technologies jointly, both as complements and as substitutes. (Journal of Agricultural Economics: Kassie, et al 2014)

Effects of Income on Food Utilization

Boonyabanha, et al (2019) conducted a study to find out how the urban poor define and measure food security in Cambodia Nepal. The findings were that access to adequate diets was a major challenge for low income communities in Asia, and that hunger was widespread. The conclusion of the study was that, the amount of income determined the quantity of food one could afford.

Further, Abbasi, et al (2016) in their research to measure the extent of food insecurity and key economic factors associated with this condition among households in the Alborze Province, Iran. The study found that more than half of the sampled population suffered from food insecurity. It was also found that food insecurity was significantly associated with lower education and income levels.

Poverty and hunger are a common phenomenon in Kenya especially in arid and semi-arid lands. Indicators of food insecurity and malnutrition such as proportion of the poor in the population, those requiring food assistance and have through the years shown that large proportions, about half the population of Kenya are food insecure (African Journal Online vol. 4, 2013).

A research carried out by Olielo in Kayole, Buruburu and Westlands in 2013 to assess consumption of foods and characteristics of various income groups and determine factors that cause food insecurity

found that the low-income group could not purchase adequate food and amounts they consumed did not meet the FAO recommended levels for foods and nutrients.

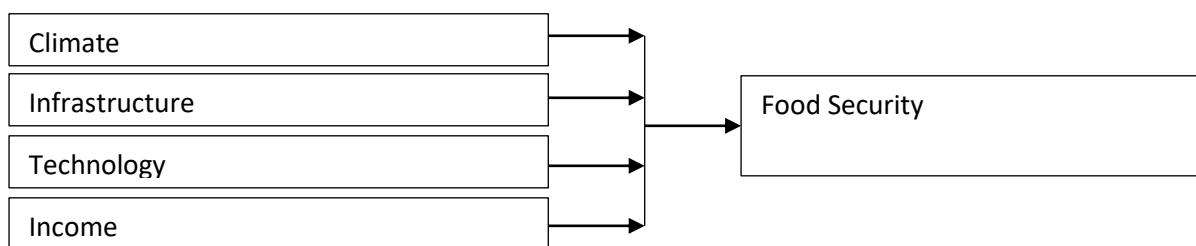
Olielo further states, “According to FAO, the main factors that influence poverty and food insecurity at national, community or individual levels are: land and water quality, political structures, government policies and services, exchange rates, fuel, farm equipment and inputs, agricultural production, research, development and processing, employment, culture, income, storage facilities, money and credit, transport, resource management, advertising, water and sanitation,

healthcare, prepared food and family food distribution.

Low incomes and poverty are the main cause of food insecurity in Kenya. It is recommended that there be better education for employment, irrigation of crops especially in arid and semi-arid lands for food production as well as improved health status and sanitation to enable earning of high income to reduce poverty and consequently enhance food security and nutrition.”

Conceptual Framework

The conceptual framework or model herein was adopted to indicate the relationship between the independent and dependent variables of the study.



Independent Variables

Dependent Variable

Figure 1: identified variables and their relationship

METHODOLOGY

This research adopted a descriptive survey design where by data collection was through the interviewing or administering questionnaires to individual within the study population. The research collected qualitative and quantitative data relating to the availability, accessibility, sustainability and utilization of food within the households. Some of the factors affecting food security within the area among them; climate conditions, infrastructure, level of technology utilization, availability of functional irrigation systems and levels of income were also considered.

The target population was in Muchonoke, a Sub-location within Gitiburi Location, Nthawa division of Embu County. The sub-Location has one thousand

one hundred and eighty two households (1,182) with a total population of three thousand nine hundred and ninety (3,990) and covers a landmass of 19.4 square kilometres (Kenya Population and Housing Census, 2019). The sample size of 92 was determined using the formula recommended by Yamane (1967).

The study relied on primary data collected from the sample questionnaire through the use of structured questionnaire, face to face interviews and secondary data from the internet, journals and other forms of publications. To find out the impact of the four identified variables, examination of relevant existing research and reports published by various Government agencies as well as other international bodies was conducted.

The questionnaire was chosen as the preferred data collection tool because according to (Bosnjak, 2015), use of questionnaire as a data collection tool relying on classic paper and pen or internet-based approaches is an economical and valuable method of obtaining data from the respondents.

Each section of the questionnaire's four questions was designed to delve into each of the specific objective of the study. The study collected both quantitative and qualitative data. The research questionnaires were serialized to avoid repetition of data contained in a single questionnaire while entering the data into the analysis software. The collected primary data was keyed into the computer and analyzed using Statistical Package for Social Science (version 23). Content analysis was used to analyze the qualitative data.

The presentation was done using tables, charts and graphs.

DATA ANALYSIS AND PRESENTATION

Climate and food security

Main component of climate were considered and their effect of food security within Muchonoke Sub-Location. The components that were considered were: Temperature, rainfall variability, prolonged dry seasons.

Effects of high temperature on crop production

Respondents were requested to what extent they agree that high temperatures within the area has affected crop growth that affecting crop production. The results were as displayed in table 1.

Majority of respondents (72.2 %) strongly agreed that temperature has had a high effect on crop growth and which intern has interred with crop production within the area. 26.4% agreed while 1.4% disagreed.

Table 1: High temperature has affected crop growth thus affecting production

| | Frequency | Percent |
|----------------|-----------|---------|
| Disagree | 1 | 1.4 |
| Agree | 19 | 26.4 |
| Strongly Agree | 52 | 72.2 |
| Total | 72 | 100.0 |

Based on the above findings, it is evident that high temperatures within Muchonoke Sub Location greatly affected food security.

Extent which lack of consistent rainfall pattern has affected availability of food throughout the year.

Respondents were requested to what extent they agree that lack of consistent rainfall patterns within the area has affected crop growth that affecting crop production.

Lack of consistent rainfall pattern has affected realization of food throughout the year.

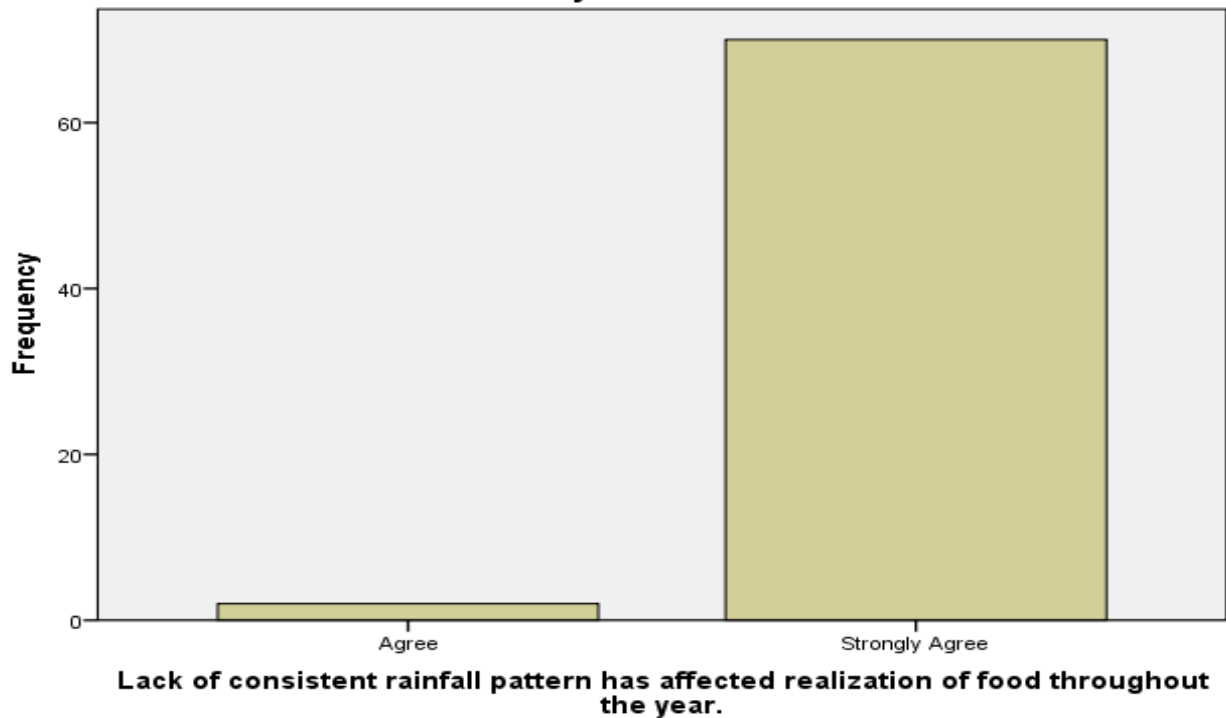


Figure 2: Lack of consistent rainfall pattern has affected realization of food

Majority of residents (97.2 %) strongly agreed that inconsistencies in rainfall patterns has greatly affected food production as shown in figure 2. This is because farmers were not able to plan well on when to undertake specific farming activities that are dependent on rainfall.

Prolonged Dry seasons and potential to produce variety of food

All the respondents agreed that prolonged dry seasons have affected the areas potential to produce a variety of food especially the types of food that require a lot of water while growing. 90.3 % strongly agreed with this argument while 9.7 % agreed as shown in table 2.

Table 2: Prolonged dry seasons have affected the area's potential to produce variety of food

| | Frequency | Percent |
|----------------|-----------|---------|
| Agree | 7 | 9.7 |
| Strongly Agree | 65 | 90.3 |
| Total | 72 | 100.0 |

Based on the above findings it is clear that farmers are limited on the type of crops they can produce and can only produce crops that are drought resistant to higher degree. This has affected the availability of certain types of food within the area which of certain nutrition values.

Pest infestation during dry seasons

Each of the components of climate has an impact on the type of active pest, and the type of activities they engage in. This section sought to establish to what extent respondents' thing that pest

infestation has affected food availability in Muchonoke Sub Location.

The findings of the study was that 69.4 % of the respondents' strongly agreed, 26.4 % agreed while

4.2% disagreed that pest infestation during seasons has affected crop production thus affecting its availability as shown in table 3 .

Table 3: During dry seasons, the rate at which pests infest farms has affected crop production, preservation and storage.

| | Frequency | Percent |
|----------------|-----------|---------|
| Disagree | 3 | 4.2 |
| Agree | 19 | 26.4 |
| Strongly Agree | 50 | 69.4 |
| Total | 72 | 100.0 |

From the findings above, it is evident that most of the pests cause more harm to crops during dry season as compared to during rainy seasons. This is because during dry season there less vegetation and thus pests end of feeding on crops.

Infrastructure and food accessibility

This section describes the opinions of the respondents on how effects of lack or poor infrastructure has as affected food accessibility

within the sub location. This section was subdivided to investigate the aspects of food availability, these included, road network, power connectivity, food storage facilities and functional irrigation network.

Poor state of road network has affected access to and from the market

The research sought to find out how the poor status of road network within the sub-location had made it difficult to get to and from the market.

The poor state of road network within the Sub-Location has made it difficult to get to and from the market.

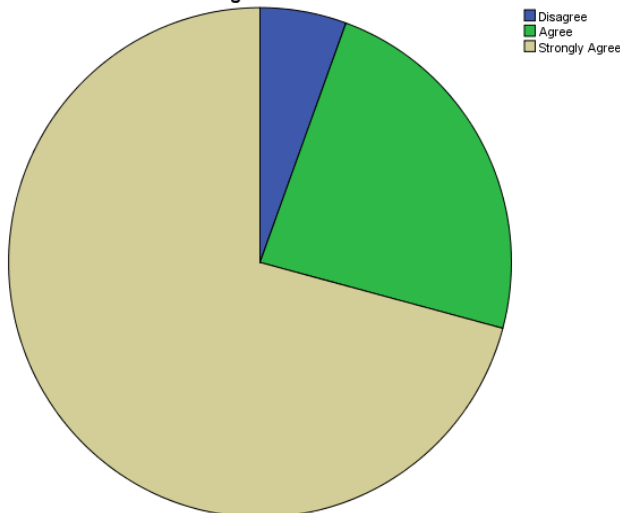


Figure 3: Poor state of road network has affected access to and from the market

From figure 3, 71% of the respondents strongly agree that poor state of road network on access of to and from the market, 24% Agree while 5%

disagree. This is an indication that majority of the respondents understand the importance of good road network in relation to food accessibility.

Lack of power connectivity has affected value addition thus interfering with attainment of processed food

On lack of power connectivity, 83% of the respondents strongly agree, while 17% agree that it affects value addition and by extension interfering with the attainment of processed food.

Table 4: Lack of power connectivity has affected value addition

| | Frequency | Percent |
|----------------|-----------|---------|
| Agree | 12 | 16.7 |
| Strongly Agree | 60 | 83.3 |
| Total | 72 | 100.0 |

With minimal or no value addition the residents have limited access to processed food and when they sell their produce they sell it raw form

throughout the year, while 29% agree and 20% disagree as illustrated in figure 4. The respondents strongly agreed that during high production season, there is need to have a storage facility especially for the dry food.

Absence of storage facilities has affected residents' ability to secure adequate food throughout the year

51% of the respondents indicated that they strongly agreed that absence of storage facilities within the area affects the ability to secure food

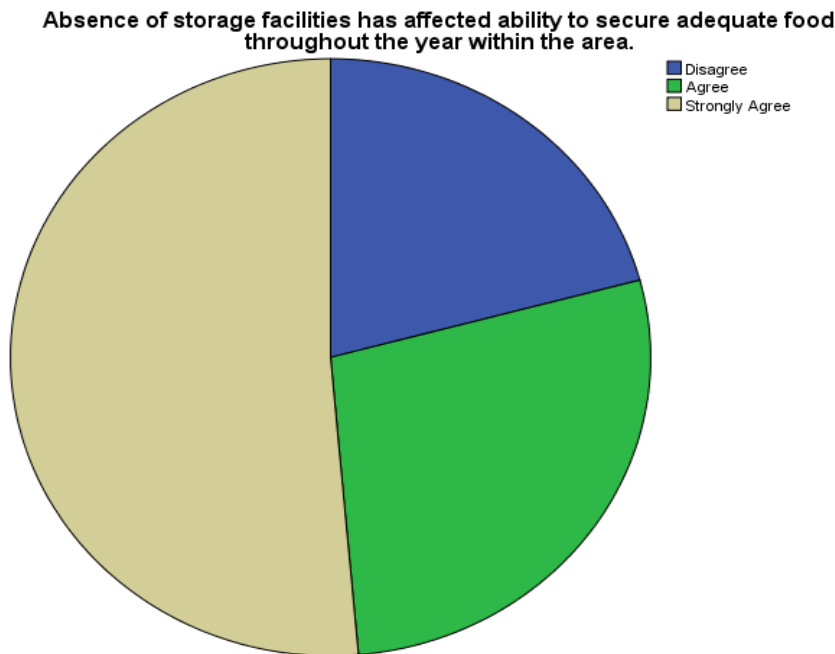


Figure 4: Absence of storage facilities has affected residents' ability to secure adequate food

Absence of functional irrigation network has affected production of variety of food

On the absence of functional irrigation network, 90% of the respondents strongly agreed that it has affected production of variety of food while 10% agreed as shown in table 5. Majority of the

residents engage in farming activities. Rainfall being a challenge in the area, the majority (90%) of the respondents indicated that supplementing the rainfall with functional irrigation systems will have a positive impact on the production of variety of food.

Table 5: Absence of functional irrigation network has affected production of variety of food

| | | Frequency | Percent |
|-------|----------------|-----------|---------|
| Valid | Agree | 7 | 9.7 |
| | Strongly Agree | 65 | 90.3 |
| | Total | 72 | 100.0 |

Level of Income and food utilization

Lack of stable income has affected ability to access quality diet

The respondents were requested to express their views on whether lack of stable income has affected

their ability to access a quality diet in households at Muchonoke Sub-location by ticking in a box for either Strongly Agree, Agree, Strongly Disagree and disagree. The responses were analysed and summarized as shown table 6.

Table 6: Lack of stable income has affected ability to access quality diet

| | | Frequency | Percent |
|----------------|--|-----------|---------|
| Agree | | 9 | 12.5 |
| Strongly Agree | | 63 | 87.5 |
| Total | | 72 | 100.0 |

The results reveal that a majority of the respondents (87.5%) strongly agreed that lack of stable income has affected ability to access quality diet in households at Muchonoke Sub-location and a minority of the respondents (12.5%) agreed. The results are also represented in figure

Low income has affected access to clean water for domestic use.

Table 7 summarizes the respondents' views on whether low income has affected access to clean water for domestic use in households at Muchonoke Sub-location.

Table 7: Low income has affected access to clean water for domestic use

| | | Frequency | Percent |
|----------------|--|-----------|---------|
| Disagree | | 1 | 1.4 |
| Agree | | 14 | 19.4 |
| Strongly Agree | | 57 | 79.2 |
| Total | | 72 | 100.0 |

From the above findings, the results show that most of the respondents, a sum of 57 (or 79%) strongly agreed, 14 (or 19.4%) agreed while one disagreed that low income has affected access to clean water for domestic use in households at Muchonoke Sub-location.

Inflation has affected ability to practice proper feeding habits

The respondents were asked to affirm whether inflation has affected ability to practice proper feeding habits (e.g. three meals a day, balanced

diet, variety of meals) in households at Muchonoke Sub-location.

The findings revealed that majority of the respondents (87.5%) strongly agreed that inflation

has affected ability to practice proper feeding habits (e.g. three meals a day, balanced diet, variety of meals) in households at Muchonoke Sub-location, 9.7% agreed and 2.8% disagreed as shown in table 8.

Table 8: Inflation has affected ability to practice proper feeding habits

| | Frequency | Percent |
|----------------|-----------|---------|
| Disagree | 2 | 2.8 |
| Agree | 7 | 9.7 |
| Strongly Agree | 63 | 87.5 |
| Total | 72 | 100.0 |

Low income has affected access to good sanitation practices

The respondents were asked to state whether low income has affected access to good sanitation practices in households at Muchonoke Sub-location.

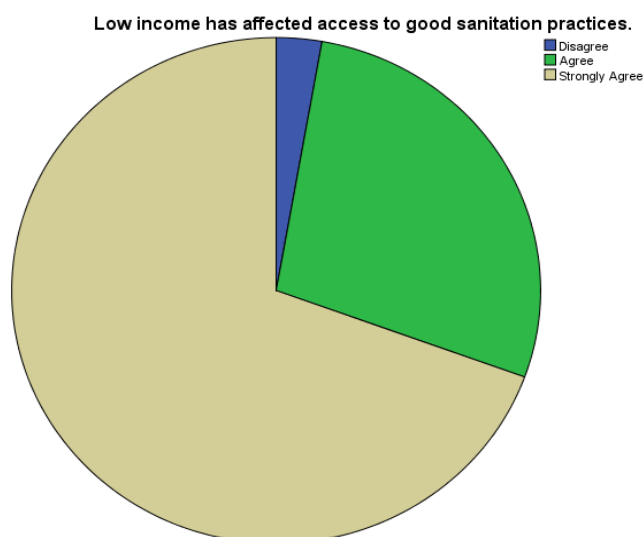


Figure 5: Low income has affected access to good sanitation practices

The findings as illustrated in figure 5 revealed that majority of the respondents (69.4%) strongly agreed that low income has affected access to good sanitation practices in households at Muchonoke Sub-location, 27.8% agreed and 2.8% disagreed.

Technology and food stability

Lack of agricultural mechanization has affected constant food supply

The respondents affirmed whether lack of agricultural mechanization had affected constant food supply in Muchonoke Sun-location. Responses were analyzed and summarized in table 9.

Table 9: Lack of agricultural mechanization has affected constant food supply

| | Frequency | Percent |
|----------------|-----------|---------|
| Disagree | 4 | 5.6 |
| Agree | 23 | 31.9 |
| Strongly Agree | 45 | 62.5 |
| Total | 72 | 100.0 |

It is evident from the findings that unavailability of agricultural mechanization has negative effect on constant food supply as 62.5% of the respondents strongly agreed and the other 31.9% agreed with our assertion.

As per the responses, it was deduced that the rural household farmers were unable to maintain a steady or constant supply of food as traditional

tools are used hence having minimal tillage which leads to less production of food.

Lack of Functional Irrigation System and Food Production in Dry Seasons

The respondents were asked to comment on the relationship between the lack of a functional irrigation system and its effect on food production during dry seasons.

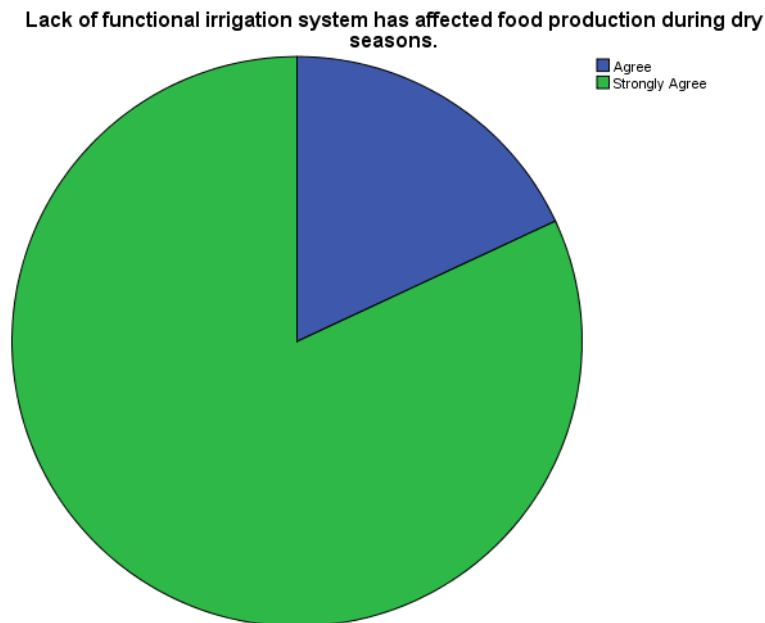


Figure 6: Lack of Functional Irrigation System and Food Production in Dry Seasons

From the data, as shown in figure 6, 90.3% strongly agreed while 9.7% agreed that without a functional irrigation system during the dry season, poor food production is exhibited hence a great risk of food insecurity.

From the results, it was established that the respondents greatly support the idea of having or establishing irrigation programs in the sub-location.

Insufficient skills and training on modern agricultural technology has affected food supply.

The respondents were asked to affirm whether lack of skills on modern agricultural technology has affected food supply.

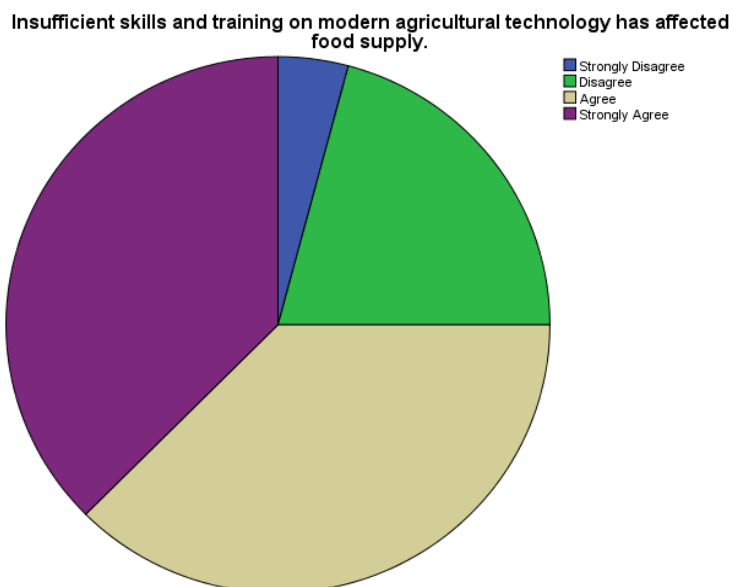


Figure 7: Insufficient skills and training on modern agricultural technology has affected food supply

As indicated in figure 7, 37.5% of the respondents strongly agreed and a further 37.5% agreed to the fact that insufficient skills and training on modern technology has impacted negatively on food supply. A total of 75% of the respondents agreed while 20.8% disagreed and 4.2% strongly disagreed. It can therefore be deduced from the analysis that training and skills in modern agricultural technology is a major factor towards achieving food security.

From the foregoing, it is important to note that technical skills and training in the use and utilization of new farming techniques. This is supported by

Stewart, R(2015) who states that Such interventions include training farmers and introducing them to new farming techniques and products, such as new crop types or fertilizers.

Low level of technology use in value addition has affected food preservation.

The respondents were asked to affirm whether low level of technology use in value addition affected food preservation. It was established that 80.6% of the rural house hold farmers were strongly in agreement with the assertion while 16.7% and 2.8% disagreed as shown in table 10.

Table 10: Low level of technology use in value addition has affected food preservation

| | Frequency | Percent |
|----------------|-----------|---------|
| Disagree | 2 | 2.8 |
| Agree | 12 | 16.7 |
| Strongly Agree | 58 | 80.6 |
| Total | 72 | 100.0 |

From the deductions, it is evident that agricultural technology is an imperative component in as far as food security is concerned as it enhances quality and value addition. This is well paraphrased by Kasturi, (2009) "Additional gains to food production and food security will come from newer processes and techniques developed recently due to

information technology, biotechnology and nanotechnology. It is important to educate people about these developments."

CONCLUSION AND RECOMMENDATIONS

The main objective of the study was to determine The Factors Affecting Food Security in Rural

Households in Kenya; A Study of Muchonoke Sub-Location, Embu County. The study specifically focused on climate conditions, infrastructure, technology and income and how these factors affected food availability, accessibility, stability and utilization in households in Muchonoke Sub-Location. The targeted population was 1,182 households. Sample size was 92 while respondents were 72. The data was collected by means of questionnaires and was then entered into the Statistical Package for Social Sciences (SPSS) software to enable the final analysis of the data. The descriptive statistics used in the study made use of statistical indexes such as frequencies and percentages. The analyzed data was finally presented in the form of figures, bar charts and tables in relation to each of the research objectives.

How Climate Conditions has affected food availability in rural households in Muchonoke Sub-location.

Climate change over the years has led to increased number of people at risk of food insecurity all over the world. This is according to a report of the Inter-Governmental Panel on Climate Change, (FAO, 2021).

Effects of high temperature on crop production

Majority of respondents (72.2 %) strongly agreed that temperature has had a high effect on crop growth and which in turn has interfered with crop production within the area. 26.4% agreed while 1.4% disagreed as shown in figure X. Based on the above findings, it is evident that high temperatures within Muchonoke Sub Location has greatly affected food security.

Extent to which lack of consistent rainfall patterns has affected availability of food throughout the year

Majority of residents (97.2 %) strongly agreed that inconsistencies in rainfall patterns has greatly affected the availability of food production. This is because farmers are not able to plan well on when to undertake specific farming activities that are dependent on rainfall.

Prolonged Dry seasons and potential to produce variety of food

Based on the above findings it is clear that farmers are limited on the type of crops they can produce and can only produce crops that are drought resistant to higher degree. This has affected the availability of certain types of food within the area which of certain nutrition values.

Pest infestation during dry seasons

The findings of the study were that 69.4 % of the respondents strongly agreed, 26.4 % agreed while 4.2% disagreed that pest infestation during seasons has affected crop production thus affecting its availability as shown in table.

How infrastructure affects food accessibility in rural households in Muchonoke Sub-location

According to Temu, (2020) in his Final Donor Report in Tanzania on 'Assessing Rural Services, Infrastructure and Their Impact On Agricultural Production, Marketing And Food Security In Tanzania' paraphrased it this way; "Notwithstanding the current debate on the relationship between investment in infrastructure and agricultural productivity, the study joins in its premise, Gibson and Rozelle (2003), Fan et al. (1999), and Wanmali and Islam (1995), who have shown positive relationships between public investment (Infrastructure) and agricultural growth."

▪ Poor state of road network affecting food access to and from the market

The findings revealed that 71% of the respondents strongly agree that poor state of road network on access to and from the market, 24% Agreed while 5% disagree. This is an indication that majority of the respondents understand the importance of good road network in relation to food accessibility.

▪ Lack of power connectivity affecting value addition thus interfering with attainment of processed food

On lack of power connectivity, 83% of the respondents strongly agree that it affects value addition and by extension interfering with the

attainment of processed food. Majority (83%) of the respondents understand the basic processes of value addition and how power is essential to the process.

▪ **Absence of storage facilities has affected ability to secure adequate food throughout the year**

From the findings 51% of the respondents indicated that they strongly agreed that absence of storage facilities within the area affects the ability to secure food throughout the year, while 29% agree and 20% disagree. The majority (51%) of respondents strongly agreed that during high production season, there is need to have a storage facility especially for the dry food.

Absence of functional irrigation network has affected production of variety of food

On the absence of functional irrigation network, 90% of the respondents strongly agreed that it has affected production of variety of food while 10% agreed. Majority of the residents engage in farming activities. Rainfall being a challenge in the area, the majority (90%) of the respondents indicated that supplementing the rainfall with functional irrigation systems will have a positive impact on the production of variety of food.

How level of income has affected food utilization in rural households in Muchonoke Sub-location

Poverty and hunger are a common phenomenon in Kenya especially in arid and semi-arid lands. According to a research carried out by Olielo in Kayole, Buruburu and Westlands in 2013 to assess consumption of foods and characteristics of various income groups and determine factors that cause food insecurity found that the low income group could not purchase adequate food and amounts they consumed did not meet the FAO recommended levels for foods and nutrients.

Low income affects food utilization in Muchonoke Sub-Location

The results reveals that a majority of the respondents (87.5%) strongly agreed that lack of stable income has affected ability to access quality

diet in households at Muchonoke Sub-location and a minority of the respondents (12.5%) agreed.

Low income has affected access to clean water for domestic use

The results show that most of the respondents, a sum of 57 (or 79%) strongly agreed, 14 (or 19.4%) agreed while one disagreed that low income has affected access to clean water for domestic use in households at Muchonoke Sub-location.

Inflation has affected ability to practice proper feeding habits

The findings revealed that majority of the respondents (87.5%) strongly agreed that inflation has affected ability to practice proper feeding habits (e.g. three meals a day, balanced diet, variety of meals) in households at Muchonoke Sub-location, 9.7% agreed and 2.8% disagreed.

Low income has affected access to good sanitation practices

The findings revealed that majority of the respondents (69.4%) strongly agreed that low income has affected access to good sanitation practices in households at Muchonoke Sub-location, 27.8% agreed and 2.8% disagreed.

How technology has affected food stability in rural households in Muchonoke Sub-location.

In order to raise crops productivity within their constrained environment (e.g. risks), farmers adopt multiple technologies jointly, both as complements and as substitutes. (Journal of Agricultural Economics: Kassie, et al 2014)

Lack of agricultural mechanization has affected constant food supply.

It is evident from the findings that unavailability of agricultural mechanization has negative effect on constant food supply as 62.5% of the respondents strongly agreed and the other 31.9% agreed with our assertion.

Lack of Functional Irrigation System and Food Production in Dry Seasons

From the data, 100% of the respondents cumulatively agreed that without a functional

irrigation system during the dry season, poor food production is exhibited hence a great risk of food insecurity.

Insufficient skills and training on modern agricultural technology has affected food supply.

The findings revealed that, 37.5% of the respondents strongly agreed and a further 37.5% agreed to the fact that insufficient skills and training on modern technology has impacted negatively on food supply. This is a total of 70% of the respondents who were in agreement.

Low level of technology use in value addition has affected food preservation.

It was established that 80.6% of the rural household farmers were strongly in agreement with the assertion while 16.7% agreed and 2.8% disagreed.

CONCLUSIONS

It was concluded that the effects of lack of adequate rainfall adversely affected food production thus a negative impact on food security in the area. It was also established that the long dry season due to inconsistent rainfall patterns in the area heightened pest infestation which reduced food production.

It was established that most roads in the area are dilapidated. This made it difficult for the residents to easily access the market for sale and purchase of food. It was noted that the area engages in traditional mode of farming, the use of hoes and animal harnessed power for farming. There was also minimal supplementing of rain by used irrigation, this affected the production of food.

It was further found out that most of the households in area did not have adequate stable income. Due to this, the residents were unable to get quality diet. There existed very low level of agricultural mechanization within the area.

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RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made:

- The County Government through its department of agriculture to expedite the establishment of an irrigation system so as to deal with the challenge of inadequate rainfall within the area. This will reduce dependency on rain fed agriculture and thus ensure food availability.
- The County Government through its department of infrastructure, transport energy and public works to accelerate the rate of road construction and maintenance thus enhancing food accessibility.
- The County Government through its department of trade and tourism to train residents on potential income generating activities like handicrafts and poultry keeping. This will lead to growth of income levels hence improve food utilization.
- The County Government through its department of agriculture to acquire agricultural mechanization equipment which can be leased to farmers at a subsidized rate hence boosting food stability.

Suggestions for further research

Based on the analysis and findings of this study, a number of avenues for further research on the factors that influence food security in households should be conducted in other regions that faces food insecurity.

This research proposed an in-depth research on the relationship between dry seasons and increased pests infest.

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