AN ASSESSMENT OF THE IMPLEMENTATION OF THE NATIONAL CLIMATE CHANGE POLICY RECOMMENDATIONS ON FOOD SECURITY IN UGANDA : A CASE OF KAPELEBYONG SUB COUNTY, KAPELEBYONG DISTRICT

ALLAN NAIMWANGA

M21M07/003

A DISSERTATION SUBMITTED TO THE SCHOOL OF SOCIAL SCIENCES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF A DEGREE OF MASTER OF RESEARCH AND PUBLIC POLICY OF UGANDA CHRISTIAN UNIVERSITY

March,2025

UGANDA CHRISTIAN UNIVERSITY

A Centre of Excellence in the Heart of Africa

DECLARATION

I Naimwanga Allan, do hereby declare, that this report titled "*An Assessment of the National Climate Change Policy Recommendations on Food Security in Uganda. A case of Kapelebyong Sub County, Kabelebyong district*" is my original work and has not been submitted to any institution for any academic award. All the sources that I have cited are acknowledged in the reference list.

Signed …… Date: 21st March, 2025

NAIMWANGA ALLAN

APPROVAL

This report titled **"***An Assessment of the National Climate Change Policy Recommendations on Food Security in Uganda***.** *A case of Kapelebyong Subcounty, Kabelebyong district*" by Naimwanga Allan has been written under my guidance and it is ready for examination.

Signature: ----------Date: 21st March, 2025

Madam. Nagadya Edith

(University Supervisor)

DEDICATION

This report is dedicated to my family for all the direct and indirect support provided through the journey.

ACKNOWLEDGEMENT

This report would not have been possible without the intent of God my creator, therefore I'm sincerely grateful to God for loving me and choosing me to pursue this course.

I cannot forget my parents Dr. Sarah Kisa, Mrs. Mirembe Irene and Mr. Naimwaga Daniel whose support, encouragement and follow up made a big boost in carrying out my research up to this end.

My supervisor, Madam Nagadya Edith who always read through my work and advised me time and again, did a great job towards perfection of this research report.

The people of Kapelebyong Sub County who availed me with data for accomplishment of this study.

Am greatly indebted to the various authors of the books from which I have gained vast knowledge and experiences in order to enrich my report.

Lastly my colleagues in MRPP class who always made phone calls to find out the progress of this report and have therefore been a great encouragement to the success of this work.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

AfDB:	African Development Bank
CVI:	Content Validity Index
FAO:	Food and Agriculture Organization
FY:	Fiscal Year
GCF:	Green Climate Fund
GHI:	Global Hunger Index
GRFC:	Global Report on Food Crisis
IPC:	Integrated Food Security Phase Classification
IPCC:	Intergovernmental Panel on Climate Change
IWRM:	Integrated water resource management
LDCs:	Least Developed Countries
NCCP:	Uganda's National Climate Change Policy
NCCP:	National Climate Change Policy
NDP:	National Development Plan
NPA:	National Planning Authority
NWIS:	National water information systems
SDG:	Sustainable Development Goals
SIDS:	Small Island Developing States
SPSS:	Statistical Package for the Social Sciences
UGX:	Ugandan Shilling
UN:	United Nations
UNBS:	Uganda National Bureau of Standards
UNEP:	United Nations Environment Programme
UNHS:	Uganda National Household Survey
USAID:	United States Agency for International Development
USD:	United States Dollar
WFP:	World Food Programme

ABSTRACT

This study assessed the contribution of the national climate change policy recommendations on food security in Kapelebyong Sub-County, Kabelebyong District. The study was guided by three study objectives which included examining the effects of food storage facilities on food security, the effect of climate change adaptation measures on food security and the effect of water resource management practices on food security. A descriptive research design was used considering quantitative approach. The study targeted 373 participants and data was collected using questionnaires. The study findings revealed that there was positive but weak and insignificant relationship between food storage methods and food security at (r = .164, P > 0.01) and results also revealed that food storage methods positive but insignificant predicted food security at (Beta = **.027**, *p=.547* >0.05). It was revealed that there was positive, moderate and significant relationship between climate change adaptation measures and food security at (r = .582**, P < 0.01) and climate change adaptation measures positively and significantly predicted food security at (Beta =**.569**, *p=.000* <0.05). There was positive but weak and insignificant relationship between water resource management practices and food security at (r= .116, P > 0.01) and water resource management practices also positive but insignificant predicted food security at (Beta = **.067**, *p=.108* >0.05). The however concluded that, there was a positive but weak and insignificant relationship between food storage methods and food security. Additionally, it was also concluded that while water resource management practices have a positive, their impact on food security is weak and insignificant. For the combined constructs of national climate change policy recommendations specifically food storage methods, climate change adaptation measures, and water resource management practices accounted for 33.8%. The study recommended that there is need training farmers to improve food storage methods among residents should focus on the introduction and adoption of modern techniques such as the use of silos, smoking, and freezing. There is need for providing comprehensive training and support programs that highlight the benefits and practical implementation of fast-maturing crop varieties, improved infrastructure, early warning systems, climate-resistant crops, and irrigation systems. It was also recommended that a comprehensive strategy be implemented including the establishment of robust rules and regulations governing water usage, supporting locals to construct and maintenance of tanks and ponds for efficient water storage, and the development of water monitoring networks to oversee and manage community water sources effectively.

Key Words: *National Climate Change Policy Recommendations, Food Security, Food Storage Facilities, Climate Change Adaptation Measures, Water Resource Management Practices.*

CHAPTER ONE

INTRODUCTION

1.0 Introduction

The study examined the effect of the national climate change policy recommendations on food security in Kapelebyong Sub-County, Kabelebyong District. This chapter presents background to the study, context, problem statement, overall objective, research hypothesis, conceptual framework, significance, rationale, and scope in addition to providing definitions to key terminologies and topics.

1.1 Background to the study

According to the September 2023 edition of the Global Report on Food Crisis (GRFC), an estimate of 238 million individuals were forecasted to confront severe food insecurity and requiring immediate assistance across 48 countries/territories in 2023 (FAO, 2023). This Food crisis which is hitting with an alarming speed and turning into a challenge for developing and developed nations has been largely influenced by climate variations leading to droughts, landslides and floods that incapacitate food production (Barioni et al., 2019).

1.1.1 Historical background

Globally, all humans are experiencing climate variances and change within the 21st century. The most familiar and predictable phenomena are the seasonal cycles forcing people to adjust their clothing, outdoor activities, thermostats and agricultural practices (Jackson, 2014). Climate variation and change may also occur over longer periods, such as decades. Some locations experience multiple years of drought, floods, or other harsh conditions. Such decadal variation of climate poses challenges to human activities and planning. For example, multiyear droughts can disrupt water supply, induce crop failures, and cause economic and social dislocation, as in the case of the dust bowl droughts in the midcontinent of North America during the 1930s. Multiyear droughts may even cause widespread starvation, as in

the Sahel drought that occurred in northern Africa during the 1970s and ’80s (Public Health Institute, 2016).

The efforts to curb climate challenge and other disaster reduction efforts didn’t start in the 19th century nor the 20th century but rather dates way back in the 1989 when the United Nations announced 1990 as the International Decade for National disaster reduction (IDNDR) (Prasad, 2009). In addition, in the late 1990s, the same efforts through the UN led to the establishment of the International Strategy for Disaster Reduction. This was then followed by the Yokohama strategy of 1994, The Hyogo Framework for Action in 2005, Sendai Framework, The Paris Agreement and then the famous Sustainable Development Goals in 2015. Additionally, the Intergovernmental Panel for Climate change has done a tremendous job in assessing the impact of science and dissemination of climate change related information and knowledge to the World for over 30 years now.

1.1.2 Contextual background

The global hunger prevalence of undernourishment as presented in the SDG Indicator (2.1.1) showed a meager variation between 2021 and 2022 impacting approximately 9.2 percent of the global population in 2022 compared to 7.9 percent in 2019 (FAO, 2023). According to the Global Report on Food Crisis (GRFC) (2023), an estimate of 691 to 783 million individuals worldwide experienced hunger in 2022. Taking the midpoint of this estimate (approximately 735 million), it is notable that 122 million more people faced hunger in 2022 compared to 2019 (FAO, 2023).

In that regard therefore, food insecurity is when individuals cannot reliably obtain both materially and financially a sufficient quantity of nourishing food that fulfils their dietary requirements and food preferences in order to lead an active and healthy lifestyle (FAO, 2002). However, climate change has continually made farmers lose harvest as a result of

climate variations (Louhaichi, 2019). This phenomenon has been persistent in the face of different global and national initiatives to combat its prevalence for example; UNEP, IPCC, the Kyoto Protocol, the Green Climate Fund, Africa Climate Change Fund and the NCCP.

In 2021, 20.2% of Africa's population experienced hunger a stark contrast to 9.1% in Asia, 8.6% in Latin America and the Caribbean, 5.8% in Oceania, and less than 2.5% in North America and Europe (Sipri, 2023). The primary factor driving this escalating food insecurity include violent climate change, Africa faces exceptional vulnerability to climate change compared to other regions. Since 2020, the Covid-19 pandemic has pushed approximately 40 million Africans into extreme poverty (FAO, 2023). FAO (2023) denotes that the combination of the pandemic and the surge in food and commodity prices following Russia's invasion of Ukraine in February 2022 has created the most severe cost-of-living crisis in decades disproportionately affecting those living in or near poverty. This complex crisis presents substantial challenges for governments and other stakeholders attempting to address it.

Despite Uganda's distinct temperature and weather patterns that foster healthy ecosystems and biodiversity, human activities have contributed to the rising carbon dioxide and other greenhouse gas emissions thereby altering the climate (IPCC, 2014). Neglecting to address this issue will result in the gradual erosion of the benefits provided by natural resources due to the adverse effects of climate change including droughts, floods, storms, heatwaves and landslides which presents a significant threat to critical sectors such as agriculture and food security (NDP II, 2015).

More than 10.9 million individuals in Uganda face severe food insecurity and 1.6 million of them are currently undergoing a crisis (IPC, 2018). Only 4% of the Ugandan households could access food in the past five years that is from FY2009/10 to FY2015/16 with 80% of

them having a history of insecurity (NPA & WFP, 2017). Furthermore, there is a widening gap in food consumption attributed to the diminishing dietary variety within the community and escalating malnutrition rates. This is evident in various regions, including Central (0.58), Karamoja (0.12), Teso (0.2), East Central (0.38), and South Western (0.31) (Oxfam, 2017). According to the 2018 Global Hunger Index (GHI), Uganda's population is experiencing increased hunger, registering a score of 31.2, up from 26.4 in 2016. Despite Uganda being known as the regional food basket" of East Africa, its GHI score surpasses that of neighboring countries, such as Kenya (23.3), Tanzania (29.5), and Rwanda (28.7), as well as the regional Sub-Saharan Africa average of 29.4 (Bamanyaki, 2020).

According to Harriet et al (2020), floods in Kabelebyong district in 2007, 2013, 2015, and 2017 caused garden flooding, agricultural field destruction, property loss, and human deaths (Harriet et al, 2020). Individuals such as the elderly, nursing mothers, and children are perishing quietly in their residences due to complications related to hunger (Reuters, 2022). In a one specific county, the district has documented a minimum of 184 fatalities attributed to hunger between June and August 2022. At least 30% of the analyzed population of 625,200 people in Teso region are facing significant levels of acute food insecurity (IPC, 2022).

As a worldwide issue, climate change has spurred the application of policy to mitigate its impact on global populations and communities. Policy serves as a structured framework offering explicit directives and processes for steering various phenomena and affairs while presenting the most appropriate means and alternatives for accomplishing activities or events (Harris & Roach, 2021). Relatedly, Uganda’s climate change policy advocates for enhanced adaptation measures and proactive actions to mitigate the country's climate change impacts while diminishing vulnerability. This plan is carried out through a coordinated structure; as an example, the Ugandan government has put in place a programme to build dams in

different sections of the country's north and northeast as a means of addressing the consequences of the protracted drought. Unfortunately, some of the planned dams have not been built because of corruption in the Ugandan government (Ministry of Water and Environment, 2015).

1.1.3 Conceptual background

Many academicians have proposed various definitions and explanations for the phrase "climate change." The National Academy of Sciences (2020) defines climate change as variations in the frequency or strength of typical weather patterns, including temperature, humidity, precipitation, cloudiness, and wind patterns. Furthermore, changes in average meteorological conditions, such as variations in temperature, humidity, precipitation, cloud cover, and wind patterns, as well as adjustments to the frequency or severity of these events, can also be attributed to climate change (Solomon, 2020). Similarly, World Banks (2017) defines climate change as the significant variation of average weather conditions becoming, for example, warmer, wetter, or drier over several decades or longer.

Hasas (2011), states that "food security is achieved when all people have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life." On the other hand, food security is the condition of always having unfettered access to enough food, both in terms of its physical availability and its affordability, to meet dietary needs for a happy and healthy life (WFP, 2017).

Measuring food security takes into assessments of dimensions, including the presence of an adequate food supply, the ability to obtain it, its effective use, consistency over time, and its appropriateness (Moir and Morris in 2011). A household achieves food security when its members are not subjected to hunger or the constant threat of it. Food insecurity is frequently

intertwined with poverty and exerts enduring consequences on the capacity of families, communities, and nations to foster growth and well-being.

For this study, the National Climate Change Policy signifies the efforts initiated by the Republic of Uganda on a national scale to align with international climate change conventions. These endeavors aim to enhance climate resilience and attain food security (Ministry of Water and Environment, 2015).

1.1.4 Theoretical background

Several theories have been postulated to underpin food security for example the Malthusian theory of famine that relates food production and population growth. However, this study will adopt the systems approach propounded by Cristina Mele, Jacqueline Pels and Francesco Polese in 1950 can be adopted in analyzing food security particularly in this context of climate change (Sen, 1981). The key elements of food security considered by this theory include; food availability, stability, utilization, and access are considered, and therefore emphasized that climate change affects all four elements. According to WHO (2007), The food system encompassing activities from production to consumption is highlighted as a crucial aspect of food security analysis. The theory emphasizes the need for an integrated approach that considers the dynamic interactions between Global Environment change processes, food systems, and their outcomes. Various drivers, including bio geophysical and human environmental factors, shape food system activities and contribute to both food security and environmental/social concerns (World Bank, 2007). The theory emphasizes on how a food systems approach is holistic, linking the actions of producers, processors, distributors, retailers, and consumers to larger contexts that include historical, social, political, economic, and environmental elements. This strategy is offered as a way to find

technical, managerial, and policy choices as well as to improve understanding of the relationships between food security and climate change on a global scale.

1.2 Problem statement

Climate change continues to pose a profound threat to food security in Uganda, as evidenced by shifting weather patterns, increased frequency of droughts and floods, and rising temperatures that negatively impact agricultural productivity and food systems (Kannan & Anandhi, 2020). In response, Uganda adopted the NCCP to provide a framework for climate-resilient development, including specific recommendations aimed at enhancing food availability, access, utilization, and stability. Through the NCCP, Uganda has undertaken initiatives such as the Climate and Clean Air Coalition in 2021 to integrate climate mitigation with food system resilience (Ministry of Water and Environment, 2022). However, despite these policy efforts, a significant proportion of Ugandans remain food insecure. By the end of 2020, an estimated 69.2% (30.6 million) of Ugandans faced food insecurity, with 21.7% (9.6 million) experiencing extreme food insecurity (UNBS, 2020). Furthermore, the Integrated Food Security Phase Classification (IPC, 2022) reported that 26% of households were in crisis and under stress due to food insecurity, with over 30% of households in North Eastern Uganda where Kapelebyong Sub-County lies consistently affected. These alarming figures indicate persistent policy implementation gaps, particularly in addressing the four pillars of food security. Regarding availability, many farming households in Kapelebyong still rely on rain-fed agriculture with minimal climate-smart interventions, which has left them vulnerable to crop failure during erratic weather conditions (Ministry of Agriculture, Animal Industry and Fisheries, 2024). In terms of access, high food prices, poor road infrastructure, and limited market linkages have constrained households from acquiring sufficient and diverse foods. On utilization, poor sanitation, inadequate nutrition awareness, and limited access to clean water compromise dietary quality and health outcomes. Finally, with regard to stability,

the absence of sustained adaptive capacity, early warning systems, and resilient storage mechanisms continues to undermine year-round food security in the region (Ministry of Agriculture, Animal Industry and Fisheries, 2024; Ssewanyana & Kasirye, 2010). While previous studies (such as Munshi et al., 2021; Antonelli et al., 2021; Atube et al., 2021) have explored the general implications of climate change on food systems in Uganda, there is limited empirical evidence on how the implementation of NCCP recommendations influences food security outcomes at the sub-county level. Specifically, the extent to which these policy recommendations have been adopted and whether they effectively address the four core pillars of food security in Kapelebyong Sub-County remains unclear. This study therefore seeks to examine the effectiveness of the implementation of the NCCP recommendations in improving food security in Kapelebyong, highlighting both successes and existing policy gaps.

1.4 Purpose of the study

The purpose of the study was to assess the effect of implementation of the national climate change policy recommendations on food security in Kapelebyong Sub-County, Kabelebyong District.

1.4.1 Specific Objectives

1. To ascertain the effects of food storage facilities on food security in Kapelebyong Sub-County, Kabelebyong District.
2. To assess the effect of climate change adaptation measures on food security in Kapelebyong Sub-County, Kabelebyong District.
3. To ascertain the effect of water resource management practices on food security in Kapelebyong Sub-County, Kabelebyong District.

1.5 Research Hypothesis

H_{01}: Food storage facilities have no significant effect on food security in Kapelebyong Sub-County, Kabelebyong District.

H_{02}: Climate change adaptation measures have no significant effect on food security in Kapelebyong Sub-County, Kabelebyong District.

H_{03}: Effective water resource management practices have no significant effect on food security in Kapelebyong Sub-County, Kabelebyong District.

1.6 Scope of the study

1.6.1 Content scope

The focus of the study was to assess the effect of national climate change policy recommendations in ensuring food security in Kapelebyong Sub-County, Kabelebyong District, taking into account of food storage facilities, climate change adaptation strategies, and the effects of water resource management practices.

1.6.2 Geographical scope

The study was conducted in Kabelebyong district in Kapelebyong Sub-County in North-Eastern Uganda. Kapelebyong Sub-county is made of parishes which include Abarilela, Acowa, Asamuk, Kapelebyong, Kuju, Morungatuny, Obalanga, Orungo, and Wera. Kabelebyong district is bordered by Katakwi in the East, Soroti to the south, Kaberamaido in west and Napak and Alebtong in the north. This region was chosen because it has seen high levels of food insecurity as a result of climate change-related issues such as extended droughts, strong rains and hail storms.

1.6.3 Time scope

The study will consider the literature between 2015 and 2024. According to Keneth (2001), a policy can be evaluated for impact after a period of 5 years after implementation. However, the National Climate Change Policy was implemented in 2015 and therefore has been into existence for a period of nine years and hence making it ready to be assessed for impact.

1.7 Justification of the Study

Kabelebyong district has recorded high weather events mostly floods and drought for a number of years (2007, 2013, 2015, and 2017) that have affected crop production resulting into food insecurity in the area (Harriet et al, 2020), hence making this area a virgin place to conduct this study on the effect of implementation of the national climate change policy recommendations on food security. Furthermore, no comprehensive studies have previously assessed the impact of NCCP recommendations on food security in the area; Munshi et al. (2021) focused on climate change and food security in Uganda, Antonelli et al. (2021) examined climate change impacts on nutrition and labor supply in Uganda, Bwambale & Mourad (2022) assessed climate change impacts in the Victoria Nile sub-basin of Uganda, similarly, Atube et al. (2021) determined smallholder farmers' adaptation strategies to the effects of climate change in the Apac and Amuru districts of Northern Uganda.

1.8 Significance of the study

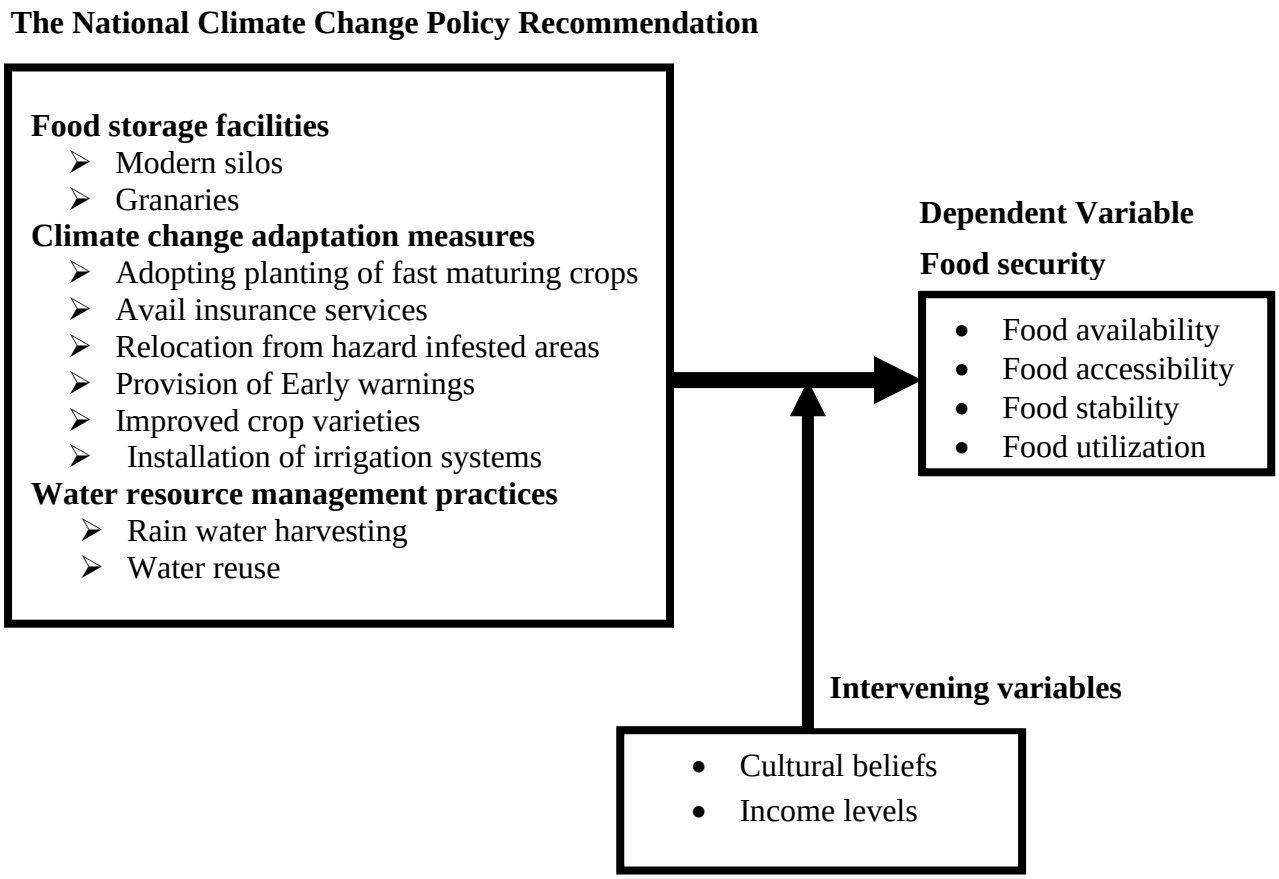
By demonstrating how the NCCP has affected food security in various regions of the nation, the research may significantly advance understanding and existing theories. This would broaden the literature's theoretical and empirical development because many studies have been made utilizing various variables and proxies. The study may make it possible for the major players in the nutrition and disaster-related organizations to understand how the National Climate Change Policy affects food insecurity/security.

This study contributes significantly to the achievement of several SDGs particularly SDG 2 (Zero Hunger), SDG 13 (Climate Action), and SDG 1 (No Poverty). By examining the effect of implementing the National Climate Change Policy (NCCP) recommendations on food security in Kapelebyong Sub-County, the research directly addresses the need for climate-resilient agricultural practices that ensure sustainable food production and improved livelihoods. The study provides insights into how climate policy can be effectively localized to enhance food availability, accessibility, and stability in vulnerable rural communities, thereby strengthening adaptive capacities and reducing climate-related vulnerabilities.

The study findings may inform policy makers for example the government to develop fact-based policies and amplify strategies regulating human activities that would lead to natural catastrophes that result into food insecurity.

Future scholars may use the study to understand the relationship between food security and the National Climate Change Policy. The study's recommendations for further research on the relationship between the aforementioned variables could make it useful as a diagnostic tool to pinpoint specific areas that would need to be improved in terms of food security. The study's findings would make recommendations that would be helpful to stakeholders like FAO and the MAAIF.

1.9 The conceptual framework



(Researcher's conceptualization, 2024)

Figure 1: Showing the conceptual framework

As presented above, the NCCP was depicted to have an impact on food security and therefore the foundation for this study. Food storage facilities, climate change adaptation strategies, and efficient water resource management practices are among the recommendations put forth by the NCCP to assist in the fight to end food insecurity hence help to explain the independent variable. The dependent variable food security was measured using food availability, food accessibility, food stability and food utilization. As a result, the conceptual framework described above is based on the representation of national climate change, food storage facilities, climate change adaptation techniques, water resource management, and food security. However, the intervening variables; cultural beliefs and income levels present the crucial supporting interventions or factors that can assist in ensuring food security. As a

result, the research examined how the government's Implementation of NCCP recommendations affect the availability of food in Kapelebyong Sub-County, Kabelebyong District.

1.10 Operational definitions

Climate change: According to the United Nations (UN, 2020), "climate change" refers to long-term modifications in temperatures and weather patterns resulting from both natural (such as variations in the solar cycle) and anthropogenic (such as the combustion of fossil fuels like coal) activities.

Policy: According to Thomas Dye, Public policy is “whatever governments choose to do or not to do” (Howlett, 2014).

Food security: Food security is when all people have physical, social and economic access to sufficient, safe and nutritious food” (PAI, 2015).

Food storage facilities: This refers to physical structures or systems designed to safely preserve harvested food over time, reducing post-harvest losses and ensuring year-round availability (Tadesse, 2024).

Climate change adaptation measures: These are proactive strategies and actions implemented to minimize the adverse effects of climate change on agriculture and food production systems (Grigorieva, Livenets & Stelmakh, 2023).

Water resource management practices: These involve the planning, development, and sustainable utilization of water resources to support agricultural activities and enhance food security (Turyasingura *et al.*, 2024).

Food stability: This is the ability of a population, a person or household to constantly have access to enough food throughout the year (Barioni et al., 2019). This looks at the short term and long-term but consistent supply of food.

Food availability: This refers to the physical presence of sufficient quantities of food, determined by production, supply chains, and market presence (Pinstrup-Andersen, 2009).

Food accessibility: This is the ability of individuals and households to obtain adequate food through physical, economic, and social means (Peng & Berry, 2018).

Food stability: This denotes the consistent and uninterrupted access to adequate food over time, regardless of seasonal or climate-related disruptions (Ogwu *et al.*, 2024).

1.11 Chapter Summary

This chapter presents a comprehensive overview of the research study and outlined the background information. It captures the problem statement, research objectives, study questions, hypothesis, conceptual framework, and scope of the study, significance of the study as well as operationalized definition of key terms. This section set a solid groundwork for the approach to literature review in chapter two.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents the theoretical review, empirical literature and the research gap. The literature however was presented in regard to the research objectives.

2.2 Theoretical literature

The Systems theory offers valuable insights into understanding the complex interrelationships between climate change and food security. According to this theory, Climate change influences agricultural productivity, water availability, and the distribution of crops, which in turn impact food production and access (Abdulkadyrova, 2016). Changes in food systems can also feedback into climate dynamics through land-use changes and greenhouse gas emissions. The emergent properties of climate change and food security systems highlight the need to consider the holistic effects of various factors. For instance, shifts in climate patterns may lead to the emergence of new agricultural practices or the adaptation of existing ones, affecting food production and distribution patterns in unpredictable ways. According to Fanzo (2023), feedback loops play a critical role in understanding the dynamics of climate change and food security systems. For example, deforestation for agricultural expansion can exacerbate climate change by releasing carbon stored in forests, leading to further environmental degradation and impacts on food production. The Systems theory acknowledges the complexity and uncertainty inherent in climate change and food security systems (Fanzo, 2023). This complexity arises from the interactions between biophysical, socio-economic, and political factors, making it challenging to predict the outcomes of interventions or policy decisions.

However, critics argue that systems theory may oversimplify the intricate dynamics of climate change and food security systems by focusing primarily on structural aspects and

feedback mechanisms. This oversimplification may overlook the nuanced interactions and dependencies between various components of the system. Additionally, the inherent complexity and uncertainty of climate change and food security systems pose challenges to the predictive power of systems theory. While it provides a framework for understanding system behavior, accurately forecasting the impacts of climate change on food security at local, regional, and global scales remains difficult (Adejumo & Raji, 2007).

Integrating systems theory with advanced modeling techniques, such as agent-based modeling or dynamic systems modeling, can enhance the predictive capabilities of climate change and food security assessments. These integrated approaches can capture the complexity and non-linear dynamics of the systems more effectively.

2.3 The Global, regional and national initiatives to combat climate change.

To progress on the adaptation initiatives, UNEP was put up as a global organization that supports nations in upholding their duties at the national, international, and regional levels. Through leadership and collaboration in environmental care, their purpose is to inspire, sensitize and boost nations to improve their social welfare without endangering the welfare of present and future generations. Additionally, the UNEP performs environmental assessments in nations that are experiencing crises and provides guidance on how to put better environmental management systems in place. This includes conducting post-conflict environmental assessments in nations including Afghanistan, Côte d'Ivoire, Lebanon, Nigeria, and Sudan.

Additionally, the World Meteorological Organisation and the United Nations Environment Programme, a non-governmental organisation, formed the Intergovernmental Panel on Climate Change (IPCC). Through its three Working Groups climate science, impacts and adaptation, and mitigation it assesses scientific literature and contributes scientific data on

climate change. The IPCC is renowned for its exhaustive assessment reports, which are thought to be the most trustworthy sources of information on climate change and provide summaries for policymakers. The Kyoto Protocol and other climate change agreements have been significantly impacted by its reports.

The Kyoto Protocol, which was ratified on February 16, 2005 and was signed on December 11, 1997, binds industrialized and developing nations to set and meet individual targets for limiting and reducing their emissions of greenhouse gases. It is founded on the tenets and regulations of the United Nations Framework Convention on Climate Change, and because developed nations are more accountable for present emissions, it places a stronger pressure on them to cut emissions. A five-year target of a 5% reduction in emissions from 1990 levels is set forth in Annex B of the Protocol for 37 nations and the European Union.

In order to contribute to the Paris Agreement's goal of keeping global warming to 2 degrees Celsius, investments in mitigation and adaptation programmes are made through the Green Climate Fund (GCF) which was established in 2014. “It focuses on bridging the gap between private investment and climate action by giving money to societies that are more vulnerable to the effects of climate change, such as LDCs, Small Island Developing States (SIDS), and African States. The GCF provides several financial instruments, such as grants, loans, shares, and guarantees. It is especially concerned with issues like distributing 50% of adaptation money to the most vulnerable nations and establishing a long-term 50:50 balance between expenditures in mitigation and adaptation. With a total investment of USD 3.5 billion, the 73 projects now in the GCF's portfolio will reach 217 million people and reduce 1.3 billion tons of CO2.”

With a start-up contribution from the German government, the African Development Bank (AfDB) launched the Africa Climate Change Fund (ACCF) in 2014. The fund intends to

support African nations as they make the transition to low-carbon and sustainable economy and increase their capacity to withstand the damaging effects of climate change. With contributions from other governments and organizations, including Global Affairs Canada, the Government of Quebec, and the Global Center on Adaptation, the ACCF has subsequently been converted into a multi-donor trust fund, increasing the fund's current worth to USD 25.71 million.

The NCCP of Uganda was created to tackle climate change challenges in alignment with the country's development goals, including exploring opportunities for green economy. Uganda might more easily meet its obligations under the Climate Change Convention if the policy and plan were put into practice. The five-year development plan for Uganda, which has an expiration date of 2020, acknowledged that addressing climate change is essential for its social and economic development. The UK, Belgium, Denmark, and the World Bank provided assistance to the Ministry of Water and Environment in developing a climate change policy that would suit the needs of Ugandans. Concerns about climate change are handled at the district level in Uganda by the Natural Resources Department of the District Local Government, and all departments collaborate to include climate change policy in district development plans. Uganda might more easily meet its obligations under the Climate Change Convention if the policy and plan were put into practice. The five-year development plan for Uganda, which has an expiration date of 2020, acknowledged that addressing climate change is essential for its social and economic development. The UK, Belgium, Denmark, and the World Bank provided assistance to the Ministry of Water and Environment in developing a climate change policy that would suit the needs of Ugandans. Concerns about climate change are handled at the district level in Uganda by the Natural Resources Department of the District Local Government, and all departments collaborate to include climate change policy in district development plans.

Despite its drawbacks, Uganda's National Climate Change Policy (NCCP) has had several positive effects on the nation, including better public education about climate change, early warnings for farmers and other stakeholders, and other positives.

2.4 Food security

According to FAO (2021) “Food security is the state in which everyone has equitable access to safe, nourishing, and enough food to satisfy their dietary needs and food preferences for an active and healthy life.” It covers the availability, usability, stability, and affordability of food. Food security is not just about having enough food, but also about ensuring that the food is of good quality, culturally appropriate, and obtained in a dignified manner. It is a multifaceted idea that considers elements including food distribution, price, food safety, and nutritional value (Council, 2017). Achieving food security is essential for promoting sustainable development and addressing hunger and malnutrition on a global scale.

Food security is measured through; food availability which focusses on the population having enough food at all times so as to sustain people’s lives. This therefore puts into consideration of the production systems that is to say production of sufficient food in the short run and also sustainable after a long while, and also the ability to respond to disruptions as result of natural disaster or any other form of climate variations (Kansas, 2019). Secondly, accessibility which implies that food should not be limited in supply. Equal access to food should be granted to the wealthy and the impoverished, suggesting that simply having food available is insufficient if individuals are unable to buy it. Finally, food needs to be sufficient to meet the unique nutritional requirements of the different demographic segments. This can be viewed as providing a variety of foods throughout the year to create a balanced diet (Nelson & Benard, 2017).

2.5 The effect of food storage facilities on food security

The Sustainable Development Agenda's main objective is to end hunger, but widespread food insecurity has grown particularly in Sub-Saharan Africa harvest seasonality causes oscillations in food insecurity (Brander et al., 2021). Brander and others contend that in order to address seasonal food poverty, both a reduction in post-harvest losses during storage and an increase in food production are required. Additionally, they make the case that household credit and liquidity restrictions, which force farmers to sell their fruit before it is ripe, are to responsible for shifts in food consumption patterns. Due to their inability to make similar purchases later, many households' consumption during the lean season is reduced (Brander et al., 2021).

According to Ayomide et al (2022), food storage encompasses a variety of methods for preserving food to prevent it from rotting. Over 828 million people are hungry worldwide and it is projected that 3.1 billion people lack access to a decent food (Kalinaki, 2022). He added that it is anticipated that there would be nine billion people on the planet by the year 2050, so it will be essential to cut down on food loss and waste to meet demand. In order to achieve other goals, especially those pertaining to food security, nutrition, and environmental sustainability, the SDGs place a high priority on decreasing food loss and waste. Thus, the need to transition to sustainable food systems that increase the efficient use of natural resources, lessen negative environmental effects, and ensure the security of food and nutrition should be prioritized.

According to FAO (2021), more harvest is now wasted as the climatic problem develops, even when it is promising or is already promising. Crops from high-drought areas are more prone to pest infestations and fungus growth when moved to humid storage facilities (FAO, 2021). Due to climate change and extreme weather occurrences, heavy rain can induce lethal

mold on crops, leading to increased food losses. A third of the food produced by farmers in low- and middle-income countries is lost between the farm and the market, and a comparable percentage is lost in high-income nations. Food losses have minimal effect on food security or levels of starvation and also contribute to climate change. Food security can be attained through proper food management, particularly food storage.

According to Adejumo and Raji (2007), small-scale farmers can reduce losses by accessing improved handling and storage techniques facilitated by farmer cooperatives. Storage plays a crucial role in sustaining both human life and food production within agriculture. Storage is essential because agricultural items are not available all year round. To meet the average demand in this situation, any excess supply must be held during the course of the harvest season and progressively released during the off-season. This strategy aids in maintaining seasonal pricing stability (Adejumo & Raji, 2007). A three-tiered grain storage system is part of the Nigerian government's strategy for guaranteeing food security. 85% of the grain required for food security must be kept on-site by farmers as well as in buffer stocks and strategic grain reserves.

Seasonal food shortages and nutritional disorders continue to be major problems in African countries, where poor food preservation abilities play a crucial role in the substantial post-harvest food losses (Adeyeye, 2017). According to estimates, 30% of food crops including maize, millet, and rice as well as 50% of perishable agricultural goods like fruits, vegetables, roots, and tubers are lost after harvest in West Africa (Ayomide et al, 2022). Multiple factors contribute to these substantial post-harvest losses in African nations. These factors include inadequate or absent packing houses, storage facilities, and market infrastructure, careless harvesting practices, ineffective handling methods after harvest, poor transportation

infrastructure including bad roads and deteriorated rail systems, unfavorable market practices, and the lack of effective food processing technologies.

However, the majority of African food preservation methods are still traditional and undeveloped, which discourages large-scale development to meet the continent's expanding demands. In reference to the above, Ayomide and others (2012), the process of food storage entails chemical additions such salting as well as curing, pickling, drying, and smoking. If African nations want to address the issue of food insecurity, a variety of preservation-related issues must be resolved. Low productivity, inconsistently low-quality goods, or products with short shelf lives are a few examples of defects. Farmers in Nigeria have challenges due to improper handling and storage techniques, which lower produce quality and protection while increasing losses. Urban areas use modern warehouses and silos for storage.

Contrarily, the majority of farmers in rural areas continue to employ a variety of traditional and improvised storage structures including platforms, cribs, sheds, baskets, and sacks (Miteu et al, 2022). Traditional grain storage structures in Nigeria are constructed from a variety of readily available materials. Traditional storage suffers from major problems like theft, roof leaks, rusting, mold, rodent infestation, and moisture infiltration. Conventional grain storage facilities subject grains to rodent and insect infestations, leading to substantial losses after harvest. Additionally, these structures create ideal environments for the growth of rodents, insects, and the proliferation of microorganisms.

The connection between food preservation and technological advancement is crucial, and a lack of food and nutritional security results from many African nations' failure to upgrade their traditional methods of food processing and preservation (Adeyeye, 2017). With consumers' expectations of being able to access and consume out-of-season crops, the significance of modern food preservation methods has grown, as fewer individuals consume

locally grown foods. Furthermore, due to a lack of knowledge in proper food storage, farmers are compelled to sell their produce at inflated prices during harvest to avoid post-harvest losses (Adeyeye, 2017). Consequently, their income, purchasing power, and enthusiasm for farming decline. Nigerian farmers face challenges in adopting new methods and technologies, as they require both adequate storage facilities and high-quality tools. Technological advancement and food preservation are strongly associated, with the limited modernization of traditional food processing and preservation methods contributing to food and nutritional insecurity in many African countries.

According to the literature mentioned above, several researchers have attempted to look at the connection between food security and food storage. However, given that none of the investigations were conducted in the Ugandan context, there are contextual and empirical gaps. In addition, only a few or none of the studies examined how policies connected to climate change affect food security. These deficits prompted a study to determine whether food storage and food security in Kapelebyong Sub-County, Kabelebyong District, are related.

2.6 Food Storage methods used by the farmers in Uganda

Farmers can store corn in outdated jerry cans that can no longer fetch water. A jerry-can, if kept in good condition, can endure for three to four years. Rats mistake jerry cans for carrying water, therefore they are less likely to attack maize kept in one. Jerry-cans are extremely lightweight and make it simple for farmers to keep track of the amount of corn. However, if the grain is not sun-dried, bugs can still harm maize, and the confined container might promote mold growth (Kyalya, 2013).

Sacks are used by farmers to store corn for six to twelve months before being replaced. Farmers can store maize within the home, lowering the danger of theft, and sacks are

accessible and reasonably priced. However, sacks are extremely vulnerable to rat and pest assaults and need to be sun-dried every few days to prevent decay. Farmers may lose some maize to birds while it is drying.

Farmers can also build a closed crib made of poles to store maize (Kalinaki, 2022). This type of storage is durable and can last up to five years without major renovations. Farmers don't need to frequently transport maize for drying because the crib allows for continuous drying and can hold many kilograms of maize. However, building one is more expensive than building a granary, and poles might not be as accessible as wire mesh.

Additionally, Kalinaki (2022), farmers have discovered that by building a platform above the cooking area, planting corn may be kept above the fire for an extended amount of time. The fire's rising smoke and heat continue to dry the maize, keeping flies and other pests away. The platform serves multiple functions and has storage space for additional objects. Smoke, however, causes the maize to lose its original color, making it only useful for planting.

Smallholder maize farmers use pots to store their crop, a technique they inherited from their forefathers. To keep pests out, the pots are sealed with a smaller pot and covered in cow dung. To raise them off the ground, they are put on logs or stones. Pots can protect maize from rodents and other pests and cost between 20,000 and 40,000 UGX. They must be treated carefully because they are fragile, but if managed correctly, they can endure up to ten years.

Another way to store corn is in granaries, which are structures built of natural resources like water, mud, clay, reeds, wood, and stones. Some farmers use cow manure to grain bins. Depending on size and use, they can last three to five years and cost about UGX 250,000. Granaries provide continuous corn drying and large-scale grain storage.

The ability of chemicals, environmental microbes, and enzymes contained in food to cause food spoilage is well known (Kumar, 2019). Moving food and food items from one location to another is also necessary. The food may lose some of its morphological attractiveness and become less nutrient-dense while being transported. It is essential to take action to preserve food in order to guarantee a longer shelf life, consistency in quality, morphological attraction, and no change in taste (Kumar, 2019).

Osmosis is the main mechanism used to reduce moisture content in foods including meat, fish, and vegetables that have been preserved. Any food with a low moisture content has a considerably lower likelihood of microbial infection and subsequent growth. Food flavoring is another purpose for curing. It is accomplished by combining dehydrating amounts of salt, nitrates, sugar, and nitrites. Bacteria are killed by dehydration caused by higher salt concentrations utilized in treatment. Additionally, salt can inhibit the oxidation of fats, delaying the process and preventing rancidity.

Freezing food at temperatures between -10°C and -20°C is a common technique used for long-term storage, as microbes do not survive freezing temperatures. However, when serving hot foods, it is necessary to heat the food above 75°C after bringing it from the freezer to room temperature. Cold stores are used for long-term storage of fruits, vegetables, and other foodstuffs. Potato tubers are stored in a cold room at temperatures ranging from 0°C to 10°C if storage is required for several months, while potato waffles are stored in a freezer.

Even today, sugar is used as a preservative in the preservation of certain foods. According to Horie et al. (2019), the main mode of action is that a high sugar content turns food into a hypertonic substance that germs cannot thrive in because the hypertonic substance dries up the microbe. Fruits are frequently stored in honey or sugar. Sugaring is also used to make

jams and jellies. Many soft drink concentrates, such as orange squash, which contain a high sugar content, are also prepared using this principle.

Pickling is a traditional food preservation method that involves anaerobic fermentation, which can increase the lifespan of foods and alter their texture, flavor, and taste. In Asian nations like India, pickled vegetables including carrots, cauliflower, lemons, and raw mangoes are common, whereas pickled eggs, fish, and meat are consumed in several European nations, Canada, and the United States. Fermentation in vinegar is also common in Asian countries, and the organic acids produced during fermentation act as preservatives. Brine (high salt) is another method of preservation used in several nations. These circumstances result in the death of bacteria and other microorganisms (Horie et al., 2019). On the other hand, canning was developed by a French confectioner by the name of Nicolas Appert (1778) at the beginning of the nineteenth century to increase the shelf life of foods. After the food has been prepared, it is sealed in cans or sterilized jars, and the containers are then boiled to make sure they are clean. Any remaining bacteria are killed or weakened in these conditions. Louis Pasteur's showing of the link between food spoilage, microbes, and disease in 1864 helped the process become more widely used.

Fadake & Walker (2021) stated that “Freeze drying is a modern technique in which the moisture content of a food is removed at a much lower temperature under frozen conditions using a vacuum. The basic principle is to evaporate solid water (ice) at a lower pressure by sublimation. As a result, high-quality food is produced. The shape of the food does not change under these conditions. This method is used in food processing and coffee preservation. Vacuum drying is also used to store bacteria and yeasts for long periods.”

Pascalization is a technique in which food is pressed inside a vessel under extremely high pressure (70,000 lb per square inch). This method is beneficial because foods retain their

freshness, flavor, texture, and nutrients while microbes are destroyed. The rate of spoilage of foodstuffs is much slower when using this technique. This method has been used to preserve orange juice, guacamole, and deli meats.

In the literature presented about the several existing food storage measures around the world, in African and Uganda in Particular, farmers and local communities do not seem to adopt them and use them in the struggle to combat food insecurity and yet if adopted, food security would be enhanced.

2.7 The effects of climate change adaptation measures on food security

The African continent is not meeting the SDG to end hunger, guarantee year-round access to sufficient, safe, and nutrient-rich food, and eradicate all forms of malnutrition (FAO, 2021). Climate extremes are the root cause of hunger and food insecurity (FAO, 2021). There were 281.6 million malnourished Africans in 2020, up 89.1 million from 2014. (WHO, 2019). Eastern Africa has 125.1 million undernourished individuals, which is more than Western Africa (75.2 million), Central Africa (57.1 million), Northern Africa (17.4 million), and Southern Africa (75.2 million) (6.8 million). Africa was responsible for 55% of the rise in undernutrition between 2014 and 2020.

In Uganda, natural disasters such as floods and droughts have been known to have heavy costs to the country (USAID, 2012). On a number of development fields, the effects of climate change are anticipated to have a substantial impact, posing a threat to vital growth sectors such as agriculture and water management just as put forth in Cox’s Climate theory. Together, the government and the donor community have been addressing the issue of climate variations by determining the most important areas for adaptation and incorporating these factors into the nation's development goals. Although there has been progress, adapting is still difficult. In order to effectively combat climate change, the public and commercial

sectors must cooperate to increase data accessibility and the ability of national agencies to anticipate future effects (USAID, 2012).

New weather patterns that continue for at least a few decades and maybe millions of years appear as the Earth's climate system changes (Fadake & Walker, 2021). Just a few examples of the extreme weather events that are impacted by climate change in terms of frequency and intensity are heatwaves, floods, unexpected rainfall patterns, and droughts. Increases in temperature have sped up the growth of illnesses, weeds, and pests, some of which are harmful to humans, plants, animals, and other living things as well as to marine life. Increased instances of extreme weather have led to soil erosion (by water and wind), which is analogous to the loss of agricultural and forestry-useful land.

The two main categories of documented farmer adaptations to climatic variability are ex ante measures, or activities done before a certain climate reality, and ex post reactions, or actions taken after the event has occurred. “Anticipated reactions to fluctuations often focus on implementing diversification tactics to capitalize on the diverse impacts a particular climate event may have on various crops and activities within a specific year (Pandey et al., 2007). For example, farmers cultivating rainfed crops in arid regions might consider relocating their farm plots, cultivating a range of crops or crop varieties with varying sensitivities to climate, or diversifying their sources of income by engaging in non-farm businesses that are less affected by climatic conditions. This allows them to leverage the significant spatial variability of rainfall (Pandey et al., 2007). They might also choose to preserve input flexibility, by postponing agricultural planting until less speculative weather conditions materialise, for example. Farmers have the choice to pay for crop loss insurance when it is offered.”

Numerous actions can be taken to adapt to climate change at all sizes, including the individual, community, regional, and national levels (Al et al., 2008). As an illustration,

several regions use a variety of tactics to address the issue of climate change. Utilizing soil carbon sequestration is one of the most promising approaches to achieve sustainable development (FAO, 2008). This process can increase the soil's carbon concentration and improve its productivity and biodiversity. It can also help improve the soil water storage capacity and increase food production. In addition, it can reverse land degradation and improve the ecological health of the environment.

Farmers also utilize a range of post-event strategies to mitigate crop or welfare losses once the impacts of climate catastrophes become evident. These strategies include using up cash reserves or grain stocks, taking out loans from family or from official or illegal credit markets, selling assets like livestock, or moving to a different location in search of work in unaffected areas. Ex post adaptations also refer to management adjustments made following the commencement of the growing season. Examples of management modifications that fall under this category include replanting faster-maturing types in the event that early-season planting fails or turning on irrigation where necessary in the event that rainfall is insufficient (Al et al., 2008). Food production, delivery, and storage are some of these. The series of steps done to alter the climate in response to the effects of climate change is referred to as adaptation. It seeks to avoid or lessen how the alteration affects human systems. Human behavior can occasionally strengthen the consequences of changes (IPCC, 2014).

Additionally, other possible farmer adaptations to climate change include switching crop kinds to ones that are more suited to the new climates they are facing. If drought occurs more frequently, a farmer who is currently cultivating maize may decide to convert to a faster-maturing variety or plant sorghum, which may be more drought-tolerant. But these choices won't be made just on the basis of the climate (Pretty, 2005). Climate change recommends two main adaptation options for switching kinds, and the choice will depend on whether heat

or moisture is anticipated to be a limiting factor. It may be possible to adapt by planting faster-maturing cultivars that can tolerate heat or drought stress during sensitive stages of plant growth, such flowering or grain filling, in low-rainfall areas where moisture stress is expected to be a significant barrier to plant growth.

Similarly, strengthening financial infrastructure could improve farmers' capacities for both ex-ante and ex-post adaptation. Input financing assistance, income adjustments in the event of output shortfalls, and promoting diversification away from low-risk, low-return crops in favor of higher-reward ventures are a few examples (Bani, 2019). Farmers may also benefit from increased access to loans and insurance in emerging countries. Developing crop insurance schemes is essential to compensate farmers in case climate change leads to a decrease in production. If a significant portion of the reluctance among impoverished farmers to adopt more lucrative technologies is due to risk aversion, the provision of insurance could accelerate the adoption of improved crop varieties and assist farmers in maintaining income during challenging economic periods.

Farmers may change the types of crops they grow, but they may also change how much land they cultivate or the number of crops they grow on it. The often-mentioned adaptation option that will undoubtedly be necessary for some regions is the installation of irrigation to rainfed systems. As was already indicated, with irrigation, you have additional options for planting times and crops, as well as possible returns on your investments in fertilizer and other inputs. It also lessens water stress. Farmers frequently are unable to opt on their own to use irrigation since large-scale irrigation infrastructure additions are frequently funded and regulated by the public sector (C Council, 2017).

The severity of floods, droughts, and sea level rise have been shown to have a direct impact on food production, food distribution networks, food emergencies, livelihoods, opportunities,

and resources, as well as human health in both rural and urban regions (FAO, 2019). This finding is consistent with Lesley's (2008) research since climatic change has a direct impact on a civilization's socioeconomic advancement. Food security is negatively impacted by floods and droughts, diseases and pests that harm humans and animals, and the effects of climate change on water security (Lesley 2008).

Farmers need access to more modern technology as well as the education, support, and incentives to employ it. Given the high financial and administrative costs frequently associated with government input distribution programs (World Bank 2008), the private sector is likely to provide farmers with access to new technologies in the long run, even though providing farmers with information will likely still necessitate direct public-sector action. Governments are frequently in a better position to make investments in the material and financial framework supporting efficient agricultural markets. This may involve enhancing the availability of financial services like loans and insurance for farmers facing difficulties, as well as investing in transportation networks to link farmers with input and product markets.

However, institutional capability and knowledge of climate change remain very low at the national and municipal levels. Expert interviews indicate that a lack of expertise and understanding in addressing the outcomes of climate variations is the primary reason for the low level of adaptation reactions. According to a significant source, we require individuals who are capable of addressing climate change in addition to fresh insights into how to tackle its issues. More precisely, we need people who can understand climate change and explain it to farmers in an understandable way. The 2007 National Adaptation Programme of Action identified a significant potential barrier to implementation as the limited analytical capacity

of local staff to effectively analyse the threats and potential impacts of climate change in order to develop practical adaptation solutions (Edidah, et al., 2016).

Additionally, although donations are a key source of money for climate change interventions, they are not enough to meet all of the goals for climate change adaptation. Additionally, there aren't enough money at this time to carry out climate change action plans. Tanzania will need to keep leveraging more financial support from the international community, the government budget, the corporate sector, and nonprofit organizations to hasten the execution of its climate change policies (Edidah et al., 2016). To make sure that funds for diverse climate change programs are made available on time, the government should execute the National Climate Change Fund it has suggested.

The literature reviewed above demonstrates that researchers have made significant attempts to link food security with climate change adaptation strategies. There are empirical gaps, and some investigations have produced contentious findings. All the studies discovered a link between food security and actions taken to adapt to climate change, while Ngoya (2017) did not. This indicated a lack of consensus over how the two variables relate to one another. This gap necessitates additional investigation of the variables' relationships using the NCCP in Kapelebyong Sub-County, Kabelebyong District, as part of this study.

2.8 The effects of water resources management practices on food security

In addition to providing rural residents with the resources and opportunities they need to lead healthy and productive lives, the agricultural sector must adopt clean technologies to ensure environmental sustainability, produce more food of higher quality with less water used per unit of output, and significantly boost both the local and national economies (FA0, 2013). The FAO is adapting its water program in the directions necessitated by these new issues in order to more effectively satisfy the demands of its member countries.

For sustainable food production, the availability of resources like energy and water is crucial, but maintaining the necessary level of output is challenging, according to Kannan & Anandhi (2020). The availability of resources can be impacted by a variety of causes, including climate change, extreme weather, and water and land scarcity. Nearly nine billion people will inhabit the earth by 2050, increasing the need for food, water, and energy by 55%, 70%, and 80%, respectively. Effective water management techniques and agricultural output are needed to meet the growing demand for food. The anticipated consequences of climate change on livestock and agricultural output are expected to have a substantial impact on water availability and quality, and extreme weather events like droughts and floods make it harder to grow food.

Food production cannot be carried out sustainably under unfavorable climatic circumstances and limited water resources without agricultural water management systems, which were developed to meet the current expanding water needs for greater food production (Bani, 2019). Water availability and demand are diverging, and it is expected that this divergence will continue to grow. The most effective use of water is required, according to Bani (2019), because a scarcity of water will diminish agricultural productivity and jeopardize the nation's food security. for efficient crop production and greater yields.

The idea that agriculture must "produce more food with less water" has emerged in response to the increased demand for water from competing industries (FAO, 2017). This idea, though intriguing, may cause confusion because it doesn't discriminate between water that is diverted and applied to farm fields and water that is transpired during the production of crop yields. Most of the irrigation water used leaks into shallow groundwater or runs off the edges of agricultural fields, where it can be used for irrigation or other purposes once more. At this stage of the hydrologic cycle, only the water used by the crop during transpiration and the

water that evaporates off plant and soil surfaces are regarded as "lost" from the system. Depending on how much water is lost in each region, technology investments could save a certain amount of water.

In locations where water withdrawals are not sustainable, water scarcity will worsen, restricting agricultural output, putting ecosystems in danger, and impacting many rural and urban populations' incomes and prospects for a living (FAO, 2017). Along with groundwater depletion, groundwater pollution and aquifer salinization brought on by seawater intrusion are also of growing concern. Since groundwater is a resource that anybody can access, it can be challenging to control and keep an eye on, and there is typically insufficient legal support for doing so. When laws are passed, they have a difficult time being enforced. This makes it difficult to save groundwater and use it effectively, and it incentivizes farmers to use it excessively.

The relevant literature mentioned above demonstrates the significant effort made by academics to link the consequences of the efficient use of water resources on food security. The majority of studies, with the exception of Uganda, were conducted in Asia and the rest of Africa, leaving contextual gaps. This motivates the researcher to conduct the study on efficient management of water resources and food security, but in the context of Uganda.

2.9 The practices in water resource management

Water is a crucial component of the services that support reducing poverty, promoting economic progress, and maintaining the environment, according to the United Nations World Water Development Report 2015, is at the heart of sustainable development. Water is obviously important for ensuring the world's food security because it is a necessary resource for agriculture. Because it is used to cool power generation and related industrial technology, it is also crucial for guaranteeing energy security and industrial development (UN, 2015).

Achieving inclusive growth, enhancing social fairness, and fostering social well-being all depend on the availability of water.

“The basic objectives of conservation are to increase water efficiency and reduce demands on the available water supply. Around 767,000-acre feet of water should be saved yearly in 2010; by 2060, all conservation measures combined should save at least 2.2 million-acre feet of water annually. Some water conservation is achieved passively when performing everyday actions like using a low-flow showerhead or flushing a low-flow toilet (The Magazine, 2012). Education and initiatives geared primarily at lowering water consumption are two other methods to save money. Municipal, irrigational, and "other" water users (mine, industrial, and power generating) are all included in water conservation. Water conservation is becoming a more and more widespread activity. Compared to the 2007 State Water Plan, the 2012 State Water Plan recommends 129,400 acre-feet more water conservation.”

Education and initiatives geared primarily at lowering water consumption are two other methods to save money. Municipal, irrigational, and "other" water users (mine, industrial, and power generating) are all included in water conservation. The practice of conserving water is growing in popularity. “The 2012 State Water Plan suggests an additional 129,400 acre-feet of water conservation as compared to the 2007 State Water Plan.”

For proper water resource management, the following strategies can be adopted

Water conservation involves “the using water more efficiently and reducing water waste through the adoption of water-saving technologies, practices, and policies. Examples include using low-flow toilets, drip irrigation systems, and rainwater harvesting.”

Water pricing: Pricing water appropriately can encourage efficient use and conservation. Water pricing can also generate revenue for water infrastructure investments and

management. Integrated water resources management: This strategy calls for coordinating the management of water resources across many sectors and stakeholders in order to ensure the fair and sustainable use of water resources. This strategy may include the creation of basin-wide plans, involvement of stakeholders, and coordination between land use planning and water resource management.

Watershed management: To guarantee the equitable and sustainable use of water resources, this strategy entails managing water resources at the watershed level. In order to prevent soil erosion and sedimentation, this may entail managing land use practices, encouraging reforestation, and safeguarding water supplies.

Water reuse: Freshwater resources can be conserved and the need for freshwater decreased by using reclaimed water for non-potable uses like irrigation.

Water governance: Effective water governance structures and policies can help to ensure the water resource management that is fair and long-term. This may entail the creation of water laws and regulations, the construction of institutions for water management, and the involvement of stakeholders in the decision-making process.

National water information systems (NWIS) and integrated water resource management (IWRM) are part of the design and implementation of water policies, which will improve the availability and accessibility of sector data. Additionally, assessments of the water supply, industry economic studies, water forecasts and industrial transformation, capacity building, and the development of water monitoring networks will all help to improve the management of water resources.

2.10 Chapter Summary and literature gap

According to the literature evaluation, policies in addressing global environmental challenges, there is a notable gap in the existing literature regarding its specific impact on food security at the local level particularly in the context of Uganda. While numerous studies have explored the broader implications of climate change policies, there is a lack of in-depth analysis focusing on the effectiveness and relevance of NCCP in the specific sub-county settings, such as Kapelebyong Sub County in Kabelebyong District.

From the literature, effective storage and water resource management techniques were identified as possible recommendations to achieving food security. Proper storage can help to reduce food waste and ensure that food remains safe to eat. Effective water resource management can improve crop yields and ensure that there is enough water available for agriculture.

This therefore raises questions about the extent to which national climate change policy recommendations translate into meaningful outcomes for food security at the local level in Uganda. Understanding the dynamics between national policies and local realities is crucial for developing targeted and context-specific interventions that can effectively address the challenges posed by climate change on food security. Thus, by undertaking a thorough evaluation of the influence and efficacy of national climate change policy recommendations on food security in Kapelebyong Sub County, Kabelebyong District, Uganda, this study seeks to close the gap in the literature. The study's focus on a particular sub-county will give researchers, policymakers, and practitioners a more nuanced understanding of the opportunities and challenges for improving food security in Uganda in the face of climate change. It also provided valuable insights into the localised implications of NCCP.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter entails the methodology used in the study. It also provides the various aspects of the study such as its structure, methodology, sampling design, data collection procedure, and research instruments. It additionally provides ethical considerations and tools for data analysis.

3.2 Research design

According to Creswell and Creswell (2018), research design serves as a framework that delineates the methodologies employed for data collection and analysis with the aim of attaining research objectives in a cost-effective and efficient manner. In this study, the researcher used a cross-sectional survey design, which involves gathering data from multiple individuals at a single point in time using the same tool (Creswell & Creswell, 2018). This design was chosen due to its ability to efficiently collect a large amount of data from the field. This design aims to determine whether changes in one variable are associated with changes in another variable, without manipulating any of them or establishing causation (Creswell & Creswell, 2018).

3.3 Research approach

The study used a quantitative research approach. This is the approach that facilitates collection of numerical data. The researcher used the quantitative approach to yield unbiased results that can be generalized to larger population. The approach further facilitates the extraction of relationship between study variables and regression to determine the predictability of the implementation of the National climate change recommendations on food security in Kabelebyong Subcounty.

3.4 Area of study

The study was carried out in Kapelebyong sub-county in Kabelebyong District, northeastern Uganda. Kabelebyong District is bordered to the east by Katakwi District, to the south by Soroti District, to the southwest by Kaberamaido District, to the northeast by Napak District, to the north by Otuke District, and to the west by Alebtong District. In addition, a number of individuals perished from starvation and death between February and April 2009 in the districts of Kabelebyong, Soroti, and Katakwi (John, 2009). The selection of the study area was influenced by the region's history of food insecurity which has been as a result of climate variations among which include floods and prolonged draught.

3.5 Sources of information

Primary and secondary sources were the main sources of data that were used in this investigation. Primary data was gathered through respondents' answers to questions that was asked during interviews and self-administered questionnaires about the issue. On the other side, secondary data was gathered from academic journals, published works, Ministry of Water and Environment policy documents, text books, and already completed dissertations that may be found in libraries and online.

3.6 Population and sampling techniques

3.6.1 Study population

A study population is the entire set of people from which the researcher drew data from, according to Cooper and Shindler (2011). This study focused on a population of 5100 people of Kapelebyong Sub County. However, a sample of 373 households was selected to participate in this study, the household heads were the primary respondents and subcounty technical personnel, local leaders, and environmental officials serving as key informants.

These were selected because the researcher believes they provided reliable information for the study.

3.6.2 Sample size and technique

A sample is a portion of a statistical population that is used to obtain data on the population as a whole, according to Kombo and Tromp (2006). In this kind of study, the researcher conducted a survey using a group of participants drawn from a larger population. Sampling is the process of gathering subjects, locations, or objects for research (Kombo and Tromp, 2006). Sekaran (2000) asserts that a sample size of greater than 30 but less than 500 is suitable. Since the population was known, the study used Yamane's formula to determine sample size for the quantitative sample (Yamane, 1967). Kapelebyong Sub County has 5100 households according to the 2014 National Census.

$$n = \frac{N}{1 + Ne^2} \quad \text{.....(2)}$$

Where

N=Population

n = sample size

e =Level of precision

At 95% confidence level and e = 0.05, we got the sample size as

$$n = \frac{5100}{1+5100\ (0.05^2)} = \textbf{373 households}$$

373 people made up the study's sample size. A simple random sampling was used to recruit stakeholders, giving each member of the population equal and known possibilities of being nominated (Kothari, 2012). The following table breaks this down;

Table 3. 1 Target population and sample size of the study

Category	**Population**	**Sample**	**Sampling technique**	**Data Collection method**
Quantitative sample				
House hold heads	**5100**	**373**	Simple random	Questionnaire

Source: Primary data, 2023

3.6.3 Sampling technique

The multistage sampling was used to collect data. To achieve so, simple random sampling was used to select household heads to take part in the study. The researcher began by defining the study area and obtaining a comprehensive list of all households within the area. This list was sourced from local the village register. Each household was then assigned a unique identification number. Using a random number generator, a predetermined number of households were randomly selected from the list. This method eliminated the possibility of selection bias and ensured that the sample was representative of the broader population. It enabled an equal opportunity for all respondents to participate in the study thus reducing the chances of selection bias (Bryman, 2018). These were selected based on the convenience or accessibility by the researcher.

3.7 Variables measurements

The independent variable which is the National climate change policy recommendations, items like food storage facilities, climate change adaptation measures and water resource management practices was used. The items were ranked on a 5 Likert scale where (1) Strongly Agree (2) Agree (3) Not Sure (4) Disagree (5) Strongly Disagree to solicit responses from participants. Additionally, food security was measured in terms of food accessibility, utilization and stability.

3.8 Data collection procedure

With approved research proposal by the Research Ethics Committee, the researcher obtained a letter from the school of social sciences which introduced the researcher to the authorities for approval for data collection in Kapelebyong Sub County. Upon obtaining permission, the researcher proceeded to seek consent from the respondents. Individuals who provided consent were then given questionnaire to complete it at their convenience

and the filled questionnaires were collected after one week.

3.9 Data collection methods

A self-administered questionnaire which is a form of research instrument that enables the collection of data from a sizable sample was used in the study (Kombo and Tromp, 2006). Because certain aspects, such as beliefs and impressions, could not be observed, the researcher used the questionnaire. Additionally, because they can swiftly acquire data about a huge group, questionnaires can be used in a very cost-effective manner. The researcher readily coded the data for further quantitative analysis, lowering the error gap, which is another advantage of the self-questionnaire (Schraeder, Becton, & Portis, 2007).

The questions were split into two categories: the open-ended ones and the closed-ended ones. The former allows researchers to collect opinions from the participants without having to go through the laborious process of coding questions. This was used to collect quantitative data from the field.

3.10 Data collection equipment

Data collecting instruments are defined by Leung (2001) as objects or tools used to gather data. Questionnaires were the primary data gathering tools used for this study. The questionnaire created to gather information that addresses all the study objectives. There were four sections in the questionnaire sent to respondents. The first section covered the respondents' demographics, the second concentrated on the elements of NCCP, and the final section discussed food insecurity as a result of climate change. The researcher designed close-ended inquiries to make it easier for respondents to decide quickly. According to Sekaran, (2003) they also reduce error margins when evaluating data and make it easier for the researcher to code the data for later study.

3.11 Quality control

This was carried out in an effort to get rid of or cut down on study instrument mistakes. The researcher conducted validity and reliability checks on the research instruments that was utilized in data collection as follows to assure the quality of the study findings.

3.11.1 Validity of the study instruments

Instrument validity refers to the extent to which the outcomes derived from an analysis genuinely portray the phenomenon being studied (Amin, 2005). In this study, validity was established through the implementation of test-retest procedures for the questionnaires. To ensure that the instruments accurately yield the desired results and measure the intended constructs, the initial questionnaires were shared with my supervisor and three fellow researchers who conducted a thorough evaluation of the questionnaire items. Their feedback played a pivotal role in guiding the researcher's judgment regarding the relevance of specific questions. Based on the aggregated ratings provided by this panel, the researcher computed the content validity index for the questionnaires (Amin, 2005). The CVI for the questionnaire is 0.83. The instruments were considered appropriate for the study because the CVI were of 0.7 recommended by Amin (2005). The formula used for the calculation of the CVI is:

$$\text{CVI} = \frac{\text{Number of Item rated as relevant}}{\text{Total number of items in the questionnaire}}$$

Questions rated not relevant were either modified by the researcher.

3.11.2 Reliability of the study instruments

By definition, reliability is the extent to which measurements are error-free and so provide consistent findings (Mohammed et al., 2014). The internal consistency approach was utilized in this study to evaluate the reliability of the questionnaire by calculating the correlation between each questionnaire item and others. By distributing questionnaires to 10% of the

entire sample size, the instrument was pre-tested. As with Likert scale questionnaires, the Cronbach alpha method was used to calculate each statement in the questionnaire (Taber, 2018). The reliability of the questionnaire as a research tool was next determined using the findings.

3.12 Data processing and analysis

Data analysis is the process of examining, cleaning, manipulating, and modeling data in order to identify pertinent information, support decisions, and inform conclusions (Loeurt, 2016). Kothari (2014) defined data analysis as the methodical organization, synthesis, and testing of research data in order to gain information pertinent to a certain research question. The submitted surveys examined by the researcher to ensure accuracy and coherence of the responses. The questionnaire items were thoroughly checked in this step to find any that have been left blank or incomplete, as well as to check for legibility and those that have been incorrectly answered. After entering the raw data into SPSS V.20.0, descriptive and inferential statistics including percentages, correlations, and regression was examined. To ascertain the level of linear dependence between the independent and dependent variables, data was evaluated using Pearson correlations. This method was employed due to its effectiveness and ability to provide clear formal analysis. To determine how much each independent variable predicts the dependent variable, a linear regression was performed. Where appropriate, tables and figures were used to present the results.

3.13 Ethical considerations

The researcher followed ethical and legal issues in research, such as the principles of confidentiality, anonymity, consent, and acknowledging other people's contributions to this study, because it's important to uphold the rights and dignity of research participants (Artal & Rubenfeld, 2017). To increase anonymity and boost participant confidence, the study's

instrument must not have any spaces for participants' names or phone numbers. This guaranteed the respondents' privacy and the rigorous application of the collected data to the intended research goal. The researcher also saw to it that the leaders give their permission for participation in the study.

Before collecting data, the researcher obtained informed consent from all participants. This process included ensuring that participants fully understood the research goals, how their data would be used, and any potential risks or benefits of their involvement.

Privacy and confidentiality of participants' personal and financial data were meticulously safeguarded. The researcher employed stringent measures to securely store the collected data, ensuring that any identifiable information was either anonymized or maintained with strict confidentiality. Furthermore, the data was used exclusively for the specified research aims, in accordance with ethical standards and regulations.

3.14 Methodological constraints of the study

The researcher faced a problem of language barrier when collecting data from the participants. This problem was solved by engaging research assistants and use of an interpreter from within the area to ease communication.

The researcher encountered restrictions due to respondents' reluctance to divulge information. However, this was resolved by conducting follow-ups, for example, on the individuals to whom questionnaires were distributed and explaining the purpose of the study to them.

3.15 Chapter conclusion

In Chapter Three, the researcher delineated the procedures for data collection that were implemented in the field. This section offered an exhaustive explanation of the methodologies used, as well as the subsequent analysis and interpretations of the data. Upon receiving

approval for the research proposal and data collection tools, the researcher started data collection. Following the completion of the data collection phase, Chapter Four was dedicated to presenting the results and findings, categorized by respondents' demographic characteristics and aligned with the study's objectives.

CHAPTER FOUR

PRESENTATION, ANALYSIS AND INTERPRETATION OF STUDY FINDINGS

4.1 Introduction

This chapter captures the presentation, analysis and interpretation of the study findings. It captures the presentation of the descriptive statistics of the demographic characteristics of the respondents and then followed by findings on the research objective which include examining the effects of food storage facilities on food security in Kapelebyong Sub-County, the effect of climate change adaptation measures on food security in Kapelebyong Sub-County and the effect of water resource management practices on food security in Kapelebyong Sub-County.

4.2 Response Rate

Table: Showing the response rate

Sample size	Responses received
373	373

Source: Field data, 2024

All the targeted 373 participants managed to respond back. This means that the response rate was 100%. This surpasses the 70% response rate recommended by the Guttmacher Institute (2006), signifying the study's response rate as satisfactory.

4.3 Findings on the Bio-data of the respondents

The study gathered bio-data of the respondents to assess different factors, such as gender, age, marital status, educational background and the household size. The respondents' background information was collected to provide readers with details about the participants who contributed data for this study. The findings are displayed in terms of frequencies and percentages in tables below.

Table 4.1: Gender of respondents

Category	Frequency	Percent
Male	227	60.9
Female	146	39.1
Total	**373**	**100.0**

Source: Field data, 2024

From Table 4.1 above, it was revealed that majority 60.9% of the respondents were male, whereas 39.1% were female, indicating a significant predominance of male representation in the study. This trend could be linked to the factor that most households were headed by men. However, at 39.1% the views of women were well captured.

Table 4.2 Age bracket of Respondents

Category	Frequency	Percent
15-20 Years	15	4.0
21-30 Years	111	29.8
31-40 Years	108	29.0
41-50 Years	81	21.7
51-60 Years	39	10.5
61 Years and above	19	5.1
Total	**373**	**100.0**

Source: Field data, 2024

The data in Table 4.2 indicates that 66.2% of the participants were over 30 years old, while 33.8% were under 30 years old. This suggests that a substantial majority of the respondents were mature and had resided in the area for an extended period. Consequently, they possessed considerable knowledge related to the study's objectives and could provide reliable responses.

Table 4.3: Highest education level attained

Category	Frequency	Percent
Never	39	10.5
Primary	166	44.5
Ordinary Level	121	32.4
Advanced Level	23	6.2
Certificate	14	3.8
Diploma	7	1.9
Degree	3	.8
Total	**373**	**100.0**

Source: Field data, 2024

According to Table 4.3, 44.5% of respondents had completed primary education, 32.4% had attained ordinary level education, 10.5% had no education, 6.2% had advanced secondary education, 3.8% held certificates, 1.9% had diplomas, and 0.8% had degrees. This demonstrates that the majority of participants had received formal education. Their educational backgrounds provided them with the necessary understanding to comprehend the survey questions and give reliable responses pertinent to the study objectives.

Table 4.4: Marital status of the respondents

Category	Frequency	Percent
Single	16	4.3
Married	287	76.9
Divorced	33	8.8
Widow/Widower	37	9.9
Total	**373**	**100.0**

Source: Field data, 2024

From Table 4.4, it was revealed that majority 76.9% of the respondents were married, 9.9% were widow/widowers, 8.8% had divorced while only 4.3% were still single. This indicates that most respondents were married hence having families that need food security. Therefore, they were in good position to reliable information regarding food security in the area.

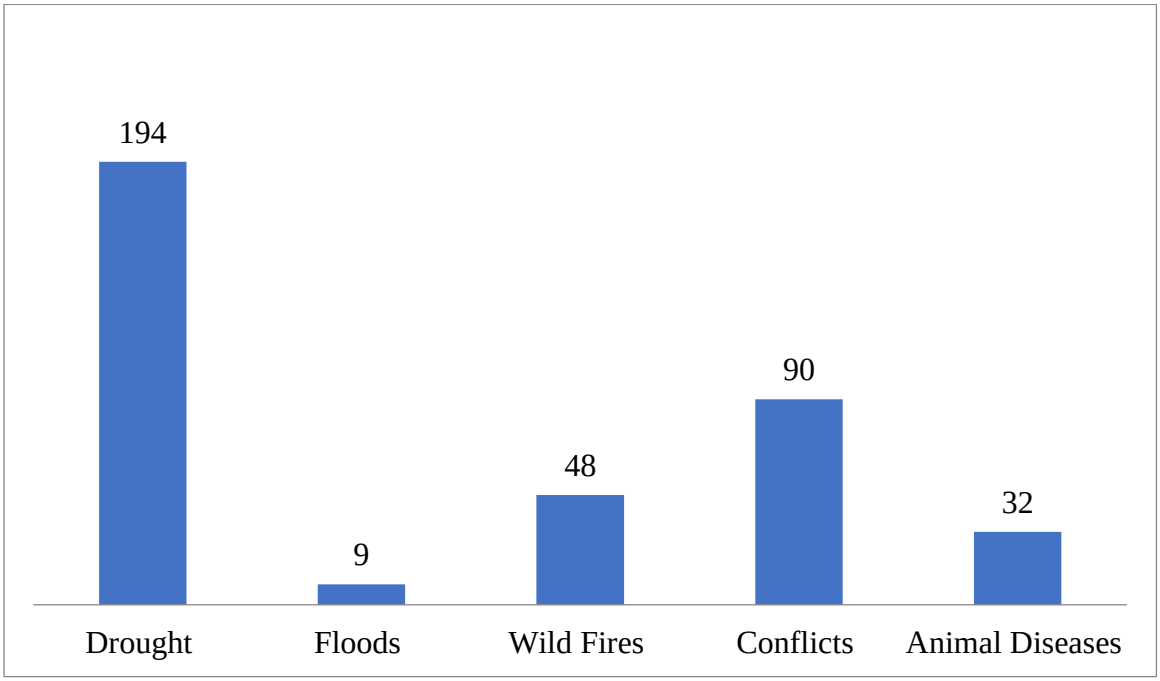
Table 4.5: Average Household Size

Category	Frequency	Percent
<3	71	19.0
3-5	219	58.7
6-9	68	18.2
9>	15	4.0
Total	**373**	**100.0**

Source: Field data 2024

Results in Table 4.5 above, it was revealed that the largest portion of the respondents, accounting for 58.7%, had family size of 3-5 members, 19.0% had <3 household members, 18.2% had family size of 6-9 members and only 4.0% had family size of 9> members. This implied that most households had a big family size of 3-5 members which need stable food security.

Figure 4.1: Common Climate Change Problems affecting food security in Kapelebyong Sub-County.



Source: Field data 2024

From Figure 4.1 above, majority 194 (52.0%) said that drought was the common climate change problem that affected food security in Kapelebyong sub-county, then 90 (24.1%)

pointed out conflicts, 48 (12.9%) pointed out wildfires, 32 (8.6%) pointed out animal diseases while 9 (2.4%) pointed out floods. This showed the food security was largely affected by drought due changes in seasons.

4.4 Descriptive statistics basing on the study objectives

4.4.1 Food storage facilities on food security in Kapelebyong Sub-County

The first objective of the study focused on the effect of food storage facilities on food security. All participants were asked to rank their responses regarding food storage facilities, and the findings were subsequently analyzed using means, and standard deviations for interpretation. The means of each item were compared to the grand mean to ascertain the level of agreement or disagreement towards the statement. Any mean value below the grand mean showed agreement while mean value above the grand mean showed disagreement with statement.

Table 4.6: Responses on food storage facilities

Scale of interpretation: From1-2.9=Disagree, 3.0=Neutral and 3.1-5 means agree

Statement	*Min*	*Max*	*Mean*	*S.D*
The people of Kapelebyong Sub-County use modern Silos for food storage.	2	5	4.18	.797
The people of Kapelebyong Sub-County use of jerrycans to store their food	1	5	3.66	.901
The people of Kapelebyong Sub-County use sacks to store food	1	5	1.24	.600
The people of Kapelebyong Sub-County use smoking to preserve their food	1	5	3.29	1.131
The people of Kapelebyong Sub-County use Granaries to keep their food.	1	5	2.95	1.393
The people of Kapelebyong Sub-County use Freezing to preserve their food	1	5	3.89	1.210
GRAND MEAN			**3.20**	

Source: Field data, 2024

Results in Table 4.6 above revealed that the people of Kapelebyong Sub-County were not using modern Silos for food storage. This was supported by a high mean value of (Mean = 4.18) since it was higher than as the grand mean of (3.20). On top of that, there was consistency in responses because of the standard deviation was below one (.797). This meant that majority of the people of Kapelebyong Sub-County didn't have modern Silos for food storage. This implied that they were either using traditional silos or they didn't not have silos at all.

On whether the people of Kapelebyong Sub-County used jerrycans to store their food, majority of the respondents were in disagreement with it. This was supported by a high mean value of (Mean = 3.66) which was below the grand mean of (3.20) and also scored a low variance in responses because of the standard deviation being below one (.901). This meant that the people of Kapelebyong Sub-County even did not have jerrycans to use to store their food.

Still from Table 4.6 above, scoring a low mean value of (Mean = 1.24) which was lower than the grand mean of (3.20) with consistency in responses because of the standard deviation being below one (.600) which revealed that majority of the respondents agreed with the statement the people of Kapelebyong Sub-County were using sacks to store food. This meant that people in Kapelebyong Sub-County largely used sacks to store food which is so traditional and unsafe for food stuff.

Furthermore, with a high mean value of (Mean = 3.29) which was high the grand mean of (3.20) despite showing a high variance in responses because of the standard deviation being above one (Std. Dev =1.131), this meant that majority of the respondents opposed the statement that the people of Kapelebyong Sub-County used smoking to preserve their food. This meant that even the people of Kapelebyong Sub-County were not using smoking to

preserve their food. This meant that even tradition preservation methods like smoking were not largely used.

Still from Table 4.6 above, it was revealed that the people of Kapelebyong Sub-County were using Granaries to keep their food. Besides inconsistency in responses because of the standard deviation being above one (1.393), the findings were supported by a low mean value of (Mean = 2.95) which was less than the grand mean of (2.95) which was the threshold. This meant that indeed people of Kapelebyong Sub-County were largely using Granaries to keep their food which is one of the common traditional methods in Uganda.

Lastly, from Table 4.6 above, regarding the statement on whether the people of Kapelebyong Sub-County use freezing to preserve their food, it scored a high mean value of (Mean = 3.89) which was above the grand mean of (3.20) with high variance in response because of the standard deviation was above one (SD =1.210) which showed that majority of the respondents opposed the statement. This showed that the most people of Kapelebyong Sub-County were not using freezing to preserve their food since some areas in the sub-county were not accessing electricity and others didn't have money to buy freezers.

4.4.2 Climate change adaptation measures on food security in Kapelebyong Sub-County

"The second study objectives examined the effect of climate change adaptation measures on food security. Like objective one, all respondents were asked to rank their responses on climate change adaptation measures and means, and standard deviations were used to interpret the results. The computed descriptive statistics (mean values) were compared with the grand mean to determine the agreement and disagreement with the statement. Any mean value below the grand mean showed agreement while mean value above the grand mean showed disagreement with statement."

Table 4.7: Responses on climate change adaptation measures

Scale of interpretation: From1-2.9=Disagree, 3.0=Neutral and 3.1-5 means agree

Statement	***Min***	***Max***	***Mean***	***S.D***
Farmers adopt planting of fast maturing crops in the event that rain fall is insufficient.	1	5	1.93	.867
People have agriculture insurance services	1	5	2.23	.891
The people relocate from hazard infested areas to safe areas	1	5	3.05	1.352
There is improved infrastructures like roads to link farmers to input and output markets	1	5	2.14	.874
Farmers are provided with early warnings to farmers for proper planning	1	5	2.15	.842
Farmers have improved crop varieties that are resistant to climate variations	1	5	2.00	.849
There is input flexibility by postponing crop planting when weather realization are less speculative	1	5	2.17	.907
There is installation of irrigation systems	1	5	1.75	.907
GRAND MEAN			**2.17**	

Source: Field data, 2024

From Table 4.7 above, it was revealed that farmers adopt planting of fast maturing crops in the event that rain fall is insufficient. These findings were supported by a low mean value of (Mean = 1.93) since it was below the grand mean of (2.17) with low variance in responses since the standard deviation was below one (SD = .867). This meant that give that rain fall was insufficient in in Eastern Uganda, farmers were advised to plant of fast maturing crops in order to have fast yields.

On whether people have agriculture insurance services, it scored a high mean value of (Mean= 2.23) which was above the grand mean of (2.17) with little variance in responses since the standard deviation was below one (SD=.891). This meant that most people didn't have agriculture insurance services. This meant that incase of any disaster, the farmers suffer the loss.

Furthermore, from Table 4.7 above, it was revealed that the people were relocating from hazard infested areas to safe areas. This was supported by a high mean value of (Mean = 3.05) which was high than the grand mean of (2.17) besides showing inconsistency in responses since the standard deviation was above one (SD =1.352). Therefore, this meant people were not willing to relocate from their areas besides facing the hazardous conditions. This was because the people have connection with their areas hence making them not willing to leave their areas.

Result in Table 4.7, on the issue that there was improved infrastructures like roads to link farmers to input and output markets, it scored a low mean value of (Mean = 2.14) which was less than the grand mean of (2.17) with low variations in responses because of the standard deviation being below one (SD = .874). This meant that there were improved infrastructures like roads to which largely linked farmers to input and output markets hence facilitating trade in the area.

Results further revealed that farmers were provided with early warnings to farmers for proper planning. This was supported by a low mean value of (Mean = 2.15) which was below the grand mean of 2.17) with the consistency in responses because of the standard deviation being below one (SD =.842). This was because Uganda has go a weather forecasting authority that regularly informs people about the about the weather conditions for them to prepare in time.

From Table 4.7 above, it was also revealed that farmers have improved crop varieties that are resistant to climate variations. This was supported by a low mean value of (Mean = 2.00) which was below than the grand mean of (2.17) on top of showing consistency in responses since the standard deviation was below one (SD = .849). This could be attributed to the Ugandan government had heavily invested in the agricultural research and development

through Uganda Agriculture Research Institute were many improved and resistant crops are developed to adapt to the changing climatic conditions.

Regarding whether there is input flexibility by postponing crop planting when weather realization are less speculative it scored a mean value of (Mean= 2.17) which was the same as the grand mean of (2.17) with little variance in responses since the standard deviation was below one (SD=.907). This meant that there was some input flexibility by postponing crop planting when weather realizations are less speculative in Kapelebyong Sub-County.

Lastly, from Table 4.7 above, it was revealed that there was installation of irrigation systems, it scored a low mean value of (Mean = 1.75), which was below the grand mean of (2.17). There was consistency in responses because of the standard deviation being below one (SD =.907). This meant that there is installation of irrigation systems. This was so because Eastern Uganda is known to be largely effected by changes in climatic conditions, the government introduced irrigation projects and training farmers to use them in order to have constant food production.

4.4.3 Water resource management practices on food security in Kapelebyong Sub-County

The third study objectives examined the effect of water resource management practices on food security. Like objective one and two, all respondents were also instructed to rank their responses regarding water resource management practices and in the same way means and standard deviations were used to interpret the results. The mean values obtained from the data were compared with the grand mean to assess the extent of agreement or disagreement concerning the statement. Any mean value below the grand mean showed agreement while mean value above the grand mean showed disagreement with statement.

Table 4.8: Responses on water resource management practices

Scale of interpretation: From1-2.9=Disagree, 3.0=Neutral and 3.1-5 means agree

Statement	***Min***	***Max***	***Mean***	***S.D***
I practice rainwater harvesting	1	4	1.88	.973
We promote water reuse	1	5	2.66	1.326
I encourage planting of drought-tolerant plant species	1	5	2.11	1.126
We have rules and regulations governing usage of water	1	5	3.30	1.305
There are tanks and ponds used in storing water	1	5	3.26	1.420
There is a water monitoring network/team that monitor use water sources in the community	1	5	3.51	1.186
I promote reforestation and protecting water supplies.	1	5	3.09	1.474
GRAND MEAN			**2.83**	

Source: Field data, 2024

From Table 4.8 above, on whether farmers practice rainwater harvesting, it scored a low mean value of (Mean = 1.88) which was below the grand mean of (2.83) and showed consistency in responding to the statement with standard deviation was below one (Std. Dev =.973). This meant that indeed people were harvesting rainwater to be used at home during the period of scarcity of water mostly during dry season.

On whether farmers promote water reuse, majority of the respondents agreed with it. It was supported by a low mean value of (Mean = 2.66) which was below the grand mean of (2.83) besides showing much variances because of the standard deviation being above one (SD = 1.326). This meant that due to water scarcity farmers had to reuse water as a way of showing efficient water utilization.

Further from Table 4.8 above, it was revealed that farmers were encouraging planting of drought-tolerant plant species because of limited water. It was supported by a lower mean value of (Mean = 2.11) which was below the grand mean of (2.83) besides high variations in responses because of the standard deviation being above one (SD =1.126). This implied that

besides facing much dry conditions, farmers in Eastern Uganda grow drought-tolerant plants like fruits hence continuously earning some money to buy food for the family.

On whether there were rules and regulations in place governing usage of water, majority of the respondents opposed it. It was supported by a high mean value of (Mean = 3.30) which was above the grand mean of (2.83) while showing much variations in responses because of the standard deviation being above one (SD =1.305). This showed that largely there were no rules and regulations governing usage of water high leading to people poor utilize and waste water which was scarce in the area.

Furthermore, on whether there were tanks and ponds used in storing water, majority of the respondents opposed the statement. This was supported by a high mean value of (Mean = 3.26) which was above the grand mean of (2.83) with high variations in responses because of the standard deviation being higher than one (SD =1.420). This was so because people didn't have enough money to construct tanks and dig ponds for storing water. Therefore, they were largely storing water in pot, jerrycans and drums which are tools for storing watering in rural areas.

Furthermore, on whether there was a water monitoring network/team that monitor the use of water sources in the community, majority of respondents disagreed with it. It was supported by a higher mean value of (Mean = 3.51) which was above the grand mean of (3.51) while scoring high variance in the responses (SD =1.186). This showed that there was monitoring network/team in most areas of the community, hence making people use water sources anyhow and wastefully.

Lastly from Table 4.8, it was revealed that to large extent farmers promoted reforestation and protecting water supplies. It was supported by a higher mean value of (Mean = 3.09) which

was higher the grand mean of (2.83). The standard deviation was also higher than one (Std. Dev = 1.474) which means that respondents were inconsistent in responding to the statement presented to them. This is because majority people were not sensitized about the importance of reforestation in forming and protecting water supplies.

4.4.4 Response on the food security in Kapelebyong Sub-County

The respondents in the study were asked to provide responses food security in Kapelebyong Sub-County and were guided to rank their responses. Mean and standard deviation were used and compared with the grand mean to gauge the extent of agreement regarding the statement. Any mean value below the grand mean showed agreement while mean value above the grand mean showed disagreement with statement.

Table 4.9: Responses on food security in Kapelebyong Sub-County
Scale of interpretation: From1-2.9=Disagree, 3.0=Neutral and 3.1-5 means agree

Statement	*Min*	*Max*	*Mean*	*S.D*
There is reduced post-harvest losses and seasonal food poverty.	1	5	2.08	.877
There is increased food production	1	5	2.03	.937
There is improved preservation of food which prevents it from going bad	1	5	2.21	.950
There is reduced food waste and loss	1	5	1.97	.844
There is enhanced stable food prices	1	5	2.10	.851
There is promotion of nutritional security	1	5	2.15	.808
There is enhanced birth of new crop varieties	1	5	1.88	.783
Improved livestock production	1	5	1.94	.795
Reduced water scarcity	1	5	2.06	.788
Reduced wastage and contamination of water resources	1	4	2.05	.779
GRAND MEAN			**2.04**	

Source: Field data, 2024

From Table 4.9 above, it was revealed that to a large extent there was reduced post-harvest losses and seasonal food poverty. These findings were supported by a high mean value of (Mean = 2.08) since it was above the grand mean of (2.04) with low variance in responses since the standard deviation was below one (SD =.877). This was so because most people had

no good food storage facilities hence still experiencing post-harvest losses and seasonal food poverty.

On whether there is increased food production, it scored a low mean value of (Mean = 2.03) which was lower than the grand mean of (2.04) with little variance in responses since the standard deviation was below one (SD =.937). This showed that largely most households had increased food production due to growing of food resistant crops and also introduction of some irrigation practices in the area by government.

On whether there was improved preservation of food which prevents it from going bad. The statement scored a high mean value of (Mean = 2.21) which was lower than the grand mean of (2.04) with consistency in responses since the standard deviation was below one (SD =.950). This showed that there was no improved preservation of food to prevent it from going bad. This was because most households didn't have good technology to preserve their food.

Furthermore, on whether there was reduced food waste and loss, majority of the respondents agreed with the statement. This was supported by a low mean value of (Mean = 1.97) which was below the grand mean of (2.04) and showed low variations in responses because of the standard deviation being below one (SD = .844). This showed that there was reduced food waste and loss because most households didn't have enough food. Therefore, they were utilizing food efficiently without waste.

Still from Table 4.9 on the issue if there was enhanced stable food prices, it attracted a high mean value of (Mean = 2.10) which was above the grand mean of (2.04) with consistency in responses because of the standard deviation being below one (SD =.851). This showed that there were no enhanced stable food prices because of inflation and changes in climatic conditions that affect food production.

On whether there is promotion of nutritional security, the statement scored a high mean value of (Mean = 2.15) which was higher than the grand mean of (2.04) with little variance in responses since the standard deviation was below one (SD = .808). This showed there was no promotion of nutritional security because most household were just eating food without minding about nutritional security.

Furthermore, on whether there was there was enhanced birth of new crop varieties, majority of the respondents agreed with the statement. This was supported by a low mean value of (Mean = 1.88) which was below the grand mean of (2.04) and showed low variations in responses because of the standard deviation being below one (SD = .783). This showed that there was enhanced birth of new crop varieties due to drought. This was so because the conditions needed drought tolerant crops.

Regarding the improvement in livestock production, the statement scored a low mean value of (Mean = 1.94) which was low than the grand mean of (2.04) with consistency in responses since the standard deviation was below one (SD =.795). This showed that was improved livestock production. This was due introduction of improved livestock breeds that are resistant to drought and diseases.

Still from Table 4.9 above, it was also revealed that there was no reduced water scarcity. This was supported by a high mean value of (Mean = 2.06) which was above than the grand mean of (2.04) on top of showing consistency in responses since the standard deviation was below one (SD = .788). This could be attributed to the fact that most of the households didn’t have enough tools like tanks to store water.

Lastly, on whether there was reduced wastage and contamination of water resources. It scored a high mean value of (Mean = 2.05), which was above the grand mean of (2.04) while

showing consistency in responses because of the standard deviation being above one (SD = .779). This was due to lack of rules and regulations governing water and lack of strong monitoring teams to monitor the use of water resources.

4.5 Inferential statistics

The researcher considered the inferential statistics to run correlation analysis and linear regression analysis. Correlation analysis was utilized to ascertain the relationship between national climate change policy recommendations and food security while linear regression analysis was employed to determine the predictive potential of national climate change policy recommendations on food security.

4.5.1 Correlation analysis

Pearson correlation was run using SPSS and was used to investigate the relationship between the constructs of national climate change policy recommendations and food security and results are presented in the Table 4.10 below.

Table 4.10: Correlation results on relationship between food storage methods, climate change adaptation measures, water resource management practices and food security.

Items	FSM	CCAM	WRMP	FS
Food Storage Methods (FSM)	**1**			
Climate Change Adaptation Measures (CCAM)	.260**	**1**		
Water Resource Management Practices (WRMP)	.149	.088	**1**	
Food Security (FS)	.164	.582**	.116	**1**

** Correlation is significant at the .01 level (2-tailed).

From the correlation results presented in Table 4.10 above, it was revealed that there was positive but weak and insignificant relationship between food storage methods and food security at ($r = .164$, $P > 0.01$). Additionally, it was revealed that there was positive, moderate and significant relationship between climate change adaptation measures and food security at

(r = .582**, P < 0.01). Lastly, the study also revealed that there was positive but weak and insignificant relationship between water resource management practices and food security at (r= .116, P > 0.01). This means that increase in food storage methods; climate change adaptation measures and water resource management practices positively increase food security.

4.5.2 Regression analysis

This study employed a regression analysis to assess the degree to which constructs of national climate change policy recommendations predict food security.

Table 4.11: Regression analysis

Regression Coefficients					
	Unstandardized Coefficients		Standardized Coefficients	T	**Sig.**
	B	Std. Error	Beta		
(Constant)	.815	.141		5.800	**.000**
Food Storage Methods	.023	.038	**.027**	.603	**.547**
Climate Change Adaptation Measures	.498	.039	**.569**	12.912	**.000**
Water Resource Management Practices	.025	.016	**.069**	1.610	**.108**
Model Summary					
Adjusted R Square	**.338**				
ANOVA[b]					
F	**64.376**				
Sig. (P)	**.000[a]**				

Source: Field data, 2024

The results in Table 4.11 show that the combined constructs of national climate change policy recommendations specifically food storage methods, climate change adaptation measures, and water resource management practices accounted for 33.8% (Adjusted R Square = .338) of the variance in food security in Kapelebyong Sub-County. The remaining

66.2% of the variance was due to factors not considered in this study. These findings indicate that the regression model effectively predicted the dependent variable. The model's validity was confirmed by the significant F-value (F= 64.376, P=.000 <0.05), demonstrating a good fit.

For the individual constructs, using Beta values, the results also revealed that food storage methods positive but insignificant predicted food security at (Beta = **.027**, *p=.547* >0.05). However, it meant that a unit increase in food storage methods leads to only .027 increase in the food security and a unit decrease in food storage methods leads to only .027 decrease in food security. Since the study results showed no significant effect, the researcher **Accepted** the study hypothesis: *H_{01} Food storage facilities have no significant effect on food security in Kapelebyong Sub-County, Kabelebyong District.*

For climate change adaptation measures, it positively and significantly predicted food security at (Beta =**.569**, *p=.000* <0.05). These findings implied that a unit increase in climate change adaptation measures leads to .569 increase in food security, and a unit decrease in climate change adaptation measures leads to .569 decrease in food security. Since the study results showed significant effect, the researcher **Rejected** the study hypothesis: H_{02} *Climate change adaptation measures have no significant effect on food security in Kapelebyong Sub-County, Kabelebyong District*

Lastly, it was also revealed that water resource management practices also positive but insignificant predicted food security at (Beta = **.067**, *p=.108* >0.05). However, it meant that a unit increase in water resource management practices leads to only .067 increase in the food security and a unit decrease in water resource management practices leads to only .067 decrease in food security. Since the study results showed no significant effect, the researcher

Accepted the study hypothesis: H_{03} *Effective water resource management practices have no significant effect on food security in Kapelebyong Sub-County, Kabelebyong District.*

Summary of the major objectives

The study findings also revealed that there was positive, moderate and significant relationship between climate change adaptation measures and food security at ($r = .582^{**}$, $P < 0.01$).

The study findings also revealed that there was positive, moderate and significant relationship between climate change adaptation measures and food security at ($r = .582^{**}$, $P < 0.01$).

The study also revealed that there was positive but weak and insignificant relationship between water resource management practices and food security at ($r= .116$, $P > 0.01$).

CHAPTER FIVE

DISCUSSION OF STUDY FINDINGS

5.1 Introduction

The chapter provides a summary and discussion of the study findings. These were presented in line with study objectives which included examining the effects of food storage facilities on food security in Kapelebyong Sub-County, the effect of climate change adaptation measures on food security in Kapelebyong Sub-County and the effect of water resource management practices on food security in Kapelebyong Sub-County.

5.2 Discussion of the study findings

5.2.1 The effects of food storage facilities on food security in Kapelebyong Sub-County

The study findings revealed a positive but weak and insignificant relationship between food storage methods and food security in Kapelebyong Sub-County are consistent with several previous studies highlighting similar challenges in food preservation. Brander et al. (2021) emphasized the importance of reducing post-harvest losses through improved storage techniques to address seasonal food insecurity. They argued that inadequate food storage and preservation methods contribute to oscillations in food availability, which aligns with the observed lack of modern storage techniques such as silos, jerrycans, smoking, and freezing among Kapelebyong residents. This deficiency leads to ongoing challenges in ensuring food security, echoing Brander's findings that efficient post-harvest storage is crucial for maintaining consistent food supplies.

Furthermore, Ayomide et al. (2022) also highlighted the critical role of food storage in preventing spoilage and waste, particularly in the context of a growing global population and the need to reduce food loss and waste to meet future demand. The findings from Kapelebyong Sub-County, where insufficient adoption of modern storage methods contributes to food insecurity, support his assertion that effective storage is essential for food

security. The need for modern storage methods to address food preservation issues is further corroborated by the Food and Agriculture Organization (FAO, 2021), which pointed out that inadequate storage leads to significant food losses, especially in regions affected by climate change. The FAO's observation that proper food management, including advanced storage techniques, is vital for food security reinforces the study's recommendation to promote and implement modern food storage practices in Kapelebyong.

Similarly, the challenges faced by Nigerian farmers in adopting new storage methods due to inadequate facilities and tools, as noted by Adeyeye (2017), resonate with the obstacles observed in Kapelebyong. The lack of modern storage infrastructure and the reliance on traditional methods in both contexts underline the necessity for technological advancements and policy interventions to improve food preservation and security. Thus, the study's findings are in line with the broader literature emphasizing the crucial link between effective food storage and enhanced food security.

5.2.2 The effect of climate change adaptation measures on food security in Kapelebyong Sub-County

The findings revealed that the implementation of climate change adaptation measures has a positive, moderate, and significant impact on food security align well with several previous studies that highlight the critical role of adaptive strategies in mitigating the adverse effects of climate change on food security. The adoption of fast-maturing crop varieties, the development of climate-resistant crops, and the installation of irrigation systems as effective adaptation measures are consistent with findings from (Fadake & Walker, 2021). They noted that climate change leads to extreme weather events, which in turn accelerate the growth of diseases, pests, and soil erosion, all detrimental to agricultural productivity. By adopting climate-resilient crops and irrigation systems, farmers can mitigate these negative impacts,

enhancing food security through increased food production and improved livestock production.

The significant positive impact of infrastructure enhancements, such as roads facilitating market access and the provision of early warnings for better planning, on food security is also supported by prior research. USAID (2012) reported that natural disasters like floods and droughts impose heavy costs on Uganda, particularly affecting agriculture and water management sectors. They emphasized the importance of government and donor community cooperation to address climate change by prioritizing adaptation measures, which includes improving infrastructure and early warning systems. This cooperation helps ensure the continuity of agricultural activities and market access, thereby safeguarding food security. The alignment between these studies and the findings from Kapelebyong Sub-County underscores the effectiveness of infrastructural improvements and early warnings in enhancing food security.

Moreover, the observed benefits of climate change adaptation measures in Kapelebyong, such as increased food production and the emergence of new crop varieties, resonate with broader literature on sustainable agricultural practices. For instance, Pandey et al. (2007) discussed how farmers' ex-ante and ex-post adaptation strategies, including diversification of crops and implementation of irrigation, help mitigate the impacts of climatic variability. Similarly, Al et al. (2008) highlighted the importance of adaptive measures like soil carbon sequestration and crop diversification in enhancing food production and ensuring environmental sustainability. The congruence between these findings and the study in Kapelebyong demonstrates a consensus on the positive role of adaptive strategies in improving food security, reinforcing the need for continued investment in climate change adaptation measures to combat food insecurity effectively.

5.2.3 The effect of water resource management practices on food security in Kapelebyong Sub-County

The findings revealed that water resource management practices have a positive but weak and insignificant impact on food security align with some of the concerns highlighted in previous studies about the role of water management in agricultural productivity. FAO (2013) emphasized the importance of clean technologies and effective water management for sustainable food production. However, they also acknowledged that without adequate regulations, infrastructure, and monitoring systems, water management alone might not significantly enhance food security. The study's findings resonate with this perspective, highlighting how deficiencies in water regulations, storage, and monitoring can lead to water scarcity and contamination, undermining efforts to secure food production.

Furthermore, Kannan and Anandhi (2020) noted the critical role of water in meeting the increasing food demands of a growing global population, stressing that effective water management is essential for maintaining agricultural output. The study findings, which indicate weak impacts of water resource management on food security due to poor infrastructure and management practices, underscore the challenge of managing water resources under current conditions. This lack of effective water management exacerbates water scarcity and contamination issues, making it difficult to meet the growing food demands and adapt to climate change impacts, as highlighted by the need for better water management systems in the study.

Bani (2019) and FAO (2017) discuss the need for efficient water management systems to support increased agricultural productivity and food security. They note that water scarcity directly affects agricultural output and food security, emphasizing that without proper management, water resources will remain insufficient to meet food production needs. The

findings from the study, which point to ineffective water management practices leading to increased water scarcity and food insecurity, align with these concerns. The study illustrates that without comprehensive water management strategies, including regulations, infrastructure improvements, and monitoring systems, the potential benefits of water resource management on food security remain limited. This highlights the need for enhanced water management approaches to address the identified deficiencies and support food security effectively.

5.3 Chapter summary

This chapter discussed the key findings of the study in relation to the effects of food storage facilities, climate change adaptation measures, and water resource management practices on food security in Kapelebyong Sub-County. The results revealed that food storage facilities have a weak and statistically insignificant impact on food security. This aligns with existing literature which emphasizes the detrimental effect of poor storage infrastructure and traditional preservation methods on post-harvest losses and seasonal food availability. The findings underscore the urgent need for the promotion and adoption of modern storage techniques to enhance food preservation and ensure a more stable food supply within the sub-county.

In contrast, climate change adaptation measures were found to have a moderate and significant positive effect on food security. Strategies such as the use of fast-maturing and climate-resilient crops, irrigation, and improved infrastructure contributed positively to agricultural productivity and resilience. However, water resource management practices, though positively related to food security, showed only weak and insignificant impacts due to inadequate infrastructure, poor regulation, and inefficient monitoring systems. These findings highlight the need for more robust investments and policy interventions in water management and storage systems. Overall, the study demonstrates that while climate adaptation measures

are making a measurable impact, greater attention must be paid to improving food storage and water resource systems to achieve holistic and sustainable food security in Kapelebyong Sub-County.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

The chapter presents the conclusion and recommendations to the study. The information was presented in line with the study objectives which included examining the effects of food storage facilities on food security in Kapelebyong Sub-County, the effect of climate change adaptation measures on food security in Kapelebyong Sub-County and the effect of water resource management practices on food security in Kapelebyong Sub-County.

6.2 Summary of the study findings

6.2.1 The effects of food storage facilities on food security in Kapelebyong Sub-County

The results revealed that food storage methods had positive but insignificant predicted food security at (Beta = **.027**, $p=.547$ >0.05). Since the study results showed no significant effect, the researcher **Accepted** the study hypothesis: H_{01} *Food storage facilities have no significant effect on food security in Kapelebyong Sub-County, Kabelebyong District.*

6.2.2 The effect of climate change adaptation measures on food security in Kapelebyong Sub-County

The study findings revealed that climate change adaptation measures positively and significantly predicted food security at (Beta =**.569**, $p=.000$ <0.05). Since the study results showed significant effect, the researcher **Rejected** the study hypothesis: H_{02} *Climate change adaptation measures have no significant effect on food security in Kapelebyong Sub-County, Kabelebyong District.*

6.2.3 The effect of water resource management practices on food security in Kapelebyong Sub-County

The study also revealed that revealed that water resource management practices also had positive but insignificant predicted food security at (Beta = **.067**, *p=.108* >0.05). Since the study results showed no significant effect, the researcher **Accepted** the study hypothesis: H_{03} *Effective water resource management practices have no significant effect on food security in Kapelebyong Sub-County, Kabelebyong District.*

6.3 Conclusions

6.3.1 The effects of food storage facilities on food security in Kapelebyong Sub-County

The study concluded that there was a positive but weak and insignificant relationship between food storage methods and food security in Kapelebyong Sub-County. This was attributed to the lack of modern food storage techniques such as the use of silos, jerrycans, smoking, and freezing among the residents. Consequently, the insufficient adoption of these advanced storage and preservation methods contributed to ongoing challenges in ensuring food security in the area. Therefore, addressing these gaps through the promotion and implementation of modern food storage practices could potentially enhance food security for the community.

6.3.2 The effect of climate change adaptation measures on food security in Kapelebyong Sub-County

It was also concluded that the implementation of climate change adaptation measures has a positive, moderate, and significant impact on food security. This was primarily due to several key factors such as the adoption of fast-maturing crop varieties in response to insufficient rainfall, the enhancement of infrastructure such as roads facilitating market access, the provision of early warnings enabling better planning, the development of crop varieties

resistant to climate variations, and the installation of irrigation systems. These adaptive strategies collectively contribute to increased food production, the emergence of new crop varieties, and improved livestock production, thereby significantly enhancing food security.

6.3.3 The effect of water resource management practices on food security in Kapelebyong Sub-County

Lastly, it was concluded that while water resource management practices have a positive, their impact on food security is weak and insignificant. This is due to several critical factors such as the lack of rules and regulations governing water usage, absence of tanks and ponds for water storage, insufficient water monitoring networks to oversee community water sources, and inadequate efforts in reforestation and protecting water supplies. These deficiencies have led to increased water scarcity, wastage, and contamination, ultimately exacerbating food insecurity in the area.

6.4 Recommendations

The following recommendations were suggested;

6.4.1 The effects of food storage facilities on food security in Kapelebyong Sub-County

It is recommended that efforts to improve food storage methods among residents should focus on the introduction and adoption of modern techniques such as the use of silos and smoking. This can be achieved through targeted education and training programs to raise awareness about the benefits and usage of these storage methods. Additionally, providing financial support or subsidies for the acquisition of storage equipment and facilitating access to the necessary technology will be crucial. Establishing community-based initiatives and cooperatives to share resources and knowledge can further enhance the effectiveness and sustainability of these improved food storage practices.

6.4.2 The effect of climate change adaptation measures on food security in Kapelebyong Sub-County

It was also recommended that efforts be intensified to encourage farmers to adopt climate change adaptation measures. This can be achieved by providing comprehensive training and support programs that highlight the benefits and practical implementation of fast-maturing crop varieties, improved infrastructure, early warning systems, climate-resistant crops, and irrigation systems. Additionally, it is essential to introduce and promote agricultural insurance services to mitigate the risks associated with climate variability. Governments and stakeholders should work together to develop affordable and accessible insurance schemes tailored to the needs of farmers. This will not only provide a safety net against potential losses but also incentivize the adoption of climate change adaptation strategies, thereby continuously improving food security.

6.4.3 The effect of water resource management practices on food security in Kapelebyong Sub-County

Lastly, it was recommended that a comprehensive strategy be implemented including the establishment of robust rules and regulations governing water usage, supporting locals to construct and maintenance of tanks and ponds for efficient water storage, and the development of water monitoring networks to oversee and manage community water sources effectively. Additionally, significant efforts should be made towards reforestation and the protection of water supplies to ensure sustainable water availability. These measures will collectively enhance water resource management, thereby improving food security in the affected areas.

6.5 Areas for further research

The following areas put forward for future research;

i) Future researchers should focus on examining the contribution of the national climate change policy recommendations on food security in different agro-ecological zones across Uganda to understand regional variations and help to provide a broader comparative analysis.

ii) Future studies need also to investigate the long-term effects of climate change policy implementations on agricultural productivity and food security to assess their sustainability and effectiveness over time.

REFERENCES

Abdalla, Y. I. (2007). *Causes of food insecurity in Southern Africa: An assessment*. Stellenbosch University.

Adejumo, B. A., & Raji, A. O. (2007). Technical appraisal of grain storage systems in the Nigerian Sudan Savanna. *CIGR Journal*, 9, 1–10.

Adeyeye, S. A. O. (2017). The role of food processing and appropriate storage technologies in ensuring food security and food availability in Africa. *Food Science and Nutrition*, 5(3), 1–10.

Al, M., et al. (2008). *Climate change and food security: A framework document*. Food and Agriculture Organization of the United Nations.

Ayomide, T., Adebayo, O., & Musa, B. (2022). The impact of high technology storage facilities on food security in Nigeria: A mini review. *African Journal of Food Science and Technology*, 13(2), 12–16.

Bamanyaki, P. A. (2020). Climate change, food and nutrition policies in Uganda: Are they gender- and nutrition-sensitive? *Journal Name*, 8(2), 1–6.

Bani, S. (2019). Efficient use of water for food production through sustainable crop management. *Desalination and Water Treatment*, 165, 1–6.

Berry, E. M., & Peng, J. (2018). The concept of food security: For non-commercial research and educational use. *Journal Name*, 12(1), 1–4.

Brander, M., Wanjala, B., & Smith, H. (2021). Improved on-farm storage reduces seasonal food insecurity of smallholder farmer households: Evidence from a randomized control trial in Tanzania. *Food Policy*, 98, 101967.

Brown, O., & Crawford, A. (2009). *Climate change and security in Africa: A study for the Nordic-African Foreign Ministers Meeting*. International Institute for Sustainable Development.

Cuncil, N. R. (2017). *Climate change: Impacts, evidence and choices*. National Academies Press.

Edidah, C., Nyasimi, M., & Amwata, D. (2016). Barriers to successful climate change policy implementation in Tanzania: Findings from a desk review and exploratory studies. *Journal Name*, 14(3), 1–8.

Edyegu, D. (2009, August 25). 12 starve to death in Kabelebyong. *New Vision*.

Fadake, A., & Walker, L. (2021). Climate change adaptation: Implications for food security and nutrition. In W. Leal Filho (Ed.), *Handbook of Climate Change Adaptation* (pp. 1203–1211). Springer.

FAO, IFAD, & WFP. (2013). *The state of food insecurity in the world: The multiple dimensions of food security*. Rome: FAO.

FAO. (2002). *Anti-hunger programme: Reducing hunger through agriculture and rural development and wider access to food*. Rome: FAO.

FAO. (2008). *Climate change adaptation and mitigation in the food and agricultural sector*. Rome: FAO.

FAO. (2017). *Water for sustainable food and agriculture: A report produced for the G20 Presidency of Germany*. Rome: FAO.

FAO. (2019). *The state of food security and nutrition in the world 2019*. Rome: FAO and IFAD.

FAO. (2021). *Africa regional overview of food security and nutrition 2021: Statistics and trends*. Accra: FAO.

Food and Agriculture Organization. (2017). *Water for sustainable food and agriculture*. Rome: FAO.

Fournier, C. (2020). Simple definition of climate change and its in-depth understanding. *Climate Change Definition*, 8(1), 1–9.

Grigorieva, E., Livenets, A., & Stelmakh, E. (2023). Adaptation of agriculture to climate change: A scoping review. *Climate*, *11*(10), 202. https://doi.org/10.3390/cli11100202

Hall, J., & Knausenberger, W. (2017). The impact of population growth and climate change on food security in Africa: Looking ahead to 2050. *International Journal of Agricultural Sustainability*, 15(2), 1–7.

Harriet, N., Okello, J., & Namutebi, L. (2020). *Kabelebyong district flood risk profile report*. Kampala: University of Reading.

Havas, K. A. (2011). Food security, components, and challenges. *International Journal of Food Safety, Nutrition and Public Health*, 4(1), 1–6.

Horie, N., Takahashi, Y., & Yamamoto, T. (2019). Evaluation of lactic acid bacteria and component change during fermentation of Ishizuchi-kurocha. *Journal of Food Processing and Preservation*, 43(3), e14186.

IDA. (2019). *Ugandan government steps up efforts to mitigate and adapt to climate change*. Lake Victoria Environment Management Project.

IPC. (2017). *Evidence and standards for better food security decisions: Uganda – Current acute food insecurity situation*. IPC Global.

IPC. (2018). *Current food insecurity in Uganda: Evidence and standards for better food security decisions*. IPC Global.

IPCC. (2014). *Climate change 2014: Impacts, adaptation, and vulnerability (Part A: Global and sectoral aspects)*. Cambridge University Press.

Jackson, S. T. (2014). Climate change throughout history. *Encyclopedia Britannica*.

John, N. (2009). Teso region wallows in hunger. *New Analysis – Archives*, 1(1), 1.

Kalinaki, N. (2022). How to reduce food loss and waste. *Don't Waste Food*, 1(1), 1–2.

Kannan, D., & Anandhi, A. (2020). Water management for sustainable food production. *Water*, 12(1), 1–6.

Kansas, M., & Peters, J. (2019). Climate change and agriculture: A perfect storm in farm country. *Journal Name*, 8(1), 1–6.

Killmann, W. (2008). *Climate change and food security: A framework document*. Rome: FAO.

Kumar, A. (2019). Food preservation: Traditional and modern techniques. *Acta Scientific Nutritional Health*, 3(1), 1–4.

Louhaichi, M., et al. (2019). Effects of climate change and grazing pressure on shrub communities of West Asian rangelands. *International Journal of Climate Change Strategies and Management*, 11(3), 1–8.

Ludi, E. (2009). *Climate change, water and food security*. Background Note.

Masego, M. (2010). Climate governance in Africa: Adaptation strategies and institutions. *Journal Name*, 4(1), 1–5.

Mayemba, A. (2021). The impacts of climate change in Uganda. *Journal Name*, 1(1), 1–3.

Ministry of Agriculture, Animal Industry and Fisheries. (2024). *Uganda Climate Smart Agricultural Transformation (UCSAT) Project - P173296: Stakeholder engagement framework.*

Miteu, J., Ayomide, T., & Musa, B. (2022). The impact of high technology storage facilities on food security in Nigeria. *African Journal of Food Science and Technology*, 13(4), 10–18.

Mkutu, K. A. (2006). Small arms and light weapons among pastoral groups in the Kenya-Uganda border area. *Journal of African Studies*, 14(2), 47–70.

Mozundar, L. (2016). Agricultural productivity and food security in the developing world. *Journal of Agricultural Development*, 8(4), 1–8.

Muller, A., et al. (2015). Implications of climate mitigation for future agricultural production. *Environmental Research Letters*, 10(12), 1–5.

Nabegu, A. A. (2016). Understanding climate change: The scientific basis, misconceptions, impacts, and global response. *Climate Science Today*, 2(1), 1–6.

Nafziger, E. (2019). Cropping systems. *Department of Crop Sciences*, University of Illinois.

Namanya, B. (2020). Uganda's climate law makes headway. *Climate Policy Journal*, 3(1), 3–5.

Nelson, K., & Benard, A. (2017). Prevalence of household food insecurity in wetlands and adjacent areas in Uganda. *Agriculture and Food Security*, 6(1), 1–7.

Ogwu, M. C., Izah, S. C., Ntuli, N. R., & Odubo, T. C. (2024). Food security complexities in the Global South. In *Food Security in the Global South.* https://doi.org/10.1007/978-981-97-2428-4_1

Oxfam. (2017). *Integrated food security phase classification: Uganda – Current acute food insecurity situation*. Oxfam International.

Pencheon, D. (2017). Sustainable development goals (SDGs) and their implementation. *Health Systems Journal*, 1(1), 1–3.

Peng, W., & Berry, E. M. (2018). The concept of food security. In *Encyclopedia of Food Security and Sustainability*. https://doi.org/10.1016/B978-0-08-100596-5.22314-7

Pielke, R. A. (2015). Climate change: The need to consider human forcings besides greenhouse gases. *Eos Transactions American Geophysical Union*, 96(8), 9–11.

Pinstrup-Andersen, P. (2009). Food security: Definition and measurement. *Food Security, 1*(1), 5–7. https://doi.org/10.1007/s12571-008-0002-y

Prasad, R. (2009). Flood estimation of Kosi River. In *Earth System Sciences* (pp. 45–67). Delhi: Concept Publishing.

Pretty, J. (2005). Farm costs and food miles: An assessment of the full cost of the UK weekly food basket. *Food Policy*, 30(1), 1–19.

Rajasthan, J. (2015). *Farming system: Concepts and approaches*. Delhi: Agrobios India.

Sen, A. (1981). *Poverty and famine: An essay on entitlement and deprivation*. Oxford: Clarendon Press.

Smith, B. (2006). Effects of climate change on agriculture. *Journal of Agricultural Science*, 3(2), 5–8.

Solomon, S. (2020). *Climate change: Causes and evidence*. Cambridge: MIT Press.

Ssewanyana, S. N., & Kasirye, I. (2010). Food security in Uganda: A dilemma to achieving the Millennium Development Goal. *Journal of Development Studies*, 19(2), 1–19.

Ssewanyana, S., & Kasirye, I. (2010). *Food security in Uganda: A dilemma to achieving the Millennium Development Goal* (Working Paper). Economic Policy Research Centre. https://eprcug.org/publication/food-security-in-uganda-a-dilemma-to-achieving-the-millennium-development-goal/

Steven, H. (2018). Achieving food security in Uganda. Washington, DC: Qaed Group.

Suraj Mal, R. S. (2018). *Climate change, extreme events and disaster risk reduction*. New Delhi: Springer.

Tadesse, K. T. (2024). The role of post-harvest management in ensuring food security in a changing world: Review article. *Journal of Clinical Research and Case Studies.* https://doi.org/10.61440/JCRCS.2024.v2.41

The Magazine. (2012). Water management strategies. *Water for Texas: State Water Plan*, 1(1), 4–7.

The National Academy of Sciences. (2020). *Climate change evidence & causes*. The Royal Society, UK.

Thunders, T. (2014). *Business research methodology*. McGraw-Hill.

Toit, A., & Ziervogel, G. (2004). Vulnerability and food insecurity: Background concepts for informing the development of a national FIVIMS for South Africa. *Background paper for FIVIMS-ZA Consortium*.

Turyasingura, B., Bekana, D., Niwagaba, C. B., Dejene, S. W., & Ayiga, N. (2024). Climate-smart water management practices for sustainable agriculture in Uganda. *Journal of Water and Climate Change, 00*(0), 1. https://doi.org/10.2166/wcc.2024.471

UBOS. (2019). *Statistical abstract 2019*. Kampala: Uganda Bureau of Statistics.

UN. (2015). *Water resource management: Climate change and sustainable development in the Caribbean*. United Nations.

UN. (2020). What is climate change? *Climate Action*, 3(1), 12.

UNDP. (2014). *Kabelebyong district: Hazard, risk and vulnerability profile*. UNDP Uganda.

UNFCCC. (2020). *Impacts, vulnerabilities and adaptation in developing countries*. UN Climate Secretariat.

UNHS. (2020). *Uganda National Household Survey 2019/2020*. Kampala: UBOS.

USAID. (2012). *Climate change adaptation in Uganda: Climate impacts and vulnerability*. USAID Uganda.

Watuleke, J., & Joseph, M. (2015). The role of food banks in food security in Uganda: The case of the Hunger Project Food Bank, Mbale Epicentre. Kampala: Byrå4.

Wesonga, R. (2014). Determining the factors that influence household food security in Uganda: A case study. *Journal of Rural Development*, 10(3), 1–9.

World Bank. (2007). *World Development Report 2008: Agriculture for Development*. Washington, DC: World Bank.

World. E. T. (2022). *Luuka Town in Eastern Region Destination Guide Uganda*.

Yusuff, F. O., Adekunle, A. M., & Akinyele, T. A. (2019). Prevalence and socio-economic impacts of malnutrition among children in Uganda. *Nutrition and Metabolic Insights*, *12*, 1–3.

APPENDICES

APPENDIX I: RESEARCH QUESTIONNAIRE

Dear respondent,

I Naimwanga Allan a student of Uganda Christian University, pursuing a Master's Degree in Research and Public Policy. I am currently doing research titled "**An Assessment of the National Climate Change Policy Recommendations on Food Security in Uganda. A Case of Kapelebyong County, Kabelebyong District"** You have been selected to take part in this study and help in providing information on the given topic. The information you provide will be specifically used for academic purposes and will be kept confidential. Kindly feel free to answer all the questions presented to you on this paper.

SECTION A: PROFILE CHARACTERISTICS OF RESPONDENTS

(Write and Tick where necessary)

1. **Age**

15–20	21–30	31–40	41–50	51–60	61 above

2. **Sex**

Male	Female

3. **Marital Status**

Single	Married	Divorced	Widow/Widower

4. **Level of education**

Never	Primary	Ordinary level	Advanced Level	Certificate	Diploma	Degree	Masters

5. **Average household size**

<3	3–5	6–9	9>

6. **Tick the most common climate chnage problem affecting food security in your household**

Drought	Floods	Wild fires	Conflicts	Animal diseases	If others specify

SECTION B: The available food storage methods in the area

To what extent do you agree or disagree with the following statements in regard to the role of improved food storage facilities on food security in Kapelebyong Sub-County, Kabelebyong District. Kindly tick in the given box below to indicate your opinion.

(1)Strongly Agree (2) Agree (3) Not Sure (4) Disagree (5) Strongly Disagree

Code	**The available food storage methods in the area**	**Responses**				
		1	2	3	4	5
B1	The people of Kapelebyong Sub-County use modern Silos for food storage.					
B2	The people of Kapelebyong Sub-County use of jerrycans to store their food					
B3	The people of Kapelebyong Sub-County use sacks to store food					
B4	The people of Kapelebyong Sub-County use smoking to preserve their food					
B5	The people of Kapelebyong Sub-County use Granaries to keep their food.					
B6	The people of Kapelebyong Sub-County use Freezing to preserve their food					

SECTION C: Climate change adaptation measures to reduce food insecurity

To what extent do you agree or disagree with the following statements. Kindly tick in the given box below to indicate your opinion. (1)Strongly Agree (2) Agree (3) Not Sure (4) Disagree (5) Strongly Disagree

Code	**Climate change adaptation measures to reduce food insecurity**	**Responses**				
		1	**2**	**3**	**4**	**5**
C1	Farmers adopt planting of fast maturing crops in the event that rain fall is insufficient.					
C2	People have agriculture insurance services					
C3	The people relocate from hazard infested areas to safe areas					
C4	There is improved infrastructures like roads to link farmers to input and output markets					
C5	Farmers are provided with early warnings to farmers for proper planning					
C6	Farmers have improved crop varieties that are resistant to climate variations					
C7	There is input flexibility by postponing crop planting when weather realization are less speculative					
C8	There is installation of irrigation systems					

SECTION D: Water resource management practices

To what extent do you agree or disagree with the following statements. Kindly tick in the given box below to indicate your opinion. (1)Strongly Agree (2) Agree (3) Not Sure (4) Disagree (5) Strongly Disagree

Code	Water resource management practices	Responses				
		1	2	3	4	5
D1	I practice rainwater harvesting					
D2	We promote water reuse					
D3	I encourage planting of drought-tolerant plant species					
D4	We have rules and regulations governing usage of water					
D5	There are tanks and ponds used in storing water					
D6	There is a water monitoring network/team that monitor use water sources in the community					
D7	I promote reforestation and protecting water supplies.					

SECTION E: Food security in Kapelebyong Sub-County

To what extent do you agree or disagree with the following statements. Kindly tick in the given box below to indicate your opinion. (1)Strongly Agree (2) Agree (3) Not Sure (4) Disagree (5) Strongly Disagree

Code	Food security in Kapelebyong Sub-County	Responses				
		1	2	3	4	5
E1	There is reduces post-harvest losses and seasonal food poverty.					
E2	There is increased food production					
E3	There is improved preservation of food which prevents it from going bad					
E4	There is reduced food waste and loss					
E5	There is enhanced stable food prices					
E6	There is promotion of nutritional security					
E7	There is enhanced birth of new crop varieties					
E8	Improved live stock production					
E9	Reduced water scarcity					
E10	Reduced wastage and contamination of water resources					

END: THANK YOU

APPENDIX II: RESEARCH INTRODUCTORY LETTER

UGANDA CHRISTIAN UNIVERSITY
A Centre of Excellence in the Heart of Africa

May 24th 2024

TO WHOM IT MAY CONCERN

Dear Sir/Madam

Re: **INTRODUCTORY LETTER FOR RESEARCH**

This is to introduce to you **NAIMWANGA Allan** Registration number **M21M07/003**, a student of Uganda Christian University, pursuing Master's degree in Research and Public Policy. He is expected to carry out research in the final year under the guidance of a university supervisor in partial fulfillment for the requirements of the above mentioned award.

Topic: "An **Assessment of the National Climate Change Policy Recommendations on Food Security In Uganda. A Case of Kapelebyong Sub County, Amuria District.**"

The purpose of this communication is to request your office to allow him collect data from your organization. Any assistance rendered to him will be highly appreciated.

Yours faithfully,

27 MAY 2024

.....

Jeremy Waiswa, PhD
HoD, Research & Postgraduate Studies Department
Tel: 0752319951
Email:jwaiswa@ucu.ac.ug

UGANDA CHRISTIAN UNIVERSITY

A Centre of Excellence in the Heart of Africa

UGANDA CHRISTIAN UNIVERSITY

SCHOOL OF RESEARCH & POSTGRADUATE STUDIES

DISSERTATION CORRECTION COMPLIANCE REPORT BY THE CANDIDATE (POST VIVA FORM)

Date: 28/04/2025

Name of Candidate: *Naimwanga Allan* **Reg. No:** *M21M07/003*

Title of Dissertation: *An Assessment of the Implementation of the National Climate Change Policy Recommendations on Food Security in Uganda; A Case of Kapelebyong Sub County, Kapelebyong District*

SN	COMMENTS BY EXTERNAL EXAMINER	ACTION TAKEN	INDICATOR
1	The title is ambiguous and irrelevant; Implementation assessment of Uganda Climate Change policy recommendations on Food security.	Changed to; An Assessment of The Implementation of the National Climate Change Policy Recommendations on Food Security in Uganda; A Case of Kapelebyong Sub County, Kapelebyong District.	Cover page.

	The problem statement	The background to the study was double checked and the problem statement revised.	Page 1-8
	Specific Objectives are Quite Different/away from the title AND So; Hypothesis are too far from the title, background and statement of the problem. This MUST be re- written to tie up everything	The objectives of the study were realigned to match the background, conceptual framework and the hypothesis	8,9 and 12
2			Page 1, etc corrected
3			
4	Presentation of findings should be on the basis of research questions	The research findings have been presented in line with the research questions	Page 50-65
5	Discussion of findings should be on the basis of research questions [Improved on the 4 pillars of food security	This was done throughout chapter five during the discussion of the findings	Page 66-70

SN	COMMENTS BY INTERNAL EXAMINER	ACTION TAKEN	INDICATOR
1	The topic may be improved to state, "An assessment of the implementation/contribution of the national climate change policy recommendations on food security in Uganda; A case of Kapelebyong Sub county, Amuria District.	The topic has been adjusted to; An Assessment of The Implementation of the National Climate Change Policy Recommendations on Food Security in Uganda; A Case of Kapelebyong Sub County, Kapelebyong District.	Cover page
	The originality to justify the study and key words on the basis of which the study can be searched are missing.	The originality to justify the study has been captured and the key words included.	Page xi
	The introduction section to the whole report starts by highlighting the key sections in the proposal without indicating what the study is about.	The topic under study was included in the introduction to clearly show what the study is about.	Page 1
	The different sub-sections of the background need to be clearly divided, instead the contextual background is mixed up in the general background. It is better to divide the above into the different sections covering; conceptual, historical, and contextual background for clarity and easy flow to the reader	The background has been clearly divided into the different sections covering; conceptual, historical, and contextual and theoretical background.	1-6
	Instead of starting with the ideal sentence followed by the actual and finally the gap between the ideal and what is, the candidates starts by giving detailed background and at the	These were addressed by the student	Page 7-8

	end of the problem statement, there is need for more adequate reflection of the research gap being investigated in this study.		
	In this subsection, while the purpose is meant to be stated in line with the topic, there are changes here. Eg, ….examine the contribution of the national climate change policy. While the topic is "An assessment of the national climate change policy recommendations on food security in Uganda……." . So, consistency is very important.	This was aligned with the topic; the purpose of the study was to examine the effect of implementation of the national climate change policy recommendations on food security in Kapelebyong Sub-County, Kabelebyong District.	Page 8-7
	Some detail is lacking in the geographical scope where parishes within kapelebyong sub-county where data was collected needed to be included.	More details about the geographical scope have been added for example the parishes including; Abarilela, Acowa, Asamuk, Kapelebyong, Kuju, Morungatuny, Obalanga, Orungo, and Wera	Page 9
	Justification of the study; The sections arguments could be strengthened by providing more context and connecting the contribution to the literature	This was enriched with more contextual data	Page 10
	Significance; There is need to provide more clarity on the existing gaps and show clearly how the proposed study is going to contribute better to policy, practice and research. It would also be of greater relevance	Clarity on the existing gaps were presented and the relevance of the study findings in regard to the SDGs was done.	Page 10-11

	to connect the study findings to the SDGs and give it a global significance.		
	Conceptual/Theoretical framework; the candidate should provide a clear narrative after the framework to explain the diagrammatical flow and relationship between the variables.	A clear and detailed narrative was provided after the conceptual framework.	Page 12-13
	Operational definition	The concepts in the conceptual framework were defined	13-14
	The candidate does not present a Where a chapter summary giving a highlight of the key areas covered in the chapter one	A chapter summary has been provided at the end of the chapter	14
2	The chapter summery that provides a highlight of the chapter content is missing	The chapter summary was provided at the end of the chapter.	Page 37
3	Ensure clear definition of the research design and then show the design adopted, how it was implemented and the justification for its adoption reflected in the advantages associated with it.	This was responded to	Page-38
	The research approach sub-section is completely lacking, so the candidate should include it, eg quantitative approach with explanation and justification for its adoption.	A research approach section was included in chapter three	Page-38
	The sources of information should be clearly categorized as primary and secondary.	The data sources are clear and elaborate	Page-39
	While the sampling is stated, the section should explained In detail	The simple random sampling was explained in detail about	Page 41

	how the simple random sampling was conducted.	how it was used.	
	Where is the chapter summary giving a highlight of the key areas covered in the chapter.	The chapter summary was included	Page-45-46
4	The candidate needs to avoid over using the same sources.	This was rectified throughout the chapter	Page 66-75
5	A number of the references used are not reflected in the literature review in the earlier chapters.	The references used in chapter were checked to match those in the previous chapters	66-75

SN	COMMENTS BY VIVA VOCE PANNEL	ACTION TAKEN	INDICATOR
1	Be clear or find out if Kabelebyong is a district or not a Sub County of Amuria District	Kabelebyong Subcounty as per the 2014 National Population Census report was located in Amuria District Until 2018 when it was made a district. Therefore, the study was conducted in Kabelebyong subcounty in Kabelebyong district.	Cover page
2	The population of 5100 was not well explained how you came up with it	The population was based on the findings of the National Census report of 2014.	Page-40
3	How was multistage done	This was elaborated	Page-41
4			
5			

Naimwanga Allan ..... **Madam Nagadya Edith** .....

Candidate's Name Signature Supervisor's Name Signature