

**INNOVATIVE FINANCING MECHANISMS AND ENHANCED FOOD SECURITY IN
TURKANA COUNTY, KENYA**

BY

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23/07563

MASTER OF SCIENCE IN DEVELOPMENT FINANCE

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**A DISSERTATION SUBMITTED IN PARTIAL FULLFILMENT OF THE
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22ND OCTOBER 2025

DECLARATION

I declare that this dissertation is my original work and has not been previously published or submitted elsewhere for award of a master's degree. I also declare that this contains no material written or published by other people except where due reference is made and author duly acknowledged.

Signature  _____

Date 22/10/25

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I do hereby confirm that I have examined this master's dissertation of Daniel Odhiambo Tocho and have approved it for examination.

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Dr. Caroline Ntara

ABSTRACT

The study examines how innovative financing mechanisms can enhance food security for pastoralists, agro-pastoralists, and smallholder farmers in Turkana County, Kenya. The study addresses a critical gap in the local evidence base regarding the roles of Public-Private Partnerships finance, impact investment, food security insurance, and climate financing in sustainable agricultural development and resilience in dry regions. The target group comprises 1,583 individuals from six wards: Turkwel, Lobei, Kotaruk, Lopur, Loima, and Turkana South, who are beneficiaries of programs administered by TUPADO, Friends of Lake Turkana (FoLT), and Seed Savers Network Kenya. The Yamane formula was employed to determine a sample size of 319 respondents using stratified random sampling methodology. The study used a descriptive study approach, and data analysis was conducted using linear regression modeling to assess both individual and ward-level effects. The research demonstrated that innovative financing mechanisms, including Public-Private Partnerships financing, impact investing, food security insurance, and climate financing, significantly and positively contribute to food security in Turkana County, Kenya. Public-Private Partnerships and impact investment enhance resource mobilization, technology integration, and agricultural efficiency, whereas insurance mechanisms and climate financing alleviate risks linked to climate unpredictability. The results correspond with Social Impact and Risk Management theories, indicating that strategic financing interventions enhance household income, resilience, and sustainable food production. The research concludes that cohesive and well-organized finance methods are essential for enhancing food systems. Recommendations advocate for governments, NGOs, private investors, and researchers to amplify Public-Private Partnerships finance, encourage impact investments, broaden insurance coverage, and improve climate financing initiatives.

DEDICATION

This study effort is dedicated to my family, friends, and colleagues for their unwavering support, encouragement, and engagement in my educational journey.

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ACRONYMS AND ABBREVIATION

AAF	: African Agriculture Fund
ASALs	: Arid and Semi-Arid Lands
CCAT	: Catalytic Capital for Agricultural Transition
CF	: Climate Finance
FoLT	: Friends of Lake Turkana
GMM	: Generalized Method of Moments
HFFI	: Healthy Food Financing Initiative
HLM	: Hierarchical Linear Modeling
ICC	: Intra-Class Correlation Coefficient
KLIP	: Kenya Livestock Insurance Program
NGOs	: Non-Governmental Organizations
NPOs	: Non-Profit Organizations
PPPs	: Public-Private Partnerships
SDG 2	: Sustainable Development Goal 2
SSA	: Sub-Saharan Africa
VIF	: Variance Inflation Factor

OPERATIONAL DEFINITION OF TERMS

Public-Private Partnerships Financing Mechanism: A financing approach that incorporates a blend of public, non- competitive, and private resources to invest in agricultural institutions, thereby mitigating investment risk and enhancing its impact (Mdadila & Aikaeli, 2022).

Climate Financing: Financial resources allocated for climate adaptation and mitigation initiatives in the agriculture industry, particularly in susceptible areas like arid and semi-arid regions (Kelly, 2024).

Food Security: A situation in which all people have economic and physical access to adequate safe and nutritious food to satisfy and support their dietary needs and wants in an active and healthy way of life (Gallegos et al., 2023).

Food Security Insurance: Insurance products to cover farmers against risks that include crop failure, loss of livestock and extreme weather events, thereby increasing household food security and resilience (Mdadila & Aikaeli, 2022).

Impact Investing: Investments that have the purpose of creating a financial and measurable social and environmental impact especially in agriculture and food systems (Mahajan et al., 2024).

CHAPTER ONE

INTRODUCTION

1.0 Background Information

Food security is defined as a condition in which all individuals, at all times, possess physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs for an active and healthy life (Gallegos et al., 2023). Their foundation comprises four dimensions: food availability, food accessibility, food usage, and food stability. Food security is a pressing global issue, with about 700 million individuals affected by food insecurity in 2023 due to conflicts, climate change, economic shocks, and systemic poverty (World Bank Group, 2023). Aligned with Sustainable Development Goal 2 (SDG 2), the aim of achieving zero hunger by 2030 is progressing slowly, particularly in underdeveloped nations (Atukunda et al., 2021). Nations and multilateral organizations have implemented policies addressing sustainable agriculture, climate risk resilience, and innovative funding techniques. Food security is essential for maintaining health, achieving economic prosperity, promoting social stability, and ensuring environmental sustainability.

Food security is a significant global issue exacerbated by rapid population growth, climate change, and economic disruptions. FAO et al. (2023) reported that food insecurity affects over 30% of the global population, with disproportionate consequences that significantly impact women and those residing in rural areas. The recession that began in 2007 and the subsequent food crises, such as COVID-19, have demonstrated that traditional funding arrangements for food security are precarious (Abdullahi et al., 2024). Despite global financial efforts to achieve SDG 2, financing limitations impede effective interventions to address the projected 60% rise in food demand by 2050 (Manzoor et al., 2024; Martin & Vos, 2024). The stated realities underscore the imperative

of adopting innovative and alternative policies to finance global food supply and access, independent of conventional donor support.

Food security has been improved worldwide using innovative funding methods. The Catalytic Capital for Agricultural Transition (CCAT) in Brazil use climate-smart agriculture capital through subordinated loan financing and commercial finance to reduce land loss (Chapple et al., 2022). Performance-based economic incentives for agricultural innovations like aflatoxin management and storage are provided via the AgResults pull mechanism in Sub-Saharan Africa and Latin America. DRIFCA provides weather-based insurance to smallholder farmers in Belize and the Dominican Republic, strengthening their resilience to climate disasters (Randall & Valdivia Zelaya, 2024). Mexico and other nations have issued green agricultural bonds for sustainable infrastructure. Meanwhile, the U.S. government's Healthy Food Financing Initiative (HFFI) attracts private investment to food deserts with public support. Barbados' debt-for-climate exchange provided \$165 million for food and water security, showing how financial restructuring can strengthen food systems (Island Innovation, 2024). Kenya might improve its food security using the models' scalable and practical solutions.

Food insecurity in Sub-Saharan Africa has encouraged new financing models. In Nigeria, Zambia, and Kenya, performance-based incentives (pull mechanisms) are given to private sector participants for delivering agricultural innovations like aflatoxin control and new storage systems (Mapanje et al., 2023). Through the R4 Rural Resilience Initiative, the WFP and Oxfam help smallholder farmers manage climate change with weather-indexed insurance, microcredit, and asset development in Ethiopia. Kenya's StARCK+ program uses donor funding and private capital to finance climate-smart agriculture, but it de-risks the investment to ensure private sector participation (Stathers et al., 2024). Meanwhile, Public-Private Partnerships Finance

instruments like the African Agriculture Fund (AAF) and the AgriFI Kenya Challenge Fund help raise financing from development partners and private companies (Warinda et al., 2020). The funds are used to develop regional agribusinesses that boost production and food security.

In Kenya, Rwanda, Burundi, and Tanzania, One Acre Fund provides smallholders with inputs, training, and funding. It increases yields and household food security with donor and investment funds. Ghana and Uganda use PPPs in their agricultural value chains to boost market access and infrastructure (Ortega-Beltran & Bandyopadhyay, 2021). These Sub-Saharan models show how financial innovation may boost resilience, output, and food access. The East African One Acre Fund combines donor financing and investments to provide smallholders with resources and training. Poor agricultural investment, climate disturbances, and poverty are the main causes of African food insecurity (FAO, 2016). Traditional finance and donor funding have failed to solve the continent's underlying needs. Despite its importance, Africa receives only 5% of global climate funds (UNFCCC, 2018; Climate Policy Initiative, 2021). To raise funds, spread risks, and leverage private sector contributions, Public-Private Partnerships finance and impact investments are encouraged. Their use to solve food security in Africa is limited and unclear.

Agriculture supports nearly 70% of Kenya's rural population and accounts for 21.8% of GDP (KNBS, 2024; IFAD, 2023). Kenya's StARCK+ initiative finances climate-smart agriculture with donor funds and private capital investment, reducing risks for private agricultural investments and helping smallholder farmers. Due to insufficient investment, climate change, and smallholder farmer financing, hunger and food insecurity remain a major concern. Government budgets, donor help, and SACCO credit do not meet the sector's entire capital needs (CBK, 2024). Kenya's Vision 2030 and Sustainable Development Goal 2 goals are threatened by this budget shortfall. Public-Private Partnerships financing and public-private partnerships offer new ways to raise and use cash

to improve food security, but their effects are poorly investigated.

The lack of empirical data about the effectiveness of innovative financial mechanisms in Kenya's food security sector warrants this research. While other industries, including healthcare, have effectively utilized such systems (Valery Che, 2024), their adoption in the agricultural sector remains in its initial stages. This shortfall is particularly concerning when food security challenges are exacerbated by climate change, a rapidly growing population, and economic difficulties. An overview of contemporary financial instruments, including impact investing, food security insurance, public-private partnerships (PPPs), and climate investing, will provide evidence-based research to guide policy and practice in bridging the financing gap to sustainably enhance food production and nutrition in Kenya at both local and national levels.

1.1.1 Innovative Financing Mechanisms

Innovative financing mechanisms refer to non-traditional financial techniques and strategies designed to generate greater funding than conventional financial methods. The proposed approaches aim to address funding deficiencies in development projects by utilizing previously untapped finance sources, enhancing efficiency, and ensuring accountability (Clark et al., 2018). These may encompass impact investing, food security insurance, public-private partnerships (PPPs), and climate investing that mitigate risk and draw investments by utilizing both public and private capital. Innovative financing does this, unlike traditional financing, which relies predominantly on government budgets or donor funds (Mdadila & Aikaeli, 2022). Such procedures are crucial, particularly in sectors such as agriculture and food security, where budget shortfalls hinder progress. Innovative financing facilitates the attainment of long-term development goals by incorporating flexibility and innovation into the resource mobilization process.

Innovative finance strategies are essential for tackling food security in Kenya, as they address several aspects of the issue. Impact investing improves food supply and accessibility by financing agricultural projects that emphasize social benefits alongside financial profits, therefore bolstering the future of farmers and agribusinesses (Mahajan et al., 2024). Food security insurance bolsters stability for farmers by safeguarding them against hazards like droughts or floods, thereby augmenting their resilience and maintaining reliable availability to food through efficient claims and reimbursements. Climate finance fosters agricultural sustainability by enabling adaption measures that reduce risks and environmental harm, therefore improving the long-term food supply (Mdadila & Aikaeli, 2022). Public-private partnerships (PPPs) enable the mobilization of resources and knowledge, thereby improving infrastructure governance, fostering joint ventures, and executing market entrance strategies that bolster food security and stability within Kenya's agricultural value chains. These techniques bolster the resilience and sustainability of the food system.

1.1.2 Food Security in Kenya

Kenya is seeing substantial food security issues, especially in Arid and Semi-Arid Lands (ASALs), where droughts, climatic volatility, and economic disruptions have intensified food insecurity. In 2024, the number of individuals facing acute food insecurity surpassed 2 million, with notable rises in malnutrition rates among children and pregnant women in areas such as Garissa, Wajir, and Mandera. Contributing causes encompass extended droughts, inflationary pressures, and supply chain disruptions. The government has not been dissuaded by these concerns from executing several programs to improve food security. The fertilizer subsidy program has resulted in a 43 % increase in maize output, reducing the number of food-insecure individuals in Kenya to 1 million by 2024, down from 1.9 million in 2023. The creation of the National Food

Reserve and Warehouse Receipt System has enabled the stabilization of food prices and diminished post-harvest losses.

The Kenyan government has taken many food security measures. Maize yields have increased due to the fertilizer subsidy program (Mogeni, 2025). The National Food Reserve and Warehouse Receipt System protect against food shortages and price variations. Fertiliser distribution issues and storage shortages have hampered these programmes (Mahajan et al., 2024). The government is adding cooperatives and agro-dealers to the fertilizer e-voucher system to improve accessibility. The Edible Oils Promotion Program aims to increase domestic oil production by allocating over 200,000 acres of sunflower seed (Cambridge Economic Policy Associates Ltd, 2016). These programs emphasize local food production, resource efficiency, and climate change resistance to promote equitable and sustainable food security.

Turkana County exemplifies Kenya's broader food security challenges due to its vulnerability to recurrent droughts, limited arable land, and reliance on pastoralism as the main livelihood. Nearly 80% of the population depends on livestock, making households highly susceptible to climate variability and market shocks (GoK, 2023). Acute malnutrition rates in Turkana consistently exceed the national emergency threshold, with levels above 30% among children under five (UNICEF, 2024). Furthermore, structural issues such as weak infrastructure, poor market integration, and limited access to agricultural finance exacerbate food insecurity in the county (Ndungu et al., 2022). Turkana is therefore representative of other ASAL counties facing overlapping climatic, economic, and institutional constraints, making it a critical case study for examining innovative financing mechanisms to strengthen food security.

1.2 Statement of the problem

Kenya continues to face persistent food insecurity, with an estimated 14.5 million people experiencing inadequate access to food in 2023 (FAO, 2023). Despite the government's investments and donor-supported interventions, food production remains vulnerable to climate shocks, limited financing structures, and weak market integration, disproportionately affecting smallholder farmers who produce 70% of Kenya's food (Malec et al., 2024). The problem is compounded by inflationary pressures, inadequate insurance coverage, and insufficient uptake of innovative financing such as Public-Private Partnerships finance, climate funds, and public-private partnerships, which have shown mixed results across Africa.

Existing studies offer mixed results regarding the effectiveness of agricultural finance and PPP mechanisms, with limited localized evidence specific to Kenya's devolved context. This lack of empirical clarity hampers targeted policymaking and investment decisions. The current study seeks to address these gaps by examining how innovative financing mechanisms, particularly PPP-based and climate-aligned financial instruments, can strengthen food security systems in Kenya. By generating context-specific insights, the study contributes to developing sustainable financing strategies that enhance smallholder farmers' resilience, food availability, and progress toward Vision 2030.

1.3 Research Objectives

The general objective of this study is to evaluate the effect of innovative financing mechanisms on food security in Turkana County, Kenya.

1.3.1 Specific Objectives

The specific objectives of this study include;

- i. Determine the effect of Public-Private Partnership (PPP) financing mechanisms on food security in Turkana County, Kenya.
- ii. Assess the effect of impact investing on food security in Turkana County, Kenya.
- iii. Examine the effect of food security insurance on food security in Turkana County, Kenya.
- iv. Evaluate the effect of climate financing on food security in Turkana County, Kenya.

1.4 Research Questions

- i. What is the effect of Public-Private Partnerships financing mechanisms on enhanced food security in Turkana County, Kenya?
- ii. How does impact investing influence enhanced food security in Turkana County, Kenya?
- iii. What is the effect of food security insurance on enhanced food security in Turkana County, Kenya?
- iv. How does climate financing affect enhanced food security in Turkana County, Kenya?

1.5 Justification for the Study

The research was essential in tackling the persistent problem of food insecurity in Turkana County, Kenya. Neglecting to do the study will expose Kenya to the dangers of ongoing dependence on insufficient traditional financing sources, an expanding financial deficit, and heightened food insecurity among at-risk communities in rural regions. The lack of actionable insights may lead to slowdown in the progress of Sustainable Development Goal 2 (Zero Hunger) and perhaps undermine national food policies and economic stability. The study offers evidence-based recommendations to policymakers, investors, and stakeholders about the adoption of innovative financing systems, including impact investing, food security insurance, and climate financing,

along with the enhancement of public-private partnership mechanisms. These strategies have the potential to access new funding sources, improve agri-food systems, and increase resilience to climate and economic disturbances. The research produces results in national development, poverty alleviation, and enhanced livelihoods for food-insecure populations in Kenya.

1.6 Significance of the study

1.6.1 The Government

Both county and national governments have a stake in investing in food security to promote the living standards of their people. The study will provide new, creative, and innovative ideas for financing agricultural food security projects. These innovative financing mechanisms may change the tide in financing gaps, promote social and economic development, and even out national over standards. The study will offer possible solutions to address financing challenges resulting from limited resources, missionization issues, poor allocation of government funds, and the diversion of funds intended for food security to other projects. The study also aims to influence the national and county governments' investment policies in food security, making them more attractive by providing risk incentives that will encourage private investors to invest in food security.

1.6.2 Non – Governmental Organization

Non-governmental organizations (NGOs) and non-profit organizations (NPOs) have played a critical role in food security through their plans to eradicate poverty and reduce hunger in the country, especially in arid and semi-arid lands (ASALs) in Kenya. NGOs and NPOs provide funds to vulnerable communities to address acute food shortages and malnutrition. Some NGOs and NPOs have programs that also promote agricultural development activities to ensure the sustainability of food security.

The study is significant for NGOs and NPOs, as it offers the necessary knowledge and insights on innovative financing mechanisms and the important packages these mechanisms have to assist them in bridging financing gaps and improving their risk management strategies. The study will also offer them sound knowledge of financial resource management and the importance of accountability for funds.

1.6.3 Private Investors

Government, NGOs, and international partners may struggle to meet the country's challenging needs and demands for food and food production. The entry of private investors in food security will catalyze capital inflows and boost the efficiency of agriculture and food production system. However, many reports indicate that private investors are slow to invest in the food sector due to potential risks such as climate change, poor yields, and low rainfall in arid and semi-arid lands (ASAL). The study aims to provide knowledge and insight into suitable financing mechanisms that offer risk management packages, inspiring and encouraging private investors to invest in food security in Kenya.

1.6.4 Researchers

Innovative financing mechanisms and enhanced food security are new areas of study in Kenya. The concept of innovative financing mechanisms for development was first introduced in 2002, barely two decades ago. This concept offers new innovative financing ideas to complement and provide an alternative source of financing for development. The study sought to provide an extensive ground for further research on this topic to the interested researchers.

1.7 Scope of the study

This study focused on the agricultural sector and food security landscape in Kenya, with a particular emphasis on Turkana County. This study targeted smallholder farmers, pastoralists, and agro-pastoralists in Turkana County, focusing on approximately 2,500 households (about 12,000 individuals) involved with TUPADO Kenya, Friends of Lake Turkana, and Seed Savers Network Kenya. Household heads and primary decision-makers were selected as respondents for their direct role in food production and financing decisions. These households represent the active segment of farmers adopting improved farming practices and participating in local markets. From this population, a sample size of 319 households was selected using stratified random sampling, ensuring equitable representation across the different sub-counties and farming zones of Turkana. Stratification was based on factors such as farming practices (irrigated vs. rain-fed) and geographic location to capture regional variations in access to financing and food security outcomes.

The study examined four key innovative financing mechanisms impact investing, food security insurance, climate financing, and Public-Private Partnerships (PPPs) and their influence on food security indicators, including food availability, accessibility, and sustainability. Data collection occurred between March 2025 and September 2025, utilizing both primary data (through structured interviews and questionnaires) and secondary data (from government agencies, NGOs, and financial institutions). Linear regression analysis was applied to determine the effect of each financing mechanism on food security outcomes. The study was geographically and culturally confined to Turkana County, an arid and semi-arid land (ASAL) region serving as a representative case of chronic food insecurity in Kenya.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter examines research related to various new financing methods and their potential to enhance Kenya's food security. It examines the main theories and integrates reports on public-private partnerships, climate financing, insurance, and impact investing to assess their impact on food security. The chapter also discusses a new concept that links food security and financial decisions. After the study design is complete, the researcher identifies the research areas that require further attention and defines the most significant study variables. The goal of this study is to explain why the topic is worth investigating and to demonstrate that imaginative funding can help Kenya address its recurring food shortages.

2.2 Theoretical Framework

2.2.1 Social Impact Theory

Bibb Latané established the theory in 1981 to elucidate how an individual's behaviour might be influenced by the community to which they belong. The objective of the theory was to ascertain that the effect of group influence is contingent upon the strength, speed, and size of the group (Latané, 1981). Over time, the concept also impacted the economic, development, and investment sectors. Impact investing considers both financial returns and societal effects when making investment decisions. In development finance, it is customary to invest in agriculture, as such initiatives are expected to benefit both the community and the economy (Bugg-Levine & Emerson, 2011).

Social Impact Theory has undergone transformation and development, particularly in the

realm of impact investing. Emerson and Cabaj (2000) define Public-Private Partnerships value as the simultaneous occurrence of economic and social returns. In addition to the GIIN, some institutions have developed tools such as IRIS+ metrics to assess the efficacy of social benefits derived from impact investing (GIIN, 2020). Furthermore, Clark and his co-authors (2015) endorsed the initiative by employing impact measurement techniques to evaluate developmental benefits in conjunction with financial outcomes. Consequently, the theory transitioned from a focus on psychology to offer a valuable framework for examining the social implications of financial policies related to agricultural and food security (Thornley et al., 2011).

The primary value of Social Impact Theory lies in its capacity to integrate psychology, economics, and development studies (Latané, 1981; Emerson & Cabaj, 2000). This has led to the development of specialised impact measurement tools and an increased focus on unconventional measures in investment research (Jackson & Harji, 2012). The theory faces criticism for seldom clarifying whether social consequences arise from financial investments or other relevant elements beyond the market (Chertok et al., 2008). Additionally, some contend that researchers' perspectives on impact may lead to discrepancies in reporting and responsibility (cf. Clifford et al. (2014)). Certain specialists argue that some investors inaccurately claim significant social value solely to enhance their social reputation (Busco et al., 2018).

Social Impact Theory has been frequently utilized in impact investment studies concerning agriculture in Sub-Saharan Africa. Researchers have determined that a focus on agriculture, irrigation, and agritech enhances food security and elevates living standards (Agrawal & Hockerts, 2019; Kato & Kratzer, 2013). For instance, Acumen and Root Capital impact funds have financed agribusinesses in Kenya, leading to increased earnings, enhanced efficiency, and improved nutrition for the population (GIIN, 2020). This study is grounded in the theory that private funds

facilitate public advantages for food security. It affirms that innovative funding approaches if implemented can facilitate both social development and sustainable development objectives within Kenya's food systems (Thornley et al., 2011).

2.2.2 Risk Management Theory

In the mid-20th century, Frank H. Knight introduced the concept of Risk Management Theory, which distinctly differentiates between measurable and unmeasurable risks. In 1952, Markowitz introduced the concept of contemporary portfolio theory, emphasising the equilibrium between risk and return in financial risk management. Tversky and Kahneman (1979) elucidated through Prospect Theory how individuals perceive and react to risks. The theory posits that individuals and organizations establish a strategy to identify, assess, and manage potential risks to their primary objectives (Crouhy, Galai, & Mark, 2006). The theory in agriculture advocates for the utilization of instruments such as insurance and hedging to safeguard smallholder farmers from declines in productivity and income due to shocks like drought, pests, or market fluctuations (Hardaker et al., 2004; Knight, 1921).

The Theory of Risk Management initially depended solely on economics and finance but has broadened to encompass additional policy domains such as insurance, health, and the environment. Beck (1992) advanced his concept of a “Risk Society” by highlighting global and ecological issues, such as climate change. Contemporary instruments such as Enterprise Risk Management (ERM) and probabilistic modelling have enhanced the applicability of the theory in addressing challenges associated with uncertainty (Frigo & Anderson, 2011). Hardaker et al. (2004) noted that agricultural economics has advanced through the use of methodologies such as stochastic programming and scenario analysis in farm decision-making. Currently, it constitutes the foundation for developing agricultural insurance, enhancing resilience, and formulating

governmental strategies for food security (OECD, 2009; Meuwissen et al., 2001). Risk management has evolved from attempting to evade risks to formulating a strategic plan to address them.

The primary benefit of Risk Management Theory is its systematic approach to addressing risk, facilitating the development of practical and quantifiable solutions in uncertain circumstances (Frigo & Anderson, 2011). It is versatile and supports the capacity to make sound and robust judgments across various sectors, including finance and agriculture (Hardaker et al., 2004). Nonetheless, some contend that it may overlook the intricate interactions between human activity and climate change (Beck, 1992). Moreover, these conventional models assume that individuals act rationally when making decisions; nevertheless, this is not always the case in stressful situations or when information is insufficient (Tversky & Kahneman, 1979). Political and social factors are often overlooked in risk assessment, particularly affecting marginalised farmers who, despite their ability to comprehend risk, are unable to obtain insurance (Meuwissen et al., 2001; OECD, 2009).

Theories about risk management have been applied in several research studies concerning agricultural risk, food security, and climate resilience. These authors examined the function of agricultural insurance in enabling farmers in developing countries to sustain operations when their income declines due to droughts or pests. The use of this theory has facilitated the establishment of the Kenya Livestock Insurance Program (KLIP) and index-based crop insurance, which are currently assisting policymakers and NGOs in mitigating risks associated with unexpected weather and other catastrophes (Greatrex et al., 2015). This study is based on the notion that examining food security insurance is crucial for identifying creative funding sources for these organizations. This study correlates risk mitigation with enhanced agricultural systems and increased food

security.

2.2.3 Environmental Economics Theory

In the mid-20th century, Environmental Economics Theory was established to analyze the impact of economic activity on the environment. The incorporation of environmental concerns into economics is frequently credited to Arthur Pigou, who in 1920 elucidated that markets typically overlook the costs associated with environmental impact (Pigou, 1920). Ronald Coase (1960) subsequently elucidated that when property rights are established, negotiation enables individuals responsible for externalities to address the issue efficiently (Coase, 1960). This theory posits that market failures contribute to environmental degradation and that economic instruments such as taxes, subsidies, and tradable permits can rectify these issues to benefit the environment (Pearce & Turner, 1990).

Environmental Economics has focused on sustainability, the significance of valuing ecosystem services, and other aspects of natural capital. Incorporating environmental outcomes into cost-benefit analysis signified genuine advancement (Hanley, Shogren, & White, 1997). Tietenberg (2006) expanded the definition of policy instruments to encompass mechanisms such as carbon trading and environmental levies. Recent years have seen climate change economics increasingly emphasize prospective environmental risks and the advantages of employing both mitigation and adaptation techniques (Stern, 2007). This significant shift arises as individuals recognize that the environment is crucial to economic success and that its preservation is essential for sustained growth (Daly, 1990).

The theory of Environmental Economics is distinguished by its methodologies, which assign monetary values to environmental concerns and include external costs in corporate financial

statements (Pearce & Turner, 1990). Furthermore, it equips governments and enterprises with instruments for effective resource management (Tietenberg, 2006). Conversely, some contend that quantifying nature in monetary terms may lead individuals to overlook the ecological and cultural elements that render nature distinctive (Sagoff, 2008). Nevertheless, analyzing scenarios characterized by limited information and power disparities proves challenging under these assumptions (Daly, 1990). They also indicate that incorporating specific environmental values into governmental accounting is challenging as it may result in the commodification of nature and similar other goods (Spanish, 2008).

The theory is crucial in research concerning climate funding, sustainable agriculture, and resource management. Research on carbon markets and green bonds suggests that economic measures may facilitate the development of climate-smart agriculture, thereby improving resilience and food security (Zilberman et al., 2018; World Bank, 2016). Based on this notion, Kenyan climate financing initiatives aim to reduce emissions and support farmers engaged in sustainable agricultural practices (Nyang'au et al., 2017). This study incorporates the theory as it delineates how innovative agricultural financing methods mitigate environmental harm and ensure future food security.

2.2.4 Collaborative Governance Theory

Collaborative Governance Theory was initially articulated by Ansell and Gash (2008) as a governance paradigm wherein governmental entities, in conjunction with non-public partners, engage in systematic, collective, and transparent decision-making and action. This idea builds upon prior theories of participatory governance and network governance, emphasizing shared accountability among various stakeholders. Their concepts originate from Ostrom's research (1990) on communal resource management and the observations made by Emerson and his team

(2012) regarding collaboration in public administration. The theory posits that addressing food security and other complex policy concerns is enhanced by the collaborative efforts of various stakeholders rather than solely adhering to directives from authorities (Ansell & Gash, 2008; Ostrom, 1990; Emerson et al., 2012).

Collaborative Governance Theory has evolved to elucidate the various conditions and processes essential for successful collaboration. Emerson, Nabatchi, and Balogh (2012) developed an integrated paradigm emphasizing the significance of reciprocal motivation, effective collaboration, and strong leadership. Scholars Bryson, Crosby, and Stone (2015) assert that a significant aspect of cooperation is its evolution over time and its dependence on the establishment of mutual trust. Adaptive governance has prompted scholars to investigate the roles of corporate, civic, and communal stakeholders alongside public institutions (Ansell & Gash, 2008; Bryson et al., 2015; Emerson et al., 2012).

The theory shares its strengths with others because it acknowledges the complexity of governance issues and supports people working together to make decisions, which increases legitimacy, stimulates new ideas, and facilitates a better sharing of resources (Ansell & Gash, 2008). It gives helpful suggestions for leading work between organizations in challenging situations (Emerson et al., 2012). Even so, some claim that trusting and leader-centred approaches are not always realistic because these settings often lack these traits (Bryson et al., 2015). Moreover, the process may require a significant amount of time and resources, and it can lead to delays when achieving agreement among members proves challenging. An imbalance in power among participants can influence people to participate in a way that is unfairly weighted (Ansell & Gash, 2008; Bryson et al., 2015).

This theory has been applied in numerous studies on environmental management, public health, and food security. For instance, reports from Kenya and similar countries demonstrate that collaboration between government bodies, NGOs, and the sector can enhance food security by leveraging their expertise and resources (Mitchell et al., 2015; Tennyson & Weible, 2020). The theory is helpful in this study when looking at public-private and community partnerships since it shows why sharing responsibilities increases reliability, teamwork, and the budget for such programs (Ansell & Gash, 2008; Emerson et al., 2012).

2.3 Empirical Review

2.3.1 Impact Investing and Food Security

Malec et al. (2024) examined the impact of agricultural investment on innovation and food security in 24 African countries from 2000 to 2016. To address problems related to data variability and bidirectional effects, the study employed a Bootstrapped Least Squares Dummy Variable and a two-step system GMM method. The data in this article were taken from FAO, World Development Indicators, and IFPRI. It was found that boosting food productivity through agricultural innovation is responsible for better food security, and the work of full-time researchers is more effective than spending alone on agricultural research and development. Increased investments yielded positive results in Eastern, Southern, and Western Africa, while problems related to food insecurity worsened in Central Africa. The authors suggest that successful cooperation and the proper use of investments are necessary, primarily to link countries and reap the benefits of large-scale production. At the same time, it highlights the problems associated with secondary data and suggests that some challenges are more prevalent in Central Africa than in other regions.

Abdi, Mohamed, and Mohamed (2024) examined the association between environmental challenges, food prices, and good institutions with food security measures in 32 SSA countries for

the period 2002-2020. Tests were applied in this study, which confirmed the existence of long-term relationships between food security, agricultural land use, income, capital formation, and population growth. Results from PMG analysis indicate that additional agricultural land and improved income for every person contribute to stronger food security; however, environmental damage is detrimental to achieving this goal. The analysis also revealed that institutional weaknesses contribute to ongoing food insecurity, and while food prices sometimes improve the situation, they remain uncertain when inflation is present. To make their analysis more reliable, the researchers employed the method of moments quantile regression and Dumitrescu–Hurlin causality tests and discovered, in general, that most effects were two-way. To ensure SSA has secure food supplies in the long run, policies stress the need for innovative land use, leadership reforms, and correct pricing.

Abebe (2025) examined how households in the northwestern Ethiopian district of Libo Kemkem cope with hunger to determine the factors that support food security. The data were collected through a survey of 216 households using a multi-stage stratified sampling method. The study utilised the FAO’s Resilience Index Measurement and Analysis II platform, and household resilience was calculated through factor analysis. According to the findings, having assets (0.85), being adaptable (0.82), and having easier access to important services (0.81) were strong contributors to resilience. Similarly, having social safety nets was linked to a lower level of resilience. By calculating the resilience index at 0.56, we find that more than half of households are vulnerable. The research shows that interventions that enhance productive assets, services, and adaptability help strengthen both food security and resilience across the region.

In their study, Mkumbukiy et al. (2025) reviewed 76 articles to explore how agri-food systems respond to issues arising from geopolitical tensions, primarily those between Ukraine and

Russia. It highlights that such conflicts disrupt food, energy, and financial systems, making it more challenging for people to access sufficient food and nutrition. Focusing on three major systems (land-water-food, water-energy-food, and water-energy), the review notes that increased resilience may come from reducing fragility, strengthening robustness, exploring various strategies, or making transformations. Fragility reduction was highlighted the most in the relevant scientific literature. The researchers discovered that resilience policies can uphold the agri-food system to some extent, but their actions can also create an unexpected chain reaction, leading to more vulnerability. It reports that policies designed to support resilience have different effects on various regions and stages of development. To ensure a sustainable food supply in the face of geopolitical shocks, it is essential to plan for various threats and collaborate across different policy areas.

Statham, Halam, and Mansfield (2024) focus on how innovation and investments aid in securing food in the UK's food manufacturing sector. Exclusive surveys and policy studies featured in the report demonstrate that food security is primarily determined by the supply of food and its price and also explain that global supply chain disruptions, climate change, and geopolitical shocks can pose significant risks. While 40% of the UK's food is imported, the authors suggest that the food sector makes the country more resilient since it supports local production, works with diverse suppliers, and adds value through innovative ideas. The data show that more than half of manufacturers are concerned about risks in their supply chain, and this concern is leading many to prefer local sources and reduce the number of suppliers. At the same time, new rules and higher costs discourage companies from investing in the future. It is concluded that resolving food security in the UK will require close policy efforts, flexible markets, and increased support for innovative ideas across the industry.

2.3.2 Food Security Insurance and Enhanced Food Security

In their study, Habtemariam, Will, and Müller (2021) investigate the association between agricultural insurance and the diversity of rural households' diets, as this reflects food security. Although agricultural insurance is promoted for mitigating climate risks and enhancing crop and income levels, its impact on dietary diversity has not been thoroughly investigated. This study examines the belief that insurance naturally leads to better nutrition by providing more financial resources and security. According to the authors, though insurance can increase the variety in people's diets, it may sometimes cause problems. These options might reduce the types of crops a farmer grows, focus farming solely on one type of crop, or rely more on buying food instead of growing it. The paper combines current findings and suggests different measures to protect against such situations. The advice is that including nutrition-sensitive approaches in insurance can prevent losing focus on household nutrition and the wide variety of foods.

Mponela and Kizito (2025) investigate how providing local farmers with crop insurance, along with fertiliser and improved seeds, helps ensure food security for households in the Guinea Savannah region. Experts study farmers who face climate, disease, and market uncertainty and must make choices between how safe and how profitable they want to be. The data shows that farmers with crop insurance sell more maize and are more able to maintain food reserves when there is a shortage of food. The results of insurance depend on factors such as the type of farming practised, the support provided to farmers, and the resources available to them. Insurance enables farmers to purchase seeds and other inputs designed explicitly for challenging conditions, thereby increasing their chances of achieving higher agricultural yields and improved sales. According to the research, combining insurance with agriculture advancements is a good approach to help vulnerable areas become more economically and food-secure for smallholder farmers.

Derouez and Alqattan (2025) examine the factors that affect food security in Saudi Arabia in both the short and long term by analyzing data from 1990 to 2023 using the ARDL and VECM models. In their work, they analyse factors such as agricultural GDP, insurance availability, stable food prices, government initiatives, and changes in weather patterns, productivity, and the adoption of new technologies. Short-term data suggest that positive changes in food security stem from rising agricultural GDP, new government policies, and gains in productivity, while climate change surprisingly appears to have a positive effect, which could reflect people adapting well to new challenges. The appearance signals high levels rather than price swings, which are detrimental to food security. Long-term studies indicate that GDP from agriculture and a good level of insurance can help improve food security; however, as climate change continues, it worsens food security over time. Ultimately, government policies are less significant than underlying economic factors. It is advisable to enhance agricultural insurance, adopt sustainable farming methods, and improve productivity to secure Saudi Arabia's food supplies while also studying the effects of climate change and its impact on food prices.

In their research, Khan, Daraz, and Bojnec (2023) examine the impact of social safety nets on the food security of households in the Torghar district of Northern Khyber Pakhtunkhwa, using interviews and a sample of 379 families. They find that several problems, such as corruption, nepotism, excessive regulations, and political interference, hinder the social safety net's ability to alleviate poverty and address food supply issues. It is found in this study that being part of an extended family, being aged 46–55, and having an education in religion increases a person's risk of struggling with food insecurity. Although social safety nets promise to enhance food security for impoverished individuals, their effects become less favourable due to political bias. These experts emphasize that collaborative action by the authorities, officials, and the people is necessary

to address these issues, maintain accountability, and foster a team effort to enhance the standard and safety of the social safety network, ultimately leading to sustained security of food supplies.

Wang, Liu, and Wang (2022) examine how agricultural insurance helps mitigate the impacts of climate change on China's food supply. When the Entropy Method is applied, the study reveals that climate change, primarily characterized by extreme temperatures, and negatively impacts both food security and production. Food security benefits from agricultural insurance and the results become even more positive when new technologies, better education, and related investments support it. Protection levels from insurance vary between regions, with areas that produce a significant amount of food experiencing higher insurance rates. Maize indeed sees more recovery from insurance compared to wheat and rice. The authors urge the Chinese government to establish a targeted subsidy scheme that addresses the diverse needs of farmers cultivating various crops nationwide, thereby promoting sustainable agricultural development. It demonstrates that combining agricultural insurance with broader development efforts can enhance food security in a changing climate.

2.3.3 Climate Financing and Food Security

Phiri and Doku (2024) investigate whether climate finance is effective in achieving food security for the population in 35 countries in Sub-Saharan Africa, using the FAO's four dimensions of food security: availability, access, stability, and utilization. It was established using both regular and sensitivity methods that climate finance increases the amount of food available, but it does not affect access, stability, or utilization levels. Additionally, factors such as foreign investment and government capabilities offer benefits in several aspects of food security. However, rural population growth, spending on agriculture, land for farming, and capacity tend to decrease food security. It seems clear from the evidence that climate finance matters; nonetheless, significant

changes in investments and governance are crucial for overall improvements in food security in this region. The report suggests that policy-making should integrate climate finance and various development policies to address all food security issues in the region.

Kelly (2024) examines the role of climate finance in enhancing food security across 37 African countries between 2012 and 2021, utilising secondary data and the system generalised method of moments (GMM). The study reports that the effects of climate finance on food security in Africa are evident and remain consistent regardless of the index used. Moreover, the analysis highlights that climate finance plays a crucial role in ensuring food security by enhancing the performance and resilience of the agricultural sector. Building on the results, the study proposes expanding programs for climate finance to support farmers in accessing them, ensuring fairness, and providing assistance. It highlights that climate finance is crucial for safeguarding food security in Africa in the face of climate change. It recommends that stronger policies and investments are necessary to maximise its role in the region.

Kirabaeva, Chen, and Zhao (2024) discuss the decisions faced by governments with limited resources in developing and emerging countries to tackle climate change in agriculture and thus provide sufficient food. The paper develops a model that explains to policymakers how they can increase adaptation actions while being constrained by financing and trade issues. The work notes that when trading is smooth, food security is enhanced by facilitating short-term food production; however, disruptions to leading nations cause such challenges to fade. When focusing on cases in Ghana, Egypt, and Brazil, the authors find that if the trade is open, agriculture performs well, spending on adjustment is efficient, and labour laws are updated, the cost of required adjustments decreases. This document advocates for strengthening free trade, securing affordable financing to support climate change mitigation, and reforming domestic systems to enhance both farmers'

yields and the flexibility of the workforce.

In their study, Doku, Richardson, and Essah (2022) analyse how the GCF helps enhance food security in SSA by focusing on the agricultural sector. By carrying out principal component analysis, they created indexes for each of the four components of food security availability, access, stability, and utilization as well as an overall composite index. The study, employing the system-GMM method, demonstrates that GCF has a positive impact on both the availability and security of food in SSA. Hence, the government's allocated funds for agricultural spending are barely sufficient to take advantage of these opportunities. It is demonstrated that stronger agricultural technology and capacity can enhance the outcomes of the Green Climate Fund in ensuring food security. The authors recommend strengthening food security by advising the government to increase agricultural spending from 6% to 10%, as stated in the Malabo Declaration. Additionally, they suggest promoting policies that foster FDI inflows, given FDI's crucial role in providing food to more people and ensuring food security sustainability across the region.

In their study, Phiri and Doku (2024) examine the impact of climate finance (CF) on improving food security in 35 Sub-Saharan African (SSA) countries. Based on the FAO food security definitions, they used principal component analysis to develop indices for every dimension. When employing the GMM and PQR techniques, they find that money directed toward improving climate has a positive impact on the amount of food available but does not significantly contribute to better access, stability, or use of that food. Furthermore, FDI and a ready government can improve several aspects of food security. However, an increasing rural population increased spending on agriculture, more farmland, and a lesser capacity has adverse effects on food security. The authors place great importance on the role of specific strategies that take into account multiple factors to enhance climate finance assistance for food security in SSA.

2.3.4 Public Private Partnership and Food Security

Smyth, Webb, and Phillips (2021) state that public-private partnerships (P3s) are crucial in addressing recent food security challenges stemming from climate issues, market risks, and declining agricultural output. Despite significant advancements, more people are now suffering from hunger than in recent years. According to the authors, the way forward lies through P3s that involve researchers, governments, industry, and civil society, as this would accelerate growth in food production and improve distribution. While several academics and civil organizations are opposed to P3s, this article highlights the various types of these partnerships and their positive impacts on agriculture and food production. The final point makes clear that expanding and accelerating the use of P3s is necessary to improve food security worldwide.

Mangeni (2019) examines how public-private partnerships (PPPs) impact farmers' ability to utilise technology in sub-Saharan Africa. Public-private partnerships (PPPs) require research institutions, universities, public bodies, producer associations, private companies, and individual farmers to cooperate, utilise resources and manage risks to drive progress in agriculture, including livestock, forestry, and fisheries. Partnerships between governments and international organisations help farms and farmers adopt new technologies regularly. Public-private partnerships (PPPs) enable both the public and private sectors to combine their strengths and address farmers' problems. It mentions that cooperation occurs in seed production, farm machinery, disease diagnostics, vaccine development, value addition, post-harvest processing, and quality testing. He outlines current approaches and strategies to support Public-Private Partnerships (PPPs) in promoting agricultural technology in sub-Saharan Africa.

Agarwal et al. (2023) explain how Public-Private Partnerships (PPPs) are helping to

advance sustainability in farming and tackle food security issues facing India and the rest of the world. Partnerships achieve this by combining the efforts of government organisations, private firms, and community groups to help farmers access technology and markets, allowing them to utilise fresh technologies and minimise the risks associated with involvement by private sector firms. Using Public-Private Partnerships (PPPs) is considered important for updating agriculture and supporting sustainability. Nevertheless, the study highlights that several challenges hinder the implementation of effective agricultural Public-Private Partnerships (PPPs) in India. The authors employ the Grey DEMATEL approach to highlight issues such as complex and time-consuming procedures, governance-related problems, a lack of a supportive environment, costly and incomplete contracts, and inadequate coordination. A thorough examination of the problems is presented in the paper, along with suggestions for policies to address them, leading to a more effective use of PPPs for sustainable farming and support for farmers.

Aseete et al. (2023) study the financial advantages of Ag-PPP programs for smallholder common bean growers in Uganda, as there is limited empirical evidence about the impact of these partnerships on their incomes. According to the study, when a doubly robust difference-in-difference method for multiple treatments was applied, the Ag-PPP increased productivity, sale volumes, and the portion of products sold. Notably, farmers who received all the help packages had more benefits than those who received only one package, and their outcomes differed between male and female bean owners. Results from the study suggest that Ag-PPPs are beneficial in helping small farmers increase their productivity and explore new market opportunities. Additionally, the study highlights that this Ag-PPP approach can be adapted for various crops and regions, offering valuable insights into food security and agriculture in other contexts.

The study by Shoniwa (2023) describes how the use of Public-Private-Community

Partnerships (PPCPs) supported efforts to provide sufficient food for people in Zimbabwe, especially during the COVID-19 emergency. Based on surveys, interviews, focus groups, and document analysis, the study highlights that PPCPs can facilitate collaboration within the supply chain, enhance access to supplies, fill information gaps, foster trust, and mitigate risks affecting various parties. The research also notes that it can be challenging to adopt PPCPs, as effective frameworks, clear roles, balanced risk allocation, and control of transaction costs are necessary. Although PPCPs have not become widespread in Zimbabwe’s agricultural industry, the study highlights why policymakers should prioritize involving multiple groups to address the lasting food insecurity caused by the pandemic.

2.4 Literature Gaps

Author and Year	Title of the Study	Methodology Used	Findings	Knowledge Gap
Malec et al. (2024)	Impact of agricultural innovation investments on food security in Sub-Saharan Africa	Bootstrapped Least Squares Dummy Variable, two-step system GMM; secondary data analysis	Agricultural innovation boosts food productivity and food security, especially via full-time researchers; impact varies by region (negative in Central Africa).	Variability of impact across regions; reliance on secondary data; structural regional differences
Abdi, Mohamed, &	Impact of	Panel data analysis,	Agricultural	Long-run relationships

Mohamed (2024)	environmental degradation, food prices, and institutional quality on food security	Pedroni and Kao cointegration tests, PMG estimation, quantile regression, causality tests	land and income improve food security; environmental degradation and institutional weaknesses worsen it; food prices have mixed effects.	between multiple determinants and food security
Abebe (2025)	Household resilience to food insecurity in Libo Kemkem, Ethiopia	Cross-sectional survey, multi-stage stratified sampling, FAO Resilience Index, factor analysis	Asset ownership, adaptive capacity, and access to services increase resilience; social safety nets negatively associated; 63% of households vulnerable.	Limited empirical data on resilience pillars and their quantification
Mkumbukiy et al. (2025)	Resilience of agrifood systems amid geopolitical tensions	Systematic literature review of 76 articles	Conflict disrupts food systems; fragility reduction is	Impact of geopolitical shocks on agrifood system resilience

			most discussed resilience strategy;	
			resilience policies have inconsistent impacts and feedback loops.	
Statham, Halam, & Mansfield (2024)	Innovation and investment in UK food manufacturing for food security	Industry polling, policy analysis	Innovation and local sourcing increase resilience; regulatory burdens and costs limit investment; coordinated reform needed.	Role of food manufacturing innovation under supply chain disruptions
Habtemariam, Will, & Müller (2021)	Agricultural insurance and rural household dietary diversity	Literature synthesis, critical assessment	Insurance can improve dietary diversity but may also reduce crop diversity and increase market dependence; nutrition-sensitive design needed.	Direct impact of agricultural insurance on dietary diversity
Mponela & Kizito (2025)	Crop insurance bundled with inputs and its effect on household food	Empirical analysis, household survey	Crop insurance encourages sales, preserves food reserves,	Limited data on bundled insurance effects on productivity and food security

	security in West Africa		and supports risk-taking with improved inputs; effectiveness varies.	
Derouez & Alqattan (2025)	Food security dynamics in Saudi Arabia: Role of agricultural GDP, insurance, climate change	ARDL, VECM time series analysis	Agricultural GDP, insurance, and productivity positively affect food security long-term; climate change negatively impacts it; government	Short- and long-term influences of insurance and climate on food security
			policy effect diminishes over time.	
Khan, Daraz, & Bojnec (2023)	Impact of social safety nets on household food security in Pakistan	Cross-sectional household survey	Safety nets undermined by corruption and political interference; vulnerability higher among certain demographic groups.	Political interference and effectiveness of safety nets

Wang, Liu, & Wang (2022)	Agricultural insurance mitigating climate change impact on food security in China	Panel data analysis, Entropy Method	Insurance improves food security especially in major food-producing regions; maize benefits most; integration with tech and education key.	Regional variations in insurance effectiveness and integration with other investments
Phiri & Doku (2024)	Climate finance and food security in Sub-Saharan Africa	PCA, system GMM, panel quantile regression	Climate finance improves food availability but not access, stability, or utilization; FDI and government readiness also important.	Limited impact of climate finance on some food security dimensions
Kelly (2024)	Impact of climate finance on food security in Africa	System GMM analysis	Climate finance reduces food insecurity and supports agricultural productivity and resilience through indirect pathways.	Limited empirical evidence on indirect pathways
Chen, Kirabaeva, & Zhao (2024)	Fiscal trade-offs in climate adaptation investments and food security	Theoretical modeling, case studies (Ghana, Egypt, Brazil)	Trade openness, productivity, and labor reforms reduce	Balancing adaptation with development goals under fiscal constraints
			adaptation costs; trade fragmentation worsens food security.	

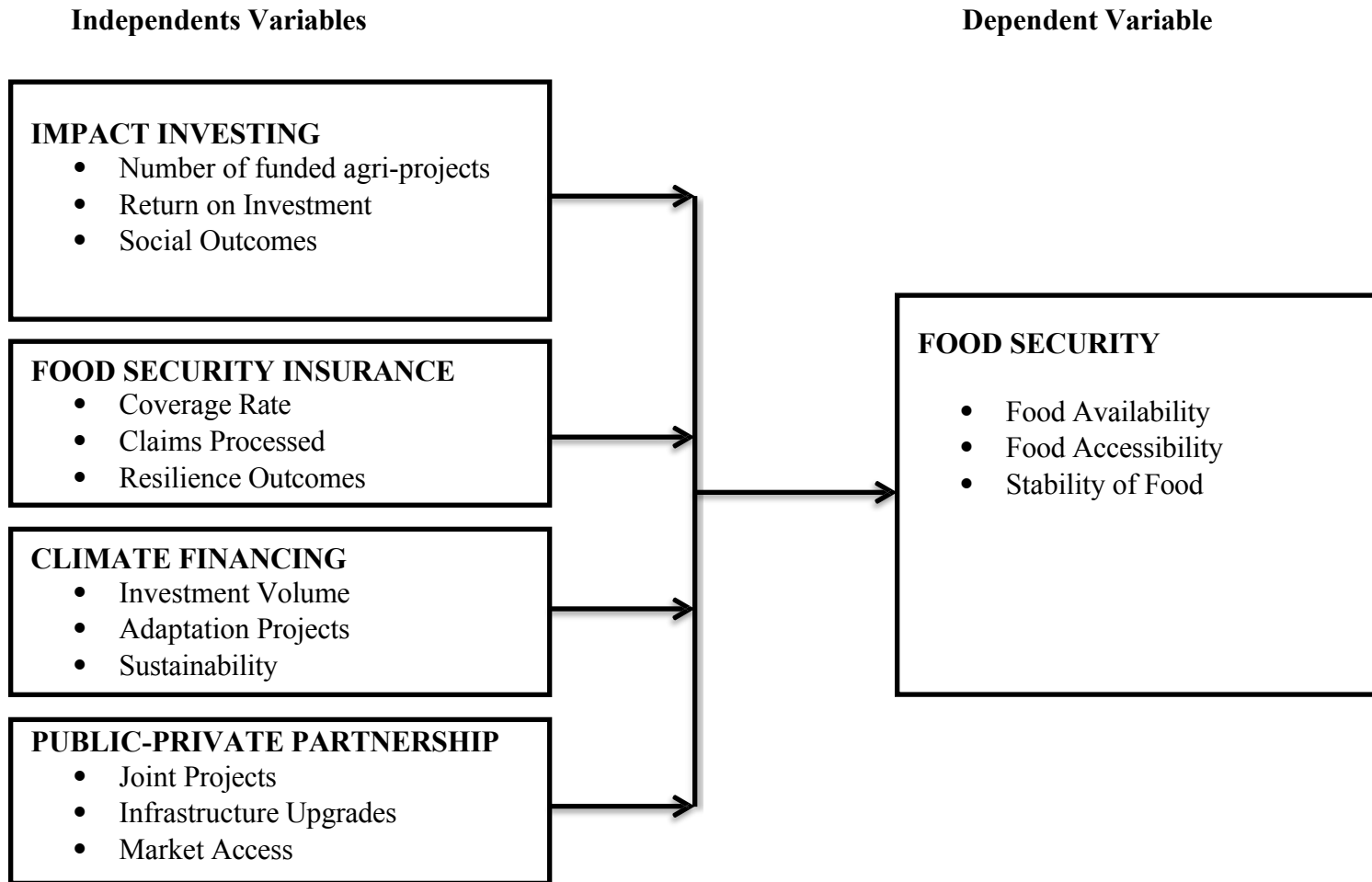
Doku, Richardson, & Essah (2022)	German bilateral climate finance's impact on food security in SSA	PCA, system-GMM	Climate finance improves food availability and overall food security; low government agricultural spending limits benefits.	Insufficient government spending limits effectiveness
Smyth, Webb, & Phillips (2021)	Role of public-private partnerships (P3s) in global food security	Literature review, policy analysis	P3s critical for food production and distribution; need for expanded use despite some opposition.	Skepticism and opposition to P3s despite their benefits
Mangeni (2019)	Public-private partnerships for technology access in sub-Saharan Africa	Literature review, case examples	PPPs effectively deliver agricultural technologies by combining public and private strengths.	Lack of detailed understanding of PPPs in technology dissemination
Agarwal et al. (2023)	Public-private partnerships for sustainable agriculture in India	Grey DEMATEL method, qualitative analysis	PPPs face procedural, governance, and coordination challenges limiting effectiveness.	Complex procedural, governance, and coordination issues in PPPs
Aseete et al. (2023)	Economic benefits of Ag-PPP for smallholder bean growers in Uganda	Doubly robust difference-in- difference, multi- treatment design	Bundled PPP interventions increase productivity, sales, and market access; gender differences observed.	Empirical evidence on multi-intervention PPP impacts on same farmers

Shoniwa (2023)	Public-Private-Community Partnerships (PPCPs) in food security during COVID-19 in Zimbabwe	Mixed-methods (surveys, interviews, focus groups, document analysis)	PPCPs improve collaboration, input access, and risk-sharing; challenges include partner roles and transaction costs.	Limited adoption and understanding of PPCPs in Zimbabwe agriculture
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2.5 Conceptual Framework

The conceptual framework illustrates the relationship between impact investing, food security insurance, climate financing, and public-private partnerships (PPPs) as independent variables influencing food security in Turkana County. Grounded in Social Impact Theory and Risk Management Theory, the framework explains how innovative financing mechanisms enhance agricultural productivity, stabilize incomes, and strengthen resilience to climate shocks. Impact investing mobilizes private capital to support sustainable agriculture, while food security insurance mitigates farmers' risks. Climate financing promotes adaptation and environmental sustainability, and PPPs improve infrastructure and market access. Collectively, these mechanisms enhance food availability, access, utilization, and stability the core dimensions of food security. The framework emphasizes that coordinated financial and institutional interventions are critical for achieving long-term food system resilience in vulnerable, arid regions like Turkana.

Figure 2.1
Conceptual Framework



2.6 Operationalization of the Variables

The study operationalizes key variables using specific indicators measured through closed-ended questionnaires. Impact Investing is based on the number of agricultural projects funded, the financial performance of the investment, and the benefits it creates for people. Risk management effectiveness is assessed by examining the rates offered, the claims being paid, and the outcomes of facing risks. Climate Financing studies the amount of investment, adaptation efforts, and

sustainability to get environmental and financial help. Public-private partnerships are evaluated by examining the projects they have undertaken, the progress on infrastructure, and their ability to open markets to each other. Ultimately, Food Security is evaluated by examining the availability, accessibility, and stability of food. All variables employ a descriptive research design with responses rated on a Likert scale from 1 to 5.

TABLE 2.1
Operationalization of the Variables

Variable	Definition	Indicators	Type of scale	Research Design
Impact Investing	Extent and effectiveness of financial commitments directed toward agricultural innovations. Respondents' rate perceived levels of investment, returns, and social outcomes (e.g., improved livelihoods, employment).	• Number of funded agri-projects • ROI • Social Outcomes	5-point Likert scale	Descriptive
Food Security Insurance	Measures how access to agricultural insurance enhances farmers' capacity to withstand shocks. Indicators capture adoption, efficiency, and contribution to resilience.	• Coverage Rate • Claims Processed • Resilience Outcomes	5-point Likert scale	Descriptive
Climate Financing	Examines external climate-related financial support in building agricultural sustainability. Respondents evaluate adequacy, adaptation projects, and environmental impact.	• Investment Volume • Adaptation Projects • Sustainability	5-point Likert scale	Descriptive
Public-Private Partnerships (PPP)	Assesses ability of partnerships to deliver infrastructure, services, and market linkages to farmers. Respondents evaluate joint initiatives and	• Joint Projects • Infrastructure Upgrades	5-point Likert scale	Descriptive

Food Security (DV)	outcomes. Outcome variable, conceptualized in terms of FAO's pillars. Respondents evaluate availability, affordability, and stability of food based on lived experiences.	• Market Access • Availability • Accessibility • Stability of Food	5-point Likert scale	Descriptive
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CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter outlines the approach to be employed in investigating the impact of innovative financing mechanisms on food security in Turkana County, Kenya. It consists of the research design, target population, sampling techniques, research instruments, and processes for data collecting and processing. The research focuses on smallholder farmers, particularly households engaged in commercial agriculture. A quantitative approach was employed to achieve a comprehensive understanding of the subject. The chapter outlines further measures taken to ensure the validity and reliability of the utilized instruments and the diagnostic tests employed to substantiate the statistical models. The ethical considerations governing the research are delineated to enhance credibility, transparency, and safeguard the rights of participants.

3.2 Research Design

This study employs a descriptive-explanatory research design to analyze the characteristics of smallholder farmers and explore how innovative financing mechanisms influence food security in Turkana County. The descriptive aspect captures farmers' demographic and agricultural characteristics, while the explanatory component identifies causal relationships among variables using statistical techniques such as regression analysis. This combined approach allows the study to move beyond mere observation to explain how impact investing, food security insurance, climate financing, and public-private partnerships affect food security outcomes. Descriptive-explanatory designs have proven effective in agricultural research for linking farmer behavior, financial access, and productivity (Mwangi et al., 2019; Otieno, 2021). The design is therefore suitable for producing both contextual understanding and empirical evidence to inform targeted

policy and intervention strategies.

3.3 Target Population

This study focused on smallholder farmers, pastoralists, and agro-pastoralists engaged in agricultural and livestock activities in Turkana County, Kenya. The primary stakeholders include households represented by TUPADO Kenya, Friends of Lake Turkana (FoLT), and Seed Savers Network Kenya, which have implemented food security and sustainable agriculture initiatives in the region. TUPADO programs in Turkwel, Lobei/Kotaruk, and Lopur wards have improved animal health for 283 families, reaching approximately 1,698 individuals. FoLT supports a comparable number of pastoralist households in the same wards, while Seed Savers Network Kenya works with 1,300 agro-pastoralist farmers in Loima and Turkana South sub-counties. Therefore, the accessible population is approximately 2,500 households (about 12,000 individuals). The study specifically targeted household heads and primary decision-makers in farming and livestock management within these households, as they are directly responsible for agricultural production, food access, and participation in financial or food security programs.

TABLE 3.1
Target Population

Location/Ward	Number of Farmers
Turkwel, Lobei, Kotaruk, Lopur	283
Loima & Turkana South	1,300
TOTAL	1,583

Source: (TUPADO Kenya, 2025; Friends of Lake Turkana, 2025; Seed Savers Network Kenya, 2025).

3.4 Sampling and Sampling Procedure

The proposed research employed stratified random sampling. The community was divided into two primary groups: (1) households receiving aid from TUPADO and Friends of Lake Turkana in the Turkwel, Lobei, Kotaruk, and Lopur wards, and (2) agro-pastoralist farmers supported by the network seed saver in Loima and Turkana South. The method enhanced the generalizability of the results across geographical and programmatic dimensions.

To determine the sample size, Yamane's formula (1967) was used:

$$n = \frac{N}{1 + N(e^2)}$$

Where:

n = sample size

N = population size = 1,583

e = margin of error (5% or 0.05) n = $1583 / 1 + 1583 (0.05^2) = 319$

Thus, a total sample size of 319 respondents was selected from the target population.

TABLE 3.2

Sample Size

Location/Ward	Population (N)	Sampling Technique	Sample Size (n)
Turkwel, Lobei, Kotaruk, Lopur	283	Stratified Random Sampling	57
Loima & Turkana South	1,300	Stratified Random Sampling	262
Total	1,583		319

Source: (TUPADO Kenya, 2025; Friends of Lake Turkana, 2025; Seed Savers Network Kenya, 2025)

3.5 Research Instrument

The study primarily employed a closed-ended questionnaire for data collection, utilizing a drop-and-pick-later strategy after a 14-day interval. The instrument systematically captured the perspectives of smallholder farmers, pastoralists, and agro-pastoralists in Turkana County regarding the effects of agricultural financing methods on food security. The questionnaire is divided into six sections: demographic data and five conceptual domains impact investment, food security insurance, climate funding, public-private partnerships, and food security outcomes. Each theme segment comprises 10 items assessed using a 5-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). This framework enables a robust data collection approach, essential for rigorous statistical analysis such as linear regression modeling. The questionnaire is justified due to its cost-effectiveness, ease of administration, and ability to gather data from a broad and geographically diverse population. Competent field assistants employed local dialects or Kiswahili to assist respondents with limited literacy or challenges in comprehending the language of the questions when required.

3.6 Pilot Study

A pilot study involving 32 smallholder farmers and pastoralists in Lodwar Kanam-Kemer Ward was conducted to pretest the research instruments. The sample size aligns with methodological recommendations of 30–50 participants, sufficient for assessing reliability, validity, and clarity of questions while ensuring cost-effectiveness and excluding respondents from the main survey. The location was selected due to its accessibility, security considerations, and similarities in socio-economic and agro-climatic conditions with the main study sites. The purpose of the pilot is to test the reliability and applicability of the research instrument in the local context. The exercise helped identify ambiguous questions, evaluate the clarity of instructions, and assess the appropriateness

of the Likert-scale items. Feedback obtained from respondents and enumerators was used to refine and restructure the questionnaire before the main data collection to ensure validity, reliability, and cultural sensitivity.

3.6.1 Validity

The research instrument underwent content and face validity evaluation prior to data collection. Content validity was ensured through expert review by agricultural and food security specialists who verified the questionnaire's alignment with research objectives and constructs. Face validity was established through a pilot test involving non-sample farmers to assess clarity, wording, and cultural appropriateness. Feedback from both experts and respondents informed revisions. Translation and back-translation further enhanced linguistic accuracy and conceptual equivalence across local contexts.

3.6.2 Reliability

The reliability of the questionnaire was assessed by a pilot study, in which the questionnaire was delivered twice to the same sample of respondents over two weeks. The test-retest method was employed to examine results and assess the stability of answers across time. The internal consistency of the instrument was determined by calculating a reliability coefficient, such as Cronbach's Alpha. A Cronbach's Alpha over 0.7 was regarded as an acceptable standard, indicating a credible measurement. Such reliability was demonstrated by the emergence of consistent and stable results, indicating that the instrument can provide dependable data with minimal random mistakes. This ensured the dependability of the questionnaire by generating reliable and accurate data that can be depended upon to support the entire study.

3.7 Data Collection Procedure

The data collection commenced by obtaining the necessary approvals from the pertinent authorities. Competent enumerators were informed on the study objectives, ethical protocols, and data gathering techniques. This strategy allows respondents a prolonged period of 14 days to complete the questionnaire. Telephone conversations conducted follow-ups, and where necessary, in-person visits were made to ensure comprehensive and transparent responses. In cases where farmers were illiterate or semi-literate, the researcher employed an enumerator trained to read questions to the farmers and document their responses. In instances when respondents did not understand English or Kiswahili, local interpreters proficient in the Turkana language were employed to ensure effective communication and understanding. To enhance efficiency, eight field assistants were distributed proportionately across the study sites, each assigned to approximately 25 farmers, ensuring adequate coverage and support. This inclusive approach minimized bias, enhance response quality, and allow all participants to engage meaningfully regardless of literacy or language barriers. The inclusive method mitigated prejudice, enhance the quality of the response, and ensure that all participants, regardless of their language or literacy proficiency, can engage meaningfully in the study.

3.8 Data Processing and Analysis

Data analysis was conducted using SPSS statistical software on the collected data, which was verified for completeness, cleansed, and coded. Descriptive statistics was employed to characterize the attributes of respondents and significant factors. Factor analysis was done to reduce a large set of variables into fewer underlying factors, uncover hidden patterns, and identify relationships among variables, making complex data more interpretable and manageable for analysis and decision-making. To examine the effects of different financing systems on food security,

considering the nested data structure, linear regression Modeling was employed. This method captures both individual-based and ward- based variability, resulting in more exact estimates. The diagnostic tests assessed model assumptions and give results as regression coefficients, significance levels, and goodness-of-fit metrics.

3.8.1Analytical Model

Regression analysis was used to estimate associations and infer potential causal relationships between financing strategies and food security outcomes, even within cross-sectional data. Although causality cannot be established definitively, regression allows for statistical control of confounding variables, helping isolate each financing mechanism's unique contribution to food security.

The model is specified as follows:

$$Y=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\epsilon$$

Where:

Y = Enhanced Food Security (dependent variable)

X1 = Public-Private Partnerships financing;

X2 = Impact investing

X3 = Food security insurance;

X4 = Climate financing

β_0 = Intercept

$\beta_1 \dots \beta_4$ = Regression coefficients measuring the effect of each financing mechanism on enhanced food security

3.9 Diagnostic Tests

3.9.1 Multicollinearity Test

Multicollinearity refers to the correlation of two or more independent variables in a regression model, leading to misleading regression coefficient estimations and diminished dependability of the results. The study employed the Variance Inflation Factor (VIF) to assess multicollinearity, calculating VIF for all predictor variables. When VIF exceeds 10, then there is usually high multicollinearity, meaning the variable is strongly correlated with other variables. Variables with high VIF values may be excluded, combined, or altered to reduce redundancy and improve model stability. Recognizing and addressing multicollinearity is crucial to accurately assess the strength of relationships between financing mechanisms and food security, ensuring that the statistical significance of predictors is neither diminished nor exaggerated due to shared information.

3.9.2 Heteroscedasticity Test

Heteroscedasticity refers to the variability of the error variance (residuals) across different levels of the independent variables, violating a fundamental assumption of linear regression models. This study assessed heteroscedasticity by plotting residuals against anticipated values at both the individual and ward levels to visually identify common patterns or funnel shapes indicative of changes in variability. Additionally, formal tests such as the Breusch-Pagan test were employed to assess heteroscedasticity under statistical significance. Heteroscedasticity may lead to inefficient estimates and biased standard errors, adversely impacting hypothesis testing. Potential treatments include variable transformation, robust standard errors, or weighted regressions to provide

trustworthy and correct inferences.

3.9.3 Normality Test

The presumption of residual normality is fundamental to hierarchical linear modeling, with errors being normally distributed at both the individual and ward levels. This study employed paired graphical approaches to compare the quantiles of residuals to a theoretical normal distribution for evaluation purposes. The Shapiro-Wilk test was utilized to conduct a statistical assessment of non-normality. Significant deviations in residuals may indicate model misspecification or the presence of outliers. Confidence intervals and hypothesis tests can be affected by non-normality. In this context, data transformation or alternative modeling techniques may be considered to satisfy the normality criterion and improve model accuracy.

3.9.4 Autocorrelation Test

Autocorrelation pertains to the correlation of residuals among observations and is likely to manifest when responses from individuals within the same ward exhibit greater correlation than those from different wards. This constitutes a violation of independence, leading to biased underestimations of the standard errors. The research computed the Durbin-Watson statistic to ascertain the presence of autocorrelation, which indicates the degree of correlation among the residuals. The fraction of clustering variance at the ward level was assessed using the intra-class correlation coefficient (ICC). If significant autocorrelation or clustering is detected, the random effects of the regression model helped elucidate it. Otherwise, autocorrelation may introduce bias in the parameter estimators and undermine the validity of results.

3.10 Ethical Consideration

The study was conducted by ethical research standards following approval from the KCA

University Ethical Review Committee. All participants got informed consent through comprehensive explanations on the study's goal, procedures, risks, and benefits in comprehensible language. The procedure was entirely voluntary, and participants were informed of their right to withdraw at any time without penalty. Confidentiality and privacy was upheld by refraining from recording any personal identifiers, with replies secured and accessible solely to approved researchers. Anonymity was ensured through the utilization of codes instead of names and by refraining from collecting sensitive individual data. Data was reported at the aggregate level. These activities are intended to uphold the rights and dignity of the participants while ensuring the ethical integrity of the study process.

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION OF FINDINGS

4.1 Introduction

This chapter describes and discusses statistics to determine how novel funding strategies improve food security in Turkana County, Kenya. The analysis addresses the study objectives using Public-Private Partnerships financing, impact investment, food security insurance, and climate financing as food system resilience elements. SPSS was used to clean, code, and analyze questionnaire data using descriptive and inferential statistics. Descriptive analysis summarizes demographics and variable responses, whereas factor analysis, correlation, and regression examine associations and significance. Diagnostic tests validated the regression model, and inferential analysis revealed causal links. To simplify explanation and comprehension, results are presented in tables.

4.2 Response rate

The objective of the study was to get a sample size of 319 respondents from Turkana County to assess the impact of new finance mechanisms on food security improvement. The response rate was 99.7 %, with 318 out of 319 questionnaires returned by the respondents. Of the total responses, 308 were fully completed and deemed suitable for analysis, representing 96.6 % of the overall answers. Ten surveys were found to be not properly answered and were excluded from the analysis to maintain the integrity and correctness of the findings. The elevated valid answer rate demonstrates substantial participation by respondents, hence enhancing the reliability, validity, and representativeness of the data for drawing inferences regarding innovative funding and food security in Turkana.

4.3 Reliability Analysis

TABLE 4.1

Reliability Statistics

Construct / Variable	Cronbach's Alpha
Public-Private Partnerships (PPP) Financing	0.889
Impact Investing	0.913
Food Security Insurance	0.901
Climate Financing	0.876
Food Security (Dependent Variable)	0.894
Overall Reliability	0.927

Table 4.1 presents the results of the reliability test for the study variables concerning innovative financing mechanisms and food security in Turkana County, Kenya. The Alpha coefficient for the 5-item measure was 0.927. It significantly exceeds the generally accepted benchmark of 0.7, indicating exceptional internal consistency and reliability of the study instrument. A Cronbach's Alpha exceeding 0.9 signifies that the items employed to assess the constructs had substantial correlation and consistently measured the intended variables. This validity enhances the credibility of the results by confirming the data as dependable and relevant for further investigation. The instrument employed in this study is robust and can facilitate valid conclusions concerning the correlation between innovative financing strategies and food security in Turkana County.

4.4 Demographic Information

The demographic analysis provided insights into the characteristics of respondents among smallholder farmers, pastoralists, and agro-pastoralists in Turkana County. The findings indicated that male and female heads of households were equally represented, reflecting a balanced gender distribution in agricultural and food security initiatives. The predominant respondents were aged

between 31 and 50 years, indicating their active participation in agricultural and decision-making processes. The educational attainment was predominantly low, with the majority possessing only primary schooling and a minor percentage having secondary or tertiary qualifications. Household sizes averaged five individuals, a significant factor contributing to a high dependency ratio, which directly impacts food availability, consumption, and the adoption of new financial systems.

4.4.1 Age Group

TABLE 4.2

Age Group of Respondents

Age Group	Frequency	%
20–29 years	61	19.8
30–39 years	55	17.9
40–49 years	59	19.2
50 years and above	73	23.7
Below 20 years	60	19.5
Total	308	100.0

Table 4.2 presents the age distribution of respondents in the research on innovative financing mechanisms and food security in Turkana County, Kenya. The results reveal that the largest demographic of respondents, 23.7% (73 individuals), were aged 50 years and above. The subsequent groups include respondents aged 20-29 years (19.8%, 61 respondents), 40-49 years (19.2%, 59 respondents), and under 20 years (19.5%, 60 responses). The youngest respondents (ages 30-39) had the smallest proportion, comprising 17.9% (55 respondents). The distribution indicates equal participation throughout various age groups, with only a minor discrepancy in the senior demographic. This indicates that both youths and adults are actively involved in issues

related to financing and food security. The significant number of elder participants may be attributed to their experience and active involvement in household food security and financial decision-making in Turkana County.

4.4.2 Gender

TABLE 4.3
Gender of Respondents

Gender	Frequency	%
Female	79	25.6
Male	108	35.1
Prefer not to say	121	39.3
Total	308	100.0

Table 4.3 illustrates the gender distribution of respondents in the study of innovative financing mechanisms and food security in Turkana County, Kenya. The results indicate that 35.1% (108 respondents) were male and 25.6% (79 respondents) were female. Notably, 39.3% (121 respondents) expressed no preference regarding the revelation of their gender. This indicates that respondents were reticent in disclosing personal demographic information, potentially due to cultural sensitivities or privacy concerns in the study area. The figures are, however, very comparable from both male and female perspectives. The substantial amount of unreported gender responses underscores the need to ensure confidentiality and confidence in future polls. The inclusion of both genders enhanced inclusivity and provides diverse viewpoints on the relationship between innovative funding mechanisms and food security in Turkana County.

4.4.3 Level of Education

TABLE 4.4
Education Level of Respondents

Education Level	Frequency	%
Adult literacy program	57	18.5
No formal education	63	20.5
Primary education	54	17.5
Secondary education	77	25.0
Tertiary education (college/university)	57	18.5
Total	308	100.0

Table 4.4 shows the educational attainment of the respondents participating in the study on novel financing mechanisms and food security in Turkana County, Kenya. The findings indicate that the largest percentage (25.0%, 77 respondents) possessed secondary education, while those with no formal education constituted the second greatest percentage at 20.5% (63 respondents). Individuals who participated in postsecondary education or adult literacy programs constituted 18.5% (57 respondents). Meanwhile, 17.5% (54 respondents) possessed an elementary education. The findings reveal a significant disparity in educational attainment among the respondents, with a considerable proportion being uneducated. The presence of respondents from diverse educational backgrounds provides a comprehensive perspective on the function of creative funding. The relatively high incidence of individuals lacking formal education suggests that literacy and awareness initiatives are crucial for improving access to and effective utilization of financial mechanisms aimed at bolstering food security programs in Turkana County.

4.4.5 Primary Economic Activity

TABLE 4.5

Primary Economic Activity of Respondents

Economic Activity	Frequency	%
Agro-pastoralism	80	26.0
Crop farming	85	27.6
Livestock keeping	73	23.7
Other	70	22.7
Total	308	100.0

Table 4.5 shows the distribution of primary economic activity among respondents in the study on innovative financing mechanisms and food security in Turkana County, Kenya. The findings reveal that crop farming is the predominant activity, with 27.6% (85 respondents) engaged in it, closely succeeded by agro-pastoralism, performed by 26.0% (80 respondents). The percentage of individuals engaged in cattle raising was 23.7% (73 respondents), whereas 22.7% (70 respondents) participated in other occupations such as trade, casual labor, or small-scale company. This dispersion highlights the reliance of the Turkana people on agricultural revenue, with both agriculture and livestock serving as fundamental sources of household livelihoods. The notable percentage of individuals involved in non-agricultural occupations signifies the diversification of livelihoods, sometimes as a reaction to climatic variability and economic difficulties. These data are essential for evaluating the correlation between novel finance structures and the diverse economic processes that influence food security in Turkana County.

4.4.6 Ward/Sub-County

TABLE 4.6
Respondents by Ward

Ward	Frequency	%
Kotaruk	58	18.8
Lobei	58	18.8
Loima	48	15.6
Lopur	50	16.2
Turkana South	42	13.6
Turkwel	52	16.9
Total	308	100.0

Table 4.6 shows the distribution of respondents by ward in the study of innovative financing mechanisms and enhanced food security in Turkana County, Kenya. The findings indicate that Kotaruk and Lobei wards exhibited the highest proportion of respondents, each comprising 18.8% (58 respondents). Turkwel accounted for 16.9% (52 respondents), and Lopur represented 16.2% (50 respondents). The Loima ward documented a 15.6% response rate from 48 respondents, while Turkana South exhibited the lowest at 13.6% from 42 respondents. The relatively balanced distribution throughout the wards suggests that the research sample effectively encompasses a diverse range of perspectives regarding the various geographical areas within Turkana County. This is a crucial aspect of representation in the implementation of localized financing dynamics and food security, as economic activities, resource availability, and social structures may vary

across wards, thereby influencing the effectiveness of innovative financing policies in enhancing food security outcomes.

4.4.7 Land Size

TABLE 4.7
Land Size Owned by Respondents

Land Size	Frequency	%
1–2 acres	61	19.8
3–5 acres	52	16.9
I do not own any farming land	68	22.1
Less than 1 acre	56	18.2
More than 5 acres	71	23.1
Total	308	100.0

Table 4.7 presents the land ownership of respondents in the study of innovative financing mechanisms and food security in Turkana County, Kenya. The results indicate that 23.1% (71 respondents) own more than 5 acres, making them the largest group. Twenty-two point one percent (68 interviewees) reported lacking ownership of agricultural land, indicating a significant prevalence of landlessness. Approximately 19.8% (61 respondents) possessed 1-2 acres, while 18.2% (56 respondents) owned less than 1 acre. The lowest percentage, 16.9% (52 respondents), owned 3-5 acres. These findings indicate disparities in land ownership, a crucial factor in agricultural productivity and food security. The significant percentage of landless agricultural workers underscores dependence on alternative livelihoods or collaborative land-use methods.

Simultaneously, larger landowners can capitalize on enhanced chances within novel finance schemes that facilitate the adoption of sustainable farming practices in Turkana County.

4.5 Factor Analysis

The construct validity of the study variables Public-Private Partnerships financing, impact investment, food security insurance, climate financing, and food security was assessed using factor analysis. The Kaiser-Meyer-Olkin (KMO) measure above the 0.7 threshold, and the Bartlett Test of Sphericity was significant ($p < 0.05$), confirming the appropriateness of the measure for factor analysis. PCA was employed to select components with eigenvalues exceeding 1, which collectively accounted for over 70% of the total variance. The Rotated Component Matrix results indicated that all items significantly loaded onto their respective constructs, indicating that the study variables were reliable and suitable for subsequent regression analysis.

4.5.1 Enhanced Food Security

TABLE 4.8

KMO and Bartlett's Test for Enhanced Food Security

Test	Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	.480
Bartlett's Test of Sphericity: Approx. Chi-Square	54.039
Bartlett's Test of Sphericity: df	45
Bartlett's Test of Sphericity: Sig.	.000

Table 4.8 presents the Kaiser-Meyer-Olkin (KMO) measure and the test of sphericity to enhance food security in the study on Innovative Financing Mechanisms and Improved Food Security in

Turkana County, Kenya. The KMO value (0.480) fell below the suggested minimum of 0.5, signifying insufficient sampling adequacy for conducting factor analysis. The Chi-Square result of the Bartlett Test of Sphericity is 54.039, with 45 degrees of freedom and a p-value of 0.001. The correlation matrix was not an identity matrix, indicating that the variables were sufficiently correlated for further analysis. Despite the low KMO value, the significant Bartlett's Test justifies a meticulous continuation of factor analysis, while also indicating that the results should be interpreted with regard to sampling adequacy. This equilibrium ensures a comprehensive understanding of the variables influencing food security in Turkana County.

TABLE 4.9
Communalities for Enhanced Food Security Items

Item	Initial Extraction	
Food is available throughout the year in my household.	1.000	.540
I can afford to buy food regularly	1.000	.445
My household consumes three meals a day consistently.	1.000	.571
Droughts or floods disrupt food availability in my area.	1.000	.685
Access to food markets is easy and affordable.	1.000	.510
I rely on food aid during certain months of the year.	1.000	.520
Climate changes have affected food availability in recent years.	1.000	.649
My household stores food for future use.	1.000	.709
Government or NGO programs help improve food availability.	1.000	.507
Overall, I feel my household is food secure.	1.000	.634

Note. Extraction Method: Principal Component Analysis.

Table 4.9 illustrates the correlations across variables evaluating enhanced food security in the study "Innovative Financing Mechanisms and Food Security in Turkana County, Kenya," utilizing Principal Component Analysis (PCA). The initial communalities are uniformly 1.000, indicating the total variance before extraction. The extraction values denote the percentage of total variance of the variables accounted for by the extracted components. The values are 0.445 (capacity for regular food purchases) and 0.709 (home food storage), indicating that most elements serve a mediating function in the hidden concept of food security. Significant communalities, such as 0.685 in drought and flood disruption and 0.649 in climate change effects, demonstrate that these factors are potent indicators of the food security issue. The findings demonstrate that the selected criteria accurately represent the essential elements of food availability, accessibility, and resilience, providing a solid basis for assessing enhanced food security in Turkana County.

TABLE 4.10

Total Variance Explained for Enhanced Food Security

Component	Initial Eigenvalues: Total	% of Variance	Cumulative %
Food is available throughout the year in my household.	1.329	13.293	13.293
I can afford to buy food regularly	1.193	11.935	25.228
My household consumes three meals a day consistently.	1.163	11.628	36.856
Droughts or floods disrupt food availability in my area.	1.052	10.517	47.373
Access to food markets is easy and affordable.	1.032	10.321	57.694
I rely on food aid during certain months of the year.	.975	9.746	67.440

Component	Initial Eigenvalues: Total	% of Variance	Cumulative %
Climate changes have affected food availability in recent years.	.924	9.245	76.684
My household stores food for future use.	.856	8.559	85.244
Government or NGO programs help improve food availability.	.789	7.891	93.134
Overall, I feel my household is food secure.	.687	6.866	100.000

Note. Extraction Method: Principal Component Analysis.

Table 4.10 illustrates the total variation explained by enhanced food security items in the study on Innovative Financing Mechanisms and Enhanced Food Security in Turkana County, Kenya, conducted by Principal Component Analysis (PCA). The table presents the initial eigenvalues, percentage of variation, and cumulative variance for each item. The primary variable, accounting for the greatest difference at 13.29%, is the year-round availability of food, followed by the capacity to consistently afford food at 11.94%. The cumulative total of the initial three items accounts for 36.86% of the overall variation, indicating that these particular factors significantly influence household food security. The ten items collectively represent 100% of the variation, demonstrating that the chosen indicators comprehensively assess the concept of enhanced food security concerning availability, accessibility, consumption strategies, and climate- and environment-related concerns.

4.5.2 Public-Private Partnerships Financing

TABLE 4.11

KMO and Bartlett's Test for Public-Private Partnership

Test	Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	.492
Bartlett's Test of Sphericity: Approx. Chi-Square	50.726
Bartlett's Test of Sphericity: df	45
Bartlett's Test of Sphericity: Sig.	.000

Table 4.11 presents the Kaiser-Meyer-Olkin (KMO) measure and the Bartlett Test of Sphericity for items evaluating the idea of public-private partnership (PPP) in the study on innovative financing mechanisms and enhanced food security in Turkana County, Kenya. The KMO score was 0.492, just below the suggested threshold of 0.5, indicating that sample adequacy is only marginally sufficient for conducting factor analysis. The Bartlett Test of Sphericity yielded a Chi-Square value of 50.726, with a Chi-squared statistic of 45 and $p = 0.001$, showing that the correlation matrix significantly deviates from an identity matrix. This implies that the variables exhibit a significant correlation warranting factor analysis; yet, the low KMO suggests a need for caution. The findings indicate that additional analysis of the PPP items is feasible; however improved sample adequacy or variable refinement could enhance the factor structure.

TABLE 4.12**Communalities for Public-Private Partnership Items**

Item	Initial	Extraction
There are joint projects between government and private sector in agriculture.	1.000	.657
PPPs have led to construction or repair of farm-related infrastructure.	1.000	.594
PPPs have improved access to farming tools and inputs.	1.000	.677
Public-private projects have expanded market access for local farmers.	1.000	.233
There is clear communication between farmers and PPP project leaders.	1.000	.452
PPP projects consider the needs of smallholder farmers.	1.000	.531
Local farmers are consulted before implementing joint projects.	1.000	.481
PPPs provide platforms for farmers to sell their produce.	1.000	.230
These collaborations have reduced post-harvest losses.	1.000	.398
I am satisfied with the level of support from public-private initiatives.	1.000	.491

Note. Extraction Method: Principal Component Analysis.

Table 4.12 presents the item communalities of the Public-Private Partnership (PPP) variables in the study on Innovative Financing methods and food security enhancement in Turkana County, Kenya, utilizing Principal Components Analysis (PCA). All initial communalities are equal to 1.000, representing the whole variance prior to extraction. The extraction values indicate the extent to which the retained components account for the variation of each item. High communalities were observed in access to agricultural tools and inputs (0.677) and collaborative agricultural initiatives between the government and the private sector (0.657), indicating a significant reflection of the PPP architecture. Conversely, elements such as enhanced market access (0.233) and platforms for

selling produce (0.230) contributed minimally, indicating a weaker correlation to the fundamental issue. The findings suggest that, although certain aspects of PPP significantly impact food security, there are areas that might be improved to accurately reflect the concept in Turkana County.

TABLE 4.13

Total Variance Explained for Public-Private Partnership

Component	Initial Eigenvalues: Total	% of Variance	Cumulative %
There are joint projects between government and private sector in agriculture.	1.341	13.413	13.413
PPPs have led to construction or repair of farm-related infrastructure.	1.181	11.811	25.224
PPPs have improved access to farming tools and inputs.	1.136	11.360	36.584
Public-private projects have expanded market access for local farmers.	1.084	10.836	47.419
There is clear communication between farmers and PPP project leaders.	1.000	9.996	57.416
PPP projects consider the needs of smallholder farmers.	.990	9.896	67.312
Local farmers are consulted before implementing joint projects.	.909	9.088	76.400
PPPs provide platforms for farmers to sell their produce.	.849	8.494	84.894
These collaborations have reduced post-harvest losses.	.805	8.054	92.948
I am satisfied with the level of support from public-private initiatives.	.705	7.052	100.000

Note. Extraction Method: Principal Component Analysis.

Table 4.13 illustrates the total variance elucidated by the Public-Private Partnership (PPP) components in the study on innovative financing mechanisms and enhanced food security in

Turkana County, Kenya, as assessed via Principal Component Analysis (PCA). The first eigenvalues signify the extent to which each item contributes to elucidating the variance of the PPP construct. The maximum deviation of 13.41% was identified in the category of collaborative projects between the government and private sector in agriculture, while 11.81% was noted in the development or repair of farm-related infrastructure. The initial three items accounted for a 36.58% variation, indicating a significant influence on PPP efficacy. The comprehensive elucidations of all ten items accounted for 100% of the variance, as the construct is thoroughly addressed. The findings suggest that the selected metrics effectively represent several facets of PPPs, including infrastructure, input availability, communication, and support for smallholder farmers in Turkana County.

4.5.3 Impact Investing

TABLE 4.14

KMO and Bartlett's Test for Impact Investing

Test	Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	.486
Bartlett's Test of Sphericity: Approx. Chi-Square	44.649
Bartlett's Test of Sphericity: df	45
Bartlett's Test of Sphericity: Sig.	.000

Table 4.14 presents the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity for items assessing Impact Investing in the study on Innovative Financing Mechanisms and Enhanced Food Security in Turkana County, Kenya. KMO = 0.486, just below the recommended threshold of 0.5, indicates limited sampling adequacy for conducting factor analysis. The Bartlett's Test of Sphericity yielded a Chi-Square value of 44.649, with 45 degrees of freedom and a p-value of p

< 0.001 , indicating that the correlation matrix is not an identity matrix. This suggests that the variables exhibit a high correlation, warranting the continuation of factor analysis; yet, the low KMO value necessitates caution in interpreting the results. The data facilitates a more comprehensive study of impact investment items while also addressing potential shortcomings due to sample insufficiency.

TABLE 4.15
Communalities for Impact Investing Items

Item	Initial Extraction	
Impact investing has increased the number of agricultural projects in my area.	1.000	.624
I have benefited directly from an impact-funded agricultural project.	1.000	.674
Impact investment projects in my community are well-monitored and evaluated.	1.000	.553
Agricultural investments in my area have generated positive financial returns.	1.000	.639
I can see long-term benefits from projects funded through impact investing.	1.000	.667
The community is involved in the planning of impact investment projects.	1.000	.611
Impact investing has improved household income among farmers.	1.000	.490
Social outcomes (health, education) have improved due to agricultural investments.	1.000	.539
There is transparency in how impact funds are allocated.	1.000	.467
Local institutions support and manage impact investment initiatives effectively.	1.000	.501

Note. Extraction Method: Principal Component Analysis.

Table 4.15 presents the common elements that assess Impact Investing inside the study on innovative financing mechanisms and enhanced Food Security in Turkana County, Kenya,

utilizing Principal Component Analysis (PCA). All initial communalities of 1.000 represent the complete variation before extraction. Extraction values denote the extent of variance attributed to each item by the extracted components. Significant communalities were seen in an item directly influenced by an impact-funded agricultural project (0.674) and the long-term advantages of impact investing initiatives (0.667), indicating a strong representation of the construct. Factors such as transparency in budget distribution (0.467) and enhancement of household income (0.490) exerted a moderate influence. The findings indicate that most items effectively illustrate key aspects of impact investing, including project reach, monitoring, financial returns, community engagement, and social outcomes, thereby offering a reliable framework for assessing the impact of impact investing on food security in Turkana County.

TABLE 4.16

Total Variance Explained for Impact Investing

Component	Initial Eigenvalues: Total	% of Variance	Cumulative %
Impact investing has increased the number of agricultural projects in my area.	1.244	12.438	12.438
I have benefited directly from an impact-funded agricultural project.	1.213	12.128	24.566
Impact investment projects in my community are well-monitored and evaluated.	1.134	11.338	35.904
Agricultural investments in my area have generated positive financial returns.	1.118	11.182	47.086
I can see long-term benefits from projects funded through impact investing.	1.056	10.565	57.651
The community is involved in the planning of impact investment projects.	.971	9.706	67.357
Impact investing has improved household income	.884	8.841	76.198

Component	Initial Eigenvalues: Total	% of Variance	Cumulative %
among farmers.			
Social outcomes (health, education) have improved due to agricultural investments.	.833	8.329	84.527
There is transparency in how impact funds are allocated.	.805	8.052	92.579
Local institutions support and manage impact investment initiatives effectively.	.742	7.421	100.000

Note. Extraction Method: Principal Component Analysis.

Table 4.16 illustrates the total variation explained by the Principal Component Analysis (PCA) for Impact Investing elements in the research article on innovative financing mechanisms and enhanced food security in Turkana County, Kenya. The initial eigenvalues signify the percentage contribution of each item to the overall construct. The biggest variance of 12.44% resulted from the item on impact investment, which increased the number of agricultural projects, closely followed by the item on direct benefits of impact-funded agricultural projects at 12.13%. The initial three elements collectively accounted for 35.90% of the overall variation, indicating their significant influence on the impact investing construct. The ten items collectively represented 100% of the variance, signifying complete representation of the construct. The findings substantiate the assertion that the items effectively measure critical elements of impact investing, including project reach, financial returns, monitoring, community engagement, and social consequences in Turkana County.

4.5.4 Food Security Insurance

TABLE 4.17
KMO, Bartlett's Test

KMO and Bartlett's Test

Test	Value	df	Sig.
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	.522		
Bartlett's Test of Sphericity – Approx. Chi-Square	42.973	45	.000

Table 4.17 presents the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity for items addressing Food Security Insurance in the study on Innovative Financing Mechanisms and Enhanced Food Security in Turkana County, Kenya. A KMO of 0.522 exceeds the minimum threshold of 0.5, indicating that the sample is adequate for doing factor analysis. Bartlett's Test of Sphericity yielded a Chi-Square value of 42.973 with 45 degrees of freedom and a significance level of $p < 0.001$, suggesting that the correlation matrix is not an identity matrix. These variables are sufficiently correlated to facilitate factor extraction. In summary, our findings confirm that the food security insurance variables can undergo additional factor analysis to investigate the impact of insurance mechanisms on enhancing food security in Turkana County.

TABLE 4.18
Communalities

Item	Initial	Extraction
I am aware of insurance schemes that protect against crop/livestock loss.	1.000	.659
Food security insurance is accessible to smallholder farmers in my area.	1.000	.530
The insurance coverage meets the needs of local farmers.	1.000	.329

Item	Initial	Extraction
I have enrolled in a food security insurance program.	1.000	.531
Claims are processed in a timely and transparent manner.	1.000	.605
The insurance system provides reliable compensation during losses.	1.000	.589
Insurance has helped me recover from drought or animal loss.	1.000	.764
I feel more secure knowing I have agricultural insurance.	1.000	.584
Community members generally trust the insurance system.	1.000	.605
Food security insurance contributes to household resilience.	1.000	.534

Table 4.18 illustrates the commonality across items assessing Food Security Insurance in the study regarding Innovative Financing Mechanisms and Enhanced Food Security in Turkana County, Kenya, utilizing Principal Component Analysis (PCA). All 1.000 represent the initial communalities, reflecting the whole variance before extraction. The extraction values determined the percentage of variance attributable to the underlying causes for each item. The elevated communalities observed in insurance have facilitated my recovery from drought or livestock loss (0.764) and awareness of insurance schemes (0.659), indicating that these two factors serve as robust indicators of the food security insurance design. Intermediate communalities were noted for the prompt processing of claims (0.605) and family resilience (0.534). In the context of insurance coverage for local farmers, the extraction value (0.329) was the lowest, indicating inadequate representation. The findings suggest that the selected questions effectively assess key aspects of food security insurance, including awareness, accessibility, reliability, and impact on resilience among farmers in Turkana County.

TABLE 4.19**Total Variance Explained**

Component	Initial Eigenvalues	% of Variance	Cumulative %
I am aware of insurance schemes that protect against crop/livestock loss.	1.311	13.111	13.111
Food security insurance is accessible to smallholder farmers in my area.	1.239	12.386	25.498
The insurance coverage meets the needs of local farmers.	1.092	10.916	36.414
I have enrolled in a food security insurance program.	1.067	10.675	47.088
Claims are processed in a timely and transparent manner.	1.021	10.210	57.299
The insurance system provides reliable compensation during losses.	.942	9.424	66.723
Insurance has helped me recover from drought or animal loss.	.884	8.845	75.568
I feel more secure knowing I have agricultural insurance.	.852	8.521	84.088
Community members generally trust the insurance system.	.821	8.213	92.301
Food security insurance contributes to household resilience.	.770	7.699	100.000

Note. Extraction method: Principal Component Analysis.

Table 4.19 presents the total variance of the Food Security Insurance components within the Innovative Financing Mechanisms and Enhanced Food Security in Turkana County, Kenya, as determined by Principal Component Analysis (PCA). The initial eigenvalues indicate the extent to which the items contribute to the overall construct. The biggest deviation was 13.11% for awareness of insurance schemes for crop and animal loss, followed by accessibility of insurance

for smallholder farmers at 12.39%. The first three items accounted for a collective 36.41% of the total variance, indicating their significant influence on the construct. The ten factors collectively represented 100 percent of the variance, signifying comprehensive coverage of the characteristics of food security insurance. These findings confirm that the items effectively encapsulate critical dimensions of awareness, access, coverage, reliability, confidence, and resilience, which can support a robust investigation of the impact of insurance on household food security in Turkana County.

4.5.5 Climate Financing

TABLE 4.20
KMO, Bartlett's Test

KMO and Bartlett's Test

Test	Value	df	Sig.
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	.507		
Bartlett's Test of Sphericity – Approx. Chi-Square	43.957	45	.000

Table 4.20 presents the Kaiser-Meyer-Olkin (KMO) scale and Bartlett's Test of Sphericity for items related to Climate Financing in the study on Innovative Financing Mechanisms and Enhanced Food Security in Turkana County, Kenya. The KMO value of 0.507 slightly exceeds the threshold of 0.5, indicating that the sample is adequate for conducting a factor analysis. The Bartlett's Test of Sphericity yielded a Chi-Square value of 43.957 with 45 degrees of freedom and a significance level of $p = 0.001$, indicating that the correlation matrix significantly deviates from an identity matrix. This signifies that the variables exhibit sufficient correlation to justify factor analysis. Overall, these findings indicate that climate finance elements warrant additional

investigation, and the research should also address the relationship between climate financing mechanisms and their impact on enhancing food security in Turkana County.

TABLE 4.21
Communalities

Item	Initial Extraction	
There has been an increase in climate-related investments in agriculture.	1.000	.441
Climate financing supports water harvesting and irrigation projects.	1.000	.463
Farmers are involved in designing climate-financed projects.	1.000	.518
Climate adaptation projects have improved agricultural output.	1.000	.530
These projects help us deal with unpredictable weather patterns.	1.000	.415
Climate financing projects promote long-term environmental sustainability.	1.000	.533
I have received training through climate-financed initiatives.	1.000	.541
Community awareness on climate-smart agriculture has increased.	1.000	.456
Community awareness on climate-smart agriculture has increased.	1.000	.558
There is regular monitoring and evaluation of climate projects.	1.000	.270

Table 4.21 presents the communalities of items assessing Climate Financing in the study on Innovative Financing Mechanisms and Enhanced Food Security in Turkana County, Kenya, utilizing Principal Component Analysis (PCA). The initial communalities are uniformly 1.000, representing the complete variation before extraction. The extraction numbers indicate the percentage of variance in each item attributed to the underlying causes. High communalities were observed in areas such as the frequent monitoring and evaluation of climate projects (0.558) and training through climate-financed initiatives (0.541), indicating a robust representation of the

climate funding architecture. Comparable degrees of communalities were identified to improve agricultural productivity through climate adaptation projects (0.530) and environmental sustainability initiatives (0.533). Conversely, climate project monitoring and evaluation (0.270) and adaptation to erratic weather patterns (0.415) exerted a diminished impact on the retrieved components. The findings indicate that most items are suitable for assessing key aspects of climate financing, including investment, project design, training, sustainability, and community awareness in Turkana County.

TABLE 4.22
Total Variance Explained

Component	Initial Eigenvalues	% of Variance	Cumulative %
There has been an increase in climate-related investments in agriculture.	1.302	13.022	13.022
Climate financing supports water harvesting and irrigation projects.	1.207	12.071	25.093
Farmers are involved in designing climate-financed projects.	1.138	11.377	36.470
Climate adaptation projects have improved agricultural output.	1.078	10.782	47.252
These projects help us deal with unpredictable weather patterns.	1.000	9.999	57.251
Climate financing projects promote long-term environmental sustainability.	.964	9.644	66.895
I have received training through climate-financed initiatives.	.889	8.888	75.783
Community awareness on climate-smart agriculture has increased.	.856	8.563	84.345

Component	Initial Eigenvalues	% of Variance	Cumulative %
Community awareness on climate-smart agriculture has increased.	.821	8.207	92.552
There is regular monitoring and evaluation of climate projects.	.745	7.448	100.000

Note. Extraction method: Principal Component Analysis.

Table 4.22 presents the overall variation accounted for in the components assessing Climate Financing, as determined by the research on innovative financing mechanisms and enhanced food security in Turkana County, Kenya, utilizing Principal Component Analysis (PCA). Preliminary eigenvalues indicate the extent of variation contributed by each item to the overall construct. The item concerning the growth in climate-related investments in agriculture had the highest variance at 13.02%, while the second highest variance of 12.07% was observed in support of water harvesting and irrigation projects. The three starting factors accounted for 36.47% of the overall variance, underscoring their significant influence on the climate financing construct. The ten items combined represented 100% of the variation, indicating thorough coverage. The findings indicate that the sampled items effectively measure various aspects of climate financing, including investment, project design, adaptation, sustainability, training, and community awareness, thereby providing a robust foundation for examining its impact on food security in Turkana County.

4.6 Descriptive Statistics

4.6.1 Enhanced Food Security

TABLE 4.23

Descriptive Statistics for Food Security Items

Item	N	Minimum	Maximum	Mean	Std. Deviation
Food is available throughout the year in my household.	308 1	5	2.95	1.432	
I can afford to buy food regularly	308 1	5	3.10	1.422	
My household consumes three meals a day consistently.	308 1	5	2.85	1.444	
Droughts or floods disrupt food availability in my area.	308 1	5	3.04	1.439	
Access to food markets is easy and affordable.	308 1	5	3.00	1.406	
I rely on food aid during certain months of the year.	308 1	5	3.12	1.391	
Climate changes have affected food availability in recent years.	308 1	5	2.86	1.420	
My household stores food for future use.	308 1	5	2.98	1.413	
Government or NGO programs help improve food availability.	308 1	5	3.06	1.444	
Overall, I feel my household is food secure.	308 1	5	3.00	1.390	
Valid N (listwise)	308				

Table 4.23 presents the descriptive statistics of food security items from the study on innovative financing mechanisms and enhanced food security in Turkana County, Kenya, based on 308 valid replies. The average ratings indicate moderate levels of food security, with households reporting

variations in availability and access. For clarification, the mean food availability throughout the year was $M = 2.95$ (Min = 1, Max = 5, SD = 1.432), while the mean affordability of regular food purchases was $M = 3.10$ (Min = 1, Max = 5, SD = 1.422). The average number of regular meals per day was $M = 2.85$ (Min = 1, Max = 5, SD = 1.444), whereas the dependence on food help was $M = 3.12$ (Min = 1, Max = 5, SD = 1.391). The overall food security of the families was $M = 3.00$ (Minimum = 1, Maximum = 5, Standard Deviation = 1.390). The data suggest that families encounter challenges related to food consistency, climatic influences, and dependence on seasonal aid, hence underscoring the necessity for targeted interventions.

4.6.2 Public-Private Partnerships Financing

TABLE 4.24

Descriptive Statistics for Public-Private Partnership Items

Item	N	Minimum	Maximum	Mean	Std. Deviation
There are joint projects between government and private sector in agriculture.	308	1	5	2.97	1.464
PPPs have led to construction or repair of farm-related infrastructure.	308	1	5	2.88	1.404
PPPs have improved access to farming tools and inputs.	308	1	5	3.11	1.377
Public-private projects have expanded market access for local farmers.	308	1	5	2.93	1.441
There is clear communication between farmers and PPP project leaders.	308	1	5	3.03	1.405
PPP projects consider the needs of smallholder farmers.	308	1	5	2.95	1.438
Local farmers are consulted before implementing joint projects.	308	1	5	2.93	1.309

Item	N	Minimum	Maximum	Mean	Std. Deviation
PPPs provide platforms for farmers to sell their produce.	308	1	5	2.98	1.389
These collaborations have reduced post-harvest losses.	308	1	5	2.96	1.467
I am satisfied with the level of support from public-private initiatives.	308	1	5	3.06	1.438
Valid N (listwise)	308				

Note. Responses were captured on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).

Table 4.24 presents the descriptive statistics for Public-Private Partnership (PPP) items related to innovative financing mechanisms and enhanced food security in Turkana County, Kenya, based on 308 valid replies. The average scores indicate a moderate view of the effectiveness of PPP. An instance is collaborative government/private sector initiatives with a mean of 2.97 (Minimum = 1, Maximum = 5, Standard Deviation = 1.464), and the development or rehabilitation of agricultural infrastructure with a mean of 2.88 (Minimum = 1, Maximum = 5, Standard Deviation = 1.404). The availability of farming instruments and inputs was relatively higher, with a mean of 3.11 (minimum = 1, maximum = 5, standard deviation = 1.377). Farmers' communication with the PPP leader was rated with a mean of 3.03 (minimum = 1, maximum = 5, standard deviation = 1.405), while satisfaction with PPP assistance had a mean of 3.06 (minimum = 1, maximum = 5, standard deviation = 1.438). These findings suggest that while public-private partnerships (PPPs) positively contribute to agricultural support, there is a need for enhanced infrastructure development, improved market access, and increased consultations to optimize the function of PPPs in food security within Turkana County.

4.6.3 Impact Investing

TABLE 4.25

Descriptive Statistics for Impact Investing Items

Item	N	Minimum	Maximum	Mean	Std. Deviation
Impact investing has increased the number of agricultural projects in my area.	308 1	5		3.17	1.429
I have benefited directly from an impact-funded agricultural project.	308 1	5		3.01	1.494
Impact investment projects in my community are well-monitored and evaluated.	308 1	5		3.02	1.423
Agricultural investments in my area have generated positive financial returns.	308 1	5		3.04	1.457
I can see long-term benefits from projects funded through impact investing.	308 1	5		3.11	1.390
The community is involved in the planning of impact investment projects.	308 1	5		3.00	1.443
Impact investing has improved household income among farmers.	308 1	5		2.91	1.410
Social outcomes (health, education) have improved due to agricultural investments.	308 1	5		2.94	1.464
There is transparency in how impact funds are allocated.	308 1	5		3.03	1.437
Local institutions support and manage impact investment initiatives effectively.	308 1	5		3.07	1.445
Valid N (listwise)	308				

Note. Responses were rated on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).

Table 4.25 presents the descriptive statistics for impact investing items derived from the research on innovative financing mechanisms and enhanced food security in Turkana County, Kenya, based on 308 valid replies. The average scores indicate a moderate assessment of the effectiveness of

impact investing. For instance, impact investing in agricultural projects yielded a mean of $M = 3.17$ ($\text{Min} = 1$, $\text{Max} = 5$, $\text{SD} = 1.429$), whereas direct benefits to respondents resulted in a mean of $M = 3.01$ ($\text{Min} = 1$, $\text{Max} = 5$, $\text{SD} = 1.494$). The effect of long-term investment yielded a mean of $M = 3.11$ ($\text{Minimum} = 1$, $\text{Maximum} = 5$, $\text{Standard Deviation} = 1.390$), while the transparency of fund allocation resulted in a mean of $M = 3.03$ ($\text{Minimum} = 1$, $\text{Maximum} = 5$, $\text{Standard Deviation} = 1.437$). Other factors, such as household income enhancement and social outcomes, had slightly lower ratings ($M = 2.91$, $\text{SD} = 1.410$; $M = 2.94$, $\text{SD} = 1.464$). The findings suggest that impact investing moderately influences agricultural development, financial gains, and social welfare in Turkana County, with potential enhancements in household income and social engagement.

4.6.4 Food Security Insurance

TABLE 4.26

Descriptive Statistics for Food Security Insurance Items

Item	N	Minimum	Maximum	Mean	Std. Deviation
I am aware of insurance schemes that protect against crop/livestock loss.	308	1	5	2.96	1.470
Food security insurance is accessible to smallholder farmers in my area.	308	1	5	2.98	1.423
The insurance coverage meets the needs of local farmers.	308	1	5	3.15	1.438
I have enrolled in a food security insurance program.	308	1	5	2.86	1.403
Claims are processed in a timely and transparent manner.	308	1	5	2.97	1.436
The insurance system provides reliable compensation during losses.	308	1	5	2.90	1.453
Insurance has helped me recover from drought or animal loss.	308	1	5	3.06	1.360

Item	N	Minimum	Maximum	Mean	Std. Deviation
I feel more secure knowing I have agricultural insurance.	308	1	5	2.92	1.414
Community members generally trust the insurance system.	308	1	5	3.03	1.414
Food security insurance contributes to household resilience.	308	1	5	3.02	1.385
Valid N (listwise)	308				

Note. Responses were rated on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).

Table 4.26 presents the descriptive statistics of items related to food security insurance within the innovative financing mechanisms and enhanced food security in Turkana County, Kenya, derived from 308 valid replies. The mean scores indicate a moderate engagement and disposition towards insurance schemes. An illustration is the cognizance of insurance programs, which recorded a mean of $M = 2.96$ (Minimum = 1, Maximum = 5, Standard Deviation = 1.470); accessibility among smallholder farmers was $M = 2.98$ (Minimum = 1, Maximum = 5, Standard Deviation = 1.423); and alignment with local requirements was greater at $M = 3.15$ (Minimum = 1, Maximum = 5, Standard Deviation = 1.438). The insurance enrollment received the lowest score with a mean of 2.86 (minimum = 1, maximum = 5, standard deviation = 1.403), while the recovery from drought or livestock loss had a mean of 3.06 (minimum = 1, maximum = 5, standard deviation = 1.360). The findings suggest that while households in Turkana County moderately value and access food security insurance, adoption and utilization remain low; thus, enhancing awareness, accessibility, and confidence in insurance programs is essential for improving household resilience.

4.6.5 Climate Financing

TABLE 4.27

Descriptive Statistics for Climate Financing Items

Item	N	Minimum	Maximum	Mean	Std. Deviation
There has been an increase in climate-related investments in agriculture.	308	1	5	2.93	1.371
Climate financing supports water harvesting and irrigation projects.	308	1	5	2.96	1.410
Farmers are involved in designing climate-financed projects.	308	1	5	3.07	1.399
Climate adaptation projects have improved agricultural output.	308	1	5	2.97	1.416
These projects help us deal with unpredictable weather patterns.	308	1	5	2.90	1.395
Climate financing projects promote long-term environmental sustainability.	308	1	5	3.02	1.387
I have received training through climate-financed initiatives.	308	1	5	3.04	1.455
Community awareness on climate-smart agriculture has increased.	308	1	5	3.00	1.379
Community awareness on climate-smart agriculture has increased.	308	1	5	2.86	1.365
There is regular monitoring and evaluation of climate projects.	308	1	5	2.87	1.431
Valid N (listwise)	308				

Note. Responses were measured on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).

Table 4.27 presents the descriptive statistics of climate financing items utilized in the study regarding innovative financing mechanisms and enhanced food security in Turkana County, Kenya, based on 308 valid replies. The average scores indicate the modest perceptions of the

efficacy and scope of climate funding programs. The involvement of farmers in climate-financed initiatives yielded a mean of $M = 3.07$ (Minimum = 1, Maximum = 5, Standard Deviation = 1.399), whereas the endorsement of water collection and irrigation projects produced a mean of $M = 2.96$ (Minimum = 1, Maximum = 5, Standard Deviation = 1.410). Climate adaptation programs that improved agricultural productivity had a mean of $M = 2.97$ (Minimum = 1, Maximum = 5, Standard Deviation = 1.416), whereas climate-financed training initiatives achieved a mean of $M = 3.04$ (Minimum = 1, Maximum = 5, Standard Deviation = 1.455). Community awareness ($M = 2.86$, $SD = 1.365$) and consistent project monitoring ($M = 2.87$, $SD = 1.431$) exhibited the lowest mean scores. The results indicate that climate funding has a moderate impact on agricultural adaptation, training, and sustainability; nonetheless, knowledge and awareness gaps in monitoring remain in Turkana County.

4.7 Correlation Analysis

TABLE 4.28

Correlation Matrix for Key Study Variables

Variable	1	2	3	4	5
1. Enhanced Food Security	1				
2. Public-Private Partnerships Financing	.751**	1			
3. Impact Investing	.669**	.699**	1		
4. Food Security Insurance	.658**	.736**	.656**	1	
5. Climate Financing	.782**	.776**	.745**	.702**	1

Note. $p < .01$ (2-tailed). $N = 308$. Pearson's correlation coefficients are reported.

Table 4.28 presents the Pearson correlation coefficients among the principal variables in the investigation about innovative financing mechanisms and enhanced food security in Turkana

County, Kenya. The results indicate that all variables have robust, positive, and statistically significant relationships ($p < 0.01$). Public-Private Partnerships Financing ($r = 0.751$), Impact Investing ($r = 0.669$), Food Security Insurance ($r = 0.658$), and Climate Financing ($r = 0.782$) exhibited positive correlations with enhanced food security, suggesting that these financing mechanisms are associated with elevated levels of household food security. Public-Private Partnerships financing and climate financing exhibited the highest association ($r = 0.776$), while Impact Investing and Food Security Insurance demonstrated a modest correlation ($r = 0.656$). The matrix demonstrates that novel finance solutions are interrelated and jointly enhance food security in Turkana County, hence substantiating the necessity for integrated initiatives.

4.8 Diagnostic tests

Diagnostic tests were performed prior to conducting the regression analysis to ascertain the model's validity and reliability. The Variance Inflation Factor (VIF) was employed to assess multicollinearity, with all VIF values below the threshold of 10 indicating the absence of multicollinearity in the study. The Breusch-Pagan test was employed to assess heteroscedasticity and determined that the variance among residuals is not statistically different. The Shapiro-Wilk test was employed to assess the normality of data distribution, while the Durbin-Watson statistic indicated the absence of autocorrelation in the residuals. These findings validated the appropriateness of the regression model, ensuring accurate parameter estimation and enhancing the robustness of the results derived from the inferential statistical analysis.

4.8.1 Multicollinearity Test

TABLE 4.29
Collinearity Statistics

Predictor	Tolerance	VIF
Enhanced Food Security	.386	2.593
Public-Private Partnerships Financing	.310	3.226
Impact Investing	.437	2.288
Food Security Insurance	.408	2.448

Note. VIF = Variance Inflation Factor. All predictors have VIF values below 10, indicating no serious multicollinearity concerns.

Table 4.29 presents the collinearity diagnostics for the predictors in the study on innovative financing mechanisms and enhanced food security in Turkana County, Kenya. The Tolerance values range from 0.310 to 0.437, while the Variance Inflation Factor (VIF) spans from 2.288 to 3.226. All VIF values are far below the commonly accepted threshold of 10, and the tolerance values exceed 0.1, indicating the absence of severe multicollinearity among predictor variables. The Variance Inflation Factor (VIF) for Public-Private Partnerships financing was the highest at 3.226, indicating a substantial association with other predictors, while the VIF for Impact Investing was the lowest at 2.288, signifying it is the least redundant. The findings indicate that the predictors can be accurately incorporated into any regression analysis without the influence of multicollinearity bias affecting the estimation of their impacts on food security enhancement in Turkana County.

4.8.2 Heteroscedasticity Test

TABLE 4.30
Residuals Statistics for Regression Model

Statistic	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	24.78	70.75	50.00	8.60	308
Residual	-15.52	14.29	0.00	5.10	308
Standard Predicted Value	-2.93	2.41	0.00	1.00	308
Standard Residual	-3.02	2.79	0.00	0.99	308

Table 4.30 presents the residual values of the regression model employed to assess the influence of novel finance mechanisms on enhanced food security in Turkana County, Kenya. The anticipated values range from 24.78 to 70.75 ($M = 50.00$, $SD = 8.60$), while the standards of the observed against predicted values are centered on zero, ranging from -15.52 to -14.29. The range of standardized expected values is -2.93 to 2.41 ($M = 0.00$, $SD = 1.00$), while the range of standardized residual values is -3.02 to 2.79 ($M = 0.00$, $SD = 0.99$). The expected value of 0, along with the symmetrical distribution on both sides and comparable spreads of the residuals, suggests the absence of heteroscedasticity, hence confirming the assumption of constant error variance. These findings validate the consistency of regression estimates in evaluating the impact of finance mechanisms on food security.

4.8.3 Normality Test

TABLE 4.31

Tests of Normality for Study Variables

Variable	Kolmogorov-Smirnov Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
Enhanced Food Security	.031	308	.200*	.997	308	.776
Public-Private Partnerships Financing	.020	308	.200*	.996	308	.678
Impact Investing	.043	308	.200*	.995	308	.489
Food Security Insurance	.026	308	.200*	.998	308	.978
Climate Financing	.029	308	.200*	.998	308	.960

Note. *p* values greater than .05 indicate that the data for all variables are normally distributed.

Table 4.31 presents the normality assessment of essential study variables in the investigation of innovative financing mechanisms and enhanced food security in Turkana County, Kenya, utilizing both the Kolmogorov-Smirnov and Shapiro-Wilk tests. For all variables enhanced food security, Public-Private Partnerships financing, impact investing, food security insurance, and climate financing the *p*-values are below 0.05 (Enhanced Food Security: K-S = 0.031, Sig. = 0.200, S-W = 0.997, Sig. = 0.776), indicating that the distributions are not significantly different. This confirms that the data across all variables are nearly normally distributed, so fulfilling a key assumption of parametric tests, including regression and correlation. This indicates that subsequent statistical tests and models can be employed with confidence, free from concerns regarding the impact of non-normality on the validity of the results.

4.8.4 Autocorrelation Test

TABLE 4.32
Autocorrelation Test

Statistic	Value
Sig. F Change	.000
Durbin-Watson	1.953

Table 4.32 presents the outcomes of the autocorrelation test within the regression model assessing the influence of innovative funding schemes on enhanced food security in Turkana County, Kenya. The Durbin-Watson statistic is 1.953, which is close to the theoretical value of 2.0, indicating an absence of considerable autocorrelation among the residuals. The Sig. F Change value of 0.000 demonstrates that the overall model is statistically significant. The findings suggest that the residuals of the regression model are independent, validating the assumption of no autocorrelation. Consequently, the coefficient estimates of the model are reliable, and the inferences drawn regarding the relationship between financing mechanisms and food security outcomes are accurate.

4.9 Inferential Analysis

An inferential analysis established the association between innovative finance strategies and enhanced food security in Turkana County. Regression analysis indicated that Public-Private Partnerships finance ($\beta = 0.244$, $p = 0.000$), impact investment ($\beta = 0.267$, $p = 0.000$), food security insurance ($\beta = 0.124$, $p = 0.000$), and climate financing ($\beta = 0.338$, $p = 0.000$) exerted positive and statistically significant effects on food security. These results demonstrate that innovative finance approaches contribute to enhanced agricultural output, resilience, and sustainable access to food. The results validate the use of social impact theory, risk management theory, and environmental

economics theory, demonstrating that the targeted financial intervention can enhance household income, mitigates climate risks, and strengthens agricultural systems in arid and semi-arid environments.

4.9.1 Model Summary

TABLE 4.33

Model Summary of Regression Analysis

Model R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.819 ^a	.670	.666
			5.780

Table 4.33 presents the model summary of the regression study assessing the influence of novel finance strategies on enhanced food security in Turkana County, Kenya. The predictors and the dependent variable exhibit a significant positive connection, as evidenced by a R value of 0.819. The R² value of 0.670 indicates that the independent variables collectively account for 67.0% of the variation in better food security, while the adjusted R² of 0.666 reflects the number of predictors and confirms the model's robustness. The anticipated distance between the observed values and the predicted values is 5.780, representing the standard error of the estimate. The model has substantial explanatory power, affirming the efficacy of new finance approaches to enhance food security results in Turkana County.

4.9.2 Anova Analysis

TABLE 4.34
ANOVA Results

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	20,576.001	4	5,144.000	153.954	.000 ^b
Residual	10,123.999	303	33.413		
Total	30,700.000	307			

Note. ^a Dependent Variable: Enhanced Food Security.

Table 4.34 presents the ANOVA results of the regression model examining the influence of novel finance strategies on enhanced food security in Turkana County, Kenya. The regression model produced a regression sum of squares of 20,576.001, with 4 degrees of freedom and a mean square of 5,144.000. The residual sum of squares was 10,123.999, with 303 degrees of freedom and a mean square of 33.413. The F-statistic of 153.954 and a p-value of 0.000 indicate that the regression model is statistically significant at the 1% level, meaning the independent variables collectively account for a substantial percentage of the improvement in food security. These data confirm that the significance of novel finance tools in the outcomes of food security in Turkana County is substantial.

4.9.3 Regression Coefficients

TABLE 4.35

Regression Coefficients

Predictor	Unstandardized Coefficients (β)	Std. Error	Standardized Coefficients (Beta)	t	Sig.
(Constant)	1.325	1.697	—	0.780	.436
Climate Financing	0.338	0.047	0.338	7.170	.000
Public-Private Partnerships Financing	0.244	0.053	0.244	4.644	.000
Impact Investing	0.267	0.044	0.267	6.017	.000
Food Security Insurance	0.124	0.046	0.124	2.713	.007

Note. Dependent Variable: Food Security.

Table 4.35 presents the regression coefficients for the determinants of climate financing in the study on innovative financing mechanisms and enhanced food security in Turkana County, Kenya. The coefficients (β) are unstandardized and indicate the anticipated change in the dependent variable (climate financing) while controlling for other factors by one unit. Specifically, climate funding has a correlation of ($\beta = 0.338$, $p < 0.001$), indicating that a 1-unit rise in better food security corresponds to a 0.338-unit increase in climate finance, which is statistically significant at the 1% level. Public-Private Partnerships Financing demonstrates positive and significant effects ($\beta = 0.244$, $p = 0.001$), as does Impact Investing ($\beta = 0.267$, $p = 0.001$). The impact of Food Security Insurance is modest yet significant ($\beta = 0.124$, $p = 0.007$), achieving significance at the 1% level. The constant (intercept) of 1.325 is not statistically significant ($p = 0.436$), indicating that the influence at the baseline, when all other predictors are zero, is inconsequential. The overall effect of all predictors on climate financing is favorable and varies in magnitude.

4.10 Discussions

The regression results show that **enhanced food security** positively influences climate financing ($\beta = 0.338$, $p = 0.000$). **Public-Private Partnerships financing** also has a significant positive effect ($\beta = 0.244$, $p = 0.000$). **Impact Investing** contributes positively and significantly ($\beta = 0.267$, $p = 0.000$), while **Food Security Insurance** has a smaller yet significant positive impact ($\beta = 0.124$, $p = 0.000$). All predictors are statistically significant at the 1% level, indicating that each factor meaningfully supports climate financing in Turkana County.

4.10.1 Public-Private Partnerships Financing and Enhanced Food Security

The study found that Public-Private Partnerships finance significantly predicts food security in Turkana County ($\beta = 0.244$, $p = 0.000$), indicating that innovative financing mechanisms are crucial for enhancing food access and stabilizing agricultural productivity. These findings align with the Social Impact Theory, which posits that beneficial social outcomes can be attained through the coordinated efforts of several stakeholders, including the government, corporations, and the local community; one such consequence is the enhancement of family food security. Public-Private Partnership finance strategies facilitate resource pooling, risk-sharing, and knowledge transfer, enabling smallholder farmers to efficiently access inputs, markets, and technology. This observation aligns with the findings of Smyth, Webb, and Phillips (2021), who indicated that public-private partnerships enhance agricultural productivity and distribution through multi-stakeholder collaboration. Mangeni (2019) underscores the significance of partnerships in enabling farmers to adopt innovative technologies. The statistically substantial impact of Public-Private Partnerships financing underscores both its magnitude and theoretical relevance in fostering collaborative efforts aimed at achieving sustainable food security.

The study's findings are further corroborated by the empirical literature concerning

agricultural public-private partnerships (PPPs). Agarwal et al. (2023) demonstrate that collaborative efforts among government, the private sector, and communities facilitate technology access, market integration, and risk mitigation; however, challenges related to strategy implementation, including ineffective governance and insufficient coordination, persist. Aseete et al. (2023) assert that Ag-PPPs augment production, market engagement, and income for smallholders, highlighting the adaptability of PPP models across many contexts. Shoniwa (2023) asserts that Public-Private-Community Partnerships can fortify supply chains, foster confidence, and improve resource allocation during crises, hence rendering them strategically pertinent to food security. While the positive impact of PPPs is well-documented in these research, minor discrepancies may arise due to Turkana County's distinct setting characterized by arid weather, inadequate infrastructure, and sociopolitical dynamics. The research illustrated that Public-Private Partnerships financing is both statistically significant and conceptually relevant in enhancing food security results, which can inform policy development and innovative agricultural financing strategies.

4.10.2 Impact Investing and Enhanced Food Security

The research indicates that impact investment significantly enhances food security in Turkana County ($\beta = 0.267$, $p < 0.001$), underscoring the importance of targeted investments in agricultural and community development. The societal Impact Theory indicates that deliberate financial investments yield measurable societal effects, specifically in household food security and resilience. Impact investments facilitate smallholder farmers' access to technology, training, and market possibilities, thereby enhancing productivity and sustainability. The findings align with those of Malec et al. (2024), which revealed that agricultural investments and innovation can enhance food security across diverse regions of Africa. Conversely, the research by Abdi,

Mohamed, and Mohamed (2024) emphasizes that institutional support and effective resource utilization are essential for successful outcomes. The value is statistically validated as the reliability of these investments, and conceptually, it demonstrates that deliberately crafted financial systems can generate tangible social and economic benefits.

Furthermore, the research findings correspond with the household-level and systemic analysis of food security interventions. Abebe (2025) demonstrates that the enhancement of productive assets, adaptability, and access to services fortifies resilience and food security, illustrating the mechanisms via which impact investments operate. Mkumbukiy et al. (2025) assert that geopolitical shocks and supply chain disruptions necessitate strategic investment to bolster the resilience of agri-food systems. Statham, Halam, and Mansfield (2024) illustrate that innovation and investment enhance the resilience of the supply chain and local production, hence fostering long-term food security. Despite Turkana County's unique challenges, including as aridity, inadequate infrastructure, and limited market access, impact investment yields beneficial outcomes. Given the specific circumstances, it can be inferred that strategically directed financing facilitated the overcoming of existing hurdles. The findings confirm the statistical and theoretical significance of the different interventions, demonstrating that capital combined with strategic innovation is essential for enhancing food security in at-risk regions.

4.10.3 Food Security insurance and Enhanced Food Security

The study indicates that food security significantly and positively influences climate funding in Turkana County ($\beta = 0.124$, $p = 0.000$), with individuals possessing greater access to food and agricultural resources being more likely to engage in climate-focused financial initiatives. According to Risk Management Theory, agricultural insurance and associated mechanisms mitigate the impact of climatic shocks, enabling farmers to invest in long-term, climate-resilient

projects. This aligns with the findings of Habtemariam, Will, and Muller (2021), who note that while insurance might bolster financial stability, careful consideration must be given to its design to mitigate any negative effects on food diversity or agricultural practices. Mponela and Kizito (2025) assert that crop insurance, when combined with superior inputs, improves food reserves and production, allowing smallholder farmers to sustain their livelihoods amid unpredictable environmental conditions. This association is statistically significant, demonstrating its reliability, and conceptually underscores the critical role of insurance in promoting adaptive and sustainable funding options.

The findings correspond with both short-term and long-term studies regarding food security interventions. Derouez and Alqattan (2025) illustrate that resilience to climate variability is augmented by agricultural insurance and productivity enhancements, while Khan, Daraz, and Bojnec (2023) emphasize that effective governance and social safety nets are essential for achieving substantial outcomes. Wang, Liu, and Wang (2022) demonstrate that insurance, in conjunction with technology and education, enhances food security under harsh climatic conditions and highlight the synergies of complementary approaches. This indicates that home protection, which fosters food security in Turkana County, facilitated household participation in climate financing programs. The association, albeit having a lesser effect size than direct investment methods, is conceptually important, suggesting that risk mitigation via insurance enhances adaptive ability and fosters sustainable climate-oriented agricultural investments.

4.10.4 Climate Financing and Enhanced Food Security

The findings indicate that climate finance exerts a positive and significant influence on food security in Turkana County ($\beta = 0.338$, $p = 0.000$), suggesting that the provision of climate-oriented funding enhances agricultural productivity and familial resilience. This aligns with Environmental

Economics Theory, which posits that environmental hazards can be mitigated by directing financial resources towards sustainable farming practices while enhancing productivity (Pigou, 1920; Pearce and Turner, 1990). This statistically significant result corroborates the finding that climate financing significantly influences food security, albeit to a lesser extent than direct agricultural investment. This underscores the notion that financial interventions aimed at addressing environmental and climatic uncertainty enabled communities to adopt adaptive technologies, improve irrigation, and embrace climate-smart agriculture, thereby ensuring long-term food availability and environmental sustainability.

These findings correspond with data from Sub-Saharan Africa, where climate finance has enhanced food availability, although access, stability, and use may not be uniformly impacted (Phiri and Doku, 2024; Kelly, 2024). The utilization of technology, capacity, and governance is essential for the efficacy of climate financing, as articulated by Doku, Richardson, and Essah (2022), and supplementary interventions are requisite. Conversely, limits found in prior studies, such as reduced access for marginalized farmers and the absence of policy frameworks, suggest that local institutional capability in Turkana may influence the outcomes. The statistical significance indicates a valid positive relationship, while the theoretical significance demonstrates that climate financing effectively supports resilience-building and adaptive capacity, balancing environmental and developmental goals, ultimately enhancing sustainable food security in vulnerable regions.

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the conclusion, summary, and recommendations of the study about innovative finance strategies and enhanced food security in Turkana County, Kenya. This study consolidates the principal findings from the analysis of Public-Private Partnerships finance, impact investment, food security insurance, and climate financing as determinants of food security for smallholder farmers, pastoralists, and agro-pastoralists. This section provides a concise overview of the research objectives, methodology, and principal findings, highlighting their significance for sustainable agricultural development and resilience in arid and semi-arid soils. The conclusions emphasize the significance of innovative funding in addressing persistent food security issues, while the recommendations offer actionable insights for policymakers, practitioners, and scholars to enhance food systems and achieve long-term sustainability.

5.2 Conclusions

The study indicates that financing through Public-Private Partnerships is a successful approach that improves food security in Turkana County by integrating government and non-government resources to address agricultural challenges. Public-Private Partnerships financing augments government, donor, and private funds to finance and implement technology, irrigation initiatives, and market linkages to enhance productivity and household food security. Public-private partnerships facilitate information exchange, risk sharing, and efficient resource allocation, ensuring that even smallholder farmers receive necessary interventions. The findings align with existing evidence regarding the influence of Public-Private Partnerships (PPPs) on enhancing food production, distribution, and resilience to climatic and market shocks (Smyth et al., 2021;

Mangeni, 2019). Statistically significant results indicate that novel financing strategies are essential for fostering agricultural expansion, improving livelihoods, and enhancing food security outcomes. Consequently, it is prudent to enhance Public-Private Partnership financing options in sustainable agricultural growth within the county.

The research validates that impact investment positively and significantly influences food security in Turkana County. Agricultural investments generate social and financial returns, promote the dissemination of modern agricultural practices, enhance infrastructure, and facilitate access to inputs. These investments enhance agricultural production, household income, and community resilience in relation to sustainable food security. The results corroborate the findings from African nations indicating that investments in agriculture stimulate innovation, improve efficiency, and promote inclusive growth (Malec et al., 2024; Abdi et al., 2024). The article delineates the dual benefit of impact investing, demonstrating that financial returns can be realized concurrently with measurable social outcomes. Therefore, it is essential to advance impact investment initiatives to address local agricultural needs, thereby fostering long-term food security, facilitating innovation uptake, and alleviating poverty in Turkana County.

The research indicates that food security insurance positively impacts food security in Turkana County by mitigating the risks associated with climate variability, crop failures, and market uncertainty. Insurance schemes provide farmers with financial security, enabling them to invest in superior seeds, fertilizers, irrigation systems, and maintain food reserves. Empirical evidence indicates that household access to insurance correlates with increased resilience, improved agricultural productivity, and a heightened capacity to withstand shocks (Habtemariam et al., 2021; Mponela and Kizito, 2025). Despite being statistically significant, it is theoretically important to determine how risk management techniques might enhance overall agriculture

policies to safeguard livelihoods. Consequently, the enhancement of insurance coverage, its accessibility, and the integration of nutrition-sensitive techniques may bolster the outcomes of food security and sustainable agricultural growth in at-risk locations, including Turkana County.

Research shows that climate finance improves food security in Turkana County, although less than other approaches. Climate funds promote adaptive agriculture, climate-sensitive technologies, and environmental health, improving food production and family resilience. These findings support Environmental Economics Theory, which holds that economic mechanisms may reduce environmental issues and promote sustainable development. Climate finance boosts production and resilience in Sub-Saharan Africa, but food security access, stability, and consumption require additional measures (Phiri and Doku, 2024; Kelly, 2024). The study states that strong governance, institutional capacity, and technology implementation are needed to maximize climate finance. Thus, Turkana County needs climate funds for food security, environmental protection, and agricultural development.

5.3 Recommendations

5.3.1 Public-Private Partnerships Financing and Enhanced Food Security

The government is advised to enhance Public-Private Partnership financing structures via policy incentives, co-funding possibilities, and regulatory facilitation to attract private sector investments in agriculture. Public-Private Partnership projects should be utilized to benefit local farmers by leveraging NGOs to promote community engagement, enhance capacity, and facilitate knowledge transfer. Public-Private Partnerships (PPP) is encouraged to involve private investors, contributing finance, technology, and expertise while sharing risks with public entities. Researchers must evaluate and monitor the interventions of Public-Private Partnerships finance to ascertain their success and identify scalable best practices. The involvement of these stakeholders will ensure

efficient resource allocation, agricultural growth, and sustained food security. Transparent governance and consistent effect evaluations would enhance confidence and accountability, hence augmenting the efficacy of Public-Private Partnership funding initiatives in Turkana County in the long term.

5.3.2 Impact Investing and Enhanced Food Security

The government should promote impact investments by providing tax incentives, regulatory support, and government co-funding to attract socially responsible private investors to agriculture. Non-governmental organizations possess the capacity to engage communities, educate farmers, and ensure that investments align with local needs to enhance food security. Private investors are invited to invest in agricultural initiatives that offer measurable social and financial advantages, emphasizing technology adoption, infrastructure development, and market accessibility. The researchers should create robust evaluation frameworks to measure social outcomes, assess risks, and provide evidence-based recommendations about impact investing strategies. Collaboration among government entities, NGOs, investors, and researchers will enable Turkana County to enhance agricultural innovation, productivity, and resilient food systems. Continuous monitoring and reporting will ensure investments achieve economic and social objectives.

5.3.3 Food Security Insurance and Enhanced Food Security

The government must enhance insurance programs in the agriculture sector by providing subsidies, formulating supportive policies, and fortifying regulatory structures to augment farmer participation. Non-governmental organizations can educate farmers about the advantages of insurance, facilitate enrollment, and integrate supplementary services such as technical assistance and extension services. It is recommended that insurance companies and private investors develop affordable climate-adapted insurance solutions tailored to the needs of smallholder farmers.

Researchers will assess the efficacy of insurance schemes, investigate the determinants affecting uptake, coverage, and their impact on food security. The collaboration of these stakeholders will augment the ability of these nations to confront climatic disturbances, improve output, and ensure food security within families. Integrating nutrition-sensitive measures with insurance linked to agricultural inputs would ensure that insurance plans contribute to the economic stability of Turkana County and enhance dietary outcomes.

5.3.4 Climate Financing and Enhanced Food Security

To enhance climate funding, the government should simplify access procedures and implement laws that enable farmers to adopt climate-smart agricultural practices. Non-governmental organizations can promote awareness campaigns, provide training, and mobilize communities to ensure that farmers utilize climate funding effectively. Private investors are encouraged to invest in climate-resilient agricultural technologies and infrastructure while collaborating with public entities to mitigate risks. Researchers should evaluate climate finance initiatives to determine their impact on food security, environmental sustainability, and adaptive capability. Stakeholder coordination is essential to ensure that funds are allocated to the intended recipients in a way that promotes sustainable practices and maximizes benefits. By leveraging a multiplier effect from the collaboration of public entities, private capital, and research, Turkana County may enhance its resilience, elevate food production levels, and attain improved long-term food security outcomes.

5.4 Limitations

This research has some limitations that may influence the interpretation of the findings. The cross-sectional methodology precluded the establishment of causality, rendering the findings restricted to associations rather than definitive cause-effect correlations. The sample size was sufficient for statistical analysis; nevertheless, it was confined to Turkana County, perhaps limiting the

generalizability of the findings to other regions. Third, the utilization of self-reported data through questionnaires introduced potential biases, including social desirability and recall bias. Fourth, constraints of time and resources limited the data gathering and the depth of qualitative information. Finally, exogenous factors such as climate variability and market fluctuations may have influenced responses independently of the analyzed variables. Future research may adopt longitudinal designs, expand regionally, and employ mixed-methods to enhance the robustness and applicability of the findings.

5.5 Suggestions for the Future

Future studies can build on this research to address its technique and context constraints. To determine long-term causal links between innovative finance structures and food security, longitudinal studies are recommended. Additional counties in the country may improve generalizability and allow comparison of diverse agro-ecological zones. A mixed-methodology using qualitative and focus group interview approaches would capture farmers', governments, and personal investors' subtle perspectives. Further research may reveal synergies between Public-Private Partnership funding, impact investment, food security insurance, and climate financing for household resilience and agricultural productivity. Policy implementation, technological adoption, and market dynamics research may also yield useful results. Finally, research may develop prediction models to guide strategic planning for new food security finance.

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APPENDICES

APPENDIX I: DATA COLLECTION INSTRUMENT

QUESTIONNAIRE SECTION A: DEMOGRAPHIC INFORMATION

Please provide the following information. Your responses will be kept strictly confidential and used for research purposes only.

1. What is your age group?

- ☐ Below 20 years
- ☐ 20–29 years
- ☐ 30–39 years
- ☐ 40–49 years
- ☐ 50 years and above

2. What is your gender?

- ☐ Male ☐ Female
- ☐ Prefer not to say

3. What is your highest level of education?

- ☐ No formal education ☐ Primary education ☐ Secondary education
- ☐ Tertiary education (college/university) ☐ Adult literacy program

4. What is your primary economic activity?

- ☐ Crop farming
- ☐ Livestock keeping
- ☐ Agro-pastoralism (both farming and livestock) ☐ Other (please specify): _____

5. Which ward/sub-county do you reside in?

- ☐ Turkwel ☐ Lobei
- ☐ Kotaruk ☐ Lopur ☐ Loima
- ☐ Turkana South

6. What is the approximate size of your farming land?

☐ Less than 1 acre ☐ 1–2 acres

☐ 3–5 acres

☐ More than 5 acres

☐ I do not own any farming land

SECTION B: IMPACT INVESTING

Each of the following sections contains 10 statements related to agricultural financing mechanisms and food security. Please indicate your level of agreement with each statement by selecting one of the following options: 1 = Strongly Disagree; 2 = Disagree; 3 = Neutral 4 = Agree; 5 = Strongly Agree

No.	Statement	1	2	3	4	5
1	Impact investing has increased the number of agricultural projects in my area.					
2	I have benefited directly from an impact-funded agricultural project.					
3	Impact investment projects in my community are well-monitored and evaluated.					
4	Agricultural investments in my area have generated positive financial returns.					
5	I can see long-term benefits from projects funded through impact investing.					

6	The community is involved in the planning of impact investment projects.					
7	Impact investing has improved household income among farmers.					

8	Social outcomes (health, education) have improved due to agricultural investments.					
9	There is transparency in how impact funds are allocated.					
10	Local institutions support and manage impact investment initiatives effectively.					

SECTION C: FOOD SECURITY INSURANCE

Each of the following sections contains 10 statements related to agricultural financing mechanisms and food security. Please indicate your level of agreement with each statement by selecting one of the following options: 1 = Strongly Disagree; 2 = Disagree; 3 = Neutral 4 = Agree; 5 = Strongly Agree

No.	Statement	1	2	3	4	5
7	Insurance has helped me recover from drought or animal loss.					
8	I feel more secure knowing I have agricultural insurance.					
1	I am aware of insurance schemes that protect against crop/livestock loss.					
9	Community members generally trust the insurance system.					
2	Food security insurance is accessible to smallholder farmers in my area.					
10	Food security insurance contributes to household resilience.					
	The insurance coverage meets the needs of local farmers.					
4	I have enrolled in a food security insurance program.					
5	Claims are processed in a timely and transparent manner.					
6	The insurance system provides reliable compensation during losses.					

SECTION D: CLIMATE FINANCING

Each of the following sections contains 10 statements related to agricultural financing mechanisms and food security. Please indicate your level of agreement with each statement by selecting one of the following options: 1 = Strongly Disagree; 2 = Disagree; 3 = Neutral 4 = Agree; 5 = Strongly Agree

No.	Statement	1	2	3	4	5
1	There has been an increase in climate-related investments in agriculture.					

2	Climate financing supports water harvesting and irrigation projects.					
3	Farmers are involved in designing climate-financed projects.					
4	Climate adaptation projects have improved agricultural output.					
5	These projects help us deal with unpredictable weather patterns.					
6	Climate financing projects promote long-term environmental sustainability.					
7	I have received training through climate-financed initiatives.					
8	Community awareness on climate-smart agriculture has increased.					
9	Climate financing has created employment opportunities.					
10	There is regular monitoring and evaluation of climate projects.					

SECTION E: PUBLIC-PRIVATE PARTNERSHIP

Each of the following sections contains 10 statements related to agricultural financing mechanisms and food security. Please indicate your level of agreement with each statement by selecting one of the following options: 1 = Strongly Disagree; 2 = Disagree; 3 = Neutral 4 = Agree; 5 = Strongly Agree

No.	Statement	1	2	3	4	5
1	There are joint projects between government and private sector in agriculture.					
2	PPPs have led to construction or repair of farm-related infrastructure.					
3	PPPs have improved access to farming tools and inputs.					
4	Public-private projects have expanded market access for local farmers.					
5	There is clear communication between farmers and PPP project leaders.					
6	PPP projects consider the needs of smallholder farmers.					

7	Local farmers are consulted before implementing joint projects.					
8	PPPs provide platforms for farmers to sell their produce.					
9	These collaborations have reduced post-harvest losses.					
10	I am satisfied with the level of support from public-private initiatives.					

SECTION D: FOOD SECURITY

Each of the following sections contains 10 statements related to agricultural financing mechanisms and food security. Please indicate your level of agreement with each statement by selecting one of the following options: 1 = Strongly Disagree; 2 = Disagree; 3 = Neutral 4 = Agree; 5 = Strongly Agree

No.	Statement	1	2	3	4	5
-----	-----------	---	---	---	---	---

1	Food is available throughout the year in my household.					
2	I can afford to buy food regularly.					
3	My household consumes three meals a day consistently.					
4	Droughts or floods disrupt food availability in my area.					
5	Access to food markets is easy and affordable.					
6	I rely on food aid during certain months of the year.					
7	Climate changes have affected food availability in recent years.					
8	My household stores food for future use.					
9	Government or NGO programs help improve food availability.					
10	Overall, I feel my household is food secure.					

APPENDIX II: TIMELINE

Dissertation Activity	Feb	March	April	May	June	July	August	September	October
Topic Selection									
Proposal Writing									
Approval of Research Proposal									
Primary Research									
Evaluating Data and Results									
Submitting Dissertation									

APPENDIX III: BUDGET

Expense Category	Details	Estimated Cost (KES)
1. Research Materials	Books, journals, software, and printing costs	13,500
2. Data Collection	Surveys, questionnaires, and data entry	20,000
3. Travel Expenses	Field visits, local transportation, fuel	35,000
4. Accommodation	For fieldwork	25,000
5. Conference Fees	Registration fees for academic conferences	10,000
6. Miscellaneous	Contingency fund, internet, and phone bills	6,000
7. Printing and Binding	Thesis printing and binding	12,000
8. Ethical Approval Fees		3,000

Total Estimated Budget: KES 124,500

APPENDIX IV: ETHICAL APPLICATION



RESEARCH, INNOVATION, AND OUTREACH DIVISION

KCA UNIVERSITY SCIENTIFIC AND ETHICS REVIEW COMMITTEE

REQUEST FOR ETHICAL REVIEW FORM

The request must include the following information for the research to be considered for approval:

Name, institution, and contact details (email and phone number) of the principal/lead investigator/researcher:	DANIEL TOCHO Student at KCA University Tochod@gmail.com / 2307563@students.kcau.ac.ke 0738643988
If it is a thesis, include also the name(s), institution(s), and contact details (emails and phone numbers) of the supervisor(s):	DR. CAROLINE NTARA
Date of request:	21 ST JULY, 2025
Title of the Research:	INNOVATIVE FINANCING MECHANISMS AND ENHANCED FOOD SECURITY IN TURKANA COUNTY, KENYA
Planned or confirmed source of funding:	From Personal Savings
Members of the research group and their roles in the implementation of the study, as well as possible cooperation with other universities, research institutes, or similar organizations:	N/A
What is the level of risk presented by your research?	Please indicate whether the research risk assessment (Check risk document) stated on the application is: ☒ Low risk (<i>Research has no foreseeable risk of harm, discomfort, or inconvenience to respondents</i>) ☐ Medium risk (<i>Research has potential risk of unexpected negative consequences, harm or discomfort, but where appropriate steps can be taken to mitigate the risk</i>) ☐ High risk (<i>Research with real and foreseeable risk of harm and discomfort to participants and or the research team, and which may lead to serious adverse consequences if these risks are not managed</i>)

1

	<i>in a responsible manner. It involves highly sensitive topics and/or the participation of very vulnerable and marginalized individuals/groups)</i>
Would you like to bring any aspects of the applications to the Ethics Review Committee's attention?	Please indicate them here N/A
What research data will be collected?	Primary data
What personal data and confidential information will be processed?	N/A
Specify any special category or sensitive data that will be collected (tick all that apply)	☐ Ethnicity ☐ Mental Health (status, medical records conditions, to include disability) ☐ Physical Health (status, medical records conditions, to include disability) ☐ Sexual Orientation/Sexual life ☐ Genetic Data (to include DNA data) ☐ Biometric data (such as facial scan, iris scan, or fingerprint data used to identify a participant) ☐ Political opinions ☐ Trade Union membership ☐ Religious or philosophical beliefs ☐ Criminal Convictions and offences (to include alleged offences and convictions) ☒ None ☐ Other – Please specify below
How will data be stored and transferred during the research?	Hard Drive
Specify who will be able to access the identifying information and how you will ensure they process the information securely	The researcher & the Supervisor
How will research data be preserved and shared on completion of the project? (NB: Enter N/A in this section unless results will be published)	N/A
Describe the measures that will be taken to ensure data are suitable for sharing, e.g., securing consent, anonymizing data prior to deposit/sharing, and sharing confidential or high-risk information using a controlled access repository.	Anonymizing the data
State how long you plan to retain personal data and any confidential information after the end of the	Save the data for three (3) years before they are destroyed

project. Indicate also how the data will be disposed	
--	--

As the Principal Investigator of this study, I declare that I take full responsibility for the proposed study and will conduct it according to the documented proposal and in line with KCAUSERC ethical guidelines.

By signing this document, I agree that:

- All documents submitted with this application are true representations of the study and have not been falsified.
- This study will not commence in any way, and no participant will be recruited until final official approval is received from KCAUSERC
- The study will be conducted according to the protocol submitted. All participants will be recruited and consented to according to the protocol.
- Any protocol deviations or protocol violations to the submitted study must be reported to KCAU in writing by email to KCAUSERC immediately. Within five (5) business days of the deviation or violation, the Deviation/Violation Must be reported to the ISERC office.
- Any study-related unexpected or serious adverse event must be reported to the ISERC Office by email within twenty-four (24) hours after the PI becomes aware of the event.

Principal Investigator's Signature

Date

21/07/2025.

INFORMED CONSENT FOR RESEARCH PARTICIPATION

Introduction

You are invited to participate in a research study. This document provides information about the study so that you can make an informed decision about your participation. Please take the time to read the information below. If you have any questions, feel free to ask the researcher. (PI to Fill in the sections italicized)

Purpose of the Study

The purpose of this study is to examine how innovative financing mechanisms can enhance food security for pastoralists, agro-pastoralists, and smallholder farmers in Turkana County, Kenya.

The research is being conducted to address a critical gap in the local evidence base regarding the roles innovative financing mechanisms and enhanced food security.

Study Procedures

If you agree to participate, you will be asked to [The closed ended questionnaires shall be used in data collection, the tasks involve meeting smallholder farmers & household commercial farmers, the duration expected to be one to two months].

Potential Risks and Discomforts

There may be some risks associated with participation in this study. These risks may include [There will be low risk and discomfort during the study]. Every effort will be made to minimize these risks, and you can withdraw from the study at any time without penalty.

Potential Benefits

While participating may not directly benefit you, the results of this study may contribute to [this study will benefit various groups including the NGOs, the community and the county government, the new knowledge or advancements in the field will be beneficial to learners who would want to pursue the same study].

Confidentiality

Your participation will be kept confidential. Any data collected will be stored securely and only accessible to the research team. Your identity will not be revealed in any publication or presentation resulting from this research.

Voluntary Participation

Participation in this study is completely voluntary. You have the right to withdraw from the study at any time without any negative consequences or loss of benefits to which you are otherwise entitled.

Questions

If you have any questions about this study, your participation, or your rights as a participant, please contact the principal investigator at [073864398].

Consent

By signing below, you indicate that you have read the information provided above, understand the purpose and procedures of the study, and voluntarily agree to participate. You can withdraw from the study at any time without penalty.

Participant Statement:

I, the undersigned, consent to participate in this study.

Name of Participant: _____

Signature of Participant: _____

Date: _____

Researcher (Principal Investigator –PI) Statement:

I, the undersigned, confirm that I have explained the nature of this study to the participants, answered all questions, and ensured that they understand the information provided.

Name of Researcher: _____

Signature of Researcher: _____

Date: _____

APPENDIX V: ETHICAL CERTIFICATE



KCA UNIVERSITY SCIENTIFIC & ETHICS REVIEW COMMITTEE

Thika Road, Ruaraka
P.O. Box 56808-00200 Nairobi Kenya
Pilot Line: +254 20 8070408/9

Tel: +254 20 3537842
Fax: +254 20 8561077
Mobile: +254 734 888022, 710 888022
Email: kca@kca.ac.ke
Website: www.kca.ac.ke

REF: KCAU/SERC/SOB0264

DATE: 18TH AUGUST 2025

TO: DANIEL ODHIAMBO TOCHO (23/07563)

Dear Sir/Madam,

**RE: INNOVATIVE FINANCING MECHANISMS AND ENHANCED FOOD SECURITY IN
TURKANA COUNTY, KENYA**

This is to inform you that the KCA University Scientific Ethics Review Committee (KCAUSERC) has reviewed and approved your research proposal. Your application approval number is **KCAUSERC/SOB0264**. The approval period is **18th August 2025 – 18th August 2026**. This approval is subject to compliance with the following requirements.

- i. Only approved documents, including informed consents, study instruments, and MTAs, will be used.
- ii. All changes, including (amendments, deviations, and violations), are submitted for review and approval by **KCAUSERC**.
- iii. Death and life-threatening problems and serious adverse events or unexpected adverse events, whether related or unrelated to the study, must be reported to **KCAUSERC** within 72 hours of notification.
- iv. Any changes, anticipated or otherwise, that may increase the risks or affect the safety or welfare of study participants and others or affect the integrity of the research must be reported to **KCAUSERC** within 72 hours.
- v. Clearance for export of biological specimens must be obtained from relevant institutions.
- vi. Submission of a request for renewal of approval at least 60 days before expiry of the approval period. Attach a comprehensive progress report to support the renewal.
- vii. Submission of an executive summary report within 90 days upon completion of the study to **KCAUSERC**.

Before commencing your study, you will be expected to obtain a research license from the National Commission for Science, Technology and Innovation (NACOSTI) <https://research-portal.nacosti.go.ke> and also obtain other clearances needed.

Yours sincerely,

Dr. Caroline Ntara,
Chairperson,
KCA University Scientific & Ethics Review Committee.



APPENDIX VI: INTRODUCTION LETTER



Thika Road, Ruaraka
P.O. Box 56808-00200 Nairobi Kenya
Pilot Line: +254 20 8070408/9

Tel: +254 20 3537842
Fax: +254 20 8561077
Mobile: +254 734 888022, 710 888022
Email: kca@kca.ac.ke
Website: www.kca.ac.ke

BOARD OF POSTGRADUATE STUDIES

KCAU/BPS/2025

Date: Wednesday, August 27, 2025

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION (NACOSTI)

P.O BOX 30623-00100

NAIROBI

Dear Sir/Madam,

RE: DANIEL ODHIAMBO TOCHO - REG NO. 23/07563

It is my distinct pleasure to introduce Daniel Odhiambo Tocho, a student at our institution pursuing a Master of Science in Development Finance degree within the School of Business.

Daniel is conducting research on the topic *“Innovative financing mechanisms and enhanced food security in Turkana County, Kenya”* His study has been reviewed and approved by the University’s Ethics Review Committee, Approval No. KCAUSERC/SOB0264. The Approval period is 18th August 2025 – 18th August 2026.

Any assistance accorded to him is highly appreciated.

Yours faithfully,

DR. JACKSON NDOLO

DIRECTOR, BOARD OF POST GRADUATE STUDIES

APPENDIX VI: NACOSTIC LICENSE

 REPUBLIC OF KENYA	 NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION
Ref No: 632356	Date of Issue: 02/September/2025
RESEARCH LICENSE	
	
This is to Certify that Mr.. Daniel Odhiambo Tocho of KCA University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Turkana on the topic: INNOVATIVE FINANCING MECHANISMS AND ENHANCED FOOD SECURITY IN TURKANA COUNTY, KENYA for the period ending: 02/September/2026.	
License No: NACOSTI/P/25/4179076	
Applicant Identification Number	
	
Ag. Director General	
NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION	
Verification QR Code	
	
NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.	
See overleaf for conditions	

APPENDIX VIII: STUDENT LETTER TO THE COUNTY COMMISSIONER OF TURKANA

2nd September, 2025

County Commissioner
Turkana County
LODWAR.

Dear Sir,

**RE: COLLECTION OF DATA IN TURKANA COUNTY FOR THE PURPOSE OF
ACADEMIC RESEARCH**

Refer to the above subject.

This is to notify your office that I have been issued with the research license No. **NACOSTI/P/25/4179076** for a period between 2nd September 2025 to 2nd September 2026 to collect data related to academic research in Turkana county and an introductory letter from KCA University ref; **KCAU/BPS/2025** dated 27th August, 2025.

Attached herewith, kindly find the relevant documents and requirements for the same.

Yours sincerely,



DANIEL TOCHO.
23/07563

**APPENDIX IX: A LETTER FROM THE COUNTY COMMISSIONER
OF TURKANA.**



**OFFICE OF THE PRESIDENT
MINISTRY OF INTERIOR AND NATIONAL ADMINISTRATION
STATE DEPARTMENT FOR INTERNAL SECURITY AND NATIONAL
ADMINISTRATION**

Telegraphic address "COMMISSIONER" LODWAR
Telephone: LODWAR
Telex:
Fax:
E-mail: ccommissionerturkana@gmail.com

COUNTY COMMISSIONER
TURKANA COUNTY
P.O BOX 1-30500
LODWAR.

REF: ADML15/29 VOL.IV (47)

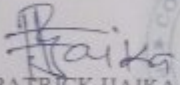
16TH SEPTEMBER, 2025

ALL DEPUTY COUNTY COMMISSIONERS
TURKANA COUNTY

RE: RESEARCH AUTHORIZATION: MR. DANIEL ODHIAMBO TOCHO
LICENCE NO: NACOSTI/P/25/4179076

The above mentioned person is a student of KCA University and has been authorized to carry out research on "Innovative Financing Mechanisms and Enhanced Food Security in Turkana County, Kenya". The research period ends on 2nd September, 2026.

Any assistance accorded to him will be appreciated.


PATRICK IJAIKA
FOR: COUNTY COMMISSIONER
TURKANA COUNTY

Copy to:

The Director of Education
TURKANA COUNTY

The Governor
TURKANA COUNTY GOVERNMENT

MR. DANIEL ODHIAMBO TOCHO