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INSTITUTE OF DIPLOMACY AND INTERNATIONAL STUDIES

MA RESEARCH PROJECT

**ASSESSMENT OF THE IMPACTS OF CLIMATE CHANGE AND VARIABILITY ON
FOOD SECURITY IN KENYA: A CASE STUDY OF KISII COUNTY**

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(IDIS), UNIVERSITY OF NAIROBI.**

NOVEMBER 2019

DECLARATION

This project proposal is my original work and has not been presented before to any university for academic award.

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DEDICATION

This research project is dedicated with love to my mother Margret Mugwika.

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I thank God for enabling me to complete my studies. I am particularly grateful and immensely indebted to my supervisor Dr. Chaudhry Shazia, who read each sentence in this project report, tirelessly critiqued my work progressively and gave me innovative suggestions to improve my project. If not for his significant guidance, it would have been difficult to complete this project. Thank you Madam, I'm greatly humbled by your support.

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ABSTRACT

With key focus on increasing rate of climate disintegration in Kenya, this study sought to examine the link between climate change and food insecurity with a specific focus of Kisii County. The study was guided by three objective namely; to assess the impact of climate change on food security in Kenya, examine the effectiveness of policies to counter food insecurity in Kisii County and lastly and determine the link between climate change and food security in Kenya. This chapter therefore, covers summary of the key findings, presents conclusion and recommendations flowing from the three key objectives that guided the study. The study has identified that, in Kenya food insecurity and conflict are the most immediate impacts of climate change which manifest in terms of shrinking water catchment, decreased and delayed rains, floods, extreme hot temperatures and drying of water points. The study has discovered that the impacts of climate change are not even across the globe despite that climate change is itself a global phenomenon which requires international cooperation in order to water down its impacts. The study has found that a number of policies have been developed to address food insecurity challenges in Kisii County as a result of climate change. The policies have registered varying levels of effectiveness in ensuring food security in the County. The National Agricultural Sector Extension Policy was formulated to respond to the challenges that traditional public extension programs was facing in providing extension services to farmers in Kenya. Under the guidance of the policy, commercial extension initiatives in Kisii County has expanded in many agricultural areas through extension officers and has seen an increase in food productivity in the region. The Root and Tuber policy is designed to stimulate demand for cheaper food alternatives like cassava, arrow roots, potatoes, and in the long term achieve food security in the country. Its implementation in Kisii County has seen a rise in production of roots and tubers and has in turn enhanced food security in the county. The agricultural sector is known to be sensitive to variations in rainfall and temperature patterns but the sector which is responsible for food production also contributes an estimated ten to twelve percent of greenhouse gases like carbon dioxide to the atmosphere. A number of studies indicate that climate change has affected agriculture and food security by shifting spatial and temporal distribution of rain, biodiversity, and terrestrial resources like water, and eventually impacting heavily on food security. With climate change, food security risks have multiplied because of the expected frequency and intensity of climate change related disasters and extremes. The effects of climate change are already evident in Kenya and surveys reveal that the national production of wheat and maize over the last two decades has declined, and that such a decline would not be witnessed if it were not for the effects of climate change.

CHAPTER ONE

INTRODUCTION AND BACKGROUND OF THE STUDY

1.0 Introduction

Globally today climate variability and change is generally accepted as the new normal. In national, regional and international discourses climate change presents grave risks it portends for life on earth. According to International Federation of Red Cross and Red Crescent Societies report, Climate change impacts are deep and broad and pose existential threat to humanity. Climate variability and change has impacted critical livelihood sectors especially in Africa. The foreseeable impacts on food security are more pronounced and spread in Africa where rain fed agriculture is largely the primary source of food and employment. Climate change ramifications in Africa add to worsening the region already home to civil wars and population target by extreme poverty. From erratic weather patterns that hinder food production to extreme heat waves and flash floods survival in the future will be difficult and costly¹.

Nakhooda and Norman assert that climate variability and change has manifested itself in radical disruptions of human livelihoods. It is a major challenge facing communities in Kenya. Climate change is progressively changing the traditional structural ways communities have relied upon for their upkeep. In fact there is shared concern that increasing climate variability and change inflict more suffering to poor communities who depend heavily on natural resources for sustenance have poor adaptive mechanisms and prone to droughts and flooding².

¹ International Federation of Red Cross and Red Crescent Societies (IFRC), (2014): Greening Kenya to address environmental sustainability and climate change.

² Nakhooda, S.; Norman, M. (2014): Climate Finance: Is it making a difference? A review of the effectiveness of Multilateral Climate Funds. ODI.

Many African countries their economies are dependent on agricultural related activities which will bear the full brunt of climate change. The magnitude of vulnerability by various economies will depend on readiness of communities to adapt the changing climate conditions. This implies that those not suited for progressive adaptations will perish and their production systems abolished. This scenario can roughly be equated to Darwinian survival for the fittest in evolution theory. Thus if climate change goes unmitigated the weak population largely in Africa will struggle to survive.

Climate change appears like a permanent problem since it is induced by human lead activities. This brings forth multiple uncertainties. Those human activities lead to piling up of greenhouse gases (carbon dioxide, methane, nitrogen oxide, hydro-fluorocarbons) to atmosphere. Anthropogenic emissions of carbon dioxide amount to 63% greenhouse in atmosphere. In Kenya the recorded $0.7^{\circ}\text{C} - 2.0^{\circ}\text{C}$ increase in temperature in past 40 years with erratic and unreliable rainfall has exacerbated water scarcity, scant pasture maturity and poor harvests. These combined outcomes translate in poor food production, disrupted incomes and weak health systems all epitomized in Africa³.

Climate change will affect all four dimensions of food security, food availability, food accessibility, food utilization and food systems stability. It will have an impact on human health, livelihood assets, food production and distribution channels, as well as changing purchasing power and market flows. Its impacts will be both short term, resulting from more intense extreme weather events, and long term caused by changing temperatures and precipitation patterns⁴.

³ Republic of Kenya, (2013): National Climate Change Action Plan 2013-2017, Vision 2030.

⁴ FAO, (2014): Transitioning towards CSA in Kenya.

Due to general impacts of climate variability and change there have been incidences of conflict. This is in Kenya has been witnessed in partial communities in northern Kenya who constantly fight over dwindling pasture and watering spots for their livestock. Furthermore, the most vulnerable in society (women, children elderly and disabled persons) are primarily strained, as strong people in community (i.e men and youth) move to cities and towns in search of better livelihoods.

The study will therefore aim to document the impact of climate change on food security in Kenya with key emphasis on Kisii County. The study will further aim to actualize critical adaptations mechanisms that agricultural communities in Kisii County can rely upon as climate change plagues them year after year.

1.1 Statement of research problem

Human led activities are documented to be key phenomenon in effecting climate change. Overdependence in fossil fuel, deforestation and modern commercial agricultural practices are predominant causes of climate change. Rapid deviations in precipitation levels, increment in temperature extreme and flooding at coastal lands will bring forth direct and indirect impacts in Africa. Due to economic underdevelopment in Africa it is highly vulnerable to impacts of climate change with possibility of reversing gains on food security and human health⁵.

Wandera argues that Kisii county in Kenya presents a classical example of a community whose sustenance is wholly dependent on agricultural activities which greatly impacted by climate change and variability. Over 95% of Kisii County residents are mixed farmers. The main crops produces in the county include maize, bananas, beans, potatoes, tea, sugarcane coffee and

⁵ Wandera, S. (2012): Food security and climate change – What food crop to count on? In The East African SusWatchdog 1(2).

horticultural crops. Whereas main livestock breed dairy cattle and Zebu, goats, sheep, donkeys and poultry, much of wheat is produced is directly consumed in the county.

Huho and Mugalavai observe that Kisii County is densely populated with average farm sizes ranging from 0.5 – 4.5 acres. These small divisions are not economically viable as modern agricultural practices cannot be employed there. This poses serious implications on county food security. The biophysical environment has been adversely affected leading to massive loss of soil fertility⁶.

There is unreliable rainfall which has halted the usual planting patterns. Farmers are left stranded as to when to plant. There is occurrence of heavy rainfall bringing flooding which makes food crops rot in the fields. These floods furthermore destroy infrastructure and sometimes injure people. During water scarce period there is severe scarcity of fodder and water stress which makes animals unproductive with less milk and meat.

Convoluting impacts of climate change and variability has brought to life new sources of conflict. This threatens social cohesion that communities in Kisii have enjoyed since prehistory. Other reinforcing factors include human diseases such as HIV/AIDs.

The adaptive mechanisms the rural communities employ depend on livelihood alternatives and strategies that they embrace. These include human, social, financial, natural and physical resources and their ability to use it to increase their resilience as well as the institutional support accorded to them. However, challenges still remain.

1.2 Research Questions

1. What is the link between climate change and food security in Kenya?

⁶ Huho, J.M.; Mugalavai, E.M. (2010): The Effects of Droughts on Food Security in Kenya, (The International Journal of Climate Change: Impacts & Responses 2(2))

2. What are the impacts of challenges of climate change on food security in Kenya?
3. How effective are the policies to counter climate change led food insecurity in Kisii County?

1.3 Research Objectives to:

This study broadly seeks to assess the impact of climate change and variability on food security in Kenya. A case study of Kisii County. The study specifically seeks to:

1. Assess the impact of climate change on food security in Kenya.
2. Examine the effectiveness of policies to counter food insecurity in Kisii County.
3. Determine the link between climate change and food security in Kenya.

1.4 Theoretical Literature Review

This section discusses the theoretical debate relevant to the study.

1.4.1 Copenhagen School of Thought

The securitization theory of Copenhagen school was started by Buzan, Weaver, and De Wilde. It was developed in early 1990s after the end of cold war. A key contribution is that it moves the referent object from the state to the individuals. They think security in terms of sectors it grew during the late decade of cold war as new issues were added to military and political agenda. This was also stimulated by the rise of the economic and the environmental agenda in international relations during 1970s and 1980s and later by concern of identity issues and international crimes in 1990s. The development gave rise to debate whether to broaden or narrow the term security. The use of sectors was introduced to help the scope of the security inquiry to more manageable proportions by reducing the number of variables at play. For Copenhagen school referent object is open to individuals, social groups, and other humanity as opposed to

being limited to state. They actually deepen and widen security studies agenda both horizontally and vertically⁷.

For Buzan security is pursuit of freedom from threats, he also argues that security rests neither with objects nor with subjects but among the subjects⁸.

The Copenhagen school stresses that due to change in political structure there were emergence of new threats which needed not traditional approach of realist (military approach to threats)⁹.

This was well broadened by the 1994 UNEP report which categorized human security into seven sectors which include food security, personal security, health security, environmental security, political security, economic security and finally community security. According to UNDP food security means that people should have at all-time have economic and physical access to basic food. This definition makes food to be an entitlement meaning people should have food by planting it themselves, buying the food through their own means or gets food through public distribution programs. This makes food security a necessary condition for security. The threat to food security is mainly due to poor distribution of food which makes some areas to lack food and food security can be as a result of total lack of purchasing power despite food itself being available¹⁰.

In Africa, the UNDP specifically views sub-Saharan Africa as the most food insecure region of African with many starving or at imminent danger of starvation. In this region, people go hungry not because food is unavailable but because they cannot afford it at all.

⁷ Ole weaver concepts of security PhD dissertation university of Copenhagen (1997) : 114

⁸ Ibid

⁹ Buzan burry. (1991), "New patterns of global security in the twenty first century". International affairs. (Royal institute of international affairs 1944) 67.3 (1991). 431-451.

¹⁰ UNEP Global Environmental Alert Service (GEAS), (2011): Food Security in the Horn of Africa: The implications of a Drier, Hotter and More Crowded Future.

1.5 Literature Review

This study reviews both theoretical and empirical literature. Theoretical literature is important because it has been used to examine the key debates on climate change impacts on food security. Empirical literature is equally important for this study since it has been used to help identify the key knowledge gaps in the whole concept of impacts of climate change on food security.

1.5.1 Empirical literature Review

Empirical literature seeks to review the three objectives of study thematically. This includes assessing the impact of climate change on food security in Kenya, to examine the effectiveness of policies to counter food insecurity in Kisii County and finally to determine the link between climate change and food security in Kenya.

1.5.2 Impact of Climate Change on Food Security in Kenya

In 1986 World Bank defined food security as access by all individuals consistently to enough food for dynamic and solid life. The definition is further broken down into availability, accessibility, adequacy, acceptability and agency. Patel, Mbagaya and Imo posit that the world has been faced by perennial food insecurity as a result of adverse climatic change. The climate change is closely linked to desertification as well as increased arid and semi-arid land which used to support farming and pastoralism. For example, over 70% of land in Kenya is unsuitable for agriculture unless irrigation schemes are initiated¹¹.

There is barely any part of human life which is not affected by climate change, and some of its impacts are already being felt. For Example healthy environment is one of the key elements of development. The impact of climate change is highest felt on the less developed countries that

¹¹ Patel, P.N.; Mbagaya, G.M.; Imo, B.E. (2012): Impact of climate change on food and nutrition security in Kenya, International Journal of Current Research 4(1), pp. 242-248.

mostly depend on agriculture as their primary source of income. Ministry of Agriculture report of 2009 this is because they produce more than they can consume in order to sell the surplus. The horn of Africa has been the hardest hit by the environmental changes manifested in form of high temperatures, decreased rainfall, and change of rainfall pattern, increased storms and depletion of pasture as well as water points. This Phenomenon has affected the livelihood of pastoralists more than any other community. This is because just as the keeping of the livestock is directly linked to climate, the livelihood of pastoralists is directly linked to the livestock as the only means of food and source of money. This means that any adverse climatic change in the region has got a direct negative impact on human security. The lack of rainfall leads to direct threat on food security, however any threat on one human security like food insecurity will simultaneously lead to threat on other sectors of human insecurity like economic security and personal. Human security is a complex web of many issues altogether and all sectors of human security are linked together meaning they are inseparable¹².

Climate change is one of the main issues of international concern. This is because climate change has got no boundaries and impacts can be felt in distant localities. The difference only lies on the severity of the problem and the population it affects. Africa and especially the horn of Africa sub-region has the highest upsurge of the population and is also the hardest hit by the climatic and unfavorable weather conditions. This region has the highest number of malnourished population and with fewest means to adapt to changes on climate.

According to Bounoua Egypt is one of the countries which have been faced by food insecurity due to climate change. For instance Egypt has already lost about 15% of its wheat production due to increased temperatures; the same condition is also being experienced in Morocco which expects

¹² Ministry of Agriculture (2009). Kenya Agricultural Sector Data Compendium, Vol. 2 - Crop Production.

to lose a large percentage of their wheat production before 2030. Currently the North of African countries import wheat. This makes these countries to be vulnerable to price shocks, shortage of rainfall and droughts occurring elsewhere. Since agriculture in the horn of Africa depends on the rain, it makes this form of agriculture is extremely vulnerable to climate change¹³.

Agricultural sector employs more than 65% of African population and contributes to 32% of their GDP. This clearly illustrates the wide reaching impacts of climate change to this population¹⁴.

Kenya has recently faced a drastic change on rainfall pattern. This has led to persistent droughts which is a threat to agriculture and keeping of livestock. The local ecosystems have collapsed due to the negative impacts of deforestation, land degradation and climate change¹⁵. One main concern in Kenya is that climate change is outpacing our efforts to address it hence the situation will only deteriorate since many decision makers do not realize this danger.

According to Gitahi, in the past six years, rainfall in Kenya has been below average, complicating the survival of many people livelihoods and economic development. This is because agriculture is major source of survival in Kenya and the sector is anchored on availability of rainfall. Gatahi specifically argues that there has been a decrease of nearly 20% of precipitation as compared to levels 20% years ago¹⁶. In Kenya, hunger and resource wars are immediate hazards. For instance, Kenya Red Cross argued that more than 3.4 million Kenyans are facing drought and starvation of which 241,000 of them are at Coastal region. Kenya is

¹³ Lahouari Bounoua , (2015), “Climate Change is Hitting African Farmers the Hardest of All” Supervisor, AST Remote Sensing; Senior Scientist , NASA. P-1.

¹⁴ Ibid. P-4.

¹⁵ Ibid P-2.

¹⁶ Gatahi M. Karanj. (2018), “Kenyans to Battle Severe Climate Change Effects” Kenya heating up year after a year and all projections indicate that things are about to get worse. Published by Researchgate Journal. P, 3.

currently facing bare consequences of environmental destruction. UNEP reports that climate change is already causing more than 400,000 premature deaths annually across the world¹⁷.

According to Tom Climate change is real and the earth is warming but the general population has a much distorted perspective on this topic. The hardest hit by climate change is horn of Africa region. This scholar views climate change as the atomic bomb of today due to its impacts. Global polls show that climate change is people's lowest priority, far behind health, education and security¹⁸. In Kenya there is unfolding reality of climate especially regarding rains. It does not rain when it usually does, and when it does rain, it floods, hence this hurts farmers most. This has made the country to be almost unable to feed itself given the prevailing past 2 degrees of global warming already.

According to FAO report climate change impacts all four dimensions of food security which include food systems stability, food utilization, food accessibility and food availability. Food insecurity will actually impact on human health¹⁹.

According to Jeff the most catastrophic climate change impact in Kenya is increase in food insecurity. According to Jeff, climate change has reduced crop yields an issue which has led to serious consequences²⁰. According to Ian, climate change has made soil to be destroyed at an alarming rate. The fisheries are getting currently affected by the crucial temperature changes which trigger major shifts in the availability and different types of fish species and other aquatic sea foods in Kenya²¹.

¹⁷ Forbes Magazine, Quora contributor on "The Impacts of Climate Change That WE Are Already Experiencing". Published in 2017. P-2.

¹⁸ Tom Watkins. (2019). "The harmful effects of global warming". Published by researchgate. P,3.

¹⁹ FAO 2008 report on food security and climate change.

²⁰ Jeff Jim, (2016), "Global Warming and Food insecurity in Africa". Loss of Agricultural Land. Oxford Publishers. Oxford. P-23.

²¹ Ibid P-4.

According to Ruth, Kisii County was one of the areas with fertile soil and predictable rainfall pattern; however the region has been facing droughts due to limited and unpredictable rainfall pattern which has led to decreased crop production. In addition, the sub-division of agricultural land in Kisii is now a major threat to food production and security in the region²². Ruth also argues that land fragmentation is also another major challenge to efficient food production. Continued sub-division of land has led to food crisis in Kisii.

A study conducted by African Women Studies Centre (AWSC), Kisii County is increasingly food insecure with most of the population having no food at all. This meant that people slept hungry due to lack of food. The study also illustrates that 41.2% of the total population in Kisii County is chronically food insecure. The study also indicates that there is more food insecurity in those houses headed by women than those headed by men in Kisii. Among many other factors like land fragmentation, high cost of farm inputs, poor preservation and lack of storage of food, climate change was specifically noted as one factor contributing to food insecurity in Kisii County²³.

1.5.3 Effectiveness of Policies to Counter Food Insecurity in Kisii

According to intergovernmental panel on change in climate (IPCC), there is dire need to adopt measures to mitigate prevailing negative climatic conditions. Climate change is a very hard problem, it requires all the countries to work and make bold policies to impact the earth in a positive way. But it is impossible expect the world to change for good without individuals thinking and contributing their effort in the meaningful way. There is need of taking responsibility for all our day to day actions and put efforts to reduce our carbon footprint.

²² Ruth Mbula. (2017), "Food insecurity fears as land division eats into agriculture". P-1.

²³ African Women Studies Centre (2015), "Food Security Research Findings and Recommendations for Kisii County" A report published in 2015 with support of National Treasury, Government of Kenya. Published by University of Nairobi Press. P-5.

According to John one of the best ways to address the issue of food insecurity in the world is to deal with the underlying causes of climate change which is threat to agriculture as it creates unpredictable and adverse weather conditions. The major cause of global warming or rise in temperatures is due to increase in greenhouse gas emissions like carbon dioxide, methane and ozone.

The largest percentage of greenhouse gas is brought about by consumption of fossil fuels which is the main source to cater the energy demand. This is the main issue which needs to be addressed. Another way to address climate change according to John is to ensure trees are planted in order to deal with deforestation issue because trees help in absorption of carbon dioxide which is harmful to ozone layer and in other cases leads to production of acidic rainfall²⁴. One of the other main way individuals can contribute towards combating of climate change is talk about it. This is because most people are still unaware of agency of the issue. So, bringing up conversation about climate change could lead to ripple effect and probably the highest change.

UN environment campaigns globally for use of new technologies as well as renewable energies as way of combating climate change. There is also the new of UN environment of “changing the finance, financing the climate”. Climate finance is actually pooling of financial resources together in order to mitigate climate due to major investments needed to counter climate change. For instance critical investments are needed in the area of reducing emissions of greenhouse gases. Climate financing is aimed also to help countries to adapt to the erratic climatic effects and reduce its impacts such as food insecurity²⁵.

²⁴ John Fiinovation, (2017), “Solutions For Climate” A Global CSR Consultancy Firm. P-2.

²⁵ United Nations Environment Campaign on Climate Finance.

Effective management of food security involves management of the factors which contribute to climate change. This will eventually reduce the risks which climate change possess to the human livelihood such as food insecurity. The need of devising strategic approaches to deal with different dangers posed by climate change on ecosystems is of necessity. FAO also advocates for the people who are facing dangers of climate change like food insecurity to change the consumption habits and change the way they practice agriculture. This includes planting crops which are more resistant to droughts make use of them as their main food because it can be grown locally²⁶.

According to Tom, changing from rain based agriculture to the irrigation based agriculture could also mitigate the impacts of climate change on food security and global food supply. Another key concern should also be drawn into proper management and conservation of livestock; this is because there are communities which depend entirely on livestock as their source of income and food like pastoralists who populate the largest part of horn of Africa region. In this case FAO advocates gradual changes in livestock production such as reducing the numbers of livestock to the level which can be sustained by the environment which involves the amount of grass available, land as well as the water points. In addition, FAO has also campaigned for pastoralists to practice agro-pastoralism. This has made some pastoralism to deviate from completely relying on livestock to practicing some form of agriculture hence this strategy has reduced the mobility of pastoralism from one place to another an issue which has been attributed as the underlying cause of conflict among the pastoralism communities not only in Kenya but in the whole African continent.

²⁶ Ibid, P-2.

Despite the fact that FAO has succeeded in encouraging pastoralism communities to reduce their livestock to manageable level and practice some form of drought resistant crop farming. Many pastoralists still believe on keeping large amounts of livestock which is a threat to their food security. For instance the case of hunger and death of Turkana livestock is as result of environmental pressure because climate change has reduced the numbers of the livestock which sustainably be managed on a given parcel of land.

Article 43 (1) (c) of the Kenya Constitution advocates for zero tolerance to hunger as a basic human right²⁷, however implementation of this article has not been successful as some regions of Kenya are still food insecure like Kisii County. In 2011the the government of Kenya developed what is currently called National Food and Nutrition Security Policy (FNSP). The aim of this policy was to offer support and help in effective implementation of existing strategies to address issues of food insecurity and malnutrition in Kenya. This policy was developed out of the fact that the existing strategies were inadequate to address issues of malnutrition in broad, therefore there was a need of all-embracing policy to incorporate the existing food and nutrition initiatives in Kenya²⁸. Vision 2030 is one of the long-term plans of Kenya to eradicate food insecurity through development of key infrastructure and economic development²⁹.

Another institution established as part of strategic efforts to cater for food security is Kenya, Agriculture and Fisheries Authority (AFA). This body was developed by Kenyan parliament in order to help in preservation and utilization of agricultural land. It also helps Counties to adopt best method in preservation of crops as well as offering advice on better methods of grading and

²⁷ Constitution of Kenya Article 43 (1) (c).

²⁸ Ibid, P-21.

²⁹ Kenya Vision 2030. P-12.

crops which fit the soil and climate depending intensity of rains³⁰. The study for African Women Studies Centre proposed various measures to address the issue of food insecurity in Kisii County which includes: Subsidization of roofing materials and water tanks for water harvesting, the harvested water could be used for agriculture through irrigation of vegetables. Secondly, the study advocates for use of extension officers to train farmers of better farming practices, use of artificial insemination, use of improved crop seeds, use of better pesticides and fertilizer in order to boost productivity, economic empowerment of youth, support program for the poor people, provide ready market for farm produce in Kisii, start irrigation schemes and improve the infrastructure.

1.5.4 The Link between Climate Change and Food Security

Agriculture, fishery and forestry are the main source of food for human consumption. Agriculture is highly sensitive to climate change. Changes in climate have led to decrease on production of food, increase in food prices and loss of income from the farm as well loss of farm land and food safety is compromised due to water pollution. According to Wheeler, the heat wave of Europe on 2003, where the temperatures ranged 6 degrees Celsius and above, production in crops significantly went down. For instance Italy lost 35% of its maize production; subsequently 25% of fruits were lost. In the case of France 30% of forage was lost. The increase in intensity and occurrence of storms has had alteration of hydrological cycles, as well as variance in precipitation which has negative implications on agro-systems and for food productivity on the world in long-term³¹.

³⁰ Kenya Agriculture and Fisheries Act of 2013. P-3.

³¹ Wheeler, T. Crauford. (2000). "Temperature Variability and the Yield of Annual Crops" Agriculture, Eco-systems and environment. PP,123-124.

Climate change has led to degradation of natural resources such as water which is a key resource for livelihood. In many cases competition over limited resources has contributed to conflict especially over water, pasture and land in Horn of Africa sub-region. Conflict on scarce resources impairs food production as well as access to food on conflicted areas. According to Williamsom, prolonged drought and deforestation increases chances of loss of vegetation, for instance in case of fire drought, grass for livestock is completely lost and also wood for firewood is lost³². For instance this year Mt. Kenya forest lost a huge vegetation cover due to severe forest fire. In Africa and especially in Kenya and Somalia, drought has a significant impact on livestock because pastoralists normally lose a lot of livestock during drought season.

Fischer argues that FAO research indicates that the effect of climate deterioration on world crop production will be small up to 2030. However FAO stipulates that after 2030 and onwards there will be a drastic decrease on potential productivity of crops. The most severe impacts of climate change on food production will be felt in Sub-Saharan Africa which has the lowest mechanisms and strategies to adapt to the world climate change. On other ways climate change also impact on food accessibility through increase on prices of food. This because most of food and especially in urban centers is not produced by household, what they do is just to buy from farmers. Climate change has a potential to diminish and increase price of certain food products as well as decreasing income generation and thereby decrease the ability to afford daily meal. When high prices brought about by climate change make food unaffordable people will definitely get

³² Williamsom, A, Turton. (2001), "The Construction of Knowledge and Climate Change Debate". A perspective from the developing South. Paper prepared for a summer school course on Global Climate Change and Impact on Natural Resources. Candriari, Italy, International School on Disarmament and Research on Conflicts. P-133.

malnourished and this has an impact on health of people of which to some extent it could be a death sentence to many³³.

Howden posits that climate change has been closely associated with vector diseases and new worms which destroy crops, plants, animals and affect human beings. This new diseases have led to new threats on food security, safety of food and eventually human health is endangered. Climate change could also change the sociocultural patterns of food productions and consumption. This because when the climate changes crops planted could. For instance in the extension officers advise the farmers to plant the seeds which are more resistant to droughts and can survive of averagely short rains. This means that when people change what they plant they also change what they consume for it much with their farming practices³⁴. Climate change is one of the contributors of the food insecurity in Kisii county and Kenya at large. In Kisii the quantity of crop production has immensely declined.

1.6 Literature Gap

The study has noted the following gaps in the literature review. Firstly Kisii County is relatively a new focus of research on matters of food security. This is because Kisii has been one of regions of Kenya with good climate and experienced enough conventional rains due to its proximity to the Lake Victoria. Therefore is very little literature focusing on the matters of food insecurity specifically in Kisii County. In addition the study has also found from literature reviewed that there are very little studies on the area of impacts climate change on food security. Climate

³³ Fischer, G. & Livermore, M. (2006). "Climate change and world food security": A new assessment. *Global Environmental Change*. PP-36-39.

³⁴ Howden, M. Jones (2000). "Carbon sequestration in Australia's rangelands.*Proceedings workshop*": *Management options for carbon sequestration in forest, agricultural and rangeland ecosystems*. Canberra. CRC for Greenhouse Accounting. P-46.

change decreases food production hence making the prices of maize and maize flour so expensive to be afforded by some people. This is so people may sleep hungry not because there is no food but because they cannot afford it.

The study has also noted that human security being a relatively new focus area, there is little theories and scholarly debates linking the concept of broadened human security to gradual deterioration of the environment.

1.7 Research Hypothesis

The research is based on the following hypothesis.

H1: There is a linkage between climate change and food security in Kenya.

H2: Climate change impacts food security in Kenya.

H3: The policies to counter food insecurity are ineffective in Kisii Kenya.

1.8 Justification of the Study

The research findings will be significant in informing policy makers about the problem of climate change and its impact on food insecurity in Kenya and more specifically in Kisii County.

This is because unless climate change is mitigated, its impact on food security could easily escalate to national disaster affecting other sectors of security as well as economy of the country.

This study is important as it will generate new literature for the academicians in the subject area of climate change and food security. The study will also facilitate policy adjustment by policy makers on efforts to mitigate the negative impacts of climate change and its impacts on food security in Kenya.

The concept of human security has many stakeholders and the perception of presence or absence of human security has a huge bearing on the future of the country. It is important to assess whether the country is headed in the right direction in matters of human security that impact the general wellbeing of the country especially the issue of food insecurity and its nexus with deterioration and downgrading of climate . The information that the current study seeks to gather will shape public opinion on food security which has a significant influence on the country's cohesion and in addressing a common threat that literally affects all spheres of life especially on underdeveloped world. The citizens of Kenya need short and long term assurances of food security and elimination of threat of climate change to their life.

1.9 Theoretical Framework

The theoretical framework of the study is extracted from the Copenhagen school of thought which has also been examined on the literature review. This study will use securitization theory for theoretical framework as discussed by Copenhagen school.

1.10 Securitization Theory

The securitization theory of Copenhagen school was started by Buzan, Weaver, and De Wilde. It was established in early 1990s after the end of cold war. A key contribution is that it moves the referent object from the state to the individuals. They think security in terms of sectors it grew during the late decade of cold war as new issues were added to military and political agenda. These new issues included food security as well, even though it was well captured by the UNDP report 1994 which established the seven categories of human security. This was also stimulated by the rise of the economic and the environmental agenda in international relations during 1970s and 1980s and later by concern of identity issues and international crimes in 1990s. The

development gave rise to debate whether to broaden or narrow the term security. The use of sectors was introduced to help the scope of the security inquiry to more manageable proportions by reducing the number of variables at play. For Copenhagen school referent object is open to individuals, social groups, and other humanity as opposed to being limited to state. They actually deepen and widen security studies agenda both horizontally and vertically³⁵.

For Buzan security is pursuit of freedom from threats, he also argues that security rests neither with objects nor with subjects but among the subjects³⁶. This school advocates for security from freedom from fear, from want and to live a dignified life.

1.11 Research Methodology

This section covers the methodology that has been used in carrying out this study. Data sources and data collection methods, research design, research site, and data analysis are also discussed.

1.12 Research Design

This study was to a large extent be anchored on qualitative research design. According to Mugenda and Mugenda,³⁷ qualitative research design is a scientific method which involves observing and describing the behavior of a subject without influencing it in any way. Many scientific disciplines including psychology which is one of the social sciences fields use this method to obtain a general overview of the subject. This design is used to describe characteristics of a population or phenomenon under study. It does answer questions about how, when, why and where the characteristics occurred³⁸.

³⁵ Ole weaver concepts of security PhD dissertation university of Copenhagen (1997) : 114

³⁶ Ibid

³⁷ Mugenda and Mugenda (1999)

³⁸ Shields, Patricia and Rangarjan, (2013) "Research Methodology". P-4.

1.13 Research Site

The study site was conducted at Kisii County in Kenya. Kisii is one of the Upper Midlands ecological zones of Kenya which is in the South East Part of the Lake Victoria. The capital city is Kisii town. Kisii town is the main commercial center with many organizations, government offices and learning institutions. Kisii County is sub-divided into 9 constituencies which include; Bonchari, Bomachoge, Nyaribari Chache, South Mugirango ,Bomachoge Borabu, Bomachoge Chache, Bobasi, Kitutu Chache, Nyaribari Masaba. The data will be sampled from each the Kisii constituency which are highly inhabited by Gusii people. The total population of Kisii County is 1,152,282 covering a total area of 1,317.9KM Sq.

Kisii County is within latitude of: 0° 41' 0 S and longitude: 34° 46' 0 E, The county has a highland climate and usually receives rain throughout the year because of its proximity to the Lake Victoria lake basin and the deeply foliated Kisii highlands. Kisii County receives two seasons of rain, short rains which is between September-November and Long rains between February-June producing 1,500 mm rainfalls per year with temperatures ranging from 16⁰C to 27⁰C³⁹.

1.14 Study sample

Kisii County has a population of 1,152,282. Therefore collecting data from the whole population is highly impossible. This necessitates adoption of a sampling technique in order to extract a sample which will represent the entire population.

For the purpose of this study the number of respondents will be determined using this formula adopted from Mugenda & Mugenda (1999) when population is more than, 10,000.

$$n = \frac{Z^2 pq}{e^2}$$

³⁹ Ibid, P-13.

$$d^2$$

Where:+

n = the desired sample size

z = the standard normal deviate at the required confidence level

p = proportion in the target population estimated to have characteristics being measured.

q = 1-p

d = level of statistical significance set

$$n = \frac{(1.96)^2 (.50) (.50)}{(0.5)^2}$$

$$(0.5)^2$$

$$= 384$$

Sample design to be represented by this table.

Constituency	Population	Sample size	Sample procedure
Bobasi Constituency	190,077	45	Simple random sampling
Bonchari Constituency	114,615	40	Simple random sampling
Bomachoge Borabu Constituency	107,199	42	Simple random sampling
Bomachoge Chache	93,530	42	Simple random sampling
Kitutu chache North Constituency	103,849	44	Simple random sampling
Kitutu chache South Constituency	132,131	40	Simple random sampling
Nyaribari Chache Constituency	129,745	42	Simple random sampling
Nyaribari Masaba Constituency	122,087	44	Simple random sampling
South Mugirango Constituency	159,049	45	Simple random sampling
TOTAL	1,152,282	384	

1.15 Data Sources and Data Collection Methods

Data are facts presented to the researcher from the environment under the study. This research study relied mainly on primary data. Primary data is sought for its proximity to the truth and its control over error⁴⁰. This method is appropriate in capturing the relevant experiences and attitudes as presented primarily by the population. Such information is invaluable to a research that is investigating the impacts of climate change on food security in Kenya and more specifically Kisii County. A self-administered structured questionnaire, consisting of both open ended and closed ended questions was used. The questions were designed to elicit specific qualitative and quantitative responses. A cover letter was obtained from University of Nairobi to enable the administering of the questionnaire.

The study utilized both primary and secondary data. Primary data was collected through interviews, observation and questionnaires. Secondary data was derived from scholarly articles about situation of human security and especially on food sector in Kenya. Academic articles were sourced from, journals, newspaper and web links. The emerging theme will be carefully analyzed. The research was also conducted with ethical consideration that maintains high standard of morals, integrity and privacy.

1.16 Data Analysis

Data analysis is a process of systematically applying statistical or logical techniques to describe, illustrate or evaluate data. Since this study will employ both qualitative and quantitative research method, the emerging data was analyzed by use of SPSS, Excel and content analysis. As such, the questionnaires which was be received from respective respondents for analysis of the responses acquired. The resultant conclusions drawn from the analysis of the responses was

⁴⁰ Cooper, R., & Schinder, S. (2013). *“Business Research Methods”*, New York: McGraw Hill. P-39.

compared to the objectives with a view of establishing if the objectives of the study were realized or not. The collected data was systematically organized, edited and entered. Also, consistency and uniformity in data collection and completeness of information was checked. Data collected will then then be organized and analyzed to enable meaningful analysis of data distribution by use of tables.

1.17 Chapter Summary

This research paper seeks to establish the impacts of climate change on food security in Kisii County and more specifically Kisii County. Climate change is a global issue of which its impacts know no boundary. Climate change though to a large extend is blamed on human activities, it is globally unwelcomed visitor though it has not still prioritized depending on its impacts on humanity. Chapter one has provided the historical background of climate change and its impacts on food security. Similarly, the chapter did also provide a literature review based on the three objectives of the study which include: To assess the impact of climate change on food security in Kenya, to examine the effectiveness of policies to counter food insecurity in Kisii County and lastly, to determine the link between climate change and food security in Kenya. The chapter has also provided knowledge gap, hypothesis of the study, theoretical framework and the methodology of the study.

Chapter two is based on objective number one which is to assess the impact of climate change on food security in Kenya. Chapter three is anchored on the objective two which seeks to examine the effectiveness of policies to counter food insecurity in Kisii County and lastly chapter four will be aligned with objective number three which is to determine the link between climate change and food security in Kisii. Chapter five covers the recommendation, findings and conclusion of the study.

CHAPTER TWO

DETERMINING THE CHALLENGES BETWEEN CLIMATE CHANGE AND FOOD SECURITY IN KENYA

2.0 Introduction

Kenya is encountering major problems in its efforts of becoming food secure because of climate change. The problems associated with climate change are emerging today and are set to intensify in the coming decades. The country is already experiencing temperatures that are higher than usual, longer drought periods, unreliable and inadequate rains, and unpredictable weather patterns. Natural resources like water have become scarce and there is a sharp change being witnessed in climatic conditions that is putting food security at risk. Food consumption is rapidly surpassing food production due to an increase in population at a time when Kenya is facing climate change challenges. Climate change and food security have become intrinsically interlinked and this chapter aims to determine the link between climate change and food security in Kenya.

2.1 Demographic Characteristics of the Study Population

This section presents demographic characteristic of the respondents

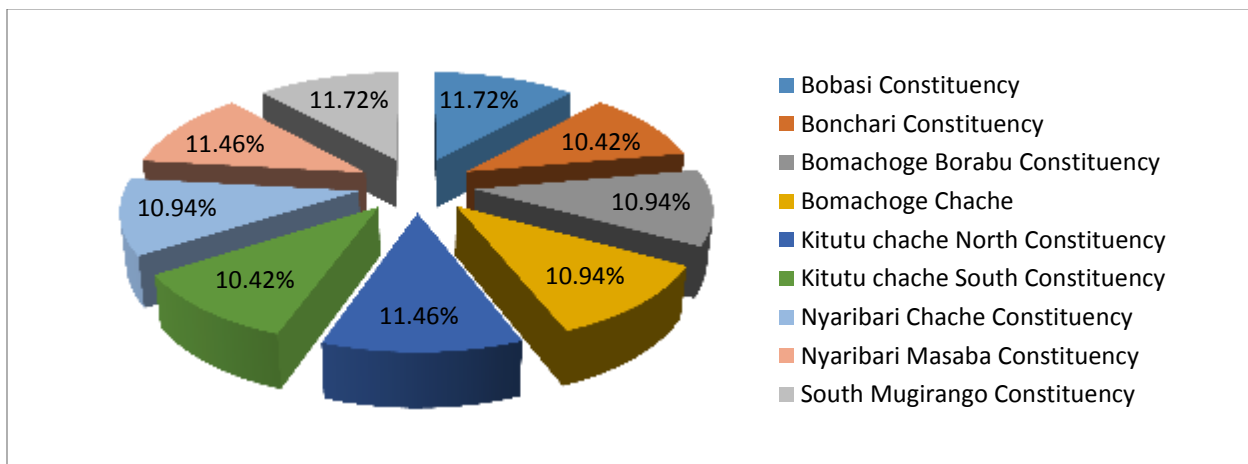


Figure 2.1: Demographic Characteristics

Source: Researcher, 2019

The study conducted primary data by sampling respondents from all the Kisii County constituencies. The highest number of respondents, 11.72% of the total number of respondents were from South Mugirango and Kitutu Chache North Constituencies. The two constituencies have the highest population in Kisii County. 11.46% of total respondents were from Nyaribari Masaba Constituency and Bobasi Constituency. 10.94% of respondents were from Nyaribari Chache, Bomachonge Borabu and Bonchari Constituencies. 10.42% of total respondents were from Kitutu Chache South and Bomachoge Chache Constituencies.

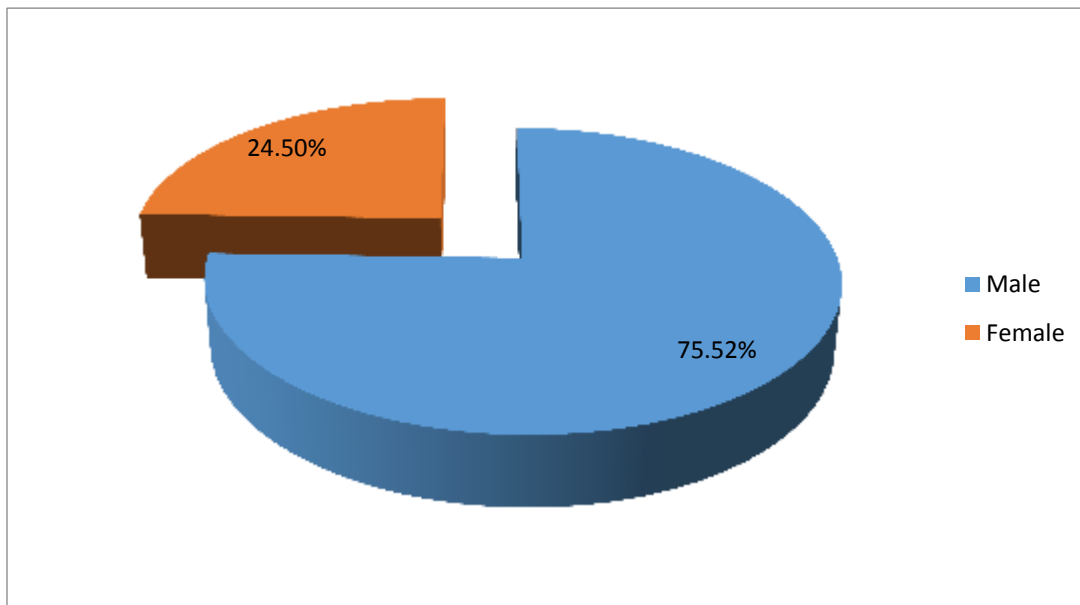


Figure 2.2: Gender Representation

Source: Researcher, 2019

The highest number of respondents was males at 75.52%, while women constitute 24.5% of total respondents.

2.2 The Nexus between climate change and food security

The link between climate change and food security in Kenya can be explained in different ways. Climate change is influencing and is being influenced by agriculture. Agriculture is known to be

sensitive to variations in rainfall and temperature patterns but the sector also contributes an estimated ten to twelve percent of greenhouse gases like carbon dioxide to the atmosphere.⁴¹ While it is considered that certain climatic changes are easily predictable, some like its effects on an entire ecosystem might not be easy to predict. For example, many crops and cultivated plants are receptive to an increase in carbon dioxide in the atmosphere in controlled amounts, but at the same time, weeds that invade farms have also been found to be just as receptive as the crops. The result is that weeds are competing for water and nutrients with cultivated plants thus resulting in a decrease of agricultural yields. According to FAO, weeds are one of the highest causes of agricultural losses and approximately 10 to 16 percent of harvests in Kenya are lost due to weeds annually.⁴²

2.3 Climate Change Act B (2016)

The act is intended to provide legal and institutional framework to address climate and variability on socio-economic ramifications to Kenyan population. The operationalization of climate change act is centred on National Climate Action Plan (NCCAP). This body forms platform for which budgets, plans and incorporation of climate change programs in county integrated development plans (CIDPs) are anchored. Climate change act establishes a powerful National Climate Change Council (NCCC) bringing together national and county governments for purposes of collaborative decision making ensuring seamless climate change action. The council instructs climate change coordination and advisory functions. NCCC is composed of nine members' chaired by president. Other members include cabinet secretaries in charge of climate change

⁴¹ McGrath, J.M and Lobell, D., (2013), *Regional Disparities in the CO2 fertilization effect and implications for crop yields*, Environmental Research Letters.

⁴² FAO (2014). *Enabling Farmers to Face Climate Change*. Second Cycle of the Benefit Sharing Fund Projects.

affairs, the national treasury, planning and energy; council of governors chair and representatives from private sector ,civil society and the academia

CCA establishes climate change fund for mobilisation of resources and bestowed in national treasury. This enables adequate mobilisation of funds towards climate change and variability mitigation activities. Under CCA for technical implementation of climate change activities there is established Climate Change Directorate (CCD). It provides operational coordination, directs climate change plans and serves as knowledge and communication entity for mobilization of climate change and variability resources. It acts as secretariat for the National Climate Change Council

2.4 Research and Development on Climate Issues

Scientific studies have also determined that effects brought about by climate change like carbon fertilization may benefit some crops and increase productivity in tuber crops like potato and cassava, but the overall impact of climate change is more negative and a big threat to food security.⁴³ The World Bank reports that since the year 2001, carbon emissions have increased globally and are volatile. The mean temperature globally has risen by 0.74 °C and is expected to rise further by the end of the century. It is reported that temperature on land is much higher than over the oceans and that the size arable land globally has significantly declined due to degradation by the effects of climate change like. An increase in global temperature has also triggered an increase in demand for water necessary for evapotranspiration in natural vegetation and crops leading to the depletion of soil moisture.⁴⁴

⁴³ Taub, D. R., Miller, B., and Allen, H., (2008), Effects of Elevated CO₂ on the Protein Concentration of Food Crops: a meta-analysis', *Global Change Biology* 14:565-75.

⁴⁴ World Bank (2016). *Arable land (hectares per person)*, World Bank.

Findings by FAO indicate that climate change has affected agriculture and food security by shifting spatial and temporal distribution of rain, biodiversity, and terrestrial resources like water, and eventually impacting heavily on food security.⁴⁵ According to FAO, agriculture is one of the sectors affected the most by natural disasters and hazards brought about as a result of climate change. People who are most vulnerable to natural disasters and hazards brought about by climate change are small-scale farmers, fishermen, herders and agriculture-dependent communities. With climate change, food security risks have multiplied because of the expected frequency and intensity of climate change related disasters and extremes. This corresponds with one of the respondents who argued that “climate change to a larger extent affects those communities who largely rely on environment for their welfare, Most of the people in Kisii County are poor small scale farmers, practice of agriculture is directly linked with climate, climate change has been progressively decreasing food production in Kisii County”⁴⁶. Crises and shocks brought about by climate change extremes like floods and drought are destroying crops, fish and livestock resources in addition to agriculture, fishing and livestock infrastructure. Productive assets like post - harvest facilities, irrigation systems, docks, livestock shelters and landing facilities are also being destroyed as a result leading to an overall decline in food production. Natural disasters due to climate change are contributing to ecosystem degradation and gradual loss, including soil erosion and salinization of the soil. The increased frequency of natural disasters is reducing the income of many households, depleting savings, interrupting trade, market access of agricultural products, and generally increasing hunger.⁴⁷

⁴⁵ FAO (2010). *The State of Food Insecurity in the World: Addressing Food Insecurity in Protracted Crises*. Rome and Agricultural Organisation of the United Nations.

⁴⁶ An interview with Gideon Moegi in 21st November 2019.

⁴⁷ FAO (2010). *The State of Food Insecurity in the World: Addressing Food Insecurity in Protracted Crises*. Rome: Food and Agricultural Organization of the United Nations.

FAO also reports that natural disasters are leading to the loss of genetic resources for agriculture and food. The genetic resources include varieties of plants, animals, and micro-organisms usually used by farmers, livestock keepers, and fishermen to provide both non-food and food agriculture products. They are also used in sustaining ecosystem structures, processes and functions around and in production systems.⁴⁸ Climate change is eroding available genetic resources for agriculture and food that have been relied upon for years by farmers and communities to improve output in food production and quality of food. Animal breeds and crop varieties come from an existing pool of genetic resources and are increasingly being threatened by climate change. Invertebrate and micro-organism genetic resources that play an important role in carbon cycle and are vital in food and agriculture production are also threatened. Changes in moisture and temperature regimes are affecting the organisms and inhibiting the vital roles they play in ecosystems.

Gradual onset changes of climate change such as changing rainfall patterns and increasing temperature are envisaged to intensify in the next few decades, setting a downward pressure on food production. The effects of climate change are already evident in Kenya. Research shows that the national production of wheat and maize over the last two decades is already 5.6 per cent and 3.6 per cent lower respectively and that such a decline would not be witnessed if it were not for the effects of climate change.⁴⁹ In addition to the gradual onset changes currently being witnessed in Kenya, climate change is increasing the severity and frequency of extreme weather phenomenon like floods, droughts and heat waves, which are seriously causing a threat to food production. This is in line with one of respondent who stated that “Climate change in Kenya has been manifested in different ways all of which threaten food security; for instance there floods,

⁴⁸ FAO (2015). *Coping with Climate Change – the Roles of Genetic Resources for Food and Agriculture*. Rome

⁴⁹ Molua, E.L. (2008). *Turning up the Heat on Africa Agriculture: The Impact of Climate Change of Kenya's Agriculture*. African Journal of Agricultural and Resources Economics (AFJARE) 2(1): 45-64.

extreme hot days and short rains which have negatively impacted agricultural sector”⁵⁰. Scientific studies reveal that crops like maize, rice and wheat are quite vulnerable to extreme temperatures. Extreme temperatures are known to cause physiological degeneration on the crops and subsequently their failure. A study reveals that in the next 20 years, globally harvested land area of maize, rice and wheat will be 31%, 16% and 11% respectively exposed to extreme temperatures that are above their thresholds annually. The globally harvested area exposed to extreme temperature for maize will further increase to 44% by the year 2050.⁵¹ Temperatures that are above average can cause quick maturity in crops, but the absence of water or sufficient amounts of nutrients in critical periods can cause a concentration of growth in the stems rather than the fruit or grain, thus reducing the quality of yields.⁵² Rising temperatures also have the likelihood of increasing crop contamination during storage by providing conducive breeding conditions for harmful fungal mycotoxins which are known to result in harvest losses and are harmful to human health.⁵³

2.5 Political will on addressing Climate Change led Food Insecurity

The Kenyan government has committed itself to ensuring food security in the country as part of the agenda in achieving vision 2030.⁵⁴ Meeting household food security forms part of the main objectives in achieving the vision. Food security is a serious concern at the household level in Kenya, especially in rural areas where dependence is highly on rain fed agriculture. Studies by FAO indicate that a large proportion of Kenyans in rural areas are vulnerable to food insecurity

⁵⁰ An interview with James Maingi on 22nd November 2019.

⁵¹ Gourджи, S.M., Sibley, A.M., & Lobell D. B. (2013). ‘*Global Crop Exposure to Critical High Temperature in the Reproductive Period: Historical trends and future projections*’, Environmental Research Letters, vol.8, no.2.

⁵² Ibid.

⁵³ Wheeler, T., Von Braun, J., (2013) ‘*Climate Change Impacts on Global Food Security*’, Science 341, 508.

⁵⁴ Ministry of Agriculture (2018). *Kenya Agricultural Sector Data Compendium*, Vol. 2 – Crop Production.

and have been strongly affected by climate change.⁵⁵ Many people living in rural areas are perilously unprotected to changes in climate and too much rain or the lack of means the difference in getting enough food or living hungry. Pastoralists in ASAL counties are losing a large proportion of their livestock and the average household walks three times longer than usual to fetch water.⁵⁶ This corresponds with one of respondent of study who stated that “In Kenya Pastoral communities are the hardest hit by climate change because their welfare is directly linked to environment; Pastoral communities have fewer mechanisms to cope with imminent climate disintegration”.⁵⁷

According to the KARI, the number of food insecure people in Kenya has moved from 1.4 million in 2014 to 2.8 million in 2019.⁵⁸ Out of the 47 counties in Kenya, 23 counties are considered to be drought prone. Latest nutrition surveys indicate that an estimated 360,000 children, pregnant and lactating women are faced with acute malnutrition in the counties of Marsabit, Baringo, and Turkana.⁵⁹ Families in ASAL regions are constantly on the move causing security risks to women and young children. High malnutrition levels are also reported to be prevalent in ASAL areas with three sub-counties registering global malnutrition rates of more than 30 percent, a percentage considered more than double the set emergency threshold.⁶⁰

Early warning bulletin by the National Drought Management Authority (NDMA) reports the annual long rains have become less reliable and hard to predict over the years even though they

⁵⁵ FAO (2008). *Climate Change and Food Security: A Framework Document*. Nairobi, Kenya: FAO.

⁵⁶ World Food Conference (2016). *Universal Declaration on the Eradication of Hunger and Malnutrition*. United Nations.

⁵⁷ An interview with Linet Ogeto on 23rd November 2019.

⁵⁸ KARI, Ministry of Agriculture, Livestock and Fisheries and Agricultural Sector Development Strategy Programme (ASDSP) (2018), *Household Baseline Survey*. Nairobi, Kenya.

⁵⁹ UNICEF (2018). *Determinants of Malnutrition in Children: A Conceptual Framework*.

⁶⁰ ASAL Policy. (2012). *National Policy for the Sustainable Development of Northern Kenya and other Arid Lands*. Nairobi, Kenya.

continue to occur annually in different parts of the country. Climate change has also triggered uncertainty on the availability of water and food prices in ASAL areas are unusually high.⁶¹

A study by Oxfam – Kenya trying to explore different food price scenarios before 2030 reveals that the lack of prompt and aggressive efforts aimed at tackling climate change will result in prices of staple foods increasing to more than double before the year 2030 and almost half of the price increases being as a direct result of climate change.⁶² International Food Policy Research Institute (IFPRI) analysis of climate change long term impact indicates that such a rise in food prices has a direct link to the changes in rainfall patterns and escalating temperatures⁶³

According to Oxfam, prices of food commodities like maize have soared over the last ten years and livestock prices in ASAL areas are low because of the animals' poor state. People have consequently reduced what they eat, with many households in Kenya only depending on one meal a day. Income and food sources are way below average in majority of the pastoral areas and the marginally food productive areas because of the significantly below average rains they are receiving. A study conducted by Rosson indicates that elasticity of food demand in Kenya is much higher in low-income households than in high income households and that the gap is expanding over time.⁶⁴ Rosson argues that even with an increase in food prices in Kenya, high and middle income households are still able buy regardless, but low income households are compelled to reduce what they consume in order to compensate for the increased purchasing burden. The burden of balancing the national demand and supply of food therefore usually falls

⁶¹ UN-Water (2013), *Regions Coping with Water Uncertainties*. Media Brief, UN-Water Decade Programme on Advocacy and Communication.

⁶² D. Willenbockel (2017) '*Exploring Food Price Scenarios Towards 2030 with a Global Multi-Regional Model*', Oxfam research report.

⁶³ IFPRI (2016). *Soaring Food Prices: Facts, Perspectives, impacts and actions required*.

⁶⁴ Rosson, C. P. (2013). *Determinants of Household Food Insecurity in Kenya*. Selected poster prepared for presentation at the Agricultural and Applied Economics Association's AAEA & CAES Joint Annual Meeting, Washington, DC.

on the low-income households.⁶⁵ Rosson therefore notes that a rise in food prices and its volatility is a threat to food access and food security in low income households. This is in line with one of respondent who stated that poor people are more vulnerable to climate change led food insecurity than rich ones; this is because rich people have the purchasing power to buy food even if it is in high prices⁶⁶.

The prevailing climatic conditions in most parts of Kenya has gradually been leading to a deterioration of agriculturally rich lands, loss of livestock, a reduction in the availability of water and pasture, and a sharp increase in food prices. High temperature has affected the health of livestock and their output. Most animals in ASAL areas are eating less, have less weight, are producing less milk, and their rate of reproduction has generally declined. Genetic varieties of livestock have been lost because pastoralists are opting for breeds that can adapt easily to changes in climate.⁶⁷ IPCC projects that ground water and renewable surface water will significantly reduce in ASAL areas and intensify competition for the existing sources of water. Studies by UNEP in ASAL areas of Kenya reveals that a reduction in rainfall or it's scarcity in those areas usually translates to a reduction in the volume of water flowing on the rivers or their complete disappearance.

While mostly the northern parts of Kenya experience drought and high temperatures annually, certain parts of Kenya has been receiving heavy rains resulting into severe flash floods, landslides, mudslides and rock falls. Kenya's meteorological department reports that high temperatures occurring in the Indian Ocean as a result of climate change is resulting in ultra-heavy rainfalls in some parts of Kenya. Heavy rainfalls have in recent years caused flooding and

⁶⁵ Ibid.

⁶⁶ An interview with Jane Makari on 23rd November 24, 2019.

⁶⁷ Kabubo-Mariara, J. (2009). *Global Warming and Livestock Husbandry in Kenya: Impacts and Adaptations*. Ecological Economics. 68: 1915-1924.

destruction especially at the coast, central, and western regions of Kenya. Above average rainfall has resulted in widespread flooding which has in turn severely affected food production. Flooding has caused harvesting to be delayed, farm produce has been spoilt, and crops and pastures submerged and destroyed. Major production areas of grain and vegetable crops like potatoes, onions, cabbage, and rice in central and western regions have been significantly impacted. The floods have also caused changes in soil and water salinity. Floods have in the past moved huge amounts of topsoil in large areas of agriculturally rich lands resulting in a decline of agricultural productivity. According to KARI the top layer of soil is usually rich in organic matter, nutrients and generally possesses better structure for the growth of plants.⁶⁸ In some regions like Tana River, flooding has caused the washing away of fertilizers applied by farmers and the resulting waterlogging has caused the delay of planting seasons for months. Irrigation infrastructure has also suffered damage as a result.

A study conducted by Pacetti on flooding notes that incidence of flooding has not only increased in Kenya but also globally because of a rise in sea level and changes in seasonal and annual rainfall due to climate change.⁶⁹ WMO reports that Kenya has witnessed a lot of flood events in the last five years alone and as a result has suffered a lot of devastating economic and social consequences including displacement of people and a decline in food production. The floods have also resulted in massive soil erosion, landslides, and the loss of nutrient-rich surface soil. Soil erosion has for example not only led to the loss of fertile land but also increased sedimentation and pollution of rivers and streams causing a decline of fish and other aquatic species. Currents by flood waters have also assisted certain weed species to invade farms in

⁶⁸ KARI, Ministry of Agriculture, Livestock and Fisheries and Agricultural Sector Development Strategy Programme (ASDSP) (2018), *Household Baseline Survey*. Nairobi, Kenya.

⁶⁹ Pacetti, T., (2017). *Floods and Food Security: A method to estimate the effect of inundation on crops availability*. *Advances in Water Resources*, 110, 494-504.

places where they were previously not established and farmers have therefore been incurring extra costs in eliminating the weeds and as a result incurring extra costs in food production.⁷⁰

This correspondent who states that recently floods have become one of the manifestations of climate change in Kenya, floods not only threatens food production but they are threat to human life⁷¹.

Climate change has also been noted to be compounding threats in aquaculture development and sustainability of capture fisheries in freshwater and marine environments in Kenya. IPCC reports that the effects are as a result of gradually increasing temperatures and associated chemical and physical changes in aquatic environments.⁷² IPCC notes further that since most aquatic species are cold blooded, their metabolic rates are heavily affected by external environmental conditions like temperature which can significantly influence their rate of reproduction, speed of growth, and rate of reaching sexual maturity.⁷³ A reduction in oxygen levels in water bodies due to too much heat on surface water is causing a decrease in the maximum body weight that many fish species can attain thus low catch potential in the long term. Subsequently, climate change coupled with human stressors such as overfishing and pollution is increasing the pressure on aquatic resources and resulting in production shortages of capture fisheries. Extreme events like floods and drought are affecting stability in freshwater and marine resources and discouraging certain fishing practices that small scale farmers formally depended on for livelihood.⁷⁴ The ecosystems in rivers have particularly been noted to be sensitive to changes in water flows and

⁷⁰ WMO – World Meteorological Organization (2018) *WMO Guideline on Multi-hazard Impact-based Forecast and Warning Services*. Geneva: World Meteorological Organization.

⁷¹ An interview with Charles Mshila on 22nd November 24, 2019.

⁷² IPCC (2013). *Climate Change 2013: The Physical Science Basis*. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

⁷³ Ibid.

⁷⁴ FAO (2018). *Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication*.

human efforts to retain water by construction of irrigation channels and reservoirs are altering river ecosystems and contributing to a decline in fish concentration. According to the maritime authority of Kenya, in 2018 only 40 per cent of fish consumed nationally was caught in inland waters. Production of fish from inland waters is increasingly being threatened by the intensity and frequency of climate events, changes in precipitation and poor management of water bodies.

2.6 Chapter Summary

Based on the reviewed literature on the link between climate change and food security in Kenya, this chapter summarizes by noting that climate change and food security have an intrinsic link. Climate change is influencing and is being influenced by agriculture. The agricultural sector is known to be sensitive to variations in rainfall and temperature patterns but the sector which is responsible for food production also contributes an estimated ten to twelve percent of greenhouse gases like carbon dioxide to the atmosphere. A number of studies indicate that climate change has affected agriculture and food security by shifting spatial and temporal distribution of rain, biodiversity, and terrestrial resources like water, and eventually impacting heavily on food security. With climate change, food security risks have multiplied because of the expected frequency and intensity of climate change related disasters and extremes. The effects of climate change are already evident in Kenya and surveys reveal that the national production of wheat and maize over the last two decades has declined, and that such a decline would not be witnessed if it were not for the effects of climate change. Climate change is also increasing the severity and frequency of extreme weather phenomenon like floods, droughts, and heat waves, which are seriously causing a threat to food security. The prevailing climatic conditions in most parts of Kenya has gradually led to a deterioration of agriculturally rich lands, loss of livestock, a

reduction in the availability of water and pasture, a sharp increase in food prices, and generally a lack of food security in many households.

CHAPTER THREE
IMPACTS OF CLIMATE CHANGE AND VARIABILITY ON FOOD SECURITY IN
KENYA

3.0 Introduction

3.1 Climate Change Impacts in Kenya

According to Chatterjee there will be no any sector of human life that is not going to face consequences of climate change, however the greatest threat posed by climate change is food insecurity not only in Kenya as well in the developing world. In 15th May United Nations International day of families, the theme was “families and climate action”. In particular U.N identified the greatest challenge of climate change on families as food insecurity. The wellbeing of families is a central pillar to healthy society but has recently been threatened by gradual climate disintegration especially in communities who rely on environment for their welfare. Climate change has exacerbated food insecurity since climate change has reduced yields from rain fed agriculture thereby jeopardizing the welfare the people who depend on agriculture for living.⁷⁵ On the other Joseph argues that climate change is detrimental to development. For instance in Kenya the regions who face prolonged droughts and short rains are also the ones who have lagged behind in development. Climate change has also taken form increased rains which have caused floods. The North Eastern of Kenya has recently faced abnormal rains which are threat to human beings, Livestock and crops. When crops are wiped away by droughts or floods people get robbed of their livelihoods and food security. The greatest killer of children’s in Africa is malnutrition which is on the verge of worsening due to climate change. Even though

⁷⁵ Siddharth Chatterjee (2019), “Hunger threatens families as Climate change persists” An article Published by Researchgate on July 2019. P-1.

climate change is happening worldwide, its impacts are not evenly shared, the developing world face more impacts of climate change than the developed world. Children's living in developing countries face the greatest risk not because effects of climate change are worse in their country but because poverty limits their ability to respond to impacts of climate change.⁷⁶

A study by Food Agricultural Organization (FAO), identified that 57% of Kenya population lives in dire poverty, mostly the female headed families who to a large extent rely on climate sensitive economic activities such as rain fed agriculture and smallholder agriculture. In addition, the report indicates that the greatest threat to climate change in Africa is generational spiral down into deeper poverty brought about by decreasing agricultural activities and productivity thereby to counter this vice there is need of increasing resilience to climate related shocks especially in agricultural sector. Eradicating hunger and pervasive poverty is one of the core objectives of U.N Sustainable Development goals (SDGS), however it has been facing challenges due to climate change danger not only in Kenya but in a global scale.⁷⁷

Wature observes that Kenya has less capability to recover from frequent cycle of droughts. Minimal and delayed rains as well as increasing temperatures have subjected more than a million people in both agricultural and pastoral localities fighting for food for survival which has led to nutrition deficits especially in Turkana. Decreasing rains have led to reduced pasture for livestock leading to death of both livestock and human beings in extreme cases⁷⁸. On the other hand Ngwiri observes that in the beginning of 2019 government of Kenya declared a drought emergency affecting twenty three counties as a result of failure of rains in 2018. This has made

⁷⁶ Samuel Joseph (2018), "The increasing danger of Climate change in Horn of Africa Region" food security and climate change in Kenya. Published by East Africa Journal on 2018. P-2.

⁷⁷ Ibid, P-54.

⁷⁸ Peter Wature (2019) "Scale Up Climate –Smart Farming for Food Security, High Incomes" Essentially, Kenya is increasingly feeling the effects of climate change. An Article published by Nation Media group on 7th may 2019, Mitigating climate change with smart technology. P-21.

more than 2.7 million Kenyans to rely on relief food however it was not available until a number of them got dead. Of the 23 counties, 15 were from north, eastern and some in central Kenya were in danger of food security due to short rains which led to lack of crops and pasture.

3.2 Climate Change and Food Insecurity Dynamics in Kenya

3.2.1 Drought led food insecurity in Kenya

According to Goldsmith, drought is one of the key determinants of conflict in the regions inhabited by the pastoralists. The protracted conflict in North Eastern is as a result successive droughts.⁷⁹ Farah argues that, pastoralists are specifically vulnerable to natural and man-made disasters, because of their over reliance on natural resources. Drought has contributed to desertification, soil erosion and bush encroachment, as well as significant reduction of land for grazing and water for the animals. The welfare of pastoralists is directly linked to their environment. However, in the same way the livestock production is directly linked to the availability of water, pasture and market. More so, this relationship has faced a major challenge due to long and persistent droughts. Drought is the single most important underlying factor, contributing to resource-based conflict in Kenya and the larger part of the Horn of Africa, which is highly inhabited by the pastoralists and extreme climatic conditions.⁸⁰

Droughts and climate change have more impact on pastoralist regions, because they depend on environmental resources for their livestock. These resources have been reduced by persistent drought contributing to limited water, pasture and increased mobility of herders which leads to conflict. Conversely, Mwangiru views that pastoralism communities often have their

⁷⁹ Goldsmith, M. (2015). “*Climate Change Contributes to Drought Instigated Conflict on Pastoralist Regions of Kenya*”. *Assessment on the Impacts of Climate Change on Pastoralist lifestyle and possible Approaches to Mitigate the Impacts of Climate Change in Horn Of Africa*. Nairobi, Kenya

⁸⁰ Farah, I. (2008). “*Human Security and the Livelihood of Pastoral Communities in the Horn of Africa*” *Human Security: Setting the Agenda for the Horn Of Africa*. Nairobi: Africa Peace Forum. pp, 193-195.

mechanisms to cope with drought; however they have been exhausted due to frequent shocks. As the negative effects of crisis accumulate, pastoralists become more vulnerable to food insecurity. This has persistently led to conflict, as pastoralists compete for the scarce resources available.⁸¹ According to FAO report climate change impacts all four dimensions of food security which include food systems stability, food utilization, food accessibility and food availability. Food insecurity will actually impact on human health⁸². According to Jeff the most catastrophic climate change impact in Kenya is increase in food insecurity. According to Jeff, climate change has reduced crop yields an issue which has led to serious consequences⁸³. According to Ian, climate change has made soil to be destroyed at an alarming rate. The fisheries are getting currently affected by the crucial temperature changes which trigger major shifts in the availability and different types of fish species and other aquatic sea foods in Kenya⁸⁴.

Kenya has recently faced a drastic change on rainfall pattern. This has led to persistent droughts which is a threat to agriculture and keeping of livestock. The local ecosystems have collapsed due to the negative impacts of deforestation and land degradation and climate change⁸⁵. One main concern in Kenya is that climate change is outpacing our efforts to address it hence the situation will only deteriorate since many decision makers do not realize this danger.

According to Gitahi, in the past six years, rainfall in Kenya has been below average, complicating the survival of many people livelihoods and economic development. This is because agriculture is major source of survival in Kenya and the sector is anchored on availability of rainfall. Gatahi specifically argues that there has been a decrease of nearly 20% of

⁸¹ Ibid

⁸² FAO 2008 report on food security and climate change.

⁸³ Jeff Jim, (2016), "Global Warming and Food insecurity in Africa". Loss of Agricultural Land. Oxford Publishers. Oxford. P-23.

⁸⁴ Ibid P-4.

⁸⁵ Ibid P-2.

precipitation as compared to levels 20% years ago⁸⁶. In Kenya, hunger and resource wars are immediate hazards. For instance, Kenya Red Cross argued that more than 3.4 million Kenyans are facing drought and starvation of which 241,000 of them are at Coastal region. Kenya is currently facing bare consequences of environmental destruction. UNEP reports that climate change is already causing more than 400,000 premature deaths annually⁸⁷.

According to Tom Climate change is real and the earth is warming but the general population has a much distorted perspective on this topic. The hardest hit by climate change is horn of Africa region. This scholar views climate change as the atomic bomb of today due to its impacts. Global polls show that climate change is people's lowest priority, far behind health, education and security⁸⁸. In Kenya there is unfolding reality of climate especially regarding rains. It does not rain when it usually does, and when it does rain, it floods, hence this hurts farmers most. This has made the country to be almost unable to feed itself given the prevailing past 2 degrees of global warming already.

There is unreliable rainfall which has halted the usual planting patterns. Farmers are left stranded as to when to plant. There is occurrence of heavy rainfall bringing flooding which makes food crops rot in the fields. These floods furthermore destroy infrastructure and sometimes injure people. During water scarce period there is severe scarcity of fodder and water stress which makes animals unproductive with less milk and meat.

⁸⁶ Gatahi M. Karanj. (2018), "Kenyans to Battle Severe Climate Change Effects" Kenya heating up year after a year and all projections indicate that things are about to get worse. Published by Researchgate Journal. P, 3.

⁸⁷ Forbes Magazine, Quora contributor on "The Impacts of Climate Change That WE Are Already Experiencing". Published in 2017. P-2.

⁸⁸ Tom Watkins. (2019). "The harmful effects of global warming". Published by researchgate. P,3.

According to FAO report climate change impacts all four dimensions of food security which include food systems stability, food utilization, food accessibility and food availability. Food insecurity will actually impact on human health⁸⁹. This corresponds with one of respondent who stated that climate change has impacted accessibility and distribution of food, this is because some regions experience adequate rains to support food productions while others experience limited or no rains, this has led to poor distribution of food⁹⁰.

According to Jeff the most catastrophic climate change impact in Kenya is increase in food insecurity. According to Jeff, climate change has reduced crop yields an issue which has led to serious consequences⁹¹. According to Ian, climate change has made soil to be destroyed at an alarming rate. The fisheries are getting currently affected by the crucial temperature changes which trigger major shifts in the availability and different types of fish species and other aquatic sea foods in Kenya⁹².

According to Ruth, Kisii County was one of the areas with fertile soil and predictable rainfall pattern; however the region has been facing droughts due to limited and unpredictable rainfall patterns which have led to decreased crop production. In addition, the sub-division of agricultural land in Kisii is now a major threat to food production and security in the region⁹³. Ruth also argues that land fragmentation is also another major challenge to efficient food production. Continued sub-division of land has led to food crisis in Kisii.

A study conducted by African Women Studies Centre (AWSC), Kisii County is increasingly food insecure with most of the population having no food at all. This meant that people slept

⁸⁹ FAO 2008 report on food security and climate change.

⁹⁰ An interview with Gladys Ongeri on 22nd November, 2019.

⁹¹ Jeff Jim, (2016), "Global Warming and Food insecurity in Africa". Loss of Agricultural Land. Oxford Publishers. Oxford. P-23.

⁹² Ibid P-4.

⁹³ Ruth Mbula. (2017), "Food insecurity fears as land division eats into agriculture". P-1.

hungry due to lack of food. The study also illustrates that 41.2% of the total population in Kisii County is chronically food insecure. The study also indicates that there is more food insecurity in those houses headed by women than those headed by men in Kisii. This corresponds with one of the respondents who stated that the mechanisms to cope with climate change led food insecurity are different from one house to the other, however in most cases the households headed by women are more poor and with less mechanisms to cope with climate change led food insecurity⁹⁴. Among many other factors like land fragmentation, high cost of farm inputs, poor preservation and lack of storage of food, Climate change was specifically noted as one factor contributing to food insecurity in Kisii County⁹⁵.

3.3 Impact of Food Insecurity on Pastoral regions of Kenya

Harsh climatic conditions have contributed to lack of food, as well as economic insecurities. Increased degradation of land, scarcity of water and pasture has led to decline in production of livestock and decrease in price of livestock. Just as Livestock production to a large extent relies on availability of pasture, water and market, the welfare of pastoralist communities in Kenya is linked to their environment. Outbreak of clashes has affected the cost of livestock; an issue which has indirectly affected prices of other items, since insecurity and low income negatively impacts demand and supply.

According to (FAO), over 15 million people in the horn of Africa are at risk of losing their livelihood to severe and recurrent drought which has subjected millions into hunger. The most vulnerable are the pastoralists who still remain poor with no other means of survival except over-relying on their livestock. Mwangiri views that, the most urgent consequence on drought season,

⁹⁴ An interview with Catherine Nzioki on 24th November 2019.

⁹⁵ African Women Studies Centre (2015), "Food Security Research Findings and Recommendations for Kisii County" A report published in 2015 with support of National Treasury, Government of Kenya. Published by University of Nairobi Press. P-5.

is lack of water and food for both humans and animal consumption as well as complete lack of pasture for animals.⁹⁶ The scenario in Kenya has made the pastoralists to be more trans-boundary in nature hence resulting to conflict over land, pasture and water points among the pastoral communities. Additionally, Hajir argues that, conflict in pastoral regions of Kenya has been exacerbated by decrease of available pasture, due to recurrent droughts.

Environmental scarcity has led to increase in malnutrition cases in both human beings and livestock which eventually resulted death of a lot of livestock, especially during the drought season. Pastoralists in Isiolo County completely rely on selling of their livestock, in order to buy food, pay school fees for their children's and buy other essentials of their own. However, pastoralists have experienced a lot of difficulties in meeting their needs due to increased malnourished livestock's. Kenya is one of the hardest hit by environmental changes that manifest in terms of shrinking water catchment resources and famine. Therefore, there is need to train and encourage the communities, to change from the culture of pastoralism and try other businesses like rearing of poultry, fish and irrigation farming. Reduction of the livestock to the level sustainable by the available environmental resources is also another approach, which will not only reduce the resource based conflict among the community, but also improve the quality and cost of livestock.

3.4 Chapter Summary

In a nutshell, the chapter has established the impacts of climate change on food security. The impacts of climate change are not even across the globe despite the fact that climate change is a global phenomenon; the severe impacts of climate change are felt in developing and poor

⁹⁶ Mwangiru. M, (2008), "*Human Security*". Setting the Agenda For The Horn Of Africa, Africa Peace Forum, First Edition. Addis Ababa: Ambo University Press

societies who lack the mechanisms to cope with climate change impacts. In Kenya food insecurity and conflict are the most immediate impacts of climate change which manifest in terms of shrinking water catchment, decreased and delayed rains, floods, extreme hot temperatures and drying of water points.

CHAPTER FOUR

EFFECTIVENESS OF POLICIES TO COUNTER FOOD INSECURITY IN KISII COUNTY

4.0 Introduction

In recent years, Kisii County has been facing food security challenges which is evidenced from a high proportion of its population having no access to adequate amounts of food. The food security challenges currently faced by the County can be attributed to a number of factors including population increase in the region leading to pressure on available agricultural land, climate change, high costs of farm inputs particularly fertilizers, high poverty levels in the region, and the ever rising food prices. The national government of Kenya and the county government of Kisii have over the years developed a number of policies to address the problems associated with food insecurity. Some of the major policies being implemented so far to counter food insecurity in the county include the Agricultural Sector Development Strategy, the National Seed Industry policy, the National Agricultural Sector Extension Policy, the Kenya Climate Smart Agriculture Strategy, and the Root and Tuber Crops Development Strategy. This chapter examines the effectiveness of the policies to counter food insecurity in Kisii County.

4.1 Agricultural Sector Development Strategy

Agricultural Sector Development Strategy (ASDS) is a ten year agricultural strategy launched in 2010 aimed at developing and propelling the agricultural sector towards ensuring food security in Kenya. The strategy envisages a food secure nation and intends to achieve it through a paradigm shift from subsistence agriculture to commercial agriculture.⁹⁷ Small scale farmers

⁹⁷ Government of Kenya, (2010). *Agricultural Sector Development Strategy (ASDS) 2010-2020*. Nairobi: Government of Kenya.

dominate the agricultural sector in Kenya and Kisii County is not an exception. The average farm holding size in Kisii County is between 0.4 acres to 4.5 acres, which is categorized as small holding.⁹⁸ The small holder farmers practice small scale rain fed farming that heavily relies on traditional technologies for input and output, and is considered unsustainable and a threat to food security in the county. High population pressure in the region which has resulted in the fragmentation and subdivision of land has been blamed for small size land holdings which has made mechanization of agriculture impossible and offered challenges to food security plans by both the national and county government.⁹⁹

The launching of ASDS and its implementation in Kisii County has promoted commercialization of small holder farming through the reduction of pricing of farm inputs like fertilizers and seeds, provision of credit facilities to the farmers through initiatives like the Kilimo Biashara Initiative, improvement of rural infrastructure like road networks and rural agricultural markets, facilitating trainings in agri-business skills, promotion of the use of natural resources like water for irrigation, and the encouragement of diversification of crops in farming. Provision of credit facilities to farmers through ASDS has made a major impact in countering food insecurity in the region. Initiatives like Kilimo Biashara has been offering credit services to farmers through a local bank. The initiative is specifically designed to offer credit services at a reduced interest rate to small scale farmers engaged in food production. The initiative is supported by agricultural officers who equip small holder farmers with skills needed to transition to commercial farming.

⁹⁸ J. M. Maitima, J.M. Olson, S. M. Mugatha, S. Mugisha and I. T. Mutie. (2010) *Land Use Changes, Impacts and Options for Sustaining Productivity and Livelihoods in the Basin of Lake Victoria*. Journal of Sustainable Development in Africa, Volume 12, No. 3

⁹⁹ J.M Olson, S. Misana, D. J. Mbonile., and S. Mogisha, (2015) *Land Use Change and Impacts and Dynamics, Project Working Paper 48,* International Livestock Research Institute, Nairobi, Kenya.

The skills have entailed training farmers on funds management like budgeting and spending.¹⁰⁰ The agricultural officers have also taught farmers on crop production needs and the essence of storing their harvests while they wait for market prices to improve. Through the initiative, more than KSHS 2.7 billion has been given to farmers as loans who have increased food productivity in the county for domestic use and selling in external markets.¹⁰¹ Certain farmers have also diversified their income sources by forming cooperatives where fellow farmers can also access financial services. The cooperatives also participate in marketing and processing of farm products for members alongside engaging in other enterprise activities. Plenty of informal type cooperatives have emerged in rural parts of Kisii County and have played a major role in countering food insecurity as well as eradicating poverty.¹⁰² Currently, the county government in partnership with the private sector has contracted some farmers to carry out seed multiplication for a number of seed companies in the region. The undertaking has been seen to be in support of transforming agriculture from subsistence to commercial focus and has also assisted in addressing a shortage of seeds in the region which was contributing to food insecurity. Agricultural value chain collaborations and partnerships have also emerged to support food production processes by farmers in the region. This corresponds with one of the respondents who stated that “ASDS have contributed to increased food production especially due to irrigation and decrease in price of farm inputs”.¹⁰³ The key players in this partnerships and collaborations include agro chemical and fertilizer companies who have set price margins for their products to

¹⁰⁰ Alliance for a Green Revolution in Africa (2011). *Implementation study of the Equity Bank Kilimo Biashara agricultural loan scheme.*

¹⁰¹ Alliance for a Green Revolution in Africa (2011). *Implementation study of the Equity Bank Kilimo Biashara agricultural loan scheme.*

¹⁰² Alene, A.D. and Coulibaly, O. (2009). *The impact of agriculture research on productivity and poverty in subsaharan Africa.* Food Policy 34:198-209

¹⁰³ An interview with Charles Okari on 23rd November 2019.

encourage distribution to rural areas. They have also packaged their products in smaller quantities to facilitate access by poor small holder farmers.¹⁰⁴

4.2 National Seed Industry Policy

The National Seed Industry Policy was formulated by the national government of Kenya to offer guidelines on how the seed industry was to develop and promote high quality seeds in order to raise food productivity in the country.¹⁰⁵ The policy issues guidance on how seed varieties produced by industries in the formal sector are distributed and used countrywide. Under the policy, new seed varieties are supposed to be tested and approved before being sold to farmers. In Kisii County, implementation of the policy has ensured that seeds circulating in the market offers farmers variety characteristics and are suitable to the local farming conditions. Quality seeds supplied to the market have saved farmers in the county from worrying about seed quality and low harvest volumes usually observed after planting. The county government has also intensified its seed subsidy programs under the policy and has been targeting poor farmers who lack the resources to acquire new seed varieties that have been recently introduced in the market. The programs have increased access small holder farmers have to certified seeds, has induced the adoption of new seed varieties in the region, and has aided efforts in countering food insecurity in the region. One of the respondents argued that “National Seed Industry has been effective in its mandate since it has researched and produced farm seeds which are resistant to droughts and can yield with minimal rains¹⁰⁶.”

¹⁰⁴ Ariga, J., Jayne, T.S., Kibaara B. and Nyoro, J.K. (2017). Trends and Patterns in Fertilizer Use by Smallholder Farmers in Kenya, 2005 – 2015. Tegemeo Working Paper No.32: Tegemeo Institute, Egerton University, Nairobi.

¹⁰⁵ Government of Kenya (2010) *National Seed Policy*. Ministry of Agriculture; Kilimo House, Nairobi.

¹⁰⁶ An interview with Maxwell Muthini on 24th November 24, 2019.

The programmes being implemented under the National Seed policy like the seed subsidy program has however has been generating complaints about their efficiency, the impact they have on the seed industry, and their overall effectiveness in countering food insecurity in the county. Seed producers in the county have lodged complaints before that seed characteristics like the quality and volume required annually for the seed subsidy programmes are usually communicated late to the producers. It has been found that there is weak involvement between the private sector producers and the final beneficiaries in managing of the programmes and because of this, the subsidy programmes are benefiting opportunistic individuals other than the farmers and the seed producing companies. The county government's weak systems to control corruption in the sector is not ensuring quality seeds are distributed to farmers under the subsidy programmes and is subsequently leading to a loss of confidence in the programmes by farmers who are resorting back to the use of traditional seed varieties thus hampering efforts towards security in the region. This tendency by farmers to resort to traditional seed varieties has developed because seeds under the subsidy programmes are usually distributed late sometimes after cropping season has already begun. In general, implementation of the National Seed policy in Kisii County has been effective in easing the efforts being made towards ensuring food security. Liberalization of the market thanks to the policy has created favourable conditions under which private producers of seeds and farmers are thriving.

4.3 National Agricultural Sector Extension Policy

National Agricultural Sector Extension Policy (NASEP) was formulated to respond to the challenges that traditional public extension programmes was facing in providing extension services to farmers in Kenya.¹⁰⁷ Traditional public extension programmes were perceived as

¹⁰⁷ Government of Kenya, (2010). *National Agriculture Sector Extension Policy*, Republic of Kenya.

bureaucratic, inefficient, out-dated, inflexible, and therefore not effective enough to meet the growing demands of modern agriculture. Through NASEP stakeholders in the agricultural sector are to find ways to diversify, devolve and strengthen extension services to increase food security and make the agricultural sector in Kenya more sustainable.¹⁰⁸ NASEP defines how the public and the private sector should participate in the organization and management of agricultural extension in Kenya. The policy aims to enhance the contribution agriculture is making in alleviating poverty and ensuring food security by promoting effective, efficient, pluralistic, and demand driven extension services to both large scale and small scale farmers.¹⁰⁹ Implementation of NASEP is steered by both the national government under the ministry of agriculture and the county governments in Kenya. Under the guidance of NASEP, commercial extension initiatives in Kisii County have been offered in most agricultural areas through extension officers. Individuals and companies are also providing farmers with advice on the use of hybrid seeds, animal feeds, veterinary services, artificial insemination, and other farming related matters. This is in line with one of the respondents of study who stated that “Kisii County has increased the number of extension officers in each sub-county, extension officers help in preventing spread of crop diseases, artificial insemination and conducting of soil test to establish the best suited crops in different parts of Kisii County”.¹¹⁰

A number of community and faith based organisations are also offering agricultural extension services to farmers. The catholic diocese for example is running two food security and agricultural programmes. The programmes are Agricultural Commercialisation Programme

¹⁰⁸ Muyanga, M. and T.S. Jayne, (2017) *Private Agricultural Extension System in Kenya: Practice and Policy lessons. Journal of Agricultural Education and Extension*, Vol. 14(2),pp111-124

¹⁰⁹ Muyanga, M. and T.S. Jayne, (2017) *Private Agricultural Extension System in Kenya: Practice and Policy lessons. Journal of Agricultural Education and Extension*, Vol. 14(2),pp111-124

¹¹⁰ An interview With Peter Mugwika on 23rd November 2019.

(ACP) and Agricultural and Environment Program (AEP). The programmes are running in six constituencies, namely Bonchari, Bobasi, Bomachoge Borabu, Kitutu Chache North, and Kitutu Chache South. The programmes are targeting more than 2000 households and aims at improving food security within the resource poor families in the programme areas. AEP targets grain storage, livestock improvement, sustainable farming methods, and marketing. ACP focuses on grain storage and marketing of select crops. The community and faith based organizations have also partnered with Kenya Agricultural Research Institute (KARI) to introduce new agricultural technologies to farmers. Some of the technologies are being introduced through the Agricultural Technology and Information Response Initiative (ATIRI).

Most of the extension providers are encouraging small scale farmers to commercialize their farming by assisting them identify crops they can grow and yield high returns.¹¹¹ While past extension activities emphasised only on production to ensure food security in the county, the influence of NASEP has encouraged extension providers to go beyond promoting production and are now supporting farmers in value addition and connecting them with external markets. Supported farmers in Kisii County are now engaging in moisture content analysis of their produce, maize sorting, grading, bulking, milling and packaging.

Extension service providers in Kisii County are also encouraging small holder farmers to form cooperatives in order to increase accessibility to extension services. So far, cooperatives have enabled farmers in rural households to access extension programmes, has increased participation in extension programmes, and increased productivity by small holder farmers. Cooperatives have helped in enabling extension services to reach farmers but more importantly has offered a platform for farmers in Kisii County to demand for better extension services. Farmers have been

¹¹¹ Odhiambo, W., Nyangito, H.O., and Nzuma, J., (2014) *Sources and determinants of agriculture growth and productivity in Kenya*. KIPPRA

able to issue feedback to extension service providers who have in turn strived to offer relevant services and be more accountable in the delivery of services.

4.4 Kenya Climate Smart Agriculture Strategy

The Kenya Climate Smart Agriculture Strategy (KCSAS) seeks to develop resilience in the agricultural sector, adapt the agricultural sector to the effects caused by climate change, and optimize benefits as a result to ensure food security.¹¹² KCSAS major benefits includes increasing agricultural productivity, development of resilience in agricultural systems, reducing the effects of greenhouse gas emissions, and the management of interfaces to give room for other land uses.¹¹³ KCSAS approach in Kenya has been to develop investment, policy and technical conditions to assist in sustainable agricultural development and ensure food security despite of the consequences climate change is causing. It incorporates social, economic and environmental dimension in sustainable development to jointly address climate change and food security. The three main pillars it is composed of includes sustainably improving productivity and incomes in agriculture, developing and adapting climatic resilience, and minimizing greenhouse emissions.¹¹⁴

Efforts to implement of KCSAS in Kisii County has made the county government to identify two priority areas. The areas are the promotion of sustainable agriculture and livestock development; and enhancement of food security in the county. Along with the identification of the priority areas, the county government implementing adaptation measures to tackle the effects of climate change. The adaptation measures has included measures to improve water and soil conservation

¹¹² GoK. (2017) *Kenya Climate Smart Agriculture Strategy 2017-2026*. Ministry of Agriculture, Livestock and Fisheries, Government of Kenya.

¹¹³ Gok. (2017) *Climate Finance Policy 2017*. Government of Kenya.

¹¹⁴ GoK. (2017) *Kenya Climate Smart Agriculture Strategy 2017-2026*. Ministry of Agriculture, Livestock and Fisheries, Government of Kenya.

in the county, encouraging farmers to plant more climate tolerant crop varieties, and improved weed and pest control. The county government's response has encouraged farmers to use stress-resistant crop varieties and adopt crop diversification practices in their farming.

In line with its effort to counter food insecurity, the county government in collaboration with KARI have also initiated some technologies that are climate resilient. New technologies related to organic farming, cropping patterns, and resistant crop varieties have been introduced in the county.¹¹⁵ The county's department of Energy, Water and Natural resources is paying greater attention in developing water pumping irrigation projects and the utilisation of ground water for farming. Alongside with the projects, Kisii County has promoted the farming of indigenous and locally-adapted crops and livestock as well as multiplication and selection of plant varieties adapted to unusual climatic conditions. The selection of plants tolerant to biotic and abiotic stresses like high temperature, floods, pests, water and disease resistance has enabled the exploitation of genetic variability in new plant varieties. Increasing food productivity and ensuring food security have therefore been very important KCSAS strategies for Kisii County.

4.5 Root and Tuber Crops Development Strategy

Root and Tuber Crops Development Strategy seeks to develop product and produce standards, and promote the sustainable farming of roots and tuber crops in the country.¹¹⁶ The policy is designed to stimulate demand for cheaper food alternatives like cassava, arrow roots, potatoes, and in the long term achieve food security in the country. The main objective areas of the strategy is nutritional health, food security and commercialization to develop domestic

¹¹⁵ Gok (2010) *National Climate Change Response Strategy*. Ministry of Environment and Mineral Resources, Government of Kenya.

¹¹⁶ GoK. (2019) *National Root and Tuber Crops Development Strategy 2019-2022*. Ministry of Agriculture, Livestock and Fisheries, Government of Kenya.

production capacity to sustainably and profitably satisfy market demands. Root and tuber crops are drought resistant crops that grow-all-year round and are thus considered important foods. They are the second most important foods after cereals and are considered to be having a high potential in attaining food security in the country.¹¹⁷ In Kisii County, the implementation of the policy has seen a rise in production of roots and tubers and an increased earnings to farmers. Many farmers have taken advantage of the policy to commercialize production and the introduction of new storage technologies has helped reduce post-harvest losses. Poor marketing and processing has however seen a market glut of the crops and consequently lowered prices in certain areas.

4.6 Chapter Summary

A number of policies have been developed to address food insecurity challenges in Kisii County. Some of the major policies being implemented so far to counter food insecurity in the county have registered varying levels of effectiveness in ensuring food security in the county. The policies include the Agricultural Sector Development Strategy, the National Seed Industry policy, the National Agricultural Sector Extension Policy, the Kenya Climate Smart Agriculture Strategy, and the Root and Tuber Crops Development Strategy. The Agricultural Sector Development Strategy envisages a food secure nation and intends to achieve it through a paradigm shift from subsistence agriculture to commercial agriculture. The implementation of the strategy in Kisii County has promoted commercialization of small holder farming through a reduction in pricing of farm inputs like fertilizers and seeds, and provision of credit facilities to the farmers. The National Seed Industry policy issues guidance on how seed varieties produced by industries in the formal sector are distributed and used countrywide. Under the policy, new

¹¹⁷ Ibid.

seed varieties are supposed to be tested and approved before being sold to farmers. In Kisii County, implementation of the policy has ensured that seeds circulating in the market offers farmers variety characteristics and are suitable to the local farming conditions. Provision of quality seeds to farmers in the county has therefore ensured high yields during harvest and has in turn enhanced food security. The National Agricultural Sector Extension Policy was formulated to respond to the challenges that traditional public extension programmes was facing in providing extension services to farmers in Kenya. Under the guidance of the policy, commercial extension initiatives in Kisii County has expanded in many agricultural areas through extension officers and has seen an increase in food productivity in the region. The Root and Tuber policy is designed to stimulate demand for cheaper food alternatives like cassava, arrow roots, potatoes, and in the long term achieve food security in the country. Its implementation in Kisii County has seen a rise in production of roots and tubers and has in turn enhanced food security in the county.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

With key focus on increasing rate of climate disintegration in Kenya, this study sought to examine the link between climate change and food insecurity with a specific focus of Kisii County. The study was guided by three objective namely; to assess the impact of climate change on food security in Kenya, examine the effectiveness of policies to counter food insecurity in Kisii County and lastly and determine the link between climate change and food security in Kenya. This chapter therefore, covers summary of the key findings, presents conclusion and recommendations flowing from the three key objectives that guided the study.

5.1 Summary of the Findings

This section covers key findings from each objective of the study.

5.1.1 Impact of climate change on food security in Kenya

The study has identified that, in Kenya food insecurity and conflict are the most immediate impacts of climate change which manifest in terms of shrinking water catchment, decreased and delayed rains, floods, extreme hot temperatures and drying of water points. The study has discovered that the impacts of climate change are not even across the globe despite that climate change is itself a global phenomenon which requires international cooperation in order to water down its impacts. In Kenya impacts of climate change is mostly felt by pastoral communities who comprehensively rely on environment for their welfare and livelihood. Among the Pastoral groups the food security and economic security is the most affected sectors by climate change. Harsh climatic conditions have contributed to lack of food, as well as economic insecurities.

Increased degradation of land, scarcity of water and pasture has led to decline on production of livestock and decrease in price of livestock. Just as Livestock production to a large extent relies on availability of pasture, water and market, the welfare of pastoralist communities in Kenya is linked to their environment. Outbreak of clashes due to climate change has affected the cost of livestock; an issue which has indirectly affected prices of other items, since insecurity and low income negatively impacts demand and supply.

The study has also established that Kisii County has been facing food security challenges which are evidenced from a high proportion of its population having no access to adequate amounts of food. The food security challenges currently faced by the County can be attributed to a number of factors including population increase in the region leading to pressure on available agricultural land, climate change, high costs of farm inputs particularly fertilizers, high poverty levels in the region, and the ever rising food prices.

5.1.2 Effectiveness of Policies to Counter Food Insecurity in Kisii County

The study has found that a number of policies have been developed to address food insecurity challenges in Kisii County as a result of climate change. Some of the major policies being implemented so far to counter food insecurity in Kisii County include the Agricultural Sector Development Strategy, the National Seed Industry policy, the National Agricultural Sector Extension Policy, the Kenya Climate Smart Agriculture Strategy, and the Root and Tuber Crops Development Strategy. The policies have registered varying levels of effectiveness in ensuring food security in the County. The National Agricultural Sector Extension Policy was formulated to respond to the challenges that traditional public extension programs was facing in providing extension services to farmers in Kenya. Under the guidance of the policy, commercial extension initiatives in Kisii County has expanded in many agricultural areas through extension officers

and has seen an increase in food productivity in the region. The Root and Tuber policy is designed to stimulate demand for cheaper food alternatives like cassava, arrow roots, potatoes, and in the long term achieve food security in the country. Its implementation in Kisii County has seen a rise in production of roots and tubers and has in turn enhanced food security in the county. The National Seed Industry policy issues guidance on how seed varieties produced by industries in the formal sector are distributed and used countrywide. Under the policy, new seed varieties are supposed to be tested and approved before being sold to farmers. In Kisii County, implementation of the policy has ensured that seeds circulating in the market offers farmers variety characteristics and are suitable to the local farming conditions. Provision of quality seeds to farmers in the county has therefore ensured high yields during harvest and has in turn enhanced food security.

5.1.3 The Link between Climate Change and Food Security in Kenya

The agricultural sector is known to be sensitive to variations in rainfall and temperature patterns but the sector which is responsible for food production also contributes an estimated ten to twelve percent of greenhouse gases like carbon dioxide to the atmosphere. A number of studies indicate that climate change has affected agriculture and food security by shifting spatial and temporal distribution of rain, biodiversity, and terrestrial resources like water, and eventually impacting heavily on food security. With climate change, food security risks have multiplied because of the expected frequency and intensity of climate change related disasters and extremes. The effects of climate change are already evident in Kenya and surveys reveal that the national production of wheat and maize over the last two decades has declined, and that such a decline would not be witnessed if it were not for the effects of climate change. Climate change is also

increasing the severity and frequency of extreme weather phenomenon like floods, droughts, and heat waves, which are seriously causing a threat to food security.

5.2 Conclusion

In a nutshell, among other impacts the study has identified that the major impact of climate in Kenya is that it has immensely contributed to food insecurity. The impacts of climate change are highly felt in regions inhabited by pastoralists. This is because pastoralism is a major factor and a complete way of life especially by pastoralists who inhabit the arid and semi-arid parts of Kenya. Food insecurity in Pastoral communities is caused by depleting agricultural and land resources, owing to harsh climatic conditions, as well as demographic pressure due to population growth. In Kenya, climate change has impacted both accessibility of food, distribution of food, purchasing power of food and production of food.

Climate change and food security have become intrinsically interlinked. The prevailing climatic conditions in most parts of Kenya has gradually led to a deterioration of agriculturally rich lands, loss of livestock, a reduction in the availability of water and pasture, a sharp increase in food prices, and generally a lack of food security in many households. In recent years, Kenya has been experiencing temperatures that are higher than usual, longer drought periods, unreliable and inadequate rains, and unpredictable weather patterns. Natural resources like water have become scarce and there is a sharp change being witnessed in climatic conditions that is putting food security at risk. Food consumption is rapidly surpassing food production due to an increase in population at a time when Kenya is facing climate change challenges.

In response to climate change that has led to food insecurity not only in Kisii County but in Kenya at large, various policies and initiatives have been developed to help in mitigating the

negative impacts of climate change. The policies have various levels of effectiveness and efficacy. The policies to address the problems associated with food insecurity and climate change include; Agricultural Sector Development Strategy, the National Seed Industry policy, the National Agricultural Sector Extension Policy, the Kenya Climate Smart Agriculture Strategy, and the Root and Tuber Crops Development Strategy. The most effective of the policies is the Agricultural Sector Development Strategy (ASDS). The Agricultural Sector Development Strategy envisages a food secure nation and intends to achieve it through a paradigm shift from subsistence agriculture to commercial agriculture. The implementation of the strategy in Kisii County has promoted commercialization of small holder farming through a reduction in pricing of farm inputs like fertilizers and seeds, and provision of credit facilities to the farmers. Though not very effective, the National Seed Industry policy issues guidance on how seed varieties produced by industries in the formal sector are distributed and used countrywide. Under the policy, new seed varieties are supposed to be tested and approved before being sold to farmers. In Kisii County, implementation of the policy has ensured that seeds circulating in the market offers farmers variety characteristics and are suitable to the local farming conditions. Provision of quality seeds to farmers in the county has therefore ensured high yields during harvest and has in turn enhanced food security.

5.3 Recommendations

In order to address the issue of increasing rate of food insecurity which is as a result of deteriorating climatic conditions, the country needs to adopt the concept of human security. There is also need of coming up with various mechanisms to cope up with climate change, for instance the community should plant crops which are resistant to drought and can produce with minimal rains.

5.4 Areas of Further Research

Further studies needs to be carried out to establish the link between climate change and economic security. This is because the study has noted that there is a close link between climate change, food security and economic security especially on the middle income countries which have fewer mechanisms to cope up with impacts of climate change. Further studies should also be carried out to establish the approaches to be taken in order to mitigate climate change and its impacts.

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APPENDICES

Appendix I: Questionnaire

UNIVERSITY OF NAIROBI

INSITUTE OF DIPLOMACY AND INTERNATIONAL STUDIES

Dear Respondents,

RE: DATA COLLECTION.

I am masters' student at University of Nairobi, in department of diplomacy and international studies. Currently am undertaking research study to fulfil requirement for award of Masters' degree in international studies. My project topic is **“ASSESSMENT OF THE IMPACTS OF CLIMATE CHANGE AND VARIABILITY ON FOOD SECURITY IN KENYA: A CASE STUDY OF KISII COUNTY”**. You have been selected to participate in this study; however, your participation is free and voluntarily. The data collected from this research will only be used for academic purposes. Your participation is completely voluntarily and anonymous and information provided will be treated with confidentiality. Please I request you to fill the questionnaire honestly.

Special thanks for your cooperation.

SECTION A : DEMOGRAPHIC INFORMATION

1. What is your gender?

[] Female [] Male

2. How old are you?

.....

3. What is your highest level of education?

PHD Masters Undergraduate Diploma College Not Completed

Secondary School Primary School Never Attended.


4. What is your occupation?


SECTION B

1. Do you think Kenya is experiencing gradual climate change?
2. On your opinion does climate change negatively impact on food security?
3. If yes, how does climate change negatively impact food security in Kenya?
4. Is there any connection between climate change, prolonged droughts, decreased rains and high temperatures in Kenya?
5. Does climate change pose a challenge to human security?
6. Has climate change reduced food production in Kenya?
7. What are some of policies which have been put in place to counter food insecurity in Kisii County?
8. Are those policies effective?
9. To what extend do you think the policies to counter food insecurity have been effective?
10. What are some of approaches which should be taken to counter climate change led food insecurity in Kisii County?

Thank you for your corporation.


Appendix II: Research Permit


REPUBLIC OF KENYA


NATIONAL COMMISSION FOR
SCIENCE, TECHNOLOGY & INNOVATION

Ref No: **527056** Date of Issue: **23/October/2019**


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