

**INFLUENCE OF AGRO-PASTORALISM DYNAMICS ON FOOD
SECURITY AMONG SMALL SCALE FARMERS IN
CHEPARERIA DIVISION, WEST POKOT COUNTY, KENYA**


Mukoya Lonah Lusike

**A Research Project Report submitted in partial fulfillment of the
requirements for the award of the Degree of Master of Arts in Project
Planning and Management, University of Nairobi**

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DECLARATION

This research project report is my original work and has not been submitted for any other award to any university


Sign: 

Date: 27.07.2019

Mukoya Lonah Lusike

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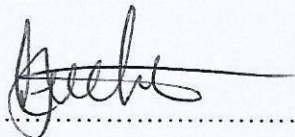
This research project report has been submitted for examination with my approval as the university supervisor

Sign: 

Date: 27/07/2019

Dr. Ronald Kikechi

Department of Open and Distance E-Learning Studies,
University of Nairobi.

Sign: 

Date: 27/07/2019

Ms. Grace Were

Department of Open and Distance E-Learning Studies,
University of Nairobi.

DEDICATION

I dedicate this work to my God, my parents, my husband Francis Mukoya and my children Ruth, Joshua and Daniel.

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I thank God for His mercies and grace towards ensuring that am of sound health to undertake this work. I would like to thank my supervisors Dr. Ronald Kikechi, Ms. Grace Were and Dr Okello for their guidance during preparation of research proposal, the identification of a topic for research and more so the preparation of this research report. My lecturers especially Dr, Patrick Cheben Simiyu, Dr Benjamin Koross for their assistance and all other lecturers in the University of Nairobi for providing an ample environment for undertaking this course that gave me a solid basis to strengthen my interest to work on this topic.

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ACRONYMS AND ABBREVIATIONS

ASAL:	Arid and Semi-Arid Land
FAO:	Food and Agricultural Organizations of the United Nations
FIES:	Food Insecurity Experience Scale
GDP:	Gross Domestic Product
GOK:	Government of Kenya
IFAD:	International Fund for Agricultural development
IFPRI:	International Food Policy Research Institute
KFSM:	Kenya Food Security Meeting
KFSSG:	Kenya Food Security Steering Group
KNBS:	Kenya National Bureau of Statistics
MOA:	Ministry of Agriculture
NDMA:	National Drought management Authority
NGO	Non-Governmental Organization
NSA	Nutrition Sensitive - Agriculture
SDG:	Sustainable Development Goals
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
UNSGSA:	United Nations Secretary Generals Special Advocate for Inclusive Finance or Development
WFP:	World Food Programme
WHO:	World Health Organization?

ABSTRACT

Food security is a concern that has been prioritized by the global community through the declaration on sustainable development goals (SDG 2) and Kenya's Big Four agenda. Most of the previous studies show that there exist a knowledge gap relating to how agro-pastoralism dynamics that include climate change, land size, land tenure and NGO interventions could contribute to addressing the gap as well as address the challenges of food shortage and the high prevalence of acute malnutrition both Global Acute Malnutrition (GAM) and Severe Acute Malnutrition (SAM), that is, among children under five years. Therefore, the purpose of this study was to investigate the influence of agro-pastoralism dynamics on food security among small-scale farmers in Chepareria division, West Pokot County, Kenya. The objectives of the study were: to determine the influence of climate change on food security; to establish the influence of land size on food security; to assess the influence of land tenure systems on food security and to determine the influence of NGO interventions on food security among small scale farmers in Chepareria division, West Pokot County. A sample size of 364 was established using Krejcie and Morgan Table for determining the sample. The study utilized stratified, simple random sampling and purposive sampling to determine the respondents. In the sample we had 320 small scale farmers, 4 Chiefs, 13 county government officers. Data was collected using questionnaires for small scale farmers, interview schedules for chiefs and county government officers and focused group discussions for small-scale farmers. Data was analyzed using thematic analysis especially from interviews, while questionnaires using descriptive and inferential statistics by employing Statistical Package for Social Science (SPSS version 22) software. The study established that there was a negative influence which was insignificant relationship between climate change and food security; there was a positive and significant relationship between land size and food security; there was a positive but insignificant relationship between land tenure and food security and lastly, there was a positive and significant relationship between NGOs interventions and food security among small scale farmers in Chepareria division. This means that to realize food security among small scale farmers in Chepareria division, combating climate change, increase the size of land holding under cropland, tenure systems in place and NGOs interventions are key. The study recommends that the government should come up with policies to guide all the small-scale farmers in Kenya on how they can adapt and mitigate the effects of climate change. Small-scale farmers should embrace diversification to spread the risk and at the same time stop further fragmentation of the land or amalgamate and practice sustainable agriculture land management practices for increased crop production and productivity. Proper land tenure system should be adopted to enhance production by the community of Chepareria with the support of the government agencies, institution and NGOs like FAO. Small scale farmers should adopt agropastoral way of farming and embrace sustainable agricultural land management practices while the NGOs should upgrade their interventions in the area as their activities have positively influenced food security among small scale farmers.

CHAPTER ONE

INTRODUCTION

1.1:Background of the study

The most notable consequence of climate change and increase in global temperatures is food insecurity in most regions in the world. The United Nations Sustainable through the Development Goals (SDGs) aims at exterminating starvation, achieving food sufficiency, improving nutrition and enhancing sustainable farming practices by the year 2030 (United Nations Sustainable Development Goals).

The World Food Summit (1996) observed that food sufficiency exists when persons, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for improved livelihoods. Moreover, World Food Summit (2016) defined food security as the ability of people to access enough food to meet their nutritional needs for productive livelihoods. This implies that, when considering food security at household level, the dimensions or indicators will include; availability, access, stability and utilization which has been explained further in chapter two.

According to the United Nations estimates, the current global population stands at 7 billion and is projected to increase to 8 billion by the year 2025 and further increase to 9 billion by the year 2043 (United Nations, 2011). Therefore, it is believed that to feed the growing world population remains a key problem for many governments in low income economies. Hence agricultural practices need to reorient themselves to meet the ever-expanding demands for food.

Bollig (2016), Greiner et.al (2013), Osterle (2008), states that, agro-pastoralism as part of transition is a process which entails change of the lifestyle from pastoralism people to agro-pastoralism, that resulted to establishment of demonstration farms to show that small-scale farmers in East Pokot could help poor farmers to cover their losses that occurred during the dry season and to practice rainfed agriculture.

Mwavali Eliuds S. (2009), analysis of his study revealed that the main explanation for the declining agricultural production is land fragmentation due to population pressure compounded by the cultural practice of land inheritance in Vihiga County. In addition, Bollig et.al (2016) in their reports on drought in East Africa and other related studies in early 1980s stated that, there was a shift “From Milk to Maize” which encouraged rainfed crop cultivation while “Cultivating pastoralists;” as seen in North-eastern African states.

According to Freja study (2016), sub-Saharan countries Kenya included, mainly depends on agriculture and most of the citizens are farmers. About 80% of Kenya’s land lies in the ASALs regions which are characterized by overgrazing, low productivity, persistent famine, land degradation, and territorial conflicts. This has consequently resulted to observable aridity and desertification and climate change since the region is semi-arid with insufficient rainfall and flooding and unreliable rainfall for crops. (Greiner et al., 2013).

According to Ali, Muturi and Mberia (2018) in their study that was carried out in Mandera, defined agro-pastoralism as farming systems that combine crop and livestock production. The interaction of crops and animal in agro-pastoral practices are beneficial to food security and

sustainability as they provide food and sources of income for the farming households (Lal et al, 2015). The study that could be related to West Pokot County, when we consider the ecological zones since it revealed that, institutional formations, other government and non-governmental organization projects have been established to increase land management and sustainability. They have been focused on increasing food production through agro-pastoralism to ultimately improve the living standards of the communities. Through training and farm inputs aids, most of the former pastoralists in Kenya are slowly adapting agro-pastoralism as a coping mechanism to food inadequacies (Wairore, Mureithi, Wasonga and Nyberg, 2015).

West Pokot County Integrated Development plan 2018-2022, Governor's manifesto and the fourth agenda of the "Big four" from the President provides the ministry of agriculture a focus on the priorities which were related to targeting food security. Additionally, the County government prioritizes to ensure adequate food is available and accessed by the residents of the region by 2022 through expansion of food production and supply, provision of incentives and subsidies to attract investments and support value addition in the food processing. Based on this study, the county initiatives will be focusing on food security elements including; availability, access, stability and utilization.

Moreover, due to the temporal climatic conditions in the drylands, most pastoralists are adversely affected by vulnerabilities following prolonged dry seasons. Such adverse environmental conditions lead to scarcity of pasture and water forcing the pastoralists to migrate with their herds to other places. Pastoralists obtain most of their food and income needs from livestock, mass loss of herds renders them food insecure and traps them in poverty (Muricho et

al., 2018). Therefore, the need to be food secure has paved way for transitions in the pastoralists production system. In some instance, the transition has been from nomadic pastoralism to sedentary agro-pastoralism lifestyles but with livestock still being the main livelihood source (Davies and Moore, 2016; Fratkin, 2001; Greiner, Alvarez, and Becker, 2013; Marshall, 1984) Nyberg et al., 2015; Greiner and Mwaka, 2016).

Findings from previous studies done in West Pokot County (Nyberg et al.,2015; Wairore et al, 2016; Muricho et al.,2018) indicate a transition pattern from nomadic to sedentary forms of pastoralism. These changes have been mainly influenced by population growth, increased market demand for products and households' need to meet its food needs. Other main contributors to these transitions was the change in land use zoning from communal to a more individualized use form of land.

1.2: Statement of the problem

According to (Makokha et al., 1999), a sustainable agro-pastoralism started late in West Pokot County. Where most pastoralists due to temporal climatic conditions in the drylands, are largely susceptible to vulnerabilities such as drought. During prolonged dry seasons, pasture and water become scarce and some pastoralists migrate part of their animals. Since pastoralists obtain most of their food and income needs from livestock, mass loss of herds often renders them food insecure and traps them in poverty. This forces them into a process of transition which entails change of lifestyle from practicing pastoralism to agro-pastoralism. This done with the aim of helping impoverished pastoralist farmers to recover losses incurred during drought and to change their mindset to adopt rain fed farming practices. Therefore, the need to be food secure has paved way for transitions in order to adopt agro-pastoralism production. Despite this, there exist a knowledge gap on how agro-pastoralism dynamics such as climate change, land size, land tenure and NGO interventions could contribute to challenges of food shortage as well as high levels of malnutrition that is both Global Acute Malnutrition (GAM) and Severe Acute Malnutrition (SAM) that is among children under five years in Chepareria division, West Pokot.

1.3: Purpose of the Study

The purpose of this study was to investigate the influence of agro-pastoralism dynamics on food security among small scale farmers in Chepareria Division, West Pokot County, Kenya

1.4: Research objectives

- i. To determine the influence of climate change on food security among small scale farmers in Chepareria division, West Pokot county
- ii. To establish the influence of land size on food security among small scale farmers in Chepareria division, West Pokot county
- iii. To assess the influence of land tenure systems on food security among small scale farmers in Chepareria division, West Pokot county
- iv. To determine the influence of the NGO interventions on food security among small scale farmers in Chepareria division, West Pokot county

1.5: Research hypothesis

This section provides a brief on hypothesis; which on one side created hypothesis that gave possible answers to the questions that were formulated from research and the literature that was reviewed on climate change, land size, land tenure systems and NGO intervention verse food security or a solution formulated on questions asked about the topic and on the other hand, hypothesis enabled the researcher to predict the relationship between two variables both sub-independent variable and dependent variable. It was at this level that the researcher began a

testable hypothesis. Therefore, in this chapter the researcher introduces the null hypothesis per objective as stated below;

HO₁: There is no significant relationship between climate change and food security among small-scale farmers in Chepareria division, West Pokot County.

HO₂ There is no significant relationship between land size and food security among small-scale farmers in Chepareria division, West Pokot County.

HO₃ There is no significant relationship between land tenure systems and food security among small-scale farmers in Chepareria division, West Pokot County.

HO₄ There is no significant relationship between NGO interventions and food security among small-scale farmers in Chepareria division, West Pokot County.

1.6: Significance of the study

The study investigated the influence of agro-pastoralism dynamics on food security among small scale farmers in Chepareria division whose findings will be helpful to the Kenya Government, West Pokot County Government and concerned NGOs. The results will provide policy makers with concrete information on how the various components of agro-pastoralism i.e. climate change, crop variety, animal breeding and agro-pastoralism support programmes influence household food security. This would pave the way for more support towards agro pastoralist's interventions to be implemented by concerned bodies in order to minimize the relief dependency and strengthens households' capacity in coping with risks of food insecurity in the semi-arid areas of Kenya.

The study findings will benefit small-scale farmers not only in West Pokot County, but also in other Counties in Kenya where food security possess a challenge. It will avail information on how agro-pastoralism dynamics including; climate change, Land size, Land tenure systems and NGO interventions influence food security. Research firms and learning institutions will use the findings from the study to enhance their experiments and tests to develop drought resistant seeds, breeds, and practices that can be used by farmers to improve crop, and livestock productivity for food security

1.7: Delimitation of the study

Delimitation is a process of minimizing the study area and population to a manageable size (Frankline and Wallen, 2014). The study was restricted in terms of scope. Although there were other agro-pastoralism dynamics influencing food security, this study was only focused on climate change, land size, land tenure system and NGO interventions. This study was also limited to the Chepareria division. The study considered the unit of analysis to be the small-scale farmers in Chepareria division.

Moreover, the study was delimited by failing to use case study research method. This research design method might be the best because it will ensure the longtime examination of sampling units for a long period. Observation from such a long examination might give the researcher an insight regarding trends in agro-pastoralism dynamics including; climate change, land size, land tenure and NGO interventions on food security. However, the challenge with the method is that it takes long, and it is subject to errors, subjects under study might behave or act differently because of the awareness that they are under examination. The researcher will avoid such

challenges by opting for descriptive survey and historical research design, which takes a relatively short period to examine subjects.

1.8: Limitation of the study

This study was carried out during the month of May and main limitations included; Some farmers were not ready to give information, getting farmers due to random sampling since some research assistants didn't know all farmers, during interviews and focus group discussions I experienced language barrier though I had to engage research assistant to help in translation which was time consuming hence I always had to reach home very late in the night. These limitations were minimized by having a research permit and a letter of acceptance to carry out research from County Human Resource officer that made farmers, sub-county, ward officers and chiefs to give information comfortably. I also had research assistants from the locations who knows farmers.

1.9: Assumptions of the study

The researcher assumed that the data which was given by small scale farmers reflected on the agro-pastoralism dynamics influencing food security in Chepareria division West Pokot County. The researcher also assumed that farmers, chief, County government officers, who were sampled were representative of the target population and that respondents were able to fill questionnaires independently and participate in the interviews effectively. The study relied on both primary and secondary data. An assumption taken was that environmental conditions and rainfall patterns were homogenous in the study area.

1.10: Definition of significant terms

Agro-pastoralism; Is the form of farming that combines agricultural (growing crops) and pastoralism (rearing livestock).

Food security: The most internationally used definition is that food security exists when all people at all times have both physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (World Bank, 1986; FAO, 1996).

Climate change: The term ‘climate change’ is used with different meanings and perspectives. In this study it may refer to all environmental change or include natural variability in terms of rainfall in onset and cession, adequacy of rainfall and drought occurrence and frequency

Land size: This refers to land under cultivation for crop production as food for the household in Chepareria division West Pokot

Land tenure system: This study considers, land tenure systems in terms of regime where the focus will be ownership in terms of Private with title or without title, Lease and communal and how these influences food security.

NGO interventions: These are programmes and projects Non-governmental organizations have had in the area of study, thus Chepareria division, West Pokot in support household to be food secure

Small scale farmers: According to MOA (2019) estimates, the small-scale farmers in Chepareria, West Pokot are farmers with land that ranges between 1- 5 acres while maximum is 20 acres.

CHAPTER TWO LITERATURE REVIEW

2.1: Introduction

This section presents the concept of food security, dependent variable and the empirical review, independent variables. An analysis of journals, government publications, publications from NGO's and other credible sources established the literal relationship between independent and dependent variable. Theoretical and conceptual framework features in this section followed by a research gap established in the empirical review.

The World Food Summit (1996) observed that food sufficiency exists when persons, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for improved livelihoods. Therefore, when considering food security at household level, the dimensions or indicators will include; availability, access, stability and utilization as explained in the following paragraphs.

Food availability relates to the supply of food through production, distribution, and exchange food production and stock level. In addition, food distribution may be interrupted by prolonged dry seasons, transportation and other logistical issues. IFPRI, one of the leading research agencies on aspects of agriculture consider purchasing power, education, demographic changes, international trade and sanitary regulations as drivers' limitations of access to food and dietary requirements. Even in the absence of these extraneous interruptions, there are aspects that systematically lead to food insecurity such as the reduction in parcels of land being cultivated due to increase in population densities (Greiner and Mwaka, 2016).

While food access refers to the affordability and allocation of food, as well as the preferences of individuals and households or is determined by disposable income and food prices. Food access is further explained that, at household level, there is a high correlation between poverty and hunger hence improvement in household income will lead to improved food and nutrition security (FNS) (Laborde, Majeed, Tokgoz, and Torero, 2016).

Further observation on the indicators, reveals that another food security pillar is food stability, which is the ability to obtain food over time, on the other hand is determined by weather, political and economic conditions causing unavailability of food during certain periods of time, hence resulting to food insecurity.

The final pillar/indicator was food utilization (food safety), which refers to the metabolism of food by individuals, determined by dietary diversity, energy and nutrient intake. Failure to meet food and dietary requirements leads to a situation of food insecurity.

Agro-pastoralism as part of a process of agriculture transition in response to education as farmer's demographic characteristic, has an impact on food security. Considering FAO (2005) report on food insecurity, it showed that poverty and hunger are essentially rural phenomena, closely related to the lack of education. In addition, the same FAO report emphasized that "low levels of education jeopardize livelihoods in terms of, employability and earning capacity, leading directly to poverty and hunger". This embodies the human capital approach in social science research. This argument places education and literacy at the center of human productivity

and national development. (Schultz 1961 and 1971; Becker 1962 and 1993; Psacharopoulos 1973).

According to Francesco Burchi, Koffio-Tessio, E.M, Tossou, Y.H (2005) study revealed that, in rural areas, education improves agricultural productivity, leading to food security. In addition, Koffio-Tessio (2005), and Egnonto (1998), argues that to attain food security and stability nations in sub-Saharan Africa have to embrace diversification in consumption. The current study agrees with this view and asserts that if critical measures such as this are not taken into consideration food security in all its key components of availability, accessibility, stability and the utilization will remain a big challenge.

Furthermore, FAO report (1996) expounds on consumption diversification as a determinant of food security through participatory community activities such as promotion of sustainable agricultural practices, integrated farming systems, introduction of food varieties with higher nutritional value, promotion of underexploited traditional foods and home gardens, raising small livestock. The report further proposes enhancement of proper conservation and storage of fruits and vegetables to reduce waste, post-harvest losses and effects of seasonality and to advocate for involvement in economic activities which will generate incomes to enable access to healthy lifestyles throughout the year.

According to the Food Agricultural Organizations (FAO) report on food security (2017), the SDGs provide an opportunity for new and better food security indicators, for instance SDG 2 on zero hunger, sets out to measure agricultural area under sustainable production, which FAO is currently working on finding appropriate sustainability indicators on food adequacy. In the same

report, historically, FAO has measured food security as availability of calories at the national level in relation to the population in the country. Another frequently used food security measure is the Global Hunger Index (GHI), where IFPRI et al. combine the four indicators: undernourished people, child wasting, child stunting and child mortality.

Therefore, food security is anchored on the second Sustainable Development Goals (SDGs), that states action needs to be taken to end starvation and food shortages, achieve food security and improve nutrition and support eco-friendly farming practices. FAO report (2018) on starvation and food shortage, points out evidence that continues to indicate raising world food insecurity levels resulting from extended severe dry seasons. An estimated 821 million people lack access to sufficient food which paints a grim scenario where approximately one out of nine experience food related deficiencies. Moreover, globally, agriculture is the single largest employer, providing livelihoods for 40 per cent of today's population. It is the largest source of income and jobs for poor rural households. There are 500 million small farms worldwide, most still rely on rain-fed agriculture which provide up to 80 per cent of food consumed in a large part of the developing world.

Feeding the increasing global population is a priority area identified by nations and development agencies. After the drought that hit most African countries in 1980's, most governments vowed to protect its residents by initiating the "Green Movement", which sought to increase the agricultural productivity by introducing drought resistant crops, launched livestock immunization and sensitization about pest and diseases, and intensified agricultural practices through mechanization. Land rehabilitation practices such as irrigation, reducing overstocking of

animals, and soil erosion prevention in ASAL were priority intervention measures adopted by countries in the Sub-Saharan Countries with pockets of successes (Daines, 1995).

The United Nations agencies and global development programmes are committed to reduce hunger related problems by a half by 2015, but that has not been the case. The Food Agricultural Organization has noted a steady rise in food production per acreage from 15 bags per acre in 1980 to 30 bags per acre in 2000 (FAO, 2006). Since the 1900s, some 75 per cent of crop diversity has been lost from farmers' fields due to the practice of monoculture driven by globalization (Wit, 2015).

Better use of agricultural biodiversity can contribute to more nutritious diets, enhanced livelihoods for farming communities and more resilient and sustainable farming systems. Agro-pastoralism farming system is partly the process of agriculture transition practices that include enclosure system, cross breeding, crop rotation, and animal rotation have been used as mitigation measures against food security in many countries. There is evidence that shows that for sustainability, the efforts of development agencies must be complemented by some positive local practices and traditions for sustainability (Altieri, 2013).

In Kenya, the government has renewed efforts to deal with food insecurity by prioritizing food security under the big four agenda. It is not clear how the agenda will be driven given that agriculture is a devolved function. Market systems are also poorly developed as evidenced from cycles of production surpluses and deficits witnessed in the maize sector (D'Alessandro, Jorge Caballero, Lichte, and Simon Simpkin, 2015).

In West Pokot, there are pockets of interventions that have been done by global development agencies and local NGOs with mixed results (Davies and Moore, 2016; Greiner et al., 2013; Greiner and Mwaka, 2016). Some of the investments by foreign corporations have little connection with local communities. The investments by local NGOs have received little attention in systematic reviews of agricultural interventions. To gain more understanding on the transition from traditional pastoral lifestyle to cultivated agriculture, a review of agro-pastoralism dynamics including; climate change, land size, land tenure systems and the efforts of development agencies including NGO (external) interventions and their relations to food security is to be undertaken.

The nutrition integrated SMART survey report (2017), states that, the main contributing factor to the deteriorating food security nutrition situation in the West Pokot county includes household reduced milk yields and soaring prices of food. Other studies have also shown that pastoralists lack cereal stocks and their animal prices tumble in drought, grossly eroding their purchasing power. These was coupled with their distribution in often harsh environment, making them more vulnerable to famine than their agricultural counterparts (Sunya, 2003 and Mulaku, 2000).

2.2 Climate change and food security

The purpose of this research was to establish how rainfall availability and reliability influences food production. Adverse environmental conditions such as extremely high temperatures are known to have a large negative impact on agricultural production in the pastoral areas. The

research findings indicated that households practicing both crop farming and livestock farming are more resilient to shocks and susceptibilities that face many pastoralists.

Moreover, a study by Joseph T. Lolemtum, Edward M. Mugalavai and John A. Obiri (2017) in West Pokot revealed that prolonged dry conditions and limited access to food are key worldwide concerns to many stakeholders and governments. Rapid response programmes are therefore needed to save the earth from the danger associated with climate change. West Pokot County is one of the drought prone counties whose livelihoods are constantly jeopardized by the effects of drought and the resultant effects. The study finding points to the need for cultivating drought resistant crops and proper utilization of the available food resources as a coping mechanism for starvation and poverty.

Climate change, land tenure and growth in family size has forced most communities to abandon pastoralism in favour of cultivated agriculture (Fratkin, 2001). Most NGOs have supported the transition because research has shown that cultivated agriculture is controlled mostly by women and compared to pastoralism that is highly patriarchal (Doss, Summerfield, and Tsikata, 2014). Statistics show that investing in women has more returns in terms of better outcomes for the household members including food security (Abu-Rabia Quader and Oplatka, 2008). Another emerging issue from the articles by ((Nyberg Gert et al 2015) on adoption of enclosure, women are defined as “inside the community” implying cultivation of land for subsistence is left to women and children while cattle is still a male space and even when times of famine/drought strikes and men are away, women cannot decide to sell the cattle that are normally left behind for food.

FAO (1990) report on the involvement of women in farming highlighted pertinent issues concerning the how lack of economic empowerment among women has limited their participation in food production despite the fact that they play a key role in ensuring food security in the low-income countries. Moreover, accurate information about men's and women's relative access to and control over, resources is crucial in the development of food security strategies.

The World food programme (WFP) as per Kenya strategic plan (2018), first voluntary national report on the implementation of the 2030 Agenda for Sustainable Development in 2017, showed that despite massive and continued investment by governments in ensuring food security the situation remains dire as most households experience acute shortage of food. It is also argued that land reform policies and sub-division of communal land holdings have further excluded women from the right to own land.

2.3 Land size and and food security

The European Development conference report (2010) purported that peasant farmers in Dakar Senegal whose survival is wholly dependent on subsistence farming own small parcels of land in most cases less than two hectares which can barely decrease the food insecurities in the country. Based on the above understanding, Masterclass report reveals that apart from low productivity, there has been land fragmentation which implies that land tenure changes have affected land size which in turn becomes a factor in terms of food security. Gronvall (2015) noted that in Chepareria, small-scale farmers who used enclosures had an 80% chance of not migrating with

animals as compared to farmers who did not use enclosures who had a 90% chance of migrating with animals in search of pasture and water. Attempts have been made to establish the relationship between land size, household income and food consumption (Muraoka, Jin, and Jayne, 2014). The study found that a 10% increase in operational land size increases per capita total consumption and per capita home-produced food consumption by 0.8% and 2%, respectively (Muraoka, Jin and Jayne 2014).

According to M.O.A (2019) estimates, the small-scale farmers in Chepareria, West Pokot are farmers with land that ranges between 0.5 to 5 acres while maximum is 20 acres. Moreover, the G.O.K (2018), specifically the CIDP 2018-22, similarly alludes that the average farm sizes in the county stands at 20 acres. Therefore, in Chepareria, West Pokot one of the emerging issues from researches on enclosure (Nyberg Gert et al 2015), revealed that as a result there has also been inequalities in land use where land size has been changing over time. It is reported that, 80% of the land is put under livestock and 20% left for crop cultivation and by this still though an improvement since time memorial. Most of the land was under livestock farming and small plots left for women as kitchen garden leaving the community food insecure. Besides it is generally agreed that engaging in small scale agriculture boosts productivity and further enhances food security locally, regionally and worldwide. (Obayelu, 2012).

2.4 Land tenure systems and Food security

The current study holds similar views with the findings of a study carried out by Greiner, Alvarez and Becker (2013) on transition from livestock farming to sedentary agriculture. The

study revealed a thinning line between crop farming and cattle rearing in many pastoralist societies (Anderson 1988; Mace 1993), The current dynamics portray changes in range land zoning together with the associated land sub division as well as changes in land ownership from extremely communal to individualized (Lesorogol 2008; Galvin 2009).

Moreover, the government of Kenya GOK (2018) as per the CIDP West Pokot (2018-2022), reveals that, land ownership in the county is under various forms of ownership including communal, private and individualized ownership. Land considered as public is majorly consists of social amenities and public utilities. Individual owned land is used for private commercial ventures. Community land is purportedly held in trust by the government for communal use.

The Government of Kenya in 2018 estimated that 80 and 90 per cent of land owners in West Pokot and Pokot South possess valid land title deed. Currently efforts are still on going in Pokot Central to ensure that private land owners have legal documents justifying rightful ownership of the land and that communal land is protected.

This will focus on land owned communal, private (with or without title deeds) and rented/leased. In addition, as per the study on the Role of Pastoralists' tenure security in sustainable land management by Muricho (2018) in West Pokot, states that tenure security is important as it enhances investment in sustainable land management practices, which contributes to sustainable livelihoods.

According to Donkor and Owusu (2014), technical inefficiencies exist under various land tenure systems, whereby comments that owned land has the lowest technical inefficiency compared to rented and share cropping arrangements in Ghana.

In India, Banerjee and Iyer (2005) noted that land property right instituted by the colonial master, British where land was given to proprietors who accrued low investments benefits from them because the system adopted was almost related to communal. However, once land ownership changed after post-independence period where individual ownership encouraged hard work, a move that improved crop and livestock productivity.

In Cambodia, in the wake of millennium, annual growth of GDP from agricultural production was 5.5% in 2014; the annual productivity was less than 1%. However, in the last decade, Cambodia's agriculture has undergone structural transformation.

It was observed that adoption of new technologies, irrigation, use of modern inputs and better mechanized agriculture, had a strong relationship to land access and food sufficiency (Muraoka et al., 2014).

The report from the Masterclass at the web conference on land and poverty, (March 2018) reveals that there are issues around pastoralist production due to low, variable and unpredictable rainfall in these areas, rangelands tend to be made up of patchily distributed resources of high and low production potential spread across a large landscape, the balanced use of these is maintained and optimized through pastoralism including movement between them. However,

change in land use zoning, subdivision of land and land tenure which has been partly brought forth by factors such as lack of regard to exclusive rights of land ownership has had an adverse effect on millions of people whose existence relies on the rangeland.

In addition, Mulaku (2000) identified the three types of tenure models in East Africa as quasi customary, pure customary and group ranch models. He suggested that for a community to succeed in attaining food security in marginal areas or in dry lands, it must give due and long-term attention to issues of land tenure, especially in transhumant and agro pastoral areas, which tend to be given limited attention by governments due to their supposedly limited potential for food production. In the study, he showed the relationship land ownership and zoning, but did not relate the two to food sufficiency. This current study is therefore informed by this knowledge gap in research.

In Chepareria, the land tenure system has been described as “a complex communal system based on closely knit family ties” (Davies and Moore, 2016). The tenure system is managed by the *kokwa* which means a meeting of elders. There is evidence of both semi-permanent and shifting cultivation on valley floors while households built on valley slopes with small gardens that are exclusive to each household. They also found that leasing of farms is the single most important mechanism that farm-deficient families use to obtain more land for cultivation even though the productivity of leased land was found to be less as compared to the farmers owned parcels of land.

Evidence of good soil management practice has been reported among communities living in the area (Davies and Moore, 2016). Manuring, hillside terracing, and mulching are among common

soil conservation measures residents invest in. Following the adoption and use of enclosures, the people of West Pokot have minimized seasonal migratory practices in search of pasture; instead, they are focused on agribusiness with less interest in livestock production. Such changes in agricultural practices are attributed to increased privatization of community land to allow development.

In addition to land tenure system, based on several articles written by several research scientists including Nyberg Gert, Per Knutsson, Madelene Ostwald and Ingrid Öborn among others (2015) on enclosure; where the focus was more on the enclosure for increase in pasture since livestock was and still is a key component for the community. However, in the same articles, states that there is on-going land privatization where individuals, group ranches, trust land and now hold title deeds but the emerging issues like land market in Chepareria related to the value the enclosures have added to the land in order to contribute to households being food secure since more investment are likely to be made on owned land. On the other hand, this has been perceived differently where some households with title deeds could easily sell or lease land for financial gains rather than to cultivate for subsistence, hence leaving the household not food secure.

2.5: NGOs interventions and food security

Triple concept (2015), reveals some of the key NGO interventions that are geared towards improved productivity in drylands. The concept reveals that, Agroforestry practices that were initiated by Vi Agroforestry and other NGOS in the late 1980's which were also adopted led to rehabilitation of land in Chepareria and led to notable improvement in levels of productivity.

The concept gained popularity with time after initial dismal acceptance among the pastoralists. Adoption and use of enclosure in West Pokot, Kenya has been high and has given rise to diversification into poultry farming, and inclusion of exotic breeds of cattle for rearing (Wairores et.al 2015).

Initially, enclosures were only meant to regulate movement of animals, but as at it is now, they can as well as be used for growing other crops, like maize, vegetable and fruits. This together with increased pasture production helps households in enhancing food security and hence improve livelihoods (Kawira's 2016).

In addition, NGO interventions, specifically Vi Agroforestry with the introduction of enclosure according to Mureithi (2015); Verdood (2010); Lal (2004); Mekuria (2011) respectively stated that as a result of enclosure adoption, changes that were observed overtime included increased food products from animals and notable rises in family incomes. This was consequently concomitant with sustainable land use practices that would eventually result in a less carbon protected atmosphere.

Davies and Moore (2016) record the involvement of the Catholic Church and World vision in programmes to enhance growth of agriculture in Chepareria. They named organizations provided financial and technical support to farmers in cultivation of various subsistence and cash crops.

This study holds similar views with a study done by Angela Hilmi (2012) on the relationship between agriculture farms. The findings of the study indicated the relevance of proper

management of land for sustainable agriculture and other related benefits importantly ensuring availability of enough food. This can be translated that small-scale farmers with support by the government as well as NGO interventions like provision of extension services that leads to adoption of sustainable agriculture land management practices will then be food secure. Most NGOs have supported the transition because research has shown that cultivated agriculture is controlled mostly by women and compared to pastoralism that is highly patriarchal (Doss, Summerfield, and Tsikata, 2014).

2.6: Theoretical framework

This study is informed by the modernization theory by Rostow (1960). Rostow in his theory describes a transition of human societies from primitive to civilized. The theory is mainly focused on the Stages of Economic Growth, where under Take-off stage, Rostow noted to have adopted the term "transition", which describes the process of a traditional economy becoming a modern one. Therefore, the researcher opines that the growth stage and modernization theories are best placed to explain the status of change in agricultural practices being observed in the study site. To begin with, pastoralism was regarded as a traditional form of life characterized by subsistence where food production absorbed about 75% or more of the working force. Instead of accumulating savings, a high proportion of extra incomes in traditional societies was spent on non-productive or low productive engagements such as religious rites, weddings, funerals and wars.

To develop, poor people must be helped to develop some conditions for take-off fashioned along the linear development paradigm experienced in medieval Europe. Modernization theory was

based on the premise that “latecomers” in development could catch up with richer countries if they did some things right.

According to Rostow, there are five phases of societal change from a primitive to a more developed economy. Progressively, agricultural societies develop to technologically advanced modern societies whose main economic activities are industrial. Historically, cultivated agriculture was a more developed system of economic activity compared to pastoralism (Greiner and Mwaka, 2016; Rice, 1981). However, under the growth theory, at the traditional stage of development with a few preconditions for take-off to enhance, there was need to increase specialization and trade with other regions. This must be facilitated by major development of infrastructure and technological changes in agriculture. Both Rostow’s modernization theory and growth schools of thought have advocated for societal and organizational change in the initial stages of societal growth. Rostow considers agriculture as the leading sector at earlier stages of growth with a role to accelerate growth through provision of food and economic opportunities for the population.

To make take-off possible, the interventions proposed included land tenure reforms, empowering peasant farmers, fiscal policy reforms, occupational distribution, changes to degree of economic integration, and changes in economic ideology. To support the process, there is need for institutional organization and development through rationalization and efficiency.

Modernization is driven by outside forces because internal processes are not sufficient for “take-off”. The downside of the growth stages theory was that it failed to factor the influence of

globalization on the development discourse. Similarly, there was little reference to participation and accountability to the local population. Simplistic projects tend to put too much emphasis on matter (such as irrigation) and too little on mind in thought on agriculture (such as farmer behavior). A reflection on agricultural development in the 20th century showed impressive production increases by adoption of monoculture, increased land cultivation, use of fertilizer, labor and technological innovations (Greiner and Mwaka, 2016).

Research on farming in both Pokot and Marakwet has shown that despite colonial and post-colonial preference for monoculture, the communities have resisted such interventions and continue to cultivate a combination of cereals and vegetables (Davies and Moore, 2016).

Traditional farming systems are applauded for proper preservation of land under kinship management system which is slowly paving way for individual parcel ownership with mixed results. Such aspects challenge the predominant role of external intervention suggested by modernization theorists. The international influence on local development priorities through the MDGs and SDGs have recently supported recognition of local resilient mechanisms above disruptive foreign interventions. There is also a more focus on the environmental and social effects of large project developments especially those that are funded by external donors.

2.7: Conceptual framework

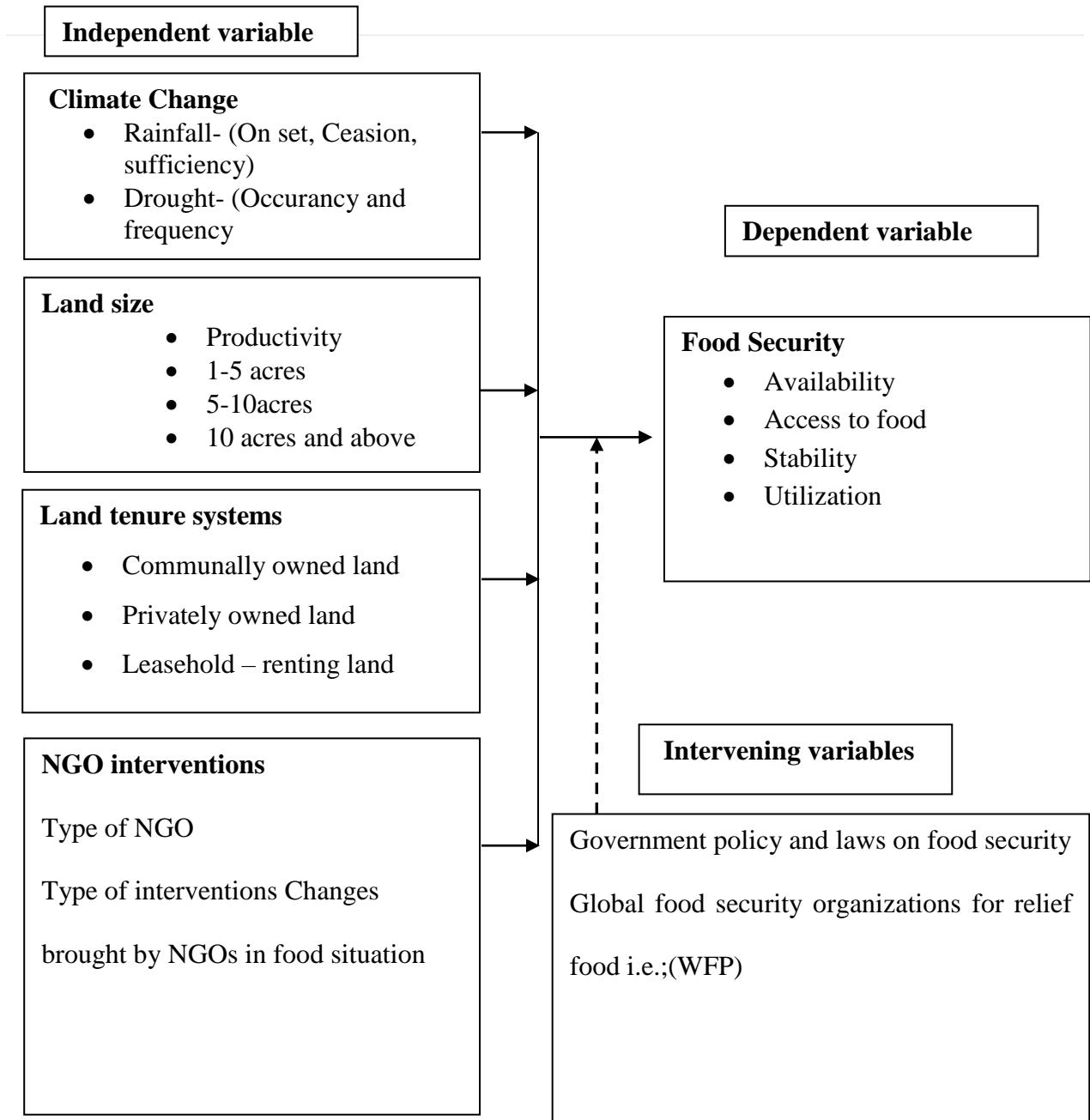


Figure 1:Conceptual Frame work

According to figure 1, it was conceptualized that the independent variables: Agro-pastoralism dynamics that included, climate change; Land size that categorizes land in terms of the following

indicators 1-5 acres, 5-10acres and 10 acres and above; Land tenure systems mainly with the following indicators, communal land systems, privately owned or freehold /with or with title deeds and leasehold and finally the dynamic of NGO interventions with the following indicators, type of NGOs, type of interventions, changes brought about by NGOs in food situation. These were the dynamics that were measured and what affected the study.

The dependent variable was measured in terms of food security that was explained by four dimensions or pillars that included; food availability that considers production, food access which focuses on affordability, food utilization that deals with food safety or handling and finally the food stability that majorly focuses on ability to obtain food during time of crisis like political, environmental, economic among others in relation to independent variable.

While the intervening variable mainly focused on government policies, regulations and other framework on food security as well as the global food security organizations on relief food like World Food Program (WFP).

2.8: Literature gap

Previous studies in West Pokot County has shown that there was an ongoing transition from nomadic pastoralism to a more settled livestock-based agro-pastoral system (Nyberg et al., 2015; Kapelo, 2017). This transition is a response to push factors such as population growth that have led to a reduction of open grazing land and climate change related shocks such as droughts. Moreover, transitions in agriculture where farmers have been shifting from pastoralism to agro-

pastoralism could contribute to improved state of food security but there has been a huge gap in knowledge of this contribution in community-based interventions, more especially in Chepareria division. This study focused on the influence of agro-pastoralism dynamics which included; climate change, land size, land tenure and NGO interventions on food security in Chepareria division West Pokot County.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1: Introduction

This chapter presents research design, target population, sampling procedure and sample size, instruments of data collection, reliability and validity of research instruments, data collection procedure, data analysis and presentation, operational definition of variables and ethical considerations.

3.2: Research design

This study adopted descriptive survey research design and historical research design. Descriptive research design enabled the researcher to test the hypothesized casual relationships between two or more variables. It involved the use of structured questionnaire and interview schedules for the purposes of collecting data. Kothari (2004) defines descriptive survey research design as both qualitative and quantitative methods of data collection and for this study interviewing and administering questionnaire to a sample of individuals was used.

Historical design is useful where primary data cannot be collected. The researcher assumed there was no documentation for resilience strategies used by the pastoralist community to adapt to effect of climate change. The researcher tried to explore, explain and understand past phenomenon from data already available through memory of the community so that she could arrive at conclusions about causes, trends and effects of past phenomenon to explain the present and predict and control the future.

3.3: Location of the Study

This study focused on all the locations while the pilot study was done in Kipkomo location within Chepareria division, Kipkomo Sub-county in West Pokot County, with a coverage of 495 Area (KMs) with two locations and seven sub-location (CIDP 2018-2022). According to Maphil (2013), the region lies between latitude $1^{\circ} 15'$ and $1^{\circ} 55'$ N: longitude $35^{\circ} 7'$ and $35^{\circ} 27'$ E. The altitude in this area differs between 1500-1900 meters above sea level. People living in Chepareria Division are agro-pastoralists with private land and enclosures (Wairore et al., 2015). The study area lies on the lower slopes of Kamatria that extends beyond Mount Morpus. This study was targeting small scale farmers with the key focus being the influence of agro-pastoralism dynamics (climate change, land size, land tenure systems and NGO interventions) on food security. The farmers in Chepareria were both large scale (10 acres and above) and small scale (1 to 10 acres of land) farmers. It was evidenced from other studies (Nyberg Gert et al 2015) that in Chepareria, most farmers practice livestock keeping and crop cultivation and this was because of transition from pure pastoralists to Agro-pastoralists.

3.4 Target population

According to the 2009 reports from the National Housing and Population Census, (KNBS, 2009) Chepareria has a population of 41,563 persons out of which as per Ministry of Agriculture Chepareria, West Pokot (2019), estimates 6998 being small-scale farmers, whose land sizes ranges between 1 acres to 20 acres as land; while according to CIDP 2018-2022, small scale farmers have an average of 5 hectares that are equivalent to 12.35 acres while large scale with an average of 25 hectares(61.75) acres of land will not be included. Although locals were

originally pastoralists, they had diversified into farming to supplement livestock production. Table 1 below show information on target population, shares who were the target group for the study.

Table 1:Target Population

Target group	Frequency	Percentage
Small-scale farmers	6998	99.7
Chiefs	5	0.1
County Government officers	13	0.2
Total	7016	100

3.5: Sample size and Sampling procedures

The following sub-sections describes the sample size and sampling procedures

3.5.1:Sample size

National Education Association came up with a formula referred to as Krejcie and Morgan (1970) Table shown in appendix iv to ease the researcher in determining sample size. For instance, based on 2009 Kenya Population and Housing Census, Chepareria had population of 7640, as well as per the Ministry of agriculture (M.O.A 2019), small-scale farmers were almost equivalent to the 2009 Chepareria population, hence the sample size was 364 at confidence level of 95% which will include small-scale farmers, Chiefs, government officials from M.O.A, Metrological department. Moreover, according to M.O.A (2019) estimates, small-scale farmers in Chepareria division were farmers with land that ranged between 1 to 20 acres.

3.5.2: Sampling procedures

Sampling is a process of selecting several individuals or objects from a population such that the selected group contains elements representative of the characteristics found in the entire population (Patton, 2002). Purposive sampling was used in identifying respondents that were to take part in responding to interviews that included; Chiefs and county government officers. This procedure was bias because it only considered respondents that were believed to have in-depth information both independent and dependent variables.

To identify respondents that took part in responding to questionnaires, the researcher used stratified sampling, a probabilistic method, specifically systematic random sampling that ensured respondents with various characteristics had equal chance to be involved to avoid bias. Interview schedule and focused group discussions, purposive sampling was used. Table 2 below show the sample frame.

Table 2:Sample frame

Respondents	Target (F)	Sample (F)	Percentage
Chiefs	5	5	1.374
County government officers	13	13	3.571
Small-scale farmers	6998	346	95.055
Total	7016	364	100.0

3.6: Research Instruments

The following subsections describe the research instruments that were used in the study, that included, questionnaire, interview schedule and focused group discussions.

3.6.1 Questionnaires for small scale farmers

The questionnaire had questions targeting small scale farmers (both learned and not learned) in Chepareria division West Pokot County. The questionnaire was developed by formulating questions that match the objectives/independent and the hypothesis, hence had four sections, but in addition it had section five with a set of questions mainly focused on the dependent variable.

In order to ensure the objectives of each questions were achieved and have acquired adequate information to support in testing the hypothesis, the research assistants with education level of form four or tertiary level from the Pokot community were trained to administer the questionnaires and where necessary they could use the local language to translate in order to simplify the question.

3.6.2 Interview schedules for County government officers and chiefs

The questions were formulated to collect qualitative data in such a way to allow respondents termed as key informants, that were knowledgeable to give a historical overview and situational analysis on climate change, land size, land tenure systems and NGOs interventions as relates to food security. These key informants included; County government officials from ministry of

Agriculture; Crop department, department of livestock, Metrological department, FAO technical officers, Chiefs Opinion leaders (Land board member) and model farmers.

3.6.3: Focused group Discussions (FGDs)

The focused group discussions were used to collect qualitative data where questions were formulated to get a historical overview and situational analysis on climate change, land size, land tenure systems and NGOs interventions as relates to sustainability of food security. The respondents were invited to provide information while in a group of 10 with consideration of gender and age. In terms of gender, women/men of age 20-40 years then 41-78 men and women were interviewed separately. The sessions were interesting, since people of different age and sex depended on memory for there were no documents in the community to refer to.

3.7: Pilot study

A pilot study was an exercise done to test research instruments on the participants who were not to be sampled in the actual study but qualified to fill questionnaires. Piloting was necessary to establish whether there were errors or weaknesses in the research instrument so that they could be corrected and standardized before the main study (Dooley, 2007). In addition, the researcher was to identify some of the challenges that might arise from administering the questionnaire and devise mechanism through which they could be addressed before the main study was conducted.

Moreover, the realism and workability aspect of the study was also tested during the pilot study. In pilot study, 36 small scale farmers located in Kipkomo location in Kipkomo Sub-County were sampled using purposive sampling technique.

According to Connelly (2008), a pilot sample in a survey research should be 10% of the sample projected for the larger parent study. Purposive sampling was preferred in the pilot study since the researcher was interested to reach a sample quickly. The method was also suitable because sampling for proportionality was not the main concern in pilot study (Dooley, 2007).

Finally, according to Mugenda and Mugenda (2003), the accuracy of data to be collected was largely dependent on the data collection instruments in terms of validity and reliability.

3.7.1: Validity

According to Sekaran and Bougie (2010) as well as Ngechu (2004) defined validity as the suitability, accuracy and relevance of contents of research instruments, more so validity determines the degree to which result obtained from the analysis of the data represented the phenomenon under study. This was to show the extent to which findings generated from data analysis that represents the phenomenon under study. Content validity was applied in this study and according to Kothari (2004), content validity is the degree at which the instrument of data gathering offers adequate and acceptable coverage of the subject under study. Content validity was established by the supervisor who had an opportunity to carefully go through the questionnaire and interview guide. Notably, face validity, expert judgmental procedure of assessing validity will be employed. This involved my supervisors and other professionals or expert from the University of Nairobi to review the questionnaire and give suggestions.

3.7.2: Reliability

Reliability refers to the degree to which a set of variables are consistent with what they are intended to measure (Mugenda and Mugenda, 2003). Pilot study was done to check the instrument structure and the sequence, meaning and ambiguity of questions. The study used Test-retest reliability method that was computed by administering an instrument to the same group of people though in different locality on two different occasions which proved to have internal consistency within the instrument or among questions. Further-more to determine reliability of the instrument is by rating the performance score. Therefore, from literature, other researchers said that the minimum reliability of 0.70 Or 70% consistency in the scores that are produced by the instrument then that instrument was considered reliable. Moreover, for pilot study data, Pearson product and correlation methods were used to test for reliability, through use of SPSS. Then the pilot study findings revealed that the score were high of 0.81 during pilot study hence proved that the instrument was reliability.

3.8: Data collection Procedure

According to Conway (2006), it was important to identify the data collection method, which was appropriate with the nature of study a researcher is conducting. For instance, the use of questionnaire in collecting quantitative data or in descriptive research was applicable and recommended. In this case, qualitative and quantitative primary data was collected using structured questionnaires, interviews, and focus group discussions. After establishing all the research instruments, the researcher administered questionnaires to small-scale farmers, sampled a few who had in-depth information about the topic of study to take part in face-to-face interviews and focus ground discussions.

To ensure clarity, validity, and reliability of quantitative data collected, the use of personal interviews and focus group discussions helped the researcher in shedding more light on information that was not clearly captured using questionnaires. Apart from that, the researcher tapped on the advantage of collecting qualitative and quantitative data, which was essential in order to ensure reliability, validity, and credibility of findings (Creswell, 2009). The use of interviews or structured questionnaires did not ensure data credibility and errors of omission and commission are common (Kothari, 2004). In order to avoid such errors, the researcher was supposed to avoid sharing data collected with other researchers or respondents.

3.9: Data analysis techniques

After data collection, response obtained after conducting interview and focus group discussions was analyzed using thematic analysis; while data collected, using questionnaires was analyzed by entering it in Statistical Package for Social Science (SPSS) software. Before quantitative data was entered in the SPSS Version 22 software, it was cleaned for consistency, data filtering by codes to determine right codes, remove duplicates, consider main parameters as well as determined outliers. Findings were presented in tables, graphs for comparisons. Descriptive analysis that included the use of mean, and standard deviation was used in explaining the relationship between variables and shed light on statistical characteristics of the findings. Inferential statistics that included correlation, chi-square and regression analysis were used in establishing the nature and extent of relationship of variables. Historical design was also used to determine the transition, through interview schedules and focused group discussions and was analyzed through thematic analysis.

Operationalization of Variables

Table 3 gives information on operationalization of variables provides details that has made the research concepts measurable;

Table 3:Operationalization of variables

Objective	Variable	Indicators	Research design	Measurement scale	Data collection method	Tools of Analysis
Influence of climate change on food security	Climate Change	Rainfall Drought occurrence Drought frequency (Continuous data)	Descriptive Survey and historical	Nominal Ordinal	Questionnaire interview schedules and FGDs	Correlation Regression
Influence of land size on food security	Land size (Categorical data)	Productivity 1-5acres 5-10acres 10 and above acres	Descriptive Survey and historical	Interval Ordinal	Questionnaire interview schedules and FGDs	Chi-square Regression

Influence of land tenure systems on food security	Land tenure (continuous data)	Communal Privately owned Leased	Descriptive Survey and historical	Nominal Ordinal	Questionnaire interview schedules and FGDs	Correlation Regression
Influence of NGO interventions on food security	NGO interventions (continuous data)	Type of NGOs Type of interventions Impacts/changes	Descriptive Survey and historical	Nominal ordinal	Questionnaire interview schedules and Focus Group Discussions	Correlation Regression

3.9: Ethical considerations

The process of ensuring ethics and professionalism during this research started with application of research license from the National Commission for Science, Technology and Innovation (NACOSTI) which is a state corporation established under the Science, Technology and Innovation Act, 2013 (Revised 2014). Thence this study was carried out on a strict ethical code guiding research at the University of Nairobi. The researcher assured the participants of the confidentiality of data provided. The respondents were informed that the data they provided was specifically for academic research and would not be shared by anyone for other benefits. The respondents were treated with respect and their identities protected.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSION

4.0. Introduction

This chapter presents the study findings in thematic arrangement based on the study objectives. The data collected was analyzed using both descriptive and inferential statistics. Therefore, this chapter presents the results of the analysis and discussions of the questionnaire response rate, background information of the respondents, influence of climate change on food security, influence of land size on food security, influence of land tenure on food security, influence of NGO interventions on food security in Chepareria division, West Pokot County, Kenya.

4.1. Questionnaire return rate

Table 4 below presents what was expected and the actual questionnaires returned after they were distributed to and responded to by farmers as well as the chiefs and County government officers during interview schedules.

Table 4: Questionnaire return rate

Respondents	Sample (F)	Return rate	%
Chiefs	5	4	1.2
County government officials	13	13	3.9
Small-scale farmers	346	320	95.0
Total	364	337	100.0

Source: Research data 2019

The results in Table 4 above show that questionnaire return rate was 100% this included 1.2% Chiefs, 3.9% County government officials and 95.0% of small-scale farmers. This implies that the most sampled respondents were available to give the information as planned.

4.2. Background information of the respondent.

The respondents were asked to indicate their ages, gender, most common occupation, average family income, access to credit and area the family invested most. The results of the respondents are shown in Tables below;

Table 5:Age of the respondent

Ages	Frequency	Percent
18-35	42	13.0
36-45	118	37.0
46-60	135	42.2
60 and above	25	7.8
Total	320	100.0

The results in Table 5 above show that 13.0% of the respondents were between the age of 18-35, 37.0% of the respondents were between the ages of 36-45 years, 42.2% of the respondents were between the age of 46-60 years and 7.8% were of the age of 60 and above years. This implies that 50% of the respondents were in the productive age in terms of labour, thus required to produce food for the households. Table 6 provides information on the gender of the respondents;

Table 6:Gender of the respondents

Gender	Frequency	Percent
Male	238	74.5
Female	82	25.5
Total	320	100.0

The results in Table 6 above show that 238(74.5%) of the respondents were male while 82(25.5%) were female. This implies that men were available due to the fact it was a season of land preparation for planting crops despite the prolonged dry spell.

Table 7: Main occupation of the respondent

	Frequency	Percent
Farming	265	82.8
Employed	22	6.8
Business	33	9.9
Total	320	100.0

The results in Table 7 above show that 265(82.8%) of the respondents' main occupation was farming, 22(6.8%) were employed and 33(9.9%) were doing business. This implies that most respondent's main occupation was farming, hence they solely depended on the farm for income and food. Table 8 below provides information on the average monthly income of the respondents, which is key in access to food.

Table 8: Average family monthly income

	Frequency	Percent
Less than 5000	106	33.3
5000-10000	155	48.4
10,000-20,000	55	17.2
Above 20,000	4	1.0
Total	320	100.0

The results in Table 8 reveals that 155(48.4%) of the respondents had family income of between Ksh 5000-10,000. 106(33.3%) of the respondent had family income of less than Ksh 5000, 55(17.2%) had family income of between 10,000-20,000 and only 4(1%) had family income above Ksh 20,000. This implies that 81.7% of the farmers fall in both the category of less than 5000 and ksh 5000-10000 meaning most respondents earn an average of ksh 5000 hence earning

Ksh 166.7(USD 1.7) per day. This shows most respondents are living slightly below the poverty line (USD 1.9). This further implies that households might not afford food sometimes of the year due to low income.

These results above are in agreement with the findings of (Laborde, Majeed, Tokgoz, and Torero, 2016), that food access has been explained that, at household level, there is a high correlation between poverty and hunger hence improvement in household income will lead to improved food and nutrition security (FNS).

Table 9: The farmer accessed credit in the last 12 months

Responses	Frequency	Percent
Yes	273	85.4
No	47	14.6
Total	320	100.0

The analyzed results shown in Table 9 above reveal that 273(85.4) accessed credit in the last 12 months and 47(14.6%) did not access any credit in the past 12 months. This implies that the respondents have assets that enable them access to credit thus provides them opportunity to invest in enterprises that gives them income as well as in farm inputs.

Table 10:Area mostly invested

	Frequency	Percent
Farming	77	24.0
Buying Food	37	11.5
Education	161	50.5
None Response	45	14.1
Total	320	100.0

The analysis in Table 10 above established that majority who are 161(50.5%) of the respondents invested their accessed credit in education, 77(24.0%) invested in farming, 45(14.1%) did not respond to where they invest their credit and 37(11.5%) on buying food. This implies that 35% of the respondents invested both in farming in terms of farm inputs and buying food. Investing in education implies food security is a development issue hence it can be easy to promote, and farmers adopt different farming technologies in the region. This will contribute to improved food production since in the past, as very few pure pastoralists valued education.

Table 11:Respondents with children in school

	Frequency	Percent
Yes	312	97.4
No	8	2.6
Total	320	100.0

The results shown in Table 11 above, revealed that 312(97.4%) of the respondents had children in school while 8(2.6%) had no children in school. This confirmed that most farmers invested in education as shown in (Table 10), since more respondents had children in school.

Therefore, this result agrees with what FAO (2005) report clarified that “lack of education undermines productivity, employability and earning capacity, leading directly to poverty and hunger”. This reflects to the human capital approach, which states that education is relevant insofar as it increases personal earnings and productivity, and economic growth at national level (Schultz 1961 and 1971; Becker 1962 and 1993; Psacharopoulos 1973).

Table 12: The household main source of food 10 years ago and current

Main food	10 years	10 years	Current	Current
	frequency	Percent	frequency	percent
Livestock	55	17.2	55	17.2
Crop	265	82.8	265	82.8
Total	320	100.0	320	100.0

The results in Table 12 above revealed that 265(82.8%) of the respondent’s main source of food 10 years ago as well as currently was crop while 55(17.2%) said the main source of food was livestock. This implies that the main source of food has not changed in the last ten years.

The results in (Tables 10, 11 and 12) were justified by one of the farmers who was a member of land board who said,

“10 years ago, as well as currently, staple food was maize though livestock in terms of goat or sheep meat, milk and chicken in small scale. Currently the land that was under pasture (Enclosures) has been opened up for cultivation implying that more land is under crop cultivation than for grazing and that is why tractors are found in Chapareria due to ploughing for maize. Due to change of time and technology development, ploughing demands the use of tractors that currently are many in chepareria, resulting to mechanization farming than use of manpower as it was in the past. This change has been contributed by families educating their children, who supports them financially to do farming.”

The result in Table in Table 13 below, provides responses by the respondents on the farming systems farmers are embracing in Chepareria.

Table 13:Main farming system both ten years ago and current

	10 years	10 years	Current	Current
	Frequency	Percent	frequency	Percent
Pastoralism	5	1.6	2	.6
Agro-pastoralism	255	79.9	251	78.4
Agroforestry	60	18.8	67	20.9
Total	320	100.0	320	100.0

The results in Table 13 show that in both 10 years ago and currently, 255(79.7%)/251(78.4 %) respectively practiced agro-pastoralism, 60(18.8%)/67(20.9%) practiced agroforestry and only a few 5(1.6%)/ 2(.6%) practiced pastoralism. This implies that the situation 10 years ago as well as currently, farmers have really shifted from pastoralism to agro-pastoralism. Although the practice has slightly decreased by 1.6% with an increase in the adoption of agroforestry by 2.1%, It is possible that the adoption of agroforestry has contributed to increased resilience of the farmer families to the effects of climate change hence increasing the food security.

This result agrees with, Bollig (2016), Greiner et.al (2013), in their reports on drought in East Africa and other related studies in early 1980s stated that, there was a shift “From Milk to Maize” which spurred rain-fed crop cultivation while “Cultivating pastoralists;” as in many other areas of North-eastern Africa.

Table 14: Average number and type of livestock owned by respondents

	Minimum	Maximum	Mean	Std. Deviation
How many cows do you own	.00	40.00	7.0156	5.33042
How many goats do you own	.00	60.00	13.8854	12.39648
How many sheep do you own	.00	50.00	12.2188	10.86924
How many chickens do you own	.00	130.00	21.0417	13.93697

The results in Table 14 above show that on average, each respondent have 7 cows, 14 goats, 12 sheep and 21 chicken. This implies that farmers have really reduced the number of herds kept compared to the past, hence justifying that farmers have shifted from being pure pastoralists to agro-pastoralists. The same results show the diversification in livestock keeping which is a coping strategy for farmers in terms of providing options to farmers in terms of food and what to sell and buy cereals as the staple of food.

Table 15: Inclusion of animal protein and fruits in all meals

Statement		Frequency	Percent
Include animal protein and fruits in all meals	strongly disagree	43	13.5
	disagree	140	43.8
	undecided	37	11.5
	agree	80	25.0
	strongly agree	20	6.3
Total		320	100.0

The results shown in Table 15 revealed that 57.3% of the respondents don't include animal protein and fruit in their meals while only 31.3% take protein and fruit. This implies that most of the respondents or households do not eat a balanced diet. This result confirms other studies findings on high prevalence of malnourishment in the county. For instance, the crop sub county officer said;

“on nutrition, chepareria children under 5 years experiences high level of malnutrition, yet Pokots have animal protein but doesn't consume instead sells for income”.

This finding is in tandem with that of FAO report (1996) which expounds on consumption diversification as a determinant of food security through sharing strategies for food and dietary diversification at the community and household levels including a range of food-based activities that can maximize the availability of adequate amounts and greater variety of nutritious foods. These strategies include; promotion of mixed cropping and integrated farming systems, introduction of new crops (such as soybean), promotion of underexploited traditional foods and

home gardens, low livestock keeping, promotion of improved preservation and storage of fruits and vegetables to reduce waste, post-harvest losses and effects of seasonality income generation and nutrition education to encourage the consumption of a healthy and nutritious diet year-round.

The finding also is in agreement with the finding of Kawira's (2016), that states that initially, enclosures were only meant to regulate movement of animals, but as at it is now, they can as well as be used for growing other crops, like maize, vegetable and fruits. This together with increased pasture production helps households in enhancing food security and hence improve livelihoods.

4.3. Climate change and food security among small scale farmers.

The first objective of the study was to determine the influence of climate change on food security among small scale farmers in Chepareria division, West Pokot County. Data collected was analyzed under the null hypothesis that; “there was no significant relationship between climate change and food security among small-scale farmers in Chepareria division, West Pokot County”. To achieve this objective, questions were asked with the aim of establishing the influence of climate change on food security among small scale farmers in Chepareria division. To establish the influence, the respondents were asked how rainfall had affected both crops yield and livestock production in the last ten years to the present and their responses were as shown in Table 16 below;

Table 16: Influence of rainfall on both crop and livestock yields in the last ten years

Influence of rainfall	Frequency	Percent
High yields	126	39.4
Low yields	163	50.9
Same	31	9.7
Total	320	100.0

The results in Table 16 revealed that 163(50.9%) of the respondents said, rainfall had contributed to low yields, 126(39.4%) said rainfall had contributed to high yields and 31(9.7%) had the view that they did not see difference on the effect of rainfall on both crop and livestock in the last ten years. This implies that most households experience low production of both crop and livestock due to rainfall either late onset of rainfall and unpredictable cessation of the rainfall as well as the sufficiency and reliability of rainfall.

This result was supported by an officer from the County metrological department who said;

“Chepareria at times receives both sufficient and insufficient rainfall, whereby like in 2013 the rainfall amounts were averagely high 1500mm and that was sufficient thus more food production, while in 2015 the rainfall amount was 950mm implying insufficient rainfall resulting to less food production. In addition, West Pokot, receives bimodal rainfall, meaning receives rains twice in a year and farmers utilize second season to plant crops but it is insufficient, crops mostly beans fails to perform”.

On the same results, the ward Livestock and Agriculture officers said that;

“the unreliable rainfall is a parameter of climate change that has affected planting seasons that has caused delays in crop planting hence low production. In addition, 10 years ago in Chepareria, people used to plant from mid-March to the beginning of April because the rains used to come early and were also reliable; while currently, rains delay as late as the month of May and yet not reliable thus affecting food production, hence evidence that there is climate change”.

This finding is in tandem with that of the report from the Masterclass at the web conference on land and poverty, (March 2018) which revealed that there were issues around pastoralist production due to low, variable and unpredictable rainfall in these areas, rangelands tend to be made up of patchily distributed resources of high and low production potential spread across a large landscape, the balanced use of these is maintained and optimized through pastoralism including movement between them.

Furthermore, the respondents were asked whether they can compare the period drought had taken for the last ten years and now. Their responses were as shown in Table 17 below;

Table 17: The period drought takes in the last ten years

Duration for drought	Frequency	Percent
Longer	70	21.9
Shorter	231	72.2
Same	19	5.9
Total	320	100.0

The results in Table 17 above also show that 231(72.2%) of the respondents said the dry spells in the last ten years were shorter compared to the current drought duration, 70(21.9) said it was longer compared to the current duration, 19(5.9%) seemed not to see any difference. This implies that, the period taken for the drought to occur has become shorter compared to 10 years ago where drought could occur only on the ninth-year e.g 1999, 2009, 2019 thus 10 years difference.

The Table below show the responses on frequency of drought in 10 years ago and now

Table 18: Frequency of drought in Chepareria for the last ten years

	Frequency	Percent
Frequent	55	17.2
Less frequent	234	73.1
Very frequent	25	7.8
Same	6	1.9
Total	320	100.0

The study in Table 18 above show that 234(73.1%) of the respondents alluded to the fact that in the past, there were less frequent occurrence of drought in Chepareria. This reveals that drought frequency in the recent years has increased. This implies that climate change is real and was manifested in the frequent droughts experienced by the community. The result is supported by the officer from the Metrological department who that said

“In Chepareria being in transitional zone, drought is not always severe as compared to Pokot North or the lowland areas of Chepareria like Chepkopegh and Pserum that receive less rainfall hence severe drought unlike highlands parts of Chepareria like Kipkomo, Ywalateke Senetwo”.

Furthermore, the officer from the National Management Authority said that;

“on draught frequency in the past drought used to be 10 years, but currently it has reduced to 3 years and yet the frequency is unpredictable. For instance, in 2008 – 2009 there was drought, four years nothing worse happened that is up to 2014-2016 there was drought, then this year 2019 there are signs of drought though from organization point of view, it had not reached emergency levels instead still alarming level for there was shortage in terms of livestock pasture and human food, thus a sign of change in climate”.

The results in Table 19 were to reveal whether drought affected variables listed;

Table 19: Whether drought has affected the following variables

Variable	Effect by drought	Frequency	Percent
Livestock	Yes	202	63.1
	No	118	36.9
Crop	Yes	274	85.6
	No	46	14.4
Milk production	Yes	207	64.7
	No	113	35.3
Drought tolerant crops	Yes	74	23.1
	No	246	76.9
water scarcity	Yes	162	50.6
	No	158	49.4

The results in Table 19 above show that 202(63.1%) of the respondents said the drought affected livestock in the last ten years. Since livestock is the main source of livelihood among the community, anything that affects the livestock will lead to increased poverty.

The results showed that 274(85.6%) of the respondents said in the last ten years the drought affected the crop yield. If the crop had been affected, then it implies that households were not food secure.

The results showed that 207(64.7%) of the respondents said that drought had affected milk production. This implies that this result agrees with livestock being affected hence milk production has been low, contributing to high milk prices on the market.

The result show that 246(76.9%) of the respondents said that the drought did not influence the yield of drought tolerant crops. This implies that one mitigation measure to the effect of climate change on food security is to plant drought tolerant crops.

The majority 162(50.6%) of respondents equally said that drought had affected water security. Since water is the source of life, no food security can be achieved without reliable and sufficient water. This therefore implies that drought contributed significantly to food insecurity of the people of Chepareria. The results are supported by the Sub County Crop Officer who said the following on the matters of climate change;

“in the past 10 years, the region experienced a lot of rainfall that was adequate and supported high yields for both livestock and crops, though with landslides, but currently due to change in climate, there are new pests and diseases like fall army worms, causing dwindling in maize yields and some years total crop failure hence leaving households not food secure”.

In addition, the ward extension agriculture officer also said the following as per the results above;

“prolonged drought causes delay in planting which results to low production. It also results to the outbreak of both human and animal diseases through waterborne diseases since both use the same source of water (river). Milk production reduces due to migration of livestock leading to high milk prices that most families can't afford. This affects greatly children under the age of 5, who end up being malnourished. The price of livestock especially cattle becomes very low while food prices are high during drought making it difficult for families to afford three meals per day”.

The discussions from the focused group of women between the age of 20 years to 50 revealed that ten years, drought used to come at the 9th year whereby in, 1999,2009,2019 and cited some effects being; increased diseases and pests on crops and animals, animals die and fetched low selling prices, food price became high and rivers dried. However, the goats were never severely affected by drought. In addition, during drought, people sold goats and chicken in order to buy food(maize) since in the neighborhood cows were dying due to lack of pasture. The prices for cows ranged between Kshs 5000 to Kshs 20000 and even the buyers could not buy since the cows were very thin”.

These findings agree with the findings of Muricho et al., (2018), who argues that due to the temporal climatic conditions in the drylands, most pastoralists are adversely affected by shocks such as drought. When droughts strike, pasture and water become scarce and some pastoralists part of their herds. Because pastoralists derive most of their food and income needs from livestock, mass loss of herds renders them food insecure and traps them in poverty.

The results in Table 20 gives more information on how farmers coped with effects of climate change;

Table 20: Copping strategies against the effects of climate change

	Frequency	Percent
Enclosure	237	74.1
Tree planting	72	22.5
Mixed farming	277	86.6
Improved seeds	202	63.1
improved breeds	31	9.7
keeping of large hard	20	6.3

The Table 20 above show that 277(86.6%) of the respondents adopted enclosure as one of the coping strategies against the effect of climate change. This would ensure that the pasture fields are protected so as grass would grow to maturity to sufficiently support the livestock. This ensured that the crops were protected from roaming livestock. The results also show that 237(74.1%) of the respondents practiced mixed farming as a coping strategy against the effect

of climate change. These included, sorghum and millet farming, planting of beans and maize and livestock keeping.

In addition, from the focused group discussions of older women of 45 to 68 years gave their story in relation to how the community predicted and prepared to cope with the drought, and they said; the old women from certain clan that were not in productive age could go to pray for rains to come on a certain hill (at Mwino) or bush for two days and on the 3rd day, they enter in a certain chosen family who slaughter a goat to celebrate and rain will follow immediately.

10 years ago, it was believed that drought was associated with what they called, Tapogh (a star), hence when scattered, there will be no rain. These Tapogh represented both male and female and whenever female star was above the male then there was feeling that the woman was urinating on him thus the rains could not come. On the other hand, when the female star was lower than the male then it rained. More interestingly was when the male and female met in the west and below them was a child star then it was said to be a good sign and to experience adequate rains soon. However, whenever the female star was seen in the east then there will be no rains at all.

The coping strategies in the past for the drought included where, people used to prepare for the drought by putting milk in a big guard that was stored and preserved by ash from a tree called Kromwo in pokot but in Luyha as kumwandanda but botanically known as *Ozoroa insignis* and the milk could dry up and stay for even a year. This milk could be put in warm water and be taken as a meal during drought.

In addition, honey as a preservative was kept in a container and stored with dried white ants or boiled, dried goat meat wrapped with animal skin, which was served to family members with water as a meal during drought. Currently, they sell goats and chicken to buy food and if the family size is large, they sell a cow to buy maize. However, when the cows are thin, then they could fetch low prices which can't sustain the family for a long period.

This findings on coping strategies was in agreement with the findings of Daines, (1995), which revealed that after the drought that hit most African countries in 1980's, most governments vowed to protect its residents by initiating the "Green Movement", which sought to increase the agricultural productivity by introducing drought resistant crops, launched livestock immunization and sensitization about pest and diseases, and intensified agricultural practices by mechanization. Land rehabilitation practices such as irrigation, reducing overstocking of animals, and soil erosion prevention in ASAL were priority intervention measures adopted by ccountries in the Sub-Saharan Countries with pockets of successes.

For the respondents who adopt these coping strategies, they needed to be trained on climate change as shown in Table 21 below.

Table 21: Respondents trained on climate change

Trained on climate change	Frequency	Percent
Yes	90	28.1
No	230	71.9
Total	320	100.0

The results in Table 21 above show that 230(71.9%) of the respondents were not trained on climate change and how to adopt and mitigate its effects. These implies that most of the respondents were vulnerable to the effects of climate change and if nothing is done, they will heavily suffer these effects now and in future.

The study was carried out to test the null hypothesis that stated that; there was no significant relationship between climate change and food security among small-scale farmers in Chepareria division, West Pokot County. To achieve this the correlations analysis was carried out between climate change and food security and the results are shown in Table 22 below;

Table 22:Correlations between climate change and food security

		Climate change indicators	Food security among small holder farmers
climate change indicators	Pearson Correlation	1	-.036
	Sig. (2-tailed)		.729
food security among small holder farmers	Pearson Correlation	-.036	1
	Sig. (2-tailed)	.729	
	N	95	316

The results in the Table 22 above show that there is a negative ($r=-.036$, $p>.05$ significant level.) but insignificant relationship between climate change and food security among small holder farmers.

This result implies that in Chepareria division, there exist no statistically significant relationship between climate change and food security. We therefore accept the null hypothesis which states that; there is no significant relationship between climate change and food security among small-scale farmers in Chepareria division, West Pokot County.

Moreover, regression analysis was also done to provide predictions in terms of how rainfall and drought occurrence as main climate change parameters in this study will influence food security in future especially on number months household will have adequate food in the year. This result is on Table 23 below.

Table 23: Regression Coefficients^afor climate variable and food security.

Model	Unstandardized		Standardized	t	Sig.
	Coefficients		Coefficients		
	B	Std. Error	Beta		
(Constant)	2.250	.414		5.438	.000
1 Effect of rainfall on both crops yield and livestock production.	.431	.228	.106	1.893	.059
(Constant)	1.953	.636		3.068	.002
2 Effect of rainfall on both crops yield and livestock production	.427	.228	.104	1.871	.062
Occurrence of droughtt in on food security.	.157	.255	-.034	.615	.539

a. Dependent Variable: Ccurrently, Months in the year the household has enough food.

$$\text{Food security} = 1.953 + .104X_1 - .034X_2$$

Where

$\alpha_0 = 1.953$ is a constant, shows that if all independent variables were rated zero, food security among small scale farmers rating would be 1.953

Rainfall (standardize $\beta=.104$). This value indicates that as rainfall increases by one standard deviation, food security among small scale farmers increases by .104 standard deviations when other factors are held constant.

Drought occurrence (standardize $\beta = -.034$). This value indicates that as drought increases by one standard deviation, food security among small scale farmers decrease by -.034 standard deviations when other factors are held constant.

The results under this objective is also in agreement with the findings of the nutrition integrated SMART survey report (2017), that argued that, the main contributing factor to the deteriorating food security nutrition situation in the West Pokot county includes household reduced milk yields and soaring prices of food. Other studies have also shown that pastoralists lack cereal stocks and their animal prices tumble in drought, grossly eroding their purchasing power. These was coupled with their distribution in often harsh environment, making them more vulnerable to famine than their agricultural counterparts (Sunya, 2003 and Mulaku, 2000).

4.4. Influence of land size and food security among small scale farmers

The second objective was to establish the influence of land size on food security among small scale farmers in Chepareria division, West Pokot county under the null hypothesis that state that; there is no significant relationship between land size and food security among small-scale farmers in Chepareria division, West Pokot County.

The farmers were asked their total size of land in acreages and the response were as shown in Table 24 below;

Table 24: Total land size in acreage

Land holding	Frequency	Percent
1-5	191	59.7
5-10	74	23.0
10 and above	55	17.3
Total	320	100.0

The results in Table 24 above show that the majority 191(59.7%) of the farmer had land holding of between 1-5 acres, 74(23.0%) had between 5-10 acres and 55(17.3%) had land above 10 acres. These findings were supported by the Ward Livestock Officer in Pokot South who had the following to say;

“the average farm size is 1-5 acres of land for the highlands and 5-20 acres for the low lands.

This was further supported by the both women and men of 20 to 45 years in the separate focused group discussions who said that; most farmers fall in the category of 1-5 acres of land who

utilizes land well especially by applying efficient fertilizers and use certified seeds on their farms, resulting to high yields and harvests maize ranging between 15-20 bags (90 kgs).

While farmers falling in the category of 5-10 acres as well as 10 acres and above since their priority was in keeping livestock under bigger portions of land while crops under very small portions could not apply efficient fertilizer and use of certified seeds thus low yields. This means that they invested less unlike those with small farms.

The study further sought to determine the land size under crop and pasture in 10 years and now. This was because the researcher wanted to establish the transition of the farmers in allocation of land for crops and pasture and the results are summarized in Table 25 below.

Table 25: Land size under crop and pasture

	Mean	Std. Deviation
land size in acres	2.1625	1.90984
land under pasture 10 years ago	1.9375	3.98065
land size under pasture currently	2.1125	.79566
land size under crop farming 10 years ago	1.9129	1.15783
currently land size under crop farming	2.1359	.81586

The result in Table 25 above show that average land size for farmers in Chepareria division is 2.1625 acres hence justifies the target group of the study that they are small scale farmers. The results also revealed that there was a slight increase of current land under pasture as well as crop land as compared to ten years ago. This implies that the families had changed their way of life

from nomadism to farming and improved livestock management. The results were supported by the Ward Livestock Officer, who said the following;

“Agro pastoralism is more practiced by farmers with land between 1-5 acres. Whereby farmers with 1-5 acres of land are food secure due to crop and animal diversification. While in the 5-10 acres in the lowland, more land is under livestock. There is diversification of livestock i.e. cows, goats, chicken and sheep. They are favoured by the climate in terms of production, survival or resilient to the harsh climatic conditions. For food, they sell livestock like goats and chicken in exchange for cereals i.e. maize. The food is also available on markets”

Table 26: Current productivity of maize

	Minimum	Maximum	Mean	Std. Deviation
currently bags of maize per acre	2.00	25.00	9.9641	5.02415

The results in the Table 26 above show that on average farms in Chepareria produce about 10 bags of maize per an acre of land, which is below the potential production of Chepareria according the Ministry of Agriculture. Thus, upscaling of sustainable agriculture land management interventions/technologies must be adopted by farmers to achieve food security.

However, this improvement in productivity of maize has been contributed by small scale farmers adopting proper land use as well as adopting the sustainable agriculture land management practices or technologies though on small scale as explained by ward Agricultural Officer in Chepareria below;

“farmers with small land sizes are more food secure because they fence their farms, have adopted sustainable agriculture land management which includes efficient use of fertilizers, certified seeds, use of farm yard manure, drought tolerant crop seeds thus more investments are made which includes; employing new technologies such as bio-intensive and keeping improved animal breeds that improves the productivity which makes households more food secure resulting to high productivity per unit area”.

These results agree with those established under focused group discussions by women who said that most small-scale farmers utilize land well especially by applying efficient fertilizers on their farms as one of the sustainable technologies resulting to high yields and harvests maize ranging between 10-20 bags (90 kgs).

Table 27: Chi-Square Tests test between land size and food security

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17152.529 ^a	9890	.000
Likelihood Ratio	2297.654	9890	1.000
Linear-by-Linear Association	14.429	1	.000
N of Valid Cases	314		

a. 10092 cells (100.0%) have expected count less than 5. The minimum expected count is .00.

The chi-square results in the Table 27 above show that the two variables are related at $p \leq 0.01$ significance level. This illustrates that there exists statistically significant relationship between land size and food security. We therefore reject the null hypothesis; which states; there is no significant relationship between land size and food security among small-scale farmers in Chepareria division, West Pokot County.

The study also adopted regression analysis where under land size the key indicators or parameters were (average land size, land under crop production and productivity of maize in bags per acre) that were analyzed to predict the influence on number of months a household will have enough food as a parameter for food security since it cut across the food security

dimensions in terms of availability, access, stability and utilization in future. The results are as shown on Table 28 below.

Table 28: Regression Coefficients^abetween land size and food security

Model	Unstandardized		Standardized	t	Sig.	
	Coefficients		Coefficients			
	B	Std. Error	Beta			
1	(Constant)	3.022	.220	13.761	.000	
	Total land size in acres	-.017	.076	-.013	-.228	.820
2	(Constant)	2.939	.455	6.462	.000	
	Total land size in acres	-.016	.077	-.012	-.208	.836
	currently total and size under crop faming	.038	.179	.012	.209	.834
3	(Constant)	.660	.602	1.097	.274	
	total land size in acres	.039	.073	.028	-.526	.599
	currently total land size under crop faming	.371	.182	.117	2.039	.042
	Currently bags of maize per acre	.162	.030	.314	5.486	.000

a. Dependent Variable: currently, months in the year the household has enough food

$$\text{Food security} = .660 + .028X_1 + .117X_2 + .314X_3$$

Where

$\alpha_0 = .660$ is a constant, shows that if all independent variables were rated zero, food security among small scale farmers rating would be .660

Total land holding (standardize $\beta=.028$). This value indicates that as total land holding increases by one standard deviation, food security among small scale farmers increases by .028 standard deviations when other factors are held constant.

The total land size currently under crop farming (standardize $\beta=.117$). This value indicates that as total land size currently under crop farming increases by one standard deviation, food security among small scale farmers increases by .117 standard deviations when other factors are held constant.

Currently bags of maize per acre (standardize $\beta=.314$). This value indicates that as currently bags of maize per acre increases by one standard deviation, food security among small scale farmers increases by .314 standard deviations when other factors are held constant.

These findings are supported with the findings of Muraoka, Jin, and Jayne (2014), who attempted to assess and quantify the relationship between operational land size, household income and food consumption -a proxy for food security. His study established that a 10% increase in operational land size increases per capita total consumption and per capita home-produced food consumption by 0.8% and 2%, respectively. While Obayelu, (2012) also said that, investing in smallholder cultivation is an important way to increase food security and nutrition for the poorest, as well as food production for local and global markets.

In addition, this finding is also in agreement with FAO report (2018) on hunger and food insecurity, points out new evidence that continues to point to a rise in world hunger in recent

years after a prolonged decline. An estimated 821 million people which approximates that one out of every nine people in the world are undernourished. Moreover, 500 million small farms worldwide, most still rain-fed, provide up to 80 per cent of food consumed in a large part of the developing world.

4.4. Influence of land tenure systems on food security among small scale farmers

The third objective of the study was to assess the influence of land tenure on food security among small scale farmers. This objective was to test the hypothesis of the study stated there is no significant relationship between land tenure systems and food security among small-scale farmers in Chepareria division, West Pokot County

The study was to establish both 10 years ago and currently what was the status of land ownership among the farmers in Cheparera division, and Table 29 below show the results;

Table 29: Status of land ownership 10 years ago and current

	10 years	10 years	Current	Current
	Frequency	Percent	frequency	Percent
Communal	188	58.6	220	68.7
Privately owned	132	41.4	100	31.3
Leased	0	0	0	0
Total	320	100.0	320	100.0

The result in Table 29 show that 10 years status of land ownership as per the respondent was 188(58.6%) and 132(41.4%) and currently 220(68.7%) and 100(31.3%) respectively, while

leasing tenure in both periods was none. This implies that there is transition from communal to private land ownership

The FAO Technical Officer had to say the following under land tenure;

“Chepareria used to have community land that was managed by a group of elders that were trusted and not managed by individuals. The community owned land but it was held in trust by the county government or municipal council. Had vast land that was open in terms of management e.g. where to graze, where to cultivate. Currently, due to pressure in terms of population and highway to Lowdar people scramble to own land individually. The community committee (responsible Pokot elders), including control land board managed land in terms of fencing land considering common resources like water sources like rivers that are natural to be used in dry season which cannot be enclosed for it results to conflicts and selling of land”.

The member of land control board had the following to say on land tenure that;

“eight out of ten farmers owned land privately while 2 communally. Farmers with privately own land invested in their land to produce more food compared to communally owned. Communally owned land was reducing since those who owned land individually could easily sell land to pay fees hence putting pressure to elders to let people own land individually instead of communal due to an increase in land value. Decisions on farming on communal land was limited to the elders and there is no leasing unless on short term like a year or 2.”

The study further sought to establish the adoption of sustainable agricultural land management practices that were on the farms that were privately owned. The results are summarized in Table 30 below.

Table 30: Private land ownership and adoption of sustainable agriculture land management practices

	Frequency	Percent
Use of manure	282	88.1
Soil conservation	133	41.6
Tree planting	111	34.7
Enclosure	230	71.9
Certified seed	94	29.4
Use of fertilizer	142	44.4
Improved breed	37	11.6

The private land ownership influenced the adoption of good farming practices in Table 30 which include; use of manure, soil conservation, tree planting, enclosure, use of certified seed, use of fertilizer and use of improved breed. This implies that private land ownership enhances the adoption of sustainable agriculture land management practices which contributes to high yields hence resulting to food security among households. The results are further explained how land tenure systems relates with food security in Table 31 below.

The findings are in agreement with the finding of Davies and Moore, (2016), who said that the evidence of good soil management practice has been reported among communities living in the area manuring, hillside terracing, and mulching are among common soil conservation measures residents invest in. Following the adoption and use of enclosures, the people of West Pokot have minimized seasonal migratory practices in search of pasture; instead, they are focused on agribusiness with less interest in livestock production. Such changes in agricultural practices are

attributed to increased privatization of community land to allow development. Further analysis was done using correlation to assess the relationship between land tenure system and food security as shown on Table 31 below;

Table 31:Correlations between land tenure system and food security

		Influence of land	
		tenure on food	food security among small holder
		security	farmers
influence of land tenure on food security	Pearson		
	Correlation	1	.103
	Sig. (2-tailed)		.067
	N	320	316
food security among small holder farmers	Pearson		
	Correlation	.103	1
	Sig. (2-tailed)	.067	
	N	316	316

The results in the Table 31 above show that there is a positive but insignificant relationship between land tenure system and food security at $r=.103$, $p>.05$ significant level.

This illustrates that there exists no statistically significant relationship between land tenure and food security. We therefore accept the null hypothesis which states that; there is no significant relationship between land tenure and food security among small-scale farmers in Chepareria division, West Pokot County.

Further analysis was done using regression to provide prediction information in terms of influence of specifically privately-owned land on food security using the parameter of number of months a household will have enough food in future and the results are shown on Table 32 below;

Table 32:Regression coefficientsa between current land ownership and food security

Model		Unstandardized		Standardized	t	Sig.
		Coefficients		Coefficients		
		B	Std. Error	Beta		
	(Constant)	2.313	.487		4.746	.000
1	currently land ownership	.424	.294	.081	1.442	.150

a. Dependent Variable: currently, how many months in the year the household has enough food

$$\text{Food security} = 2.313 + .081X_1$$

Where; $\alpha_0 = 2.313$ is a constant, shows that if all independent variables were rated zero, food security among small scale farmers rating would be 2.313

Current land ownership (standardize $\beta=.081$). This value indicates that as current land ownership increases by one standard deviation, food security among small scale farmers increases by .081 standard deviations when other factors are held constant.

These findings agree with the findings of Mulaku (2000) who identified the three types of tenure models in East Africa as quasi customary, pure customary and group ranch models. He suggested that for a community to succeed in attaining food security in marginal areas or in dry lands, it

must give due and long-term attention to issues of land tenure, especially in transhumant and agro-pastoral areas, which tend to be given limited attention by governments due to their supposedly limited potential for food production. In the study, he showed the relationship land ownership and zoning, but did not relate the two to food sufficiency.

The findings of the study are also in agreement with the findings of Davies and Moore, (2016) who said that land tenure system in Chepareria has been described as “a complex system of kinship-based land-tenure” The tenure system is managed by the *kokwa* which means a meeting of elders. There is evidence of both semi-permanent and shifting cultivation on valley floors while households built on valley slopes with small gardens that are exclusive to each household. They also found that land renting is the single most important mechanism that land-poor households use to access additional land for cultivation even though the productivity of rented land was found to be significantly lower than owned plots and farmers tend to apply less organic manure to rented land than to own land hence low crop yields.

4.5: Influence of NGO interventions on security among small scale farmers

The fourth objective of the study was to determine the influence of NGO interventions on the food security among small scale farmers, with a null hypothesis of the study stated that there is no significant relationship between NGO interventions and food security among small-scale farmers in Chepareria division, West Pokot County. Table 33 below provides the type of NGOs that had had interventions that contributed towards household’s food situations in the study area.

Table 33: Type of NGO that contributed towards food security

NGO	Frequency	Percent
World vision	118	36.9
Vi. Agroforestry	150	46.9
F.A.O	2	.6
OX-FARM	18	5.6
WFP	6	1.9
Afya Plus	6	1.9
NALEP	18	5.6
CRS	2	.6
Total	320	100.0

Based on the responses in Table 33 above, it can be concluded that 150(46.9%) and 118(36.9%) of the respondents from the study area recognized Vi Agroforestry and World vision among other NGOs respectively to have had interventions that were geared towards improved food production. The results imply that among the many NGOs that have had their interventions in the study area Vi Agroforestry and World Vision have had significant interventions that contributed towards improving food production. Table 34 below show the type of interventions that were carried out;

Table 34: NGO interventions

	Frequency	Percent
Enclosure	73	22.8
Extension services	17	5.3
Tree planting	124	38.8
Soil/water cons.	22	6.9
Boma rode grass	5	1.6
Access to market information	13	4.1
Food provision	10	3.1
Seed provision	14	4.4
Training/Capacity development	24	7.5
Provide animals	6	1.9
Access to credit	2	.6
Fruit tree provision	7	2.2
Tanks provision	3	.9
Total	320	100.0

Table 34 show the responses by farmers on key interventions by NGOs that contributed towards improving productions; 124(38.8%) of the respondents said tree planting, 73(22.8%) of the respondents said enclosure, 24(7.5%) training or capacity development, 22(6.9%) on Soil/water conservation among others. This implied that most interventions were again related to Vi Agroforestry and World vision. The Director of Agriculture West Pokot County said the following on Vi Agroforestry and World Vision as key NGOs that;

“Vi Agroforestry interventions included; enclosures which were key and farmers who had them did soil and water conservation structures, dug ditches, fenced their farms using sisal that was provided by Vi Agroforestry as well as using cactus live-fencing materials. Trained farmers on various sustainable agricultural land management practices. Provided extension services to farmers, supported on digging water pans and promoted agroforestry farming system. These interventions improved soil fertility, rehabilitated degraded land, reduced crop damages by browsing animals hence productivity per unit area increased, that resulted to boosting the maize production from 5 bags of maize 10 years ago to currently harvesting between 10- 20 bags per acre. Milk production increased due to more pastures in the enclosed land and animals fetched higher prices on the market than before. For instance, farmers who adopted the practice harvested more in terms of grass, fodder trees, upgraded goats (galla), cows, sheep (doppa). This resulted to one of the farmers who enclosed his land and upgraded his animals to improved breed was given an opportunity to present his best bull in Agriculture show for competition and he won 1st price in agriculture show of Kenya (ASK) in 2014 and 2015 best bull fetching a price of KES 110000 followed by KES 100,000. Vi agroforestry realized these results due to effective collaboration she had with other stakeholders (M.O.A. Livestock department, other NGOs and faith-based organizations)”

“World vision mainly focused on nutrition by promoting fruit trees like; mangoes and oranges. Supported water harvesting techniques by giving tanks to households and schools for roof catchment. Then supported in provision of relief food, children education through creation of awareness on children rights and medication or health services. Finally helped in infrastructure by building schools, desks and books to promote education”

Table 35 result show the change realized after the interventions by NGOs in terms of food situations at household level.

Table 35: Changes related to the NGO interventions that contributed to food situation

	Frequency	Percent
Improved	252	78.8
Same	6	1.9
Reduced	60	18.8
Don't know	2	.6
Total	320	100.0

The results in Table 35 above show that 252(78.8%) of the respondents reported that the interventions by NGO had contributed to improvement in food situation in the study area. This result could easily be verified by the interventions shown per NGO above.

The results in Table 36 below show that there was a relationship between NGO intervention and food security which is summarized that the NGO interventions positively and significantly influences food security.

Table 36:Correlations between NGOs interventions and food security.

		food security among small holder farmers	Influence of NGO on food security
food security among small holder farmers	Pearson Correlation	1	.135*
	Sig. (2-tailed)		.017
	N	316	316
Influence of NGO on food security	Pearson Correlation	.135*	1
	Sig. (2-tailed)	.017	
	N	316	320

*. Correlation is significant at the 0.05 level (2-tailed).

The results in Table 36 above show that there is a positive and significant relationship between NGOs interventions and food security $r=.135^*$, $p<.05$. Calculating the coefficient of determinant, NGOs intervention contributes 1.8% variability to food security when other factors are held constant.

This illustrates that there exists statistically significant relationship between NGO interventions and food security. The researcher therefore rejects the null hypothesis which states that there is no significant relationship between NGO interventions and food security among small-scale farmers in Chepareria division, West Pokot County.

Table 37 provides information that predicts the future influence the NGO interventions will have on food security.

Table 37: Regression between NGO interventions and food security

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.591	.232		11.185	.000
	interventions	.095	.044	.121	2.170	.031

a. Dependent variable: currently, months in the year the household has enough food

$$\text{Food security} = 2.591 + .121X_1$$

Where

$\alpha_0 = 2.591$ is a constant, shows that if all independent variables were rated zero, food security among small scale farmers rating would be 2.591.

NGO interventions (standardize $\beta=.121$). This value indicates that as NGO interventions increases by one standard deviation, food security among small scale farmers increases by .121 standard deviations when other factors are held constant.

These findings agree with the findings of several studies by Mureithi et al. (2015); Verdoodt et al. (2010); Lal (2004); Mekuria et al. (2011) respectively which revealed that NGO interventions, specifically Vi Agroforestry with the introduction of enclosure stated that as a result of enclosure adoption, changes that were observed overtime included increased productivity of livestock and alleviate poverty; protect crops, arrest land degradation and improve carbon (C) sequestration from once a degraded and unproductive land.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION, RECOMMENDATIONS AND SUGGESTIONS

5.1: Introduction

This chapter presents the key findings in summary, make conclusions and recommendations based on the study findings. Suggestions in favor of areas for further research in specific study objectives are provided too. The chapter also summarizes the contribution to the existing body of knowledge. Therefore, from the analysis of the data collected the following are the findings, conclusions and recommendations made in this study.

5.2 Summary of the research findings

The research findings are presented based on the four objectives as well as the four hypothesis that mainly focused on; influence of climate change, land size, land tenure and NGO interventions on food security among small scale farmers in Chepareria division, West Pokot County, Kenya. Data gotten from relevant literature review, questionnaires, interview schedules of key informants, focused group discussions were analyzed based on hypothetical relationship that existed between variables, hence used descriptive and inferential analysis.

5.2.1. Influence of climate change and food security

Data analysis and interpretation of questionnaire responses from the small holder farmers, chiefs and county government officers. The study established that there was a negative but insignificant influence between climate change and food security among small scale farmers in Chepareria division at $r = -.036$ $P > .05$ significant level.

The study also through regression analysis predicts that rainfall and drought occurrence as main parameters considered for climate change in this study has an influence on food security. The predicted results are; rainfall (standardize $\beta = .104$), hence this value indicates that as rainfall increases by one standard deviation, food security among small scale farmers increases by .104 standard deviations while other factors are held constant. In addition, the results on drought occurrence (standardize $\beta = -.034$), where this value indicates that as drought increases by one standard deviation, food security among small scale farmers decrease by -.034 standard deviations while other factors are held constant.

5.2.2. Influence of land size and food security

Data analysis and interpretation of questionnaire responses from the small holder farmers, chiefs and staff from the County government officers. The study established that there was a positive and significant relationship between land size and sustainability of food security among small scale farmers in Chepareria division at $r = .215^{**}$, $P < .01$ significant level contributing 4.6 % variability to the food security among small scale farmers. These findings indicate that land size is a significant factor to the food security among small scale farmers in Chepareria division.

Under regression analysis, it is predicted that; total land holding (standardize $\beta=.028$), where this value indicates that as total land holding increases by one standard deviation, food security among small scale farmers increases by .028 standard deviations when other factors are held constant.

Another parameter was, the total land size currently under crop farming (standardize $\beta=.117$), where this value indicates that as total land size currently under crop farming increases by one standard deviation, food security among small scale farmers increases by .117 standard deviations when other factors are held constant.

The last parameter was current bags of maize per acre (standardize $\beta=.314$), where this value indicates that as currently bags of maize per acre increases by one standard deviation, food security among small scale farmers increases by .314 standard deviations when other factors are held constant.

5.2.3. The influence of land tenure systems and food security

Data analysis and interpretation of questionnaire responses from the small holder farmers, chiefs and staff from the County government officers. The study established that there was a positive but insignificant relationship between land tenure and food security among small scale farmers in Chepareria division at $r=.103$ $P>.05$ significant level.

Further regression analysis predicts that, current land ownership (standardize $\beta=.081$). which this value indicates that as currently privately-owned land increases by one standard deviation, food

security among small scale farmers increases by .081 standard deviations when other factors are held constant.

5.2.4. Influence of NGO interventions and food security

Data analysis and interpretation of questionnaire responses from the small holder farmers, chiefs and county government officers. The study established that there was a positive and significant relationship between NGOs intervention and food security among small scale farmers in Chepareria division at $r=.135^{**}$, $P<.05$ significant level contributing 1.8% variability to food security among small scale farmers in Chepareria division. These findings indicate that NGO interventions is a significant factor to food security among small scale farmers in Chepareria division.

Regression analysis revealed that, NGO interventions (standardize $\beta=.121$), which this value indicates that as NGO interventions increases by one standard deviation, food security among small scale farmers increases by .121 standard deviations when other factors are held constant.

5.3. Conclusions

This study investigates the influence of agro-pastoralism dynamics on food security among small scale farmers in Chepareria Division, West Pokot County, Kenya. The study specifically sought to determine the influence of climate change, to establish the influence of land size, to assess the influence of land tenure systems and to determine influence of NGO interventions on food security among small scale farmers in Chepareria division, West Pokot county.

The study established that there was a negative but insignificant relationship between climate change and food security, implying that as climate change increases, food production will decrease over time.

There was a positive and significant relationship between land size and food security, implying when land under crop (Maize as staple food) increases, then food production will increase.

There was a positive but insignificant relationship between land tenure and food security, implying that as land ownership specifically privately owned enhances investment than communally owned hence more production on farm.

Finally, there was a positive and significant relationship between NGOs interventions and food security, this implies that as farmers adopt more innovative sustainable agricultural technologies through the government projects and research that attracts NGOs interventions, then that will contribute to more food production among small scale farmers in Chepareria division.

This means that to realize food security in Chepareria division, small scale farmers must adopt practices that contribute to adaptation and mitigate effects of climate change; the size of land

holding under cropland must be of higher acreage or existing small sizes be amalgamated; adopt privately owned land tenure systems; and encourage NGOs interventions are key.

5.4 Contribution to the body of Knowledge

The research made the following contribution to the existing body of Knowledge.

Influence of climate change on food security

The indigenous knowledge on prediction of rainfall onset and drought occurrence and the preparations done in having nutritious food stored to sustain the families in order to cope with drought occurrence was new knowledge.

The adoption of climate change adaptation and mitigation measures will enable family's to be resilient and food secure.

The indicator of access to food meaning farmers can afford to buy food is key in Chepareria, whereby the food on the market through traders from within and neighboring counties can be bought by farmers when their food in stores at home are empty. Since production of maize is generally low which exposes most families not to be food secure the whole year round, they cope by selling part of their livestock to buy maize from the market.

Influence of Land size on food security

The contribution is that proper land use through adoption of sustainable agriculture land management practices and diversification to reduce the risk of depending on either one type of crop or livestock on small scale farms will result to high productivity. Implying the investment put in farming will contribute to high yields for both crop and animal.

Influence of land tenure on food security

The analysis from the questionnaire data didn't bring out much difference between who owns land communally and privately owned, but from interviews, it was clear that generally almost all households own land privately though without title deeds but still have legal documents from elders or chiefs that enable them buy and sell land. This is because the group ranch that contributed most to communal land ownership also broke recently. Moreover, the leasing tenure system was missing out hence people just lease for one year to plant crop or for pasture production.

Influence of NGO interventions on food security

The significance NGO interventions contributes to food security is core in terms of knowledge. This means that the government could come up with projects to attract more NGOs whose interventions contributes to food production in the study area.

Finally, the fact that the results from the study states that there was influence of agro-pastoralism dynamics on food security, then that confirms that the study has contributed to the knowledge gap.

5.5 Recommendations of the Study

The researcher has argued that combating climate change, the size of land holding under cropland, tenure systems in place and NGOs interventions are key a to the food security among small scale farmers. The study has also established that these dynamics are significant for food security among small scale farmers.

Despite its limitations, these study findings should be used to enhance food security among small scale farmers. Basing generalization on the findings of this study, the researcher recommends that:

5.4.1. Recommendations for policy

The government should come up with policies to guide all the small-scale farmers in Kenya on how they can adapt and mitigate the effects of climate change. The process that facilitates farmers to own land privately to be made affordable and simplified, since people say they own land but don't have legal documents. Government to come up with minimum land holding for the area to avert over-exploitation that may result in degradation in future.

The County government to be innovative enough through research like this one to design projects that will attract NGOs intervention that will contribute to increased crop and animal productivity, hence supporting households to be food secure. This is because currently the NGOs like Vi Agroforestry phased out their activities, yet farmers still need their services.

5.4.2. Recommendations for practice

Farmers to adopt sustainable agriculture land management practices as mitigation measures against effects of climate change as well as embrace the coping strategies like diversification of both crops and livestock to spread the risk in order to be food secure by the community during or

in preparation for dry season. The government should provide alternative extension services on sustainable agriculture land management to be accessed by farmers.

The small-scale farmers should stop further fragmentation or amalgamate small pieces of land into bigger pieces of land and practice sustainable agriculture land management practices or technologies for increased crop production and diversification for high productivity per unit area.

To enhance production on farms for households to be food secure, proper land tenure system should be adopted by the community of Chepareria, through the leadership of the County or national government and the support of institutions like Food Agricultural Organizations (FAO).

The Government to attract more NGOs through new projects and research whose interventions are geared towards improving food situation among small scale farmers in the study area, since the few NGOs that have been in the area their interventions have had a positive influence on food security.

5.5 Suggestions for Further Research

Based on the findings of this study, the following suggestions for further research were made;

- Future researchers should dwell on extensive feasibility studies to be carried out in establishing why negative influence of climate change on food security. This implies that more is to be done to find out what it means when climate change increases then the food production or productivity decreases.
- Indigenous knowledge especially on drought prediction and how women are involved in this verses food security by the community and the preparations for drought in terms of being food secure during the dry period.
- Gender and land tenure, it was interesting to learn that women were always allocated land by their husbands though without any legal document and how this contributes to a household being food secure. This proposed study could also investigate the aspects of women access and control of productive resources like land. However, during the study, I learnt that FAO, had an on-going study that revealed that nationally 2% of women own land, 5% of women own land in West Pokot and 10% of women own land in Chepareria

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APPENDICES

Appendix i: Questionnaire For Small-Scale Farmers

(Please tick response as appropriate, where explanation is requested, be precise.)

Code No. of the Questionnaire.....

General Information

Farmer's Name.....Age (18-35, 36-45,46-60, 60 and above)

Sex (Male/Female)

Main Occupation (Farming, Employment, Business)

Education level (Primary, Secondary, Tertiary)

County..... Sub-county.....

Ward.....Village.....

Date of Interview.

Name of The Interviewer.....

2.What is the average family monthly income in KES? < 5000 5000-10000 10000-20000
>200000 Others specify.....

3a. Has the farmer accessed credit in the last 12 months or season? Yes No

3b. If yes, where does farmer invest most? Education Health Farming Buying food

4. Does your children go to school? Yes No

Section 2: How Climate change influences food security

1.How has rainfall affected both crop yield and livestock production in the last 10 yrs. ago?

High yields Low yields Same yields

2.Compare the period drought has taken for the last 10 years and now?

Longer Shorter Same

3. What is the occurrence of drought in Chepareria in last 10 years as compared to now?

Frequent Less frequent Very frequent Same

4. What have been the effects of drought 10 years and now? (**Tick more than one option**)

Loss of Livestock Low crop maize yield Low milk production

High yield of tolerant drought crop Water is scarce

5. What have you done on farm as coping strategies against the effects of climate change /drought

above? (**Tick more than one**) Enclosed part the farm Planted trees Practicing mixed

farming Use improved crop seeds Keeping improved breeds Keeping large hard size none

6a. Have you had any training on climate change? Yes No

7a. What was the main farming system for the household 10 years ago?

Pastoralism Agro-pastoralism Agroforestry

7b. What is the current main farming system for the household?

Pastoralism Agro-pastoralism Agroforestry

Section 3: How Land size influences food security

1. What is the total size of your land in acreages? (1-5 acres, 5-10 acres, 10 and above) **Tick one**

2. What was total land size under pasture 10 years ago?.....**Just indicate acreage**

2b. Currently what is the land size under pasture?.....**Just indicate acreage**

3a. What was total land size under crop farming 10 years ago?.....**Just indicate acreage**

3b. Currently what is total land under crop farming? ?.....**Just indicate acreage**

4a. What was considered as staple food 10 years ago?.....

4b. Currently what is staple food?.....

5a. What is the current maize production in terms of bags per acre? (**90Kg Bag**)

Section 4: How land tenure systems influences food security

1. What was the status of land ownership 10 years ago?

Communal Privately owned (Title/Documented) Leased

2. Currently what is the status of land ownership at household level

Communal Privately owned (Title/documentated) Leased

3.What sustainable land management practices have been adopted on land owned?

(Tick more than one) Manuring/ farm yard manure Mulching Soil and water
 conservation Tree planting Enclosure Use of certified crop seed
 Use fertilizers efficiently Use of improved breeds None

Section 5: How NGO interventions influences food security

1.List the NGOs that has had interventions in Chepareria relevant to improving food situation

No.	Name of NGO	List the interventions by indicating some of the options; <i>(Agriculture related trainings, Access to credit to invest in farming, Access to market information, agriculture extension services, Introduction of Enclosure for food, management of Enclosure for food etc.)</i>
1		
2		

2. State the changes related to food situation contributed by the NGOs *(Use codes appropriately to indicate the impact): 1. Improved food 2 Same 3. Reduced 4 don't know)*

No.	Name of NGO	Impact of the interventions
1		
2		

Section 6: Key questions on food security

1. What was the household **main** sources of food 10 years ago?

Livestock Crop

2. what type of livestock/total number do you own? Goats ...Sheep..... Cows... Chicken

3. Currently, how many months in the year the household has enough food?

1-3month 4-6 Months 7-9 months 10-12months

4. Tick the statement that best describes your household currently.

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
I include animal protein and fruits in all meals					

5. List all crops in last one year you planted on farm with acreage; Maize/beans acreage...

Sorghum acres Millet acres...Bananas acres... Fruits trees no. types of fruit tree.....

Appendix ii: Interview Schedule for key informants

For the researcher after brief introduction and explaining the purpose of the study, then should ask the questions as they are and note key responses

NOTE: Inform the respondent about your need to write short notes about the 15 minutes interview:

1a. Briefly share how drought/rainfall variability in the past and now has influenced food at household level (How climate change influences food security).

1b. Briefly share some of the common coping strategies/mitigation measures against drought/effects of climate change in the past and now

2a. In your view, how has land size dynamics past and now influenced food security, is it always a farmer with large land size food secure or is it always a small size of land holder food insecure?)

2b. What is the average land size?

3. How land tenure system dynamics in the past and now (Communal, privately owned and Leased/rented) has influenced on food security?

4. In your view, share how NGO intervention in the past and now have had influence on food security (How NGO interventions influences food security?)

Appendix iii: Focus Group Discussions

This form will be used to record the proceedings of the 4 focus group discussions (Adult male farmers, Adult female farmers (36 years and above), Young male/Young female farmers (18 to 35 years). Notes should be extensive and reflect accurately on the content of the discussion, as well as any notable observations of nonverbal behavior, such as facial expressions, hand movements, group dynamics, etc.

Date Type of focus Group and No: _____

1a. Briefly share how drought/rainfall variability in the past and now has influenced food at household level (How climate change influences food security).

1b. Briefly share some of the common coping strategies/mitigation measures against drought/effects of climate change in the past and now

2a. In your view, how has land size dynamics past and now influenced food security, is it always a farmer with large land size food secure or is it always a small size of land holder food insecure?)

2b. What is the average land size?

3. How land tenure system dynamics in the past and now (Communal, privately owned and Leased/rented) has influenced on food security?

4. In your view, share how NGO intervention in the past and now have had influence on food security (How NGO interventions influences food security?)

Appendix iv: Table for Determining Sample Size from a Given Population

Table for Determining Sample Size from a Given Population					
N	S	N	S	N	S
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—N is population size.
S is sample size.


Appendix v. Research Permit

THIS IS TO CERTIFY THAT: **Permit No : NACOSTI/P/19/18568/30419**
MS. LONAH MUKOYA LUSIKE **Date Of Issue : 30th May,2019**
of UNIVERSITY OF NAIROBI , 4380-30200 **Fee Received :Ksh 1000**
KITALE,has been permitted to conduct
research in Westpokot County

on the topic: INFLUENCE OF
AGRO-PASTORALISM DYNAMICS ON
SUSTAINABILITY OF FOOD SECURITY
AMONG SMALL SCALE FARMERS IN
CHEPARERIA DIVISION, WEST POKOT
COUNTY, KENYA

for the period ending:
23rd May,2020

Applicant's
Signature



Director General
National Commission for Science,
Technology & Innovation


INNOVATION ACT, 2013

The Grant of Research Licenses is guided by the Science,
Technology and Innovation (Research Licensing) Regulations, 2014.

CONDITIONS

- 1. The License is valid for the proposed research, location and specified period.**
- 2. The License and any rights thereunder are non-transferable.**
- 3. The Licensee shall inform the County Governor before commencement of the research.**
- 4. Excavation, filming and collection of specimens are subject to further necessary clearance from relevant Government Agencies.**
- 5. The License does not give authority to transfer research materials.**
- 6. NACOSTI may monitor and evaluate the licensed research project.**
- 7. The Licensee shall submit one hard copy and upload a soft copy of their final report within one year of completion of the research.**
- 8. NACOSTI reserves the right to modify the conditions of the License including cancellation without prior notice.**

National Commission for Science, Technology and innovation
P.O. Box 30623 - 00100, Nairobi, Kenya
TEL: 020 400 7000, 0713 788787, 0735 404245
Email: dg@nacosti.go.ke, registry@nacosti.go.ke
Website: www.nacosti.go.ke



REPUBLIC OF KENYA
National Commission for Science,
Technology and Innovation
RESEARCH LICENSE

Serial No.A 25085
CONDITIONS: see back page

Appendix vi: National Commission For Science, Technology and Innovation



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349, 3310571, 2219420
Fax: +254-20-318245, 318249
Email: dg@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/19/18568/30419**

Date: **30th May, 2019**


Lonah Mukoya Lusike
University of Nairobi,
P.O. Box 30197 – 00100,
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *“Influence of agro-pastoralism dynamics on sustainability of food security among small scale farmers in Chepareria Division, West Pokot County, Kenya”* I am pleased to inform you that you have been authorized to undertake research in **West Pokot County** for the period ending **23rd May, 2020.**

You are advised to report to **the County Commissioner and the County Director of Education, West Pokot County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit a **copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.


BONIFACE WANYAMA
DIRECTOR GENERAL/CEO

Copy to:

The County Commissioner
West Pokot County.

The County Director of Education
West Pokot County.

Appendix vii: A Map Of West Pokot County

