

**ANALYSIS OF TECHNOLOGY ADOPTION ON FOOD SECURITY IN  
AGRICULTURAL PROJECTS PERFORMANCE: A CASE OF THE GALANA  
KULALU MAIZE IRRIGATION PROJECT**

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## DECLARATION AND APPROVAL

### Declaration by the student

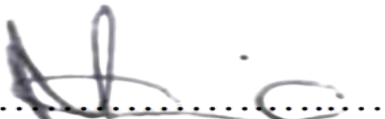
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Dr. Maria Wambui Mung'ara

## DEDICATION

I dedicate this work to my family who have been an inspiration, and mentors in my life.



## **ACKNOWLEDGEMENT**

I thank God Almighty for the opportunity to be alive and in a position to work on this research. I wish to express my sincere gratitude to my supervisor and advisor Dr. Maria for her guidance, suggestions and invaluable time she has spent with me since the inception of this research. I express my profound thanks to all those who have directly or indirectly guided me and helped me throughout my research work.



## ABSTRACT

The integration of technology in agriculture has significantly transformed the sector, leading to increased farm productivity and a reduction in poverty. Technologies such as precision farming, mechanized equipment, and advanced irrigation systems have played a crucial role in enhancing farm productivity by monitoring and adjusting soil fertility, crop health, and moisture levels. Agricultural development projects, aligned with Sustainable Development Goal (SDG) 2 on zero hunger, are essential for economic growth in developing nations. However, these projects often face challenges in achieving their objectives as the case of Galana Kulalu Maize Irrigation Project in Kenya. This study aims to analyze the influence of technology adoption in project management on the performance of agricultural development projects, specifically focusing on the Galana Kulalu Maize Irrigation Project. The objectives of the study were to assess how Management Information Systems (MIS) influences the efficiency of technology adoption, investigate the impact of different financing structures on the successful adoption of technology, examine challenges associated with stakeholder engagement in technology-driven initiatives, and evaluate the adoption of enterprise resource planning systems. The study utilized a descriptive research design. Method to be used for sampling was purposive sampling method to select a sample size of 60 participants. Purposive sampling was used to select Project administrators, Managers, Agricultural Extension Officers, Policy Makers, Consultants and Technical Experts. Questionnaires and interview guides were used for data collection, and pilot testing was done to ensure the validity and reliability of the instruments. Data analysis involved descriptive statistics to present quantitative data, including frequencies, percentages, mean scores, and standard deviation. Regression analysis was used to demonstrate the impact of technology adoption on food security in the Galana Kulalu maize irrigation project. Ethical considerations, including obtaining permission and consent, was adhered to throughout the research process to ensure the dignity and confidentiality of participants. The recommendations from this study might guide policymakers on policy formulation of development projects. Furthermore, practitioners can use the study's findings to give valuable insights to project managers on strategies to leveraging technology to improve project performance.

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## LIST OF ABBREVIATIONS AND ACRONYMS

<b>EFInA</b>	Enhancing Financial Innovation and Access
<b>EPR</b>	Enterprise Resource Planning
<b>FAO</b>	Food and Agriculture Organization
<b>GPS</b>	Global Positioning System
<b>HRIS</b>	Human Resource Information Systems
<b>IoT</b>	Internet of Things
<b>IPPIS</b>	Integrated Personnel and Payroll Information System
<b>MIS</b>	Management Information System
<b>MSEs</b>	Medium Small Enterprises
<b>PBOs</b>	Project-Based Organizations
<b>PMS</b>	Project Management System
<b>SAPMP</b>	Sustainable Agriculture Productivity and Market Linkage Project
<b>SDG</b>	Sustainable Development Goals
<b>SDLC</b>	Software Development Life Cycle
<b>TARDA</b>	Tana And Athi Rivers Development Authority
<b>UNEP</b>	United Nation Environmental Progr

## CHAPTER ONE

### INTRODUCTION

This chapter entails the background to the study, the research problem statement, objectives, research study questions, scope of the study, justification, assumptions and the meaning of terms as used in the study.

#### 1.1 Background to the Study

In developing economies such as India, different sectors and geographic areas display varying degrees of openness to innovation. For example, the financial services sector in India has swiftly embraced E- payment methods. A study conducted by the Reserve Bank of India (RBI, 2018) indicated a substantial annual growth of more than 50% in digital transactions between 2014 and 2018, signifying of importance adoption of E-payment advances. Also in China, the retail sector has undergone a transformation due to the expansion of e-commerce platforms. According to research conducted by Deloitte (2019), E-commerce accounted for over 60% of online merchandize trading in 2018, and China's e-commerce industry exceeded \$1.5 trillion, highlighting a notable level of innovation acceptance within the retail domain. When it comes to the use of biofuels, especially ethanol made from sugarcane, Brazil has taken the lead. Goldemberg and Guardabassi's (2019) research highlights Brazil's sophisticated biofuel sector, whereby ethanol accounts for almost forty percent of the nation's gasoline use. This reflects a substantial implementation of merchandized in the energy sector, contributing to Brazil's energy safe and environmental sustainability objectives (Goldemberg and Guardabassi, 2019). In a similar vein, mobile health (mHealth) solutions are becoming more widely used in South Africa. A study by (Leon, 2018) found that especially in underserved rural areas, the use of mHealth application for patient monitoring and healthcare delivery has

significantly expanded. This demonstrates a noteworthy level of innovation adoption targeted and improving the nation's healthcare results and accessibility (Leon, 2018).

Adopting innovation as a means of advancing economic development and addressing social concerns is becoming increasingly important in Sub Saharan Africa, including Ethiopia. Research by (Biru and Molla 2018) highlights the extensive use of mobile banking technology as an example. Their study shows a consistent uptick in mobile banking usage in Ethiopia, especially among rural communities that are traditionally underserved. This trend underscores a significant level of innovation adoption within the financial industry, leading to improved monetary inclusion and wider accessibility to banking services.

Similarly to this, Rwanda has a thriving technology start up environment as a result of government measures that actively support innovation and entrepreneurship. According to the world bank (2019), Rwanda has made significant strides in fostering innovations-driven entrepreneurship through the implementation of policies and programs, which has led to the creation of many technology firms and incubators. This is an indicative of an increasing trend in Sub Saharan Africa to use innovation to spur economic diversification and growth, especially when it comes to solving issues in the agriculture sector. Additionally, fintech industry in Nigeria has grown quickly and adopted new innovations. Nigeria's fintech sector has seen substantial investment and development, according to EFINA's study (2020), with peer-peer lending platforms, digital payment solutions, blockchain-based financial services becoming more and more well-liked. This signifies a considerable level of innovation adoption in the financial sector, contributing to increased financial inclusion and economic advancement in the country.

Parallel to this, Vietman's industrial sector-especially the electronics sector-has witnessed a notable uptake of innovation. With investments from major international

firms, Vietnam has become a key hub for electronics production. The study carried out by (Tran, 2019) highlights Vietnam's accomplishments in employing advancement to improve its competitiveness in the electronic production sector, with a particular focal point on technological innovations and workforce training. This is an example of how innovation has been used to a significant extent in driving industrial expansion and promoting national economic development. Furthermore, a great deal innovation in the digital economy has been adopted in Indonesia, especially in the areas of ride-hailing and e-commerce. Due the countries sizable and quickly growing population as well as the rising internet penetration rate, digital innovations have flourished in Indonesia. A study done by (Kusumawati, 2018) noted the robust growth in Indonesia's e-commerce market, fueled by the widespread adoption of online marketplaces and digital payment platforms. Additionally, ride-hailing services such as Gojek and Grab have revolutionized urban transportation, creating new avenues for income generation. This underscores a noteworthy level of innovation adoption in leveraging digital advancements to stimulate economic improvement and enhance the standard of living for Indonesians.

In a study by Jelimo (2023), the impact of mobile technology and farmer education on agricultural projects was examined. The research found that mobile technology significantly improved farmers' access to crucial agricultural information, such as weather forecasts and market prices, thereby aiding informed decision-making. Additionally, mobile platforms for farmer education enhanced farmers' knowledge and skills, leading to better crop management and productivity. The adoption of improved agricultural practices was encouraged through mobile technology, resulting in higher yields and better-quality crops. Economic benefits were observed, with increased incomes due to higher crop yields and improved market prices. The study concluded that

using mobile technology in farmer education is sustainable and scalable, suggesting potential for replication in other regions (Jelimo, 2023).

Henri's (2023) research investigates the use of collaborative systems thinking to boost the adoption of climate-smart agricultural (CSA) technologies in Africa. The study found that this approach significantly improved collaboration among stakeholders, including farmers, researchers, and policymakers, leading to better communication and problem-solving. Increased awareness and knowledge about CSA technologies, combined with the identification of barriers such as financial constraints and inadequate training, facilitated higher adoption rates. Moreover, the study emphasized the need for supportive policies and institutional frameworks to sustain CSA initiatives (Henri, 2023).

Laura (2023) explored the role of AI in agriculture, highlighting its benefits in enhancing crop management and increasing yields. The study showed that AI tools optimized planting and irrigation, improved pest and disease management, and provided accurate yield predictions. These AI applications enabled data-driven decisions, resulting in better resource usage, increased productivity, and higher profitability for farmers by reducing costs and maximizing yields (Laura, 2023).

### **1.1.1 Technology Adoption**

Technology has revolutionized agriculture, leading to higher farm productivity and a decrease in poverty (Ruzzante et al., 2021). The incorporation of technology like precision farming, mechanized equipment, and advanced irrigation systems plays a vital role in enhancing farm productivity. Precision farming employs sensors, GPS, and drones to monitor and adjust soil fertility, crop health, and moisture levels, allowing farmers to tailor the use of fertilizers, water, and pesticides to specific requirements (Ruzzante & Bilton, 2021). Additionally, agricultural technology aids in managing natural resources by enhancing crop varieties, chemical inputs, mechanization, and infrastructure, as

highlighted by Ruzzante and Bilton (2021). Technology adoption enables farmers to tackle environmental issues such as land degradation and nutrient depletion. Furthermore, the introduction of new crop varieties with technological advancements results in crops resistant to pests and drought, with improved nutritional value. The widespread use of chemical inputs associated with technology adoption helps control pests, reduce losses, and boost yields. Furthermore, the adoption of technology in agricultural projects leads to mechanization, better infrastructure, and the utilization of various physical equipment like underground pumps, threshers, pumps, grain storage silos, and land leveling tools (Ruzzante & Bilton, 2021). This holistic approach underscores how technology serves as more than just a productivity tool but also drives sustainable agricultural practices and enhances livelihoods.

### **1.1.2 Agricultural Development Projects**

Agricultural development initiatives are designed to enhance agricultural productivity, aligning with Sustainable Development Goals (SDG), which targets zero hunger (United Nations, 2015). SDG 2 by the United Nations aims to combat hunger and food insecurity, emphasizing agricultural sustainability. These projects are crucial, particularly in developing nations, as they significantly contribute to economic growth (Rafael, 2023). The agricultural sector plays a pivotal role in economic development by generating employment, ensuring food security, and raising living standards. Despite its immense potential in Africa, the agricultural sector faces challenges such as inadequate infrastructure, funding, land availability, and the impacts of climate change. Helfenstein et al. (2022) argued that agricultural development initiatives lead to increased productivity by introducing new farming techniques and advanced technology, resulting in higher yields and overall enhanced productivity. Furthermore, agricultural development projects promote sustainable practices, as noted by Yet et al. (2020). These

projects aim to conserve environmental resources, preserve natural resources, and boost productivity. Sustainable practices include organic farming, agroforestry, and integrated pest management. Similarly, Hu et al. (2023) concurred that agricultural development projects encourage sustainable farming practices and also support crop and livestock diversification and value addition. The authors also highlighted that these projects introduce value-added services such as processing and packaging of agricultural products.

Despite the recognized potential of technology to enhance food security and improve agricultural project performance, there remains a significant gap in understanding the specific mechanisms and factors that influence successful technology adoption in large-scale agricultural projects. The Galana Kulalu Maize Irrigation Project, one of Kenya's largest agricultural undertakings, presents a unique case for examining these dynamics. However, existing literature lacks comprehensive analysis in several key areas. Firstly, while Management Information Systems (MIS) are known for improving efficiency and decision-making, empirical evidence on their influence on technology adoption efficiency in large agricultural projects is limited. Secondly, the role of different financing structures in facilitating or hindering technology adoption remains underexplored, making it crucial to investigate how various financing models impact successful technology uptake. Thirdly, although stakeholder engagement is critical for the success of technology-driven initiatives, there is insufficient research on the specific challenges stakeholders face in this context, particularly concerning food security. Finally, the influence of Enterprise Resource Planning (ERP) systems on project performance in agricultural settings has not been extensively studied, with most existing research focusing on industrial or manufacturing applications. This study aims to fill these gaps by providing a detailed analysis of technology adoption in the Galana Kulalu

Maize Irrigation Project, focusing on the roles of MIS, financing structures, stakeholder engagement, and ERP systems. By addressing these gaps, the study contributed to a better understanding of the factors that drive successful technology integration in agricultural projects, ultimately enhancing food security outcomes.

### **1.1.3 Galana Kulalu Irrigation Development Project**

The project is located within Kilifi and Tana River Counties in Kenya. This irrigation development project has viable physical infrastructure, such as water storage, livestock production, aquaculture road network, eco-tourism, and land development. The irrigation contains various farm activities including maize farming, sugarcane plantation, dairy and beef ranching, fisheries, among others (National Irrigation Authority, 2023). Once the Galana Kulalu Irrigation project is full developed, it provided employment opportunities to Kenyans direct and indirect, and phenomenally contribute to both local and national economies. More importantly, the project provided raw materials in the entire region to agro-industries, and its dividends directly boosted food security in the country. When it comes to the projects' performance, it did not meet its intended objectives. For the project to achieve its full potential, there is need to address adverse climatic and weather changes and implement clear financial guidelines.

### **1.2 Statement of the Problem**

Food insecurity in Kenya has been a main challenge and has persisted for many years. The table 1 and 2 below summarizes recent researchers done about food supply and population growth in the country.

**Table 1: Tabulated summary focusing on the most critical information regarding malnutrition in Kenya:**

<b>County</b>	<b>Malnutrition Phase</b>	<b>Year</b>	<b>Period</b>	<b>Key Issues/Drivers</b>
<b>Kitui</b>	IPC Phase 3	AMN	2024 February to March	Improvement due to better rains and food security interventions
<b>Marsabit</b>	IPC Phase 2	AMN	2024 March to June (projected)	Expected improvement in nutrition
<b>Turkana South</b>	IPC Phase 5	AMN	2023 July	Extremely critical; high food insecurity, low milk availability, and severe water scarcity
<b>Turkana South</b>	IPC Phase 4	AMN	2024 March to May (projected)	Deteriorating nutrition situation due to high food insecurity
<b>Laisamis</b>	IPC Phase 5	AMN	2023 July	Extremely critical
<b>Turkana West</b>	IPC Phase 4	AMN	2023 July	Critical situation
<b>Mandera</b>	IPC Phase 4	AMN	2023 July	Critical situation
<b>Garissa</b>	IPC Phase 4	AMN	2023 July	Critical situation
<b>Isiolo</b>	IPC Phase 4	AMN	2023 July	Critical situation
<b>Turkana Central</b>	IPC Phase 4	AMN	2023 July	Critical situation
<b>Turkana North</b>	IPC Phase 4	AMN	2023 July	Critical situation
<b>Tiaty (Baringo)</b>	IPC Phase 4	AMN	2023 July	Critical situation
<b>North Horr</b>	IPC Phase 4	AMN	2023 July	Critical situation
<b>Moyale</b>	IPC Phase 4	AMN	2023 July	Critical situation
<b>West Pokot</b>	IPC Phase 3	AMN	2023 July	Serious situation
<b>Laikipia</b>	IPC Phase 3	AMN	2023 July	Serious situation
<b>Tana River</b>	IPC Phase 3	AMN	2023 July	Serious situation
<b>Wajir</b>	IPC Phase 3	AMN	2023 July	Serious situation

**Source:** IPCA (2024)

**Table 2: Summarizing key information about population increase and food insecurity in Kenya**

<b>Aspect</b>	<b>Details</b>
<b>Population Growth</b>	- 1948: 5.4 million; Current: 45.8 million; Projected 2020: 52 million; Projected 2030: 65 million.
<b>Food Poverty Headcount Rate</b>	- National: 32% - Rural Areas: 35.8% - Turkana: 66.1% - Meru & Nyeri: 15.5%
<b>Maize Production</b>	- 2013: 40.7 million bags - 2017: 35.8 million bags - National consumption: 45 million bags annually
<b>Agricultural Sector Growth</b>	- 2013: 5.4% - 2017: 1.6%
<b>Food Security Targets (2022)</b>	- Increase maize production: 40 million to 67 million bags - Increase rice production: 125,000 to 400,000 metric tonnes - Increase potato production: 1.6 million to 2.5 million tonnes
<b>Urban Population (1999-2009)</b>	- Increased from 5 million to 12 million - Urban population: 31.1% of total population
<b>Food Security Challenges</b>	- High population growth and dependency ratio - Decrease in agricultural land - Migration to urban areas
<b>Dietary Patterns and Health</b>	- Shift towards less healthy diets - Increase in diabetes prevalence: 4.56% (urban 10.7%, rural 2.7%)
<b>Key Recommendations</b>	- Address rapid population growth - Incorporate population structure in agricultural planning - Promote family planning

**Sources:** FAO, IFAD, UNICEF, WFP, and WHO. (2018). *The State of Food Security and Nutrition in the World 2018*. FAO.

Galana Kulalu project has never achieved its full potential. For instance, in 2019 only one hundred and nineteen thousand ninety kilograms bags of maize whose worth was about two hundred's and thirty-seven Kenyan shillings million was produced. This did not meet the one point two Kenyan shillings billion in maize sales projection per season. Also, in 2015, the maize crop yielded approximately eight thousand bags of 90kg, which meant only 17 bags were harvested per acre. In September 2015 to January 2016, averagely three thousand bags of 90kg, were harvested from 500 acres, translating to six bags per acre. The bags produced did not meet the recommended 22 bags of 90kgs (KIPPRA,2021). KIPPRA noted that the Galana Kulalu Project failed to achieve its

intended objectives due to challenges in project and contract implementation. According to the researcher's knowledge, no study has been conducted to investigate how project management technology affects agricultural development projects in Kenya, particularly the Galana-Kulalu Irrigation Project. Therefore, the present study was conducted to analyze the influence of technology in project management on the performance of agricultural development projects: A case of The Galana Kulalu Maize Irrigation Project.

### **1.3 Objectives of the Study**

#### **1.3.1 General Objective**

To analyze the impact of technology adoption on food security and the performance of agricultural projects, with a specific focus on the Galana Kulalu Maize Irrigation Project.

#### **1.3.2 Specific Objectives of the Study**

This study's specific research objectives are:

- i. To assess how the implementation of Management Information Systems (MIS) influences the efficiency of technology adoption in the Galana Kulalu Maize Irrigation Project.
- ii. To investigate the impact of different financing structures on the successful adoption of technology.
- iii. To assess the extent to which stakeholders engage with technology-driven initiatives aimed at enhancing food security.
- iv. To assess the extent to which adoption of enterprise resource planning systems on project performance relates to enhancing food security.

### **1.5 Research Questions**

- i. How will the implementation of management information systems (MIS) influence the efficiency of technology adoption?
- ii. What is the impact of different financing structures on the successful adoption of technology?
- iii. To what extent do stakeholders engage with technology-driven initiatives aimed at enhancing food security?
- iv. How does the adoption of enterprise resource planning systems relate to project performance and the enhancement of food security?

### **1.6 Significance of the Study**

The results of the study benefited academics and researchers; this study's findings hope to give valuable insights to the role of technology in project management, and its farfetched impact on the performance of agricultural development projects. Researchers conducting research in a similar study used this study as a guide and a reference point, adding to the body of knowledge. For policymakers; this study's findings hope to benefit the Kenyan Government of the role of technology in fostering the performance of agricultural development projects. The recommendations from this study might guide policymakers on policy formulation of development projects. Furthermore, practitioners can use the study's findings to give valuable insights to project managers on strategies to leveraging technology to improve project output.

### **1.7 Scope of the Study**

The study was carried out in the Coastal region, particularly along the Tana River and Kilifi border. The respondents of the research study was in the managerial level which included Project administrators, Managers, Agricultural Extension Officers, Policy Makers, Consultants and Technical Experts. The study focused on implementation of Management Information Systems (MIS) influences the efficiency of technology adoption, investigate the impact of different financing structures on the successful adoption of technology, challenges associated with stakeholder engagement in implementing technology-driven initiatives and adoption of enterprise resource planning systems on project performance for enhancing food security in Galana Kulalu Maize Irrigation Project. This study was on analyzing of technology adoption on food security in agricultural projects at Galana Kulalu maize irrigation project.

### **1.8 Limitation and Delimitation**

The time available for conducting the research is limited, often constrained by agricultural cycles and project timelines. This limitation can restrict the size and diversity of the sample, potentially leading to a less accurate representation of the population. Access to various stakeholders and regions within the Galana Kulalu project presents another challenge. Geographical barriers, political considerations, and the willingness of participants can all impede access. Some areas within the project may be remote or difficult to reach, and some stakeholders may be less willing to participate.

To address the limitation of time constraints, the research adopted efficient planning and leverage technology such as mobile data collection tools to expedite the process. Recruiting local research assistants and implementing a purposive sampling method helped in obtaining a diverse and representative sample within the limited timeframe.

Additionally, to overcome access challenges, the study engaged local leaders and community representatives to build trust and facilitate entry into remote areas. Utilizing remote data collection methods like phone interviews and online surveys ensured broader coverage, while meticulous logistical planning and providing incentives for participation enhanced stakeholder engagement.

### **1.9 Assumptions of the Study**

It assumes participants provided honest and accurate information, ensuring the validity and reliability of the data. The technological interventions are expected to be implemented consistently across the project, which is crucial for drawing reliable conclusions. The study also presumes stability in external factors such as weather, market access, and government policies to isolate the impact of technology adoption. Access to necessary resources, including funding, logistical support, and stakeholder cooperation, is essential for effective data collection and analysis.

### **1.10 Operational Definition of terms**

**Enterprise Resource Planning System (ERP):** ERP structure are integrated software solutions that manages important business procedures including project management, supply chain, finance and human resource. In the study, EPR system would refer to the software used to streamline and optimize various operations within the Galana Kulalu Maize Irrigation Project, particularly focusing on resource allocation, planning, and coordination.

**Food Security:** This refers to the condition where all people within a society have a way to be guarded, nutritious, and sufficient edible meals to maintain a healthy and active life. In the research study, food security would be evaluated in terms of how technology adoption impacts the availability, accessibility, and stability of food production within the Galana Kulalu Maize Irrigation Project area.

**Information System:** An information system is a system that collects, processes, stores, and disseminates data and information within an organization or project. In the context of the research, information systems would encompass the technologies and tools used to gather, analyze, and utilize data related to technology adoption and its impact on food security and project performance.

**Management Software:** Management software refers to computer programs or applications designed to assist in managing and organizing various aspects of a project, organization, or business. In the study, management software specifically relates to software used to manage and oversee agricultural development projects, including project planning, execution, monitoring, and evaluation.

**Project Performance:** Project performance refers to the overall success, effectiveness, and efficiency of a project in achieving its objectives and delivering desired outcomes. In the context of the study, project performance would assess how technology adoption influences the productivity, sustainability, and impact of the Galana Kulalu Maize Irrigation Project in terms of food security and agricultural development.

**Stakeholders:** These are group of people who come together with a common interest for a new project. In the research study, stakeholders would include various entities involved in or impacted by the Galana Kulalu Maize Irrigation Project, such as government agencies, local communities, farmers, investors, and project managers.

**Technology Adoption:** This refers to the process of integrating and using new technological advancements or innovations within a specific context or industry. In the context of the research study, technology adoption would involve assessing how new technologies are implemented and utilized within the Galana Kulalu Maize Irrigation Project to enhance food security and improve agricultural project performance.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

In this chapter, the study's underlying theories are presented in the first section. The empirical research on the impact of technology adoption on food security in agricultural projects is presented in the second section. The study's compiled literature, gaps that have been found, and gaps that the current investigation has filled are all shown in the third section. The variables are presented in a conceptual framework in the fourth and final section.

#### **2.2 Theoretical Literature**

##### **2.2.1 Technology Adoption of Agricultural Projects**

The adoption of technology in agricultural projects plays a critical role in enhancing productivity, sustainability, and food security. Research indicates that several factors influence the uptake of such technologies, including socio-economic conditions, access to information, and institutional support. For instance, Hornum et al. (2024) discuss how the diffusion of drip irrigation technology among African smallholders is facilitated by climate action plans and donor projects, which provide the necessary infrastructure and training. Similarly, Li et al. (2024) highlight the importance of economic incentives and the availability of resources in encouraging family farms in Jiangsu, China, to adopt green agricultural technologies.

Moreover, Priya and Singh (2024) identify various determinants for the adoption of sustainable agricultural practices in India through a systematic literature review. They emphasize the significance of knowledge dissemination and government policies in promoting sustainable techniques. Yamoah and Kaba (2024) explore the integration of

climate-smart agricultural innovations and agribusiness management skills to enhance the livelihoods of smallholder female cocoa farmers in Ghana, underscoring the role of gender-specific support and capacity building.

In the Brazilian Amazon and Atlantic Forest biomes, Tanure et al. (2024) find that farmers' perceptions of climate change significantly affect their willingness to adopt sustainable agricultural technologies. This suggests that awareness and education about climate impacts are crucial for technology adoption. Similarly, Wang et al. (2024) examine the effectiveness of agricultural extension services in promoting scientific fertilization practices among farmers, indicating that such services are essential for translating technology adoption into practical applications.

Lastly, Bin Khaled and Maredia (2024) present evidence from Tanzania showing the long-term influence of social networks and peers' characteristics on the adoption of agricultural technologies. Their findings suggest that social dynamics and peer influence are pivotal in technology diffusion within farming communities.

Overall, these studies collectively highlight the multifaceted nature of technology adoption in agriculture, involving economic, social, educational, and institutional dimensions that need to be addressed to improve agricultural performance and food security.

### **2.2.1 Food Security**

Food security is a multifaceted issue influenced by various factors, including technological advancements, environmental sustainability, and socio-economic conditions. Akintuyi (2024) examines how vertical farming in urban environments can enhance food security by integrating agricultural practices into urban architecture. This approach not only increases food production but also reduces the need for transportation, thereby addressing urban food supply challenges.

Wani et al. (2024) provides new insights into food security through effective waste food management. They argue that managing food waste can significantly contribute to environmental sustainability and improve food security by redistributing resources and reducing the pressure on food production systems. This approach highlights the importance of sustainable practices in maintaining a stable food supply.

Varzakas and Smaoui (2024) discuss global food security and sustainability issues, emphasizing the need for systemic changes in food systems to meet the goals of 2030. They advocate for sustainable healthy diets and nutrition-focused strategies to address food security challenges. Their analysis underscores the necessity of transforming food systems to ensure long-term food availability and accessibility.

The impact of climate change on food security is explored by Lee, Zeng, and Luo (2024), who provide evidence from China. Their study highlights how climate change exacerbates food insecurity by affecting crop yields and altering agricultural productivity. They stress the need for adaptive measures to mitigate the effects of climate change on food systems.

Okpala, Korir, and Manning (2024) introduce the concept of food acquirability as a crucial, yet often overlooked, component of food security. They argue that ensuring the accessibility of food, beyond just availability, is essential for achieving comprehensive food security. This perspective broadens the traditional understanding of food security to include factors influencing food access.

Lee, Yan, and Wang (2024) explore the impact of population aging on food security in the context of artificial intelligence. Their research from China suggests that demographic changes and technological advancements, such as AI, played a significant role in shaping future food security strategies. They propose leveraging AI to enhance food distribution and management systems.

Lastly, Mu et al. (2024) discusses how integrating artificial intelligence, big data, and the Internet of Things into food safety systems can improve resilience to food safety risks. By implementing advanced technologies in early warning and risk identification, food systems can become more robust and capable of addressing emerging food safety challenges.

Together, these studies illustrate the complex interplay of technology, environmental sustainability, and socio-economic factors in addressing food security. They highlight the need for innovative solutions and systemic changes to ensure a stable and secure food supply for the future.

### **2.3 Empirical review**

This area discusses the review of related studies about analysis of technology adoption (Management Information Systems (MIS) and technology adoption, Financing structures on the successful adoption of technology, Stakeholder engagement in technology adoption and adoption of enterprise resource planning systems) and on food security in agricultural projects in order to comprehend the relationship that exists between them.

The adoption of agricultural technologies is critical for enhancing food security and improving the performance of agricultural projects. This literature review synthesizes findings from various studies to understand the impact and factors influencing technology adoption in agriculture, focusing on food security outcomes.

Amankwah and Gwatidzo (2024) examine the effects of agricultural technology adoption on food security and poverty reduction in rural Zimbabwe. Using a multinomial endogenous switching regression model, they find that the adoption of modern agricultural technologies significantly improves food security and reduces poverty

among smallholder farmers. This study highlights the importance of targeted interventions that promote technology adoption to achieve food security goals.

Zhao et al. (2024) explore the relationship between agricultural technology innovation and food security in China. Their empirical study utilizes a coupling coordination model to assess the interplay between technological advancements and food security. The findings indicate that innovation in agricultural technology positively influences food security, emphasizing the need for continuous investment in research and development to sustain agricultural productivity and food availability.

Hornum, Bolwig, and Trærup (2024) focus on the diffusion and adoption of drip irrigation technology among African smallholders. Their document analysis of climate action plans and donor projects reveals that enabling environments, including supportive policies and access to financial resources, are crucial for the widespread adoption of this technology. Drip irrigation is shown to enhance water efficiency and crop yields, thereby contributing to improved food security.

Andre and Nkechi (2024) investigate the performance of agricultural projects in Rwanda, specifically the Kayonza Irrigation and Integrated Watershed Management Project, in the context of climate change adaptation. Their study demonstrates that integrating climate change adaptation strategies with technology adoption leads to better project outcomes and enhanced food security. The research underscores the importance of adaptive management practices in agricultural projects to mitigate the impacts of climate change.

Raji, Ijomah, and Eyieyien (2024) emphasize the role of extension services and innovative training programs in improving agricultural practices and productivity. Their study in the *International Journal of Applied Research in Social Sciences* shows that farmers who receive training and support are more likely to adopt new technologies,

leading to higher productivity and better food security. This highlights the need for robust extension services to facilitate technology adoption.

Ayo-Lawal (2024) conducts a technology audit of the Nigerian agricultural sector, identifying gaps and opportunities for achieving food security. The audit reveals that despite the availability of various agricultural technologies, adoption rates are low due to factors such as inadequate infrastructure, limited access to credit, and insufficient training. The study calls for comprehensive strategies to address these barriers and promote the adoption of technologies that can enhance food security.

Collectively, these studies underscore the multifaceted nature of technology adoption in agriculture and its critical role in enhancing food security. They highlight the importance of supportive policies, financial resources, training programs, and adaptive management practices. Addressing the barriers to technology adoption and fostering an enabling environment are essential for improving the performance of agricultural projects and achieving sustainable food security outcomes.

### **2.3.1 Management Information Systems (MIS) and Technology Adoption**

Al-Mamary, Al-Nashmi, Shamsuddin, and Abdulrab (2019) carried out research to develop a comprehensive model for adopting management information systems (MIS) in telecommunication organizations. The research aimed to investigate the effects of advancement, structural, and human issues on perceived usefulness and user satisfaction, with the goal of improving individual performance. The findings revealed that system quality and information quality (technological factors), along with computer self-efficacy and computer experience (people factors), had a significant impact on perceived usefulness. Additionally, user satisfaction was notably influenced by system quality, information quality, user training (organizational factors), computer experience, and perceived usefulness. The research concluded that perceived usefulness had a positive

effect on individual performance, providing valuable insights for telecom managers regarding MIS adoption and its positive impacts on individual performance, company revenues, and the national economy.

Lutfi, (2023) sought to assess the Accounting Information System (AIS) in Sudanese banks using De Lone and McLean's Information System Model (DM ISM). This study explored various elements such as the quality of information, the effectiveness of the system, the caliber of service, the extent of system utilization, and the satisfaction of users, assessing how these aspects impact the performance of banks. Results showed that system quality and information quality significantly affected system usage, while service quality did not. Moreover, AIS usage was found to have a significant positive impact on business performance.

Stamenkov and Zhaku-Hani (2023) investigated the post-adoption phase of the Education Management Information System (EMIS) in mandatory settings, focusing on perceived benefits and usage by individuals and institutions. Their analysis indicated that perceived ease of use, perceived usefulness, compatibility, complexity, and governmental support indirectly influenced post-adoption usage in mandatory environments. Conversely, technological knowledge and external ICT support directly impacted post-adoption usage. The study emphasized that the perceived benefits of EMIS significantly affected individual post-adoption usage in mandatory settings, with accumulated knowledge and experience being central factors. Another study by Lutfi, Idris and Mohamad, (2017) explored the factors that influence accountants continued use of an Accounting Information System (AIS) in Jordanian SMEs. The study discovered that effort expectancy, performance expectancy, and facilitating conditions positively influenced accountants' intention to continue using AIS, while top management support had a significant negative effect.

Thuan, Nguyen Vinh, Anh, Hanh, Thi, Tram and Han (2022) aimed to identify the components affecting the adoption of accounting information systems (AIS) in Vietnamese SMEs within the context of the Industrial Revolution 4.0. Utilizing the Technology–Organization–Environment (TOE) framework, Diffusion of Innovations (DOI) theory, and Resource-Based View (RBV), the study found that relative advantage, owner/manager commitment, and the impact of COVID-19 significantly influenced AIS usage. Additionally, AIS usage was positively associated with its effectiveness, which in turn positively affected overall business performance. These findings provide important insights for business owners considering AIS adoption to improve operational efficiency and reduce workload, particularly in accounting.

Al-Okaily, A., Al-Okaily, M., Shiyya, F., & Masadah, W. (2020) aimed to evaluate the effectiveness of Accounting Information Systems (AIS) at the organizational level in developing countries like Jordan by extending the DeLone and McLean success model. The study focused on the impact of system quality, information quality, process quality, collaboration quality, service quality, individual performance, and workgroup performance on organizational performance during the COVID-19 pandemic. The findings revealed that individual performance benefitted from high information quality, efficient processes, and superior service quality. In turn, workgroup performance improved as a result of enhanced individual performance. Consequently, both individual and workgroup performance collectively influenced the overall organizational performance.

### **2.3.2 Financing Structures on the Successful Adoption of Technology**

Ranganathan and Lagarde (2011) conducted an assessment of the impact of incorporating financial technology on both sides of the market, considering supply and demand factors. The study investigated the consequences of distributing one million debit cards to

participants of Mexico's conditional cash transfer program between 2009 and 2012. Notable effects were identified, including an increase of 21% in debit card usage among consumers due to small retailers adopting point-of-sale terminals for card transactions. Furthermore, the availability of these terminals in corner stores led wealthier consumers to divert 13% of their supermarket spending to these outlets. To gauge the benefits to consumers resulting from this policy, data on store prices, locations, and consumer preferences across various store types were analyzed.

Alabi and Olaoye (2022) delved into the impact of technology adoption on financial inclusion, focusing on ATMs, internet usage, and mobile subscriptions. Their findings indicated modest positive effects on financial inclusion in China and Nigeria, with more significant impacts evident when analyzing other countries. Additionally, the study highlighted a significant negative correlation between GDP growth rate and financial inclusion in several countries.

Ali and Ghildiyal (2023) explored the influence of ICTs, macroeconomic factors, and demographics on financial inclusion in India, examining credit penetration, account ownership, and digital financial services accessibility. They discovered a positive relationship between internet usage, mobile penetration rates, and financial inclusion in India. Individual characteristics and economic factors such as education, income, age, gender, government support, and saving habits also played significant roles in financial inclusion. The study stressed the importance of inclusive financial strategies, pro-poor growth, and technological advancements to achieve sustainable development goals.

Matsepe and Van der Lingen (2022) investigated factors affecting the adoption of AI, cloud computing, and DLT in South African financial services during the fourth industrial revolution. They identified various influential factors, including adopter traits,

technology usability, industry characteristics, and organizational leadership. Leadership diversity emerged as a novel factor impacting technology adoption.

Gupta and Dhingra (2022) employed interpretive structural modeling to analyze factors influencing mobile financial services adoption, highlighting the importance of facilitating conditions for successful implementation. The study provided valuable insights for effective resource allocation by bank managers and telecom companies. Also, Zakariyah et al. (2023) examined the impact of Industry 4.0 on fintech expansion into cash waqf management in Malaysia, emphasizing the role of trust and social norms in fintech adoption by waqf institutions. Another study by Rizvi, Rahat, Naqvi, and Umar (2024) investigated the relationship between innovation, digital adoption, and fintech, uncovering bidirectional causality between these themes. A study conducted by Branzoli, Rainone, and Supino (2024) explored IT adoption by banks and its effects on credit allocation during the COVID-19 pandemic, highlighting the significance of online credit provision and AI for risk assessment.

### **2.3.3 Stakeholder Engagement in Technology Adoption**

Guo et al. (2023) conducted a study on the impact of stakeholder engagement (SE) on green manufacturing (GM) adoption, specifically focusing on carbon neutrality environmental orientation (EO) as a moderating element. The objective was to understand how SE influences GM operationalization, particularly within China's carbon neutrality initiatives. Empirical results showed a positive correlation between SE and GM, with carbon neutrality EO moderating this relationship. This emphasizes the significance of robust SE and dedicated commitments to carbon neutrality in enhancing the GM process. The study's implications are crucial for policymakers and firms in the apparel sector, stressing strategic stakeholder engagement and clear environmental focus for sustainable manufacturing practices.

Best, Sibson, & Morgan (2024) conducted an exploratory study to gain insights into technology's advantages and challenges within not-for-profit sports organizations in Australia. They found several benefits, including increased productivity, better communication, and facilitation of remote work. However, barriers included financial and organizational costs, staff proficiency, and social system influences. Embracing technology can improve business operations in not-for-profit sports, but balancing technological needs with program delivery and operational management remains challenging.

Aloulou et al. (2024) explored the UAE's positive approach to FinTech adoption and its impact on the banking sector's competitiveness and performance, especially during the COVID-19 pandemic. Effective FinTech implementation and technology management alignment directly influenced the sector's resilience during challenging times.

Moetlhoa et al. (2024) focused on challenges and facilitators in implementing digital-connected point-of-care (POC) diagnostic models in South Africa, identifying limited connectivity and electricity issues as significant barriers. Oriekhoe, Ilugbusi, & Adisa (2024) proposed integrating blockchain technology into food supply chains to enhance global food safety, emphasizing transparency and efficient recall processes.

Defe & Matsa (2024) highlighted stakeholder involvement's importance in developing sustainable climate-smart villages in Zimbabwe, while Maina (2022) explored stakeholder engagement's impact on solar energy project sustainability in Kenya, revealing significant positive correlations across various engagement factors. Lastly, Gichuru & Onjure (2019) assessed stakeholder engagement practices' impact on an oil software upgrade project in Kenya, emphasizing transparent communication and effective engagement strategies for project success.

### **2.3.4 Adoption of Enterprise Resource Planning Systems**

The research conducted by EMON, M. M. H., Nahid, M. H., Abtahi, A. T., Siam, S. A. J., & Chakraborty, S. (2023) focused on exploring the significant role of user engagement in the effective adoption of Enterprise Resource Planning (ERP) systems, specifically in Bangladesh. The study aimed to comprehend how user participation influences work performance, competency, user-friendliness, and training, taking into account organizational characteristics and strategy alignment. The results underscored the critical impact of organizational support, training initiatives, and strategic alignment on the successful implementation of ERP systems, along with the substantial influence of user engagement on various related factors.

Similarly, Khatatbeh, I. N., Alshurafat, H., Al Shbail, M. O., & Jamaani, F. (2023) developed a comprehensive UTAUT model-based framework to analyze the factors influencing the adoption of ERP systems within Jordan's banking sector. By gathering insights from 150 department heads and managers across 13 banks that were already using ERP systems, the study highlighted factors such as attitude, perceived utility, ease of use, and self-efficacy as crucial determinants. The findings emphasized the positive impact of ERP system implementation on bank performance and suggested leveraging attitudes and perceived utility to enhance system adoption and overall bank performance.

In another study, Alsmairat, M. A. K., Al-Ma'aitah, N., & Alrafaty, I. (2022) delved into the investigation of critical success factors (CSFs) influencing ERP adoption, considering organizational, environmental, and technological aspects, including potential variations based on company size. The study revealed that while factors like cost, employee IT proficiency, and top management support were not strongly correlated with ERP adoption, elements such as complexity, relative advantage, compatibility,

competitive pressure, and support availability significantly impacted adoption rates, with variations based on the size of the company.

Aremu, A. Y., Shahzad, A., & Hassan, S. (2019) aimed to construct a theoretical framework identifying factors influencing ERP system adoption among medium-sized companies (MSEs) in Nigeria. Through a thorough analysis encompassing organizational culture, internet quality, infrastructure support, and top management support, the study highlighted the pivotal role of organizational culture and top management support in driving ERP adoption, ultimately leading to enhanced MSE performance.

Furthermore, Fatimah, H., & Trisminingsih, R. (2018) conducted an assessment of businesses' ERP system implementation, utilizing the Analytical Hierarchy Process (AHP) approach to evaluate user happiness, organizational impact, and use benefit. The study emphasized the critical importance of these factors in gauging ERP system performance and continuity.

Shimange, T. P., & Pillay, K. (2023) explored the potential of South African government institutions to adopt sustainable ERP systems, identifying facilitating factors such as change management policies, end-user knowledge, organizational culture alignment, while also noting barriers like system complexity and budget constraints.

R. Gabryelczyk (2020) investigated the role of business process management (BPM) in ERP systems within the public sector, challenging the conventional belief of BPM's criticality for ERP adoption. Utilizing a multiple case study methodology, the study assessed BPM's significance in ERP success within public sector institutions. Finally,

Wekesa, B. M., & Namusonge, G. S. (2018) evaluated the impact of ERP systems on public institutions' performance, using Jomo Kenyatta University of Agriculture and Technology as a case study. The study underscored the importance of information

systems, quality management, buyer-supplier relationships, and inventory management in enhancing public entities' performance.

## **2.4 Theoretical framework**

The study was guided by, resource-based view theory and stakeholder theory

### **2.4.1 Resource-Based View Theory**

The Resource-Based View (RBV) Theory, first introduced by Birger Wernerfelt in 1984, posits that an organization's competitive advantage is largely derived from its ability to manage and utilize its resources effectively. This theory emphasizes the strategic importance of internal resources and capabilities over external market conditions

The implementation of Management Information Systems (MIS) is a critical resource. According to RBV, effective MIS implementation can enhance the efficiency of technology adoption by providing timely and accurate information, facilitating better decision-making, and improving overall project management. This aligns with the first objective of assessing how MIS influences technology adoption efficiency, as MIS can be viewed as a valuable resource that enhances the project's operational capabilities.

Financing structures, as investigated in the second objective, also tie into the RBV theory. Different financing models can be considered strategic resources that influence the adoption of technology. Adequate and well-structured financing can provide the necessary capital for acquiring and implementing advanced technologies, thus impacting the project's success. The availability and management of financial resources directly affect the project's ability to leverage technology for improved performance and food security.

About the challenges faced by stakeholders in technology-driven initiatives. From an RBV perspective, understanding these challenges is crucial because the stakeholders'

skills, knowledge, and commitment are essential resources. Identifying and mitigating these challenges can enhance stakeholder engagement, thereby optimizing the utilization of technological resources aimed at enhancing food security.

Finally, the adoption of enterprise resource planning (ERP) systems, as addressed in the fourth objective, reflects the RBV's emphasis on integrating and managing resources efficiently. ERP systems can streamline operations, improve resource allocation, and enhance coordination across different project components. This integration is vital for improving project performance and achieving food security goals.

#### **2.4.2 Stakeholder Theory**

Stakeholder Theory, introduced by R. Edward Freeman in 1984, emphasizes the importance of addressing the interests and needs of all stakeholders involved in a project or organization. This theory argues that the success of any initiative depends not only on financial performance but also on the value created for various stakeholders, including employees, customers, suppliers, communities, and others who have a vested interest in the project's outcomes.

The implementation of Management Information Systems (MIS) involves multiple stakeholders, including project managers, farmers, technology providers, and government agencies. According to Stakeholder Theory, assessing how MIS influences the efficiency of technology adoption requires considering the perspectives and needs of these various groups. Engaging stakeholders in the MIS implementation process ensures that the system addresses their specific requirements and contributes to improved decision-making and operational efficiency, thereby enhancing technology adoption.

Different financing structures, as explored in the second objective, also impact stakeholders differently. Investors, financial institutions, and government bodies are key stakeholders whose interests and support are crucial for securing the necessary funds for

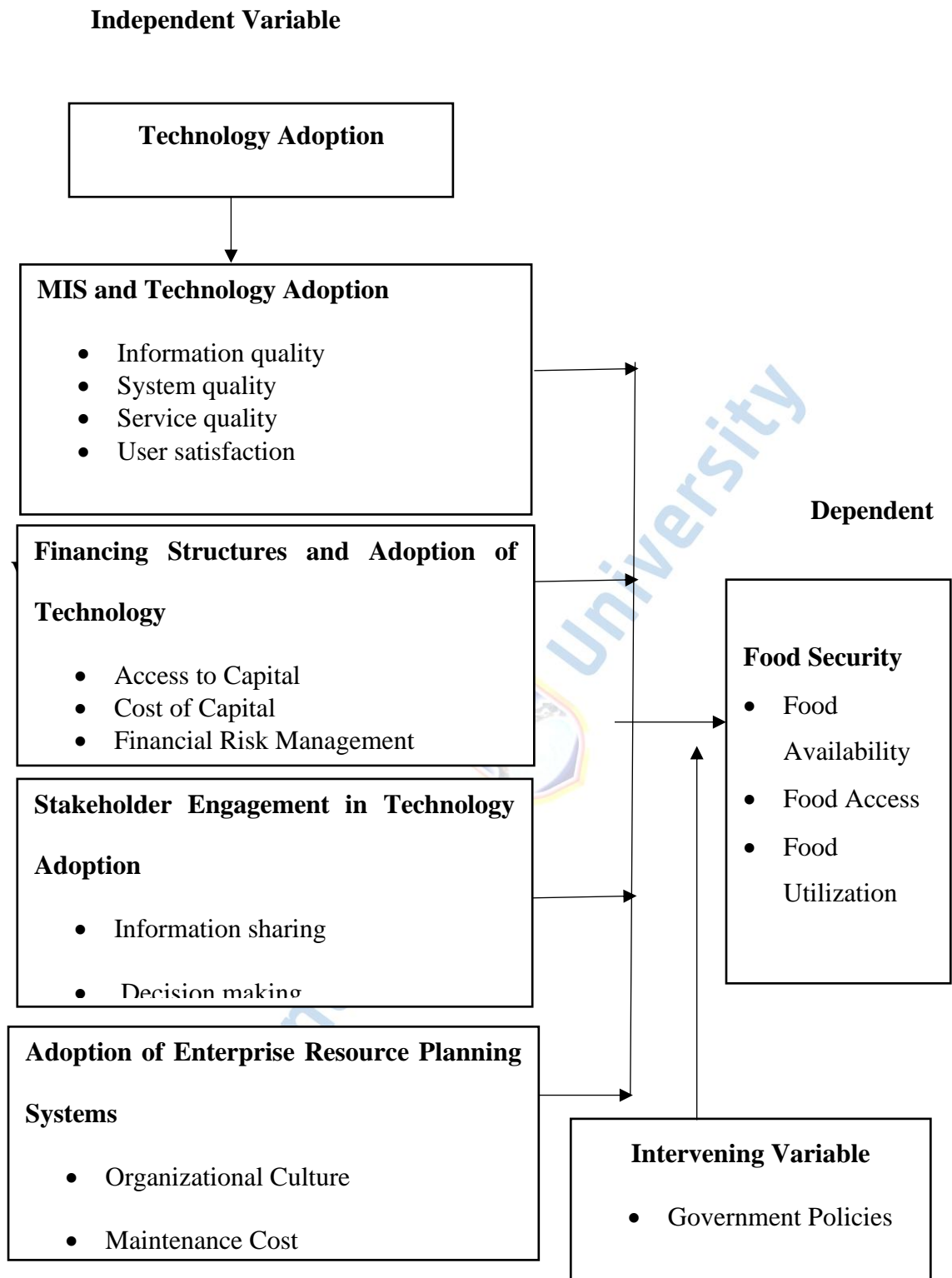
technology adoption. Stakeholder Theory suggests that understanding and aligning the financial expectations and objectives of these groups can facilitate successful technology adoption by ensuring adequate and sustained funding, ultimately benefiting the project's overall performance.

Challenges faced by stakeholders in technology-driven initiatives is directly aligned with Stakeholder Theory. Identifying and addressing these challenges is essential for fostering stakeholder engagement and collaboration. Farmers, local communities, technology providers, and regulatory authorities may face various barriers, such as resistance to change, lack of technical skills, or regulatory hurdles. By recognizing and addressing these challenges, the project can enhance stakeholder participation and support, thereby improving the likelihood of successful technology adoption and its positive impact on food security.

Finally, the adoption of enterprise resource planning (ERP) systems, as outlined in the fourth objective, involves coordinating and integrating the efforts of multiple stakeholders. ERP systems can enhance project performance by improving resource allocation, communication, and transparency among stakeholders. Stakeholder Theory underscores the importance of involving all relevant parties in the ERP adoption process to ensure that the system meets their needs and contributes to the project's success. By aligning the interests of stakeholders with the goals of the ERP system, the project can achieve better coordination, efficiency, and outcomes related to food security.

## 2.5 Conceptual framework

The conceptual framework for technology adoption and its impact on food security comprises independent variables like the MIS and technology adoption, financing structures and adoption of technology, stakeholder engagement in technology adoption, and adoption of enterprise resource planning systems. These independent variables encompass factors such Information quality, System quality, Service quality, User satisfaction, Access to Capital, Cost of Capital, Financial Risk Management, Investment Incentives, information sharing, decision making, and partnership with parties, organizational culture, maintenance cost, and system complexity. These variables influence dependent variables like food availability, food access, and food utilization, which are crucial components of food security. Intervening variables such as government policies play a vital role in moderating the relationship between technology adoption and food security, shaping how these technologies are implemented and their ultimate impact on food security outcomes. Thus, understanding the interplay between these variables is essential for devising effective strategies to enhance food security through technology adoption.



**Figure 1: Technology adoption on food security in agricultural projects**

## 2.6 Summary and research gap

While various studies highlight the benefits of different technologies like management information systems (Nsekarije and Irechukwu, 2022), machine learning (Attri et al., 2024), and evaluation models for project management (Barghoth et al., 2021), there is a gap in comparative analysis specifically focusing on the effectiveness of different types or configurations of project management software in agricultural development projects. Existing studies like Fatkhuri et al. (2024) assess user satisfaction with MIS applications in various contexts but do not specifically delve into their utilization and effectiveness within agricultural projects like the Galana Kulalu Maize Irrigation Project in Kenya. Similarly, studies by Abdumutalov and Yunusova (2024) and Libriantono (2024) concentrate on personnel management systems but do not specifically address their application and impact in agricultural settings related to food security. Furthermore, studies like Ogunode and Garba (2023) and Udekwe et al. (2022) explore technology's impacts but not within the context of a specific agricultural project aimed at enhancing food security. Existing studies like Guo et al. (2023) focus on stakeholder engagement in the context of green manufacturing and carbon neutrality, but they do not specifically address the challenges related to technology-driven initiatives for food security in agricultural projects. Similarly, studies by Best et al. (2024) and Aloulou et al. (2024) explore technology adoption and its impacts in various sectors, but they do not delve into the specific challenges of stakeholder engagement within agricultural projects aimed at enhancing food security. Furthermore, studies like Oriekhoe et al. (2024) and Defe & Matsa (2024) examine technology's potential in sectors like food supply chains and climate-smart villages but do not focus on the challenges of stakeholder engagement in implementing such technologies for food security within irrigation projects. Existing studies such as those by EMON et al. (2023), Khatatbeh, I. N., Alshurafat, H., Al Shbail,

M. O., & Jamaani, F. (2023) and Aremu et al. (2019) focus on ERP adoption factors, influences, and frameworks in various industries and contexts but do not specifically address the adoption and impact of ERP systems in agricultural projects aimed at enhancing food security. Similarly, studies by Fatimah & Trisminingsih (2018), Shimange & Pillay (2023), and Gabryelczyk (2020) explore ERP implementation, facilitating factors, and BPM components but do not concentrate on ERP adoption's direct relationship with project performance for food security within irrigation projects.



Mount Kenya University

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

In this chapter, the researcher explored the research design, identify the target population, examine sampling methods, and discuss data collection techniques. Additionally, we reviewed the instruments and procedures used, assess validity and reliability, outline the ethical guidelines followed, and describe the methods planned for data analysis.

#### **3.2 Research Methodology**

Descriptive type of research design oriented towards presenting existing practices, beliefs, opinions, attitudes, trends, and ongoing processes to derive meaningful interpretations Siedlecki, (2020). The current study was guided by a descriptive research design aimed at analyzing the impact of advancement adoption in project governance on the performance of agricultural development projects: a case of the Galana Kulalu irrigation project. The use of a descriptive survey design allows researchers to efficiently gather data from a wide area and gain a comprehensive interpretation of the entire population from a representative part (Mugenda & Mugenda, 2013). Furthermore, Siedlecki, (2020) notes that descriptive design facilitates the collection of substantial data quickly and at a minimal cost. The design aims to describe, interpret, and explain present state, including practices, relationships, structures, ongoing processes, opinions, or evident trends Siedlecki, (2020).

#### **3.3 Target Population**

Officials working at management level Project administrators, Managers, Agricultural Extension Officers, Policy Makers, Consultants and Technical Experts at Galana Kulanu Maize Irrigation project was involved in the study's target population because they are

engaged in daily activities for efficient operation of the project. The target population was 60. Table 3 lists the target population for the study.

**Table 3: Target Population**

<b>Management level</b>	<b>Population</b>
Project administrators	2
Managers	3
Agricultural Extension Officers	5
Policy Makers	10
Consultants	10
Technical Experts	30
<b>Total</b>	<b>60</b>

**Source:** Researcher (2024)

### **3.3 Sampling Technique and Sample Size**

According to Bryman and Bell (2015), the sample size is considered a representation of the population under study. The population were Project administrators, Managers, Agricultural Extension Officers, Policy Makers, Consultants and Technical Experts. All of the respondents were purposively selected. The table 4 below shows the sample size of the research study.

**Table 4: Sample Size**

<b>Management level</b>	<b>Sample Size</b>
Project administrators	2
Managers	3
Agricultural Extension Officers	5
Policy Makers	10
Consultants	10
Technical Experts	30
<b>Total</b>	<b>60</b>

**Source:** Researcher (2024)

### **3.4 Piloting of the Instruments**

The researcher administered questionnaires and interview inquiry to 12 staff in Garsen - Tana and Athi Rivers Development Authority, Tana River County. The participants selected for the pilot study shared similar characteristics with management levels involved in in the research study. The questionnaires were distributed and collected immediately after administration.

### **3.5 Data collection Methods and Procedures**

Self-administered questionnaires and interview guides were used. Respondents were able to elaborate on their answers to the questions or inquiry by using a self-administered questionnaire. This clarifies and is likely to offer suitable responses. When a self-administered questionnaire were not relevant, the researcher left to be collected later. The questionnaires were administered to the Agricultural Extension Officers, Policy Makers, Consultants and Technical Experts. The interview guides were administered to the

project administrators and the project managers. A letter of introduction from the university was included to boost the response rate while protecting the respondents' privacy, security, and confidence. The researcher was given permission by The National Commission for Science, Technology, and Innovation before carrying out the research.

### **3.6 Validity and Reliability of Research Instrument**

#### **3.6.1 Validity of Instrument**

Questions were carefully crafted to thoroughly measure most of the variable constructs, ensuring content validity. For criterion validity, the questions were designed to be relevant and unbiased. According to J. (2017), a pilot study used a sample size equal to 10% of the anticipated population for the main study to test the validity and reliability of the data collection tools (questionnaires). The pilot test involved administering six questionnaires and an interview guide to confirm the suitability and validity of the chosen format.

#### **3.6.2 Reliability of Instrument**

Sürücü and Maslakc (2020). described reliability as the extent to which a research instrument is expected to yield the same measured outcome upon repetition of measurements. To assess reliability in this study, a test-retest method was applied to six participants, representing 10% of the sample frame, with an additional four participants included to address one of the primary limitations of the Pearson Correlation coefficient when measuring reliability for two tests—namely, the overestimation of the true relationship in samples smaller than 15. A Pearson correlation coefficient of 0.796 indicated that the instruments possess acceptable reliability.

### 3.7 Data analysis and Presentation

After collecting the questionnaires, the researcher reviewed them for consistency and completeness before coding and entering the data for the closed questions. Once the data is entered, it underwent data cleaning to ensure there are no errors. Using SPSS, descriptive statistics such as frequencies, percentages, mean scores, and standard deviations were calculated for the research variables. These statistics helped identify the frequency, trend, and pattern in the collected data for meaningful interpretation. Quantitative data was presented in tables using frequencies. To examine the impact of technology adoption on food security in the Galana Kulalu maize irrigation project, regression analysis was also conducted. The following the regression model was used:

$$Y = B_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon_i$$

Where:  $Y$  = Food Security (Dependent Variable)

$B_0, \beta_1, \beta_2$  and  $\beta_3$  = constants

$X_1$  = Adoption of Project Management software

$X_2$  = Personnel Management information systems

$X_3$  = Stakeholder Engagement in Technology Adoption

$X_4$  = Adoption of Enterprise Resource Planning Systems

$\varepsilon_i$  = error term

### 3.8 Ethical Considerations

Researchers obtained informed consent from participants, explaining the research purpose, data usage, and privacy protections, and ensuring participants understand their rights, including withdrawal. Anonymization of data is essential to protect participant identities, especially when dealing with sensitive information. Secure data storage, using encrypted solutions and strong access controls, along with regular backups and physical

security for hard copies, is necessary to prevent unauthorized access, loss, or corruption. Data minimization practices should be followed, collecting only necessary data and promptly deleting unnecessary information. Access to research data was restricted to authorized personnel through password protection, user authentication, and access level management, with logs maintained for accountability.



## CHAPTER FOUR

### RESEARCH FINDINGS AND DISCUSSIONS

#### 4.1 Introduction

This chapter presents the findings and discussions of the research conducted on the Galana Kulalu Maize Irrigation Project, focusing on the integration of technology in enhancing food security. The study aims to assess the influence of Management Information Systems (MIS) on the efficiency of technology adoption, evaluate the impact of various financing structures on the successful implementation of technology, and analyze stakeholder engagement with technology-driven initiatives.

#### 4.2 Response Rate

The response rate for this study was 95%, with 57 out of 60 sampled respondents completing the survey. This high response rate indicates a strong engagement from participants, reflecting their willingness to contribute insights regarding the Galana Kulalu Maize Irrigation Project and its technological initiatives.

#### 4.3 Demographic Study

This section consists of gender, age and level of education

##### 4.3.1 Gender

From the study, 36 (63.2%) of the respondents identified as male, while 21 (36.8%) identified as female. This indicates that the majority of participants were male, which may influence the perspectives shared on the implementation of technology in the Galana Kulalu Maize Irrigation Project.

**Table 5: Gender**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	36	63.2	63.2	63.2
	Female	21	36.8	36.8	100.0
	Total	57	100.0	100.0	

**Source:** Field Data (2024)

#### 4.3.2 Age

The study reveals that respondents are distributed across three age ranges. Specifically, 22 (38.6%) of the respondents are aged between 18 and 35 years, while another 22 (38.6%) fall within the 36 to 55 years range, 13 (22.8%) respondents are above 55 years. This distribution indicates a balanced representation of younger and middle-aged individuals, which may provide diverse perspectives on the implementation of technology in the Galana Kulalu Maize Irrigation Project.

**Table 6: Age**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18 - 35 years	22	38.6	38.6	38.6
	36 - 55 years	22	38.6	38.6	77.2
	Above 55 years	13	22.8	22.8	100.0
	Total	57	100.0	100.0	

**Source:** Field Data (2024)

#### 4.3.3 Level of education

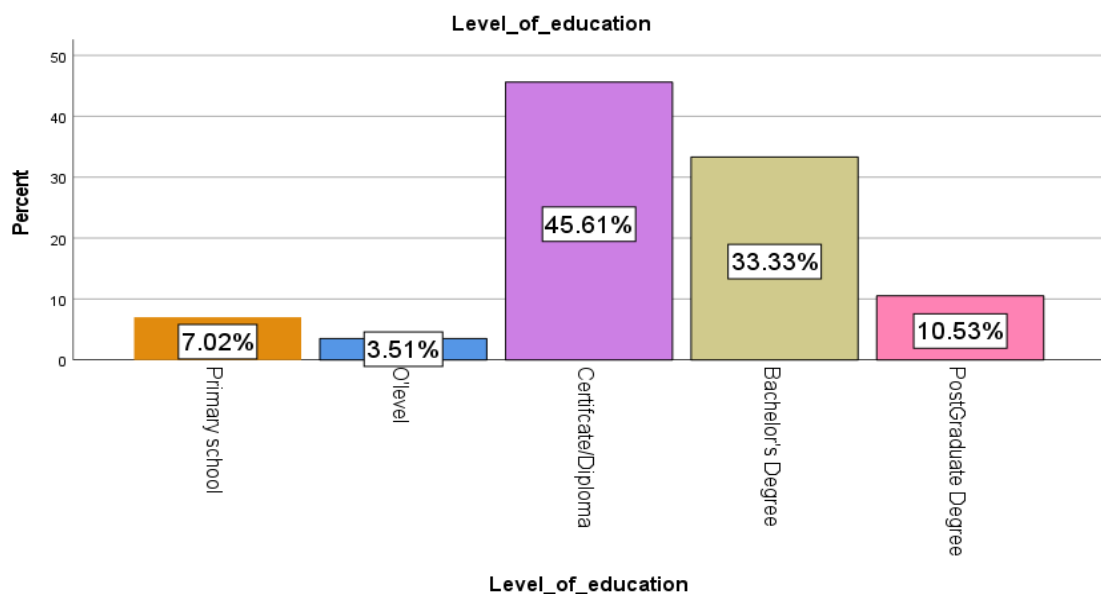
The study reveals a diverse educational profile among the respondents, reflecting a broad spectrum of educational attainment that may influence their perspectives on technology adoption in the Galana Kulalu Maize Irrigation Project. A small portion of the

participants, 4 (7.0%), completed primary school, while an even smaller group, 2 (3.5%), attained O'level qualifications. In contrast, a significant number of respondents hold certificates or diplomas, accounting for 26 (45.6%), which indicates a strong representation of vocational education, 19 (33.3%) of the respondents have obtained bachelor's degrees, and 6 (10.5%) possess postgraduate degrees. This distribution suggests that a majority of participants (79.1%) have achieved at least a diploma or higher, highlighting their potential to engage meaningfully with the project's technological aspects.

**Table 7: Level of education**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Primary school	4	7.0	7.0	7.0
	O'level	2	3.5	3.5	10.5
	Certificate /Diploma	26	45.6	45.6	56.1
	Bachelor's Degree	19	33.3	33.3	89.5
	Postgraduate Degree	6	10.5	10.5	100.0
	Total	57	100.0	100.0	

**Source:** Field Data (2024)



**Figure 2: Level of Education**

**Source:** Field Data (2024)

#### 4.3.4 For how long have you worked at Galana Kulalu

The study assessed the length of time respondents worked at the Galana Kulalu Maize Irrigation Project, providing insight into their experience and familiarity with the initiative. Among the participants, 18 (31.6%) reported having worked at the project for less than one year, indicating a fresh influx of personnel who brought new perspectives. A further 15 (26.3%) of respondents had been employed for between one to three years, contributing a moderate level of experience to the workforce, the largest group consisted of those who had worked at the project for three to five years, totaling 20 respondents (35.1%). This group represented the most experienced segment of the workforce, likely possessing valuable insights into the project's development and the challenges faced over time, 4 (7.0%) of the participants had been with the project for more than five years, showcasing a small yet crucial segment of long-term staff who provided continuity and institutional knowledge.

**Table 8: For how long have you worked at Galana Kulalu**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Less than 1 year	18	31.6	31.6	31.6
1 - 3 years	15	26.3	26.3	57.9
3 - 5 years	20	35.1	35.1	93.0
more than 5 years	4	7.0	7.0	100.0
Total	57	100.0	100.0	

**Source:** Field Data (2024)

#### 4.4 Descriptive Analysis

##### 4.4.1 Implementation of Management Information Systems (MIS)

The study sought to assess how the implementation of Management Information Systems (MIS) influenced the efficiency of technology adoption in the Galana Kulalu Maize Irrigation Project. The findings indicated a generally positive perception of MIS among

the respondents, as reflected in their ratings across several key statements. For the statement that the use of MIS has improved efficiency in operations within the project, the respondents provided a mean of 4.05, reflecting a standard deviation of 1.38, suggesting that they agreed on the significant role of MIS in enhancing operational efficiency. Similarly, the statement that MIS adoption has enhanced the speed of decision-making processes in the project received a mean of 4.26, with a standard deviation of 1.37, indicating strong agreement among participants regarding the impact of MIS on expediting decision-making. Respondents also acknowledged the contribution of MIS to improving communication among project stakeholders, with a mean of 4.11 and a standard deviation of 1.29, reinforcing the importance of effective communication facilitated by MIS. Additionally, the statement regarding the sufficiency of training on MIS tools received a mean of 4.16, reflecting a standard deviation of 1.47, indicating that most respondents felt adequately prepared to utilize these tools for efficient technology use, these results highlight the positive influence of MIS implementation on technology adoption within the Galana Kulalu Maize Irrigation Project, demonstrating its importance in enhancing operational efficiency, decision-making speed, and communication among stakeholders. The findings also underscore the necessity of providing sufficient training to ensure that staff can effectively leverage these systems in their work.

**Table 9: Implementation of Management Information Systems (MIS)**

	N	Minimum	Maximum	Mean	Std. Deviation
The use of MIS has improved efficiency in operations within the project.	57	1.00	5.00	4.0526	1.38127
MIS adoption has enhanced the speed of decision-making processes in the project.	57	1.00	5.00	4.2632	1.36965
MIS has contributed significantly to improving communication among project stakeholders.	57	2.00	5.00	4.1053	1.29124
Training on MIS tools has been sufficient to support efficient technology use.	57	1.00	5.00	4.1579	1.47345
Valid N (listwise)	57				

**Source:** Field Data (2024)

#### 4.4.2 Impact of different financing structures

The study sought to investigate the impact of different financing structures on the successful adoption of technology within the Galana Kulalu Maize Irrigation Project. The findings revealed varied perceptions among respondents regarding the effectiveness of the current financing arrangements. Regarding the statement that the current financing structure supports effective adoption of technology, the respondents provided a mean of 2.93, reflecting a standard deviation of 1.37. This indicates a general consensus that the existing financing framework may not fully facilitate effective technology adoption. In contrast, the statement about the availability of funding impacting the ability to adopt

new technology received a mean of 3.35 and a standard deviation of 1.53, suggesting that while funding availability is recognized as a contributing factor, it is not viewed as wholly sufficient for driving technology adoption. When evaluating the flexibility of the funding model in addressing emerging technology needs, respondents indicated a mean of 3.46 with a standard deviation of 1.51, reflecting a moderate perception of flexibility in the financing structures. However, the statement that changes in financing impact the continuity of technology use within the project garnered a notably higher mean of 4.33 and a standard deviation of 1.30. This finding indicates strong agreement among respondents that financing changes are critical for maintaining technology utilization, the results suggest that while challenges exist concerning the current financing structures particularly in supporting effective technology adoption there is a recognized importance of financing continuity for the successful integration of technology in the project. These insights underscore the need for a more supportive and flexible financing approach to enhance technology adoption and sustain its benefits within the Galana Kulalu Maize Irrigation Project.

**Table 10: Impact of different financing structures**

	N	Minimum	Maximum	Mean	Std. Deviation
The current financing structure supports effective adoption of technology.	57	1.00	5.00	2.9298	1.37399
Availability of funding impacts the ability to adopt new technology within the project.	57	1.00	5.00	3.3509	1.52937
The funding model in place is flexible enough to address emerging technology needs.	57	1.00	5.00	3.4561	1.51269
Changes in financing impact the continuity of technology use within the project.	57	1.00	5.00	4.3333	1.30018
Valid N (listwise)	57				

**Source:** Field Data (2024)

#### 4.4.3 Assess the extent to which stakeholders engage with technology-driven initiatives

The study sought to assess the extent to which stakeholders engage with technology-driven initiatives aimed at enhancing food security within the Galana Kulalu Maize Irrigation Project. The findings indicated a strong level of engagement and positive perceptions among stakeholders regarding these initiatives. Respondents indicated that stakeholders actively participate in technology-driven initiatives for food security, yielding a mean of 4.25 and a standard deviation of 1.33. This suggests a high level of agreement that stakeholder participation is robust and meaningful. Furthermore, the statement regarding sufficient communication between stakeholders and project management concerning technology use received a mean of 4.40 and a standard deviation

of 1.16, highlighting the effectiveness of communication in facilitating stakeholder involvement.

When assessing stakeholders' awareness of the benefits of technology adoption for food security, the respondents again scored a mean of 4.40, with a standard deviation of 1.21. This finding demonstrates that stakeholders are well-informed about how technology can enhance food security outcomes. Additionally, the ability of stakeholders to provide constructive feedback on technology initiatives related to food security garnered a mean of 4.26 and a standard deviation of 1.37, indicating that stakeholders feel encouraged to contribute their insights and perspectives on technology-driven initiatives, these findings reflect a strong engagement of stakeholders with technology-driven initiatives aimed at enhancing food security within the project. The results underscore the importance of effective communication and active participation in fostering a collaborative environment that supports the successful adoption and implementation of technology for improved food security outcomes.

**Table 11: Assess the extent to which stakeholders engage with technology-driven initiatives**

	N	Minimum	Maximum	Mean	Std. Deviation
Stakeholders actively participate in technology-driven initiatives for food security.	57	1.00	5.00	4.2456	1.32666
There is sufficient communication between stakeholders and project management regarding technology use.	57	1.00	5.00	4.4035	1.16281
Stakeholders are well-informed about the benefits of technology adoption for food security.	57	1.00	5.00	4.4035	1.20800
Stakeholders provide constructive feedback on technology initiatives related to food security.	57	1.00	5.00	4.2632	1.36965
Valid N (listwise)	57				

**Source:** Field Data (2024)

#### **4.4.4 Assess the extent to which adoption of enterprise resource planning systems on project performance**

The study sought to assess the extent to which the adoption of enterprise resource planning (ERP) systems relates to project performance in enhancing food security within the Galana Kulalu Maize Irrigation Project. The findings indicated a generally positive impact of ERP adoption on various aspects of project performance. Respondents reported

that ERP adoption has significantly improved project resource management efficiency, with a mean score of 4.53 and a standard deviation of 1.24. This reflects a strong consensus that the ERP system has played a crucial role in optimizing the management of resources. Additionally, the statement regarding the ERP system facilitating better tracking of project goals related to food security garnered a mean of 4.23 and a standard deviation of 1.50, indicating that stakeholders recognize the system's effectiveness in aligning project activities with food security objectives. Furthermore, the impact of ERP usage on the project's overall performance in enhancing food security received a mean of 4.32, along with a standard deviation of 1.39. This suggests that respondents perceive ERP usage as beneficial to the project's success in achieving its food security aims. Finally, the adequacy of training and support for ERP system use among staff members was evaluated, yielding a mean score of 4.30 and a standard deviation of 1.36, which indicates that stakeholders feel adequately prepared to utilize the system effectively, the findings emphasize the positive relationship between the adoption of ERP systems and improved project performance, particularly in the context of enhancing food security.

**Table 12: Assess the extent to which adoption of enterprise resource planning systems on project performance**

	N	Minimum	Maximum	Mean	Std. Deviation
ERP adoption has improved project resource management efficiency.	57	1.00	5.00	4.5263	1.24076
The ERP system has facilitated better tracking of project goals related to food security.	57	1.00	5.00	4.2281	1.50021
ERP usage has positively impacted the project's overall performance in enhancing food security.	57	1.00	5.00	4.3158	1.39076
Training and support for ERP system use have been adequate for staff members.	57	1.00	5.00	4.2982	1.36231
Valid N (listwise)	57				

**Source:** Field Data (2024)

## 4.5 Inferential Statistics

### 4.5.1 Regression

The study sought to explore the relationships between stakeholders' engagement with technology, different financing structures, and the implementation of Management Information Systems (MIS) in relation to project performance and food security. The regression analysis results are summarized in Table 13. The regression model indicated an R value of 0.416, suggesting a moderate correlation between the predictors and the dependent variable. The R Square value of 0.173 signifies that approximately 17.3% of

the variance in project performance and food security outcomes can be explained by the combined influence of stakeholder engagement, financing structures, and MIS implementation. The Adjusted R Square value of 0.127 suggests that, after accounting for the number of predictors in the model, the explanatory power remains relatively modest. The standard error of the estimate was calculated to be 4.04547, indicating the average distance that the observed values fall from the regression line. In terms of change statistics, the R Square change was noted as 0.173, with an associated F-change value of 3.704, which indicates the significance of adding the three predictors to the model. The degrees of freedom for this F-test were 3, suggesting that the predictors provided a statistically significant contribution to explaining project performance.

**Table 13: Regression**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1
1	.416 <sup>a</sup>	.173	.127	4.04547	.173	3.704	3

a. Predictors: (Constant), Stakeholders engage with technology, different financing structures, Implementation

**Source:** Field Data (2024)

#### 4.5.2 ANOVA

The ANOVA table indicates a regression sum of squares of 181.873, which reflects the variability explained by the regression model. The degrees of freedom (df) for the regression is 3, corresponding to the number of predictors used in the model. The mean square for the regression was calculated as 60.624. The F-statistic for the model was found to be 3.704, with a significance level (Sig.) of 0.017. This p-value indicates that the regression model is statistically significant, as it is below the conventional alpha level of 0.05. This suggests that at least one of the predictors significantly contributes to

explaining the variability in project performance and food security outcomes. In comparison, the residual sum of squares was 867.390, with 53 degrees of freedom, yielding a mean square of 16.366 for the residuals. The total sum of squares was calculated to be 1049.263, with 56 degrees of freedom.

**Table 14: ANOVA**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	181.873	3	60.624	3.704	.017 <sup>b</sup>
	Residual	867.390	53	16.366		
	Total	1049.263	56			

a. Dependent Variable: adoption of enterprise resource

b. Predictors: (Constant), Stakeholders engage with technology, different financing structures, Implementation

**Source:** Field Data (2024)

#### 4.5.3 Coefficients

The study examined the relationship between the predictors implementation of Management Information Systems (MIS), different financing structures, and stakeholder engagement with technology and the dependent variable, the adoption of enterprise resource planning systems. The coefficients obtained from the regression analysis are summarized in Table 15. The constant term (intercept) was found to be 8.889, indicating the expected value of the dependent variable when all predictors are zero. The unstandardized coefficient for the implementation of MIS was 0.471, suggesting that for each unit increase in the implementation of MIS, the adoption of enterprise resource planning systems is expected to increase by 0.471 units, holding other variables constant. This coefficient had a standard error of 0.151, yielding a t-value of 3.117 and a

significance level (Sig.) of 0.003, which indicates that this predictor is statistically significant at the 0.05 level.

For different financing structures, the unstandardized coefficient was 0.196 with a standard error of 0.124, resulting in a t-value of 1.576 and a significance level of 0.121. This suggests that while there is a positive relationship between financing structures and the adoption of enterprise resource planning systems, it was not statistically significant at the 0.05 level. The coefficient for stakeholder engagement with technology was -0.120, with a standard error of 0.130, leading to a t-value of -0.929 and a significance level of 0.357. This indicates that stakeholder engagement did not have a significant impact on the adoption of enterprise resource planning systems in this study.

**Table 15: Coefficients**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.889	3.186		2.790	.007
	Implementation different financing structures	.471	.151	.429	3.117	.003
	Stakeholders engage with technology	.196	.124	.201	1.576	.121
		-.120	.130	-.128	-.929	.357

a. Dependent Variable: adoption of enterprise resource

**Source:** Field Data (2024)

#### 4.5.4 Reliability

The study assessed the reliability of the measurement instruments used to evaluate the predictors related to the adoption of enterprise resource planning systems. The reliability coefficients are summarized in Table 16. The Cronbach's Alpha for the scale was found to be 0.827, indicating good internal consistency among the items. This value suggests

that the items are measuring the same underlying construct reliably, the Cronbach's Alpha based on standardized items was 0.834, which further supports the reliability of the scale. Both values exceed the commonly accepted threshold of 0.70 for indicating acceptable reliability.

**Table 16: Reliability**

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.827	.834	4

**Source:** Field Data (2024)

#### 4.5.5 ANOVA with Friedman's Test

The study employed Friedman's Test to evaluate differences among related groups, specifically assessing the variations in responses across different items related to the predictors of enterprise resource planning systems adoption. The results of the analysis are summarized in Table 17. The total sum of squares between items was 411.474, with 3 degrees of freedom, resulting in a mean square of 137.158. The Friedman's Chi-Square value was calculated to be 22.893, with a significance level (Sig) of 0.000. This indicates that there were statistically significant differences among the items, suggesting that the respondents had varying perceptions regarding the factors influencing the adoption of enterprise resource planning systems.

In terms of the total variance explained, the sum of squares within people was 2662.026, with a total of 171 observations, contributing to a total sum of squares of 3073.500. The grand mean across all items was calculated to be 16.3333. Additionally, the analysis provided Kendall's coefficient of concordance (W), which was found to be 0.089. This value indicates a low level of agreement among the respondents regarding the importance of the different items assessed. While there are significant differences among the items,

the low concordance suggests that the extent to which the respondents agreed on the relative importance of the factors was limited.

**Table 17: ANOVA with Friedman's Test**

		Sum of Squares	df	Mean Square	Friedman's Chi-Square	Sig
Between People		1549.167	56	27.664		
Within People	Between Items	411.474 <sup>a</sup>	3	137.158	22.893	.000
	Residual	2662.026	168	15.845		
Total		3073.500	171	17.974		
Total		4622.667	227	20.364		

Grand Mean = 16.3333

a. Kendall's coefficient of concordance  $W = .089$ .

**Source:** Field Data (2024)

#### 4.5.6 Correlations

The study investigated the relationships between key variables related to the adoption of enterprise resource planning systems, focusing on the implementation of Management Information Systems (MIS), different financing structures, and stakeholder engagement with technology-driven initiatives. The findings revealed a significant positive correlation between the implementation of MIS and stakeholder engagement with technology (Pearson Correlation = 0.392,  $p = 0.003$ ), indicating that improved MIS implementation is associated with increased stakeholder engagement. However, the correlation between different financing structures and stakeholder engagement was weak and not statistically significant (Pearson Correlation = -0.107,  $p = 0.427$ ), suggesting that financing structures may not play a crucial role in facilitating engagement. Additionally,

there was a significant positive correlation between stakeholder engagement and the adoption of enterprise resource planning systems (Pearson Correlation = 0.357,  $p = 0.006$ ), highlighting that higher levels of stakeholder involvement are linked to a greater likelihood of adopting these systems. Overall, these results underscore the importance of MIS implementation and stakeholder engagement in the successful adoption of enterprise resource planning systems, while indicating that the influence of financing structures on these relationships may be limited.

**Table 18: Correlations**

		Implementation	different financing structures	Stakeholders engage with technology	adoption of enterprise resource
Implementation	Pearson Correlation	1	-0.107	.392**	.357**
	Sig. (2-tailed)		0.427	0.003	0.006
	N	57	57	57	57
different financing structures	Pearson Correlation	-0.107	1	0.119	0.140
	Sig. (2-tailed)	0.427		0.379	0.299
	N	57	57	57	57
Stakeholders engage with technology	Pearson Correlation	.392**	0.119	1	0.064
	Sig. (2-tailed)	0.003	0.379		0.636
	N	57	57	57	57
adoption of enterprise resource	Pearson Correlation	.357**	0.140	0.064	1
	Sig. (2-tailed)	0.006	0.299	0.636	
	N	57	57	57	57

\*\* . Correlation is significant at the 0.01 level (2-tailed).

**Source:** Field Data (2024)

## **4.6 Discussion of Findings**

### **4.6.1 Management Information Systems (MIS) and Technology Adoption**

The study assessing the influence of Management Information Systems (MIS) on technology adoption within the Galana Kulalu Maize Irrigation Project highlighted a generally positive perception among respondents regarding the effectiveness of MIS in improving operational efficiency, decision-making speed, and stakeholder communication. Respondents rated the impact of MIS on operational efficiency at a mean of 4.05 (SD = 1.38), echoing findings from Al-Mamary et al. (2019), which underscored the significant role of system quality and information quality in enhancing perceived usefulness and user satisfaction, ultimately contributing to individual performance. Additionally, the strong agreement on the impact of MIS on decision-making speed (mean = 4.26, SD = 1.37) aligns with Lutfi's (2023) findings that system effectiveness directly influences business performance, emphasizing that MIS adoption fosters quicker, more informed decision-making. The respondents also acknowledged the role of MIS in improving communication, with a mean score of 4.11 (SD = 1.29), reinforcing Stamenkov and Zhaku-Hani's (2023) conclusion that perceived benefits and ease of use significantly affect post-adoption usage in mandatory settings. Furthermore, the adequacy of training on MIS tools, rated at a mean of 4.16 (SD = 1.47), reflects the critical importance of organizational support and user training highlighted by Al-Mamary et al. (2019) and Al-Okaily et al. (2020) in enhancing user satisfaction and overall performance. Collectively, these findings illustrate the essential role of MIS in promoting efficient technology adoption within the project, suggesting that a robust framework of training and support is crucial for maximizing the benefits of such systems in enhancing operational outcomes.

#### 4.6.2 Financing Structures on the Successful Adoption of Technology

The study investigating the impact of different financing structures on technology adoption within the Galana Kulalu Maize Irrigation Project revealed varied perceptions among stakeholders regarding the effectiveness of current financing arrangements. Respondents indicated a mean score of 2.93 (SD = 1.37) for the statement that the existing financing structure supports effective technology adoption, suggesting a consensus that it may not fully facilitate this process. In contrast, the importance of funding availability was acknowledged, with a mean score of 3.35 (SD = 1.53), highlighting that while funding is a contributing factor, it is not sufficient on its own. The flexibility of the funding model was rated at a mean of 3.46 (SD = 1.51), indicating a moderate perception of its adaptability to emerging technology needs. Notably, the strongest agreement was observed for the impact of financing changes on the continuity of technology use, with a mean score of 4.33 (SD = 1.30), emphasizing the critical role of financing continuity for sustaining technology utilization. These findings align with existing literature, such as Ranganathan and Lagarde (2011), who illustrated the benefits of structured financial interventions, and Alabi and Olaoye (2022), who noted that while technology adoption positively influences financial inclusion, it is often insufficient without supportive mechanisms. Moreover, the moderate flexibility perception mirrors the findings of Matsepe and Van der Lingen (2022), which emphasize the importance of adaptability in financing models., the study underscores the necessity for a more supportive and flexible financing approach that not only acknowledges the significance of funding availability but also adapts to the evolving technological needs of the project to enhance food security and achieve sustainable outcomes.

### **4.6.3 Stakeholder Engagement in Technology Adoption**

The findings from the current study, which evaluated stakeholder engagement with technology-driven initiatives aimed at enhancing food security in the Galana Kulalu Maize Irrigation Project, closely align with the existing literature on stakeholder engagement (SE) and its impact across various sectors. The study revealed a high level of stakeholder engagement, with a mean score of 4.25, indicating robust participation in technology-driven initiatives for food security. This finding resonates with Guo et al. (2023), who emphasized the critical role of strong stakeholder engagement in facilitating the adoption of green manufacturing practices. The positive correlation between stakeholder engagement and operational effectiveness in both studies underscores the necessity of involving stakeholders in decision-making processes, particularly when addressing significant challenges like food security and sustainability.

Moreover, the emphasis on effective communication in the current study, highlighted by a mean score of 4.40 for communication between stakeholders and project management, mirrors challenges identified by Best, Sibson, and Morgan (2024). Their exploratory study noted barriers such as communication inefficiencies that can hinder the effective use of technology in achieving operational goals. The findings from the Galana Kulalu Project demonstrate that sufficient communication facilitates stakeholder involvement, reinforcing the idea that overcoming communication barriers is vital for enhancing program delivery in any initiative. Additionally, the stakeholders' awareness of the benefits of technology adoption, also scoring a mean of 4.40, reflects the positive approach to technology highlighted by Aloulou et al. (2024). Their research noted that aligning technology management with effective implementation fosters resilience and improved performance in the banking sector during crises. Similarly, the current study

shows that well-informed stakeholders can significantly contribute to successful technology adoption, thereby enhancing project outcomes related to food security.

Furthermore, the ability of stakeholders to provide constructive feedback, indicated by a mean score of 4.26, reinforces the importance of participatory approaches in project management. This finding aligns with insights from Maina (2022) and Gichuru & Onjure (2019), who emphasized that stakeholder engagement through transparent communication and feedback mechanisms is essential for the sustainability of initiatives such as solar energy projects and software upgrades in Kenya. By fostering an environment where stakeholders feel encouraged to share their insights, the project can benefit from diverse perspectives that enhance decision-making processes. The findings also resonate with the works of Moetlhoa et al. (2024), who identified challenges faced in implementing digital initiatives in South Africa. While the current study showcases positive perceptions and engagement, it is crucial to remain vigilant about potential barriers that could arise in the future. As noted by Oriekhoe et al. (2024), integrating technology, such as blockchain in food supply chains, requires a well-informed and engaged stakeholder base to be effective, this study's results underscore the significance of stakeholder engagement, effective communication, and awareness in the successful adoption of technology-driven initiatives for food security, reinforcing insights from the broader literature on stakeholder engagement across various sectors.

#### **4.6.4 Adoption of Enterprise Resource Planning Systems**

The findings of the current study, which assessed the impact of Enterprise Resource Planning (ERP) systems on project performance in enhancing food security within the Galana Kulalu Maize Irrigation Project, resonate strongly with the existing literature on ERP adoption. The study highlighted a positive correlation between ERP adoption and various facets of project performance, notably resource management efficiency, tracking

project goals, and overall project success in food security initiatives. For instance, the research conducted by Emon et al. (2023) emphasized the critical role of user engagement and organizational support in the effective adoption of ERP systems. The positive response from stakeholders regarding the improvement in project resource management efficiency (mean score of 4.53) aligns with Emon et al.'s findings on the necessity of training and support for successful ERP implementation. Similarly, the study's results regarding the ERP system's facilitation of better tracking of project goals (mean of 4.23) echo Khatatbeh et al.'s (2023) assertion that perceived utility and ease of use are pivotal in enhancing system adoption and overall performance, as they are integral to achieving strategic objectives.

Moreover, Alsmairat et al. (2022) identified critical success factors impacting ERP adoption, emphasizing aspects such as complexity and compatibility. The findings of the current study, particularly regarding stakeholders' satisfaction with training and support (mean of 4.30), indicate that adequate training is crucial for overcoming potential barriers to ERP adoption, akin to the factors mentioned by Alsmairat et al. Aremu et al. (2019) highlighted the significance of organizational culture and top management support in driving ERP adoption among medium-sized enterprises. The findings in this study suggest that similar dynamics may exist within the context of agricultural projects, where leadership and cultural alignment with technology adoption are essential for optimizing ERP utilization. Fatimah and Trisminingsih (2018) also pointed out the importance of evaluating user satisfaction and organizational impact. The current study's results, particularly in terms of stakeholders' perceptions of ERP's contribution to enhancing food security, reinforce this notion, showcasing the system's tangible benefits in project outcomes.

The findings from Shimange and Pillay (2023), which discuss barriers to ERP adoption such as system complexity and budget constraints, further contextualize the necessity for effective change management and training initiatives within the Galana Kulalu Maize Irrigation Project, the investigation by Gabryelczyk (2020) on the role of business process management (BPM) in ERP systems emphasizes that understanding the operational processes is crucial for successful ERP integration. The positive outcomes reported in the current study suggest that integrating BPM principles with ERP systems can lead to enhanced project performance in food security initiatives, the study's findings collectively affirm the literature's emphasis on the positive impact of ERP systems on organizational performance, highlighting user engagement, adequate training, and strategic alignment as essential elements for successful ERP adoption in enhancing food security through effective project management.

## CHAPTER FIVE

### SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 Introduction

Chapter Five provides a clear summary of the study's findings, conclusions, and recommendations. In this chapter, we review the important insights gained from exploring how Management Information Systems (MIS) affect technology adoption in the Galana Kulalu Maize Irrigation Project. We highlighted key results related to project management, operational efficiency, and stakeholder involvement. Additionally, this chapter offers practical recommendations to improve MIS implementation, helping to ensure that the lessons learned are applied to enhance outcomes in similar agricultural projects.

#### 5.2 Summary of Findings

##### 5.2.1 Role of MIS in Enhancing Operational Efficiency

The findings indicate that MIS plays a crucial role in improving operational efficiency within the Galana Kulalu Maize Irrigation Project. Respondents rated the effectiveness of MIS in streamlining operations with a mean score of 4.05, reflecting a strong agreement that the system significantly enhances productivity. This improvement is likely due to the automation of various processes, enabling staff to manage tasks more effectively and reducing the time taken to complete them. The system facilitates better tracking of resources, irrigation schedules, and overall project management. Consequently, this increased efficiency can lead to more effective irrigation practices, ultimately enhancing crop yields and ensuring sustainable resource use. The emphasis on operational efficiency is particularly important in agriculture, where timely interventions can significantly impact outputs.

### **5.2.2 Impact of MIS on Decision-Making Processes**

The study also examined the influence of MIS on decision-making processes within the project. The respondents provided a mean score of 4.26, suggesting a strong belief that MIS expedites decision-making significantly. The ability to access real-time, accurate data allows project managers and stakeholders to make informed decisions quickly, which is essential in the agricultural sector, where conditions can change rapidly. Enhanced decision-making capabilities contribute to better resource allocation and problem-solving, enabling the project to adapt effectively to challenges and optimize its operations. This responsiveness is critical for the success of the project, particularly in maximizing the benefits of investments in technology.

### **5.2.3 Effectiveness of MIS in Improving Communication Among Stakeholders**

Another significant finding was the role of MIS in enhancing communication among project stakeholders, with a mean score of 4.11. This suggests that MIS has facilitated improved information sharing and collaboration among team members, project managers, and other stakeholders. Effective communication is vital for cohesive teamwork, as it ensures that all parties are informed about project developments and changes. The transparency provided by the system fosters trust among stakeholders and encourages collaborative problem-solving, which is essential for addressing the complex challenges faced in agricultural projects. Improved communication not only strengthens relationships among team members but also enhances the overall effectiveness of the project.

### **5.2.4 Adequacy of Training for Utilizing MIS Tools**

Finally, the study assessed the adequacy of training provided to staff for utilizing MIS tools. Respondents rated the training positively, with a mean score of 4.16, indicating that they feel well-prepared to use these technologies effectively. Adequate training is

crucial for maximizing the benefits of MIS, as it enables staff to navigate the system confidently and leverage data for enhanced performance. Continuous training and support are essential for maintaining user proficiency, particularly as technology evolves. The positive perception of training highlights the importance of investing in human capital to ensure that staff can effectively utilize MIS for optimal project outcomes.

## **5.2 Conclusions of the Study**

The study concluded that MIS plays a vital role in enhancing operational efficiency within the Galana Kulalu Maize Irrigation Project. The positive perception of MIS among respondents, reflected in their high mean ratings, indicates that the system streamlines processes, allowing for better management of resources and time. By automating tasks and providing easy access to vital information, MIS enables staff to work more effectively, ultimately improving productivity and crop yields.

The study concluded that MIS significantly impacts decision-making processes in the project. The strong agreement among respondents that MIS expedites decision-making highlights its effectiveness in providing real-time, accurate data. This timely access to information empowers project managers and stakeholders to make informed decisions quickly, enhancing the project's ability to adapt to changing conditions and optimize operations. The findings emphasize that effective decision-making is crucial for the success of agricultural initiatives, where quick responses can make a considerable difference.

The study concluded that MIS significantly improves communication among stakeholders in the Galana Kulalu Maize Irrigation Project. The positive feedback regarding communication reflects the system's ability to foster transparency and collaboration among team members, project managers, and external stakeholders.

Effective communication is essential for building trust and ensuring that everyone involved in the project is aligned with its goals and objectives. The findings suggest that MIS not only enhances operational processes but also strengthens relationships, ultimately contributing to a more cohesive project environment.

The study concluded that adequate training is crucial for the effective utilization of MIS tools. Respondents expressed confidence in their ability to use the system, indicating that the training provided has been sufficient. This confidence is essential for maximizing the benefits of MIS, as it allows staff to navigate the system effectively and utilize data for improved performance. The findings underscore the importance of ongoing training and support, especially in a rapidly evolving technological landscape, to ensure that staff can fully leverage the capabilities of MIS.

#### **5.4 Recommendations of the Study**

The study recommended that ongoing training programs be established to ensure that all staff members are proficient in using MIS tools. Regular training sessions should be organized to keep team members updated on new features and functionalities of the system. This not only improved their confidence and competence in utilizing the technology but also maximize its potential benefits for operational efficiency and decision-making.

The study recommended that efforts be made to integrate MIS with other relevant technologies and systems used in agricultural management. This integration can facilitate seamless data exchange and collaboration among different departments and stakeholders, leading to improved coordination and resource management. A holistic approach to technology adoption created a more interconnected and efficient project environment.

The study recommended fostering greater stakeholder engagement in the implementation and ongoing use of MIS. Regular meetings and feedback sessions should be organized to gather input from all users, including project staff, managers, and external partners. This engagement helped identify challenges early, encourage collaboration, and ensure that the system meets the diverse needs of its users.

### **5.5 Recommendations for Further Studies**

The study recommended conducting comparative studies to evaluate the effectiveness of MIS in different agricultural projects and regions. This could help identify best practices and common challenges associated with MIS adoption, allowing for a better understanding of the contextual factors that influence technology integration. Such studies can highlight strategies that have been successful in various settings and provide actionable insights for future implementations.

The study suggested that longitudinal studies be carried out to track the adoption and sustained use of MIS over time. By examining changes in efficiency and decision-making as the project progresses, researchers can gain insights into how user engagement evolves, what factors contribute to long-term success, and how technological advancements impact operational practices in agricultural settings.

The study emphasized the need for research focused on user experience and satisfaction among stakeholders using MIS. Understanding the perspectives of farmers, project managers, and other users can provide valuable insights into their challenges and preferences. This information can inform system design improvements, ensuring that MIS effectively meets the needs of all users involved in agricultural projects.

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## APPENDICES

### Appendix I: Informed Consent Letter

**Dear Participant,**

I'd like to ask you to take part in a research project called (**ANALYSIS OF TECHNOLOGY ADOPTION ON FOOD SECURITY IN AGRICULTURAL PROJECTS PERFORMANCE: A CASE OF THE GALANA KULALU MAIZE IRRIGATION PROJECT.**): I'm writing my master's project while I'm enrolled at Mount Kenya University's (MASTER OF BUSINESS ADMINISTRATION) program. The investigational goal of the study is to: (**The study seeks to analyze the impact of technology adoption on food security and the performance of agricultural projects, with a specific focus on the Galana Kulalu Maize Irrigation Project.**)

It is entirely up to you whether or not you take part in this study. You may choose not to answer any questions at all or leave them blank. Beyond the dangers associated with daily living, there are no recognized risks associated with involvement. Your comments will be kept private and anonymous. The results of this study's data will be kept confidential and only given as a combined total. Your specific responses to this questionnaire will only be known by the researchers. You won't directly gain anything by taking part in this study. However, you could find it fascinating to discuss the difficulties raised in the study, and it might also be helpful to the industry and to customers or other people in the future who have similar worries.

Please provide the most accurate responses you can to the questionnaire's questions if you accept to take part in this experiment. The completion time should be about seven minutes. To allow me to finish the project report, please return the questionnaire as soon as feasible.

Please contact the Ethics Review Committee, Mount Kenya University. P.O Box 342-01000-Thika. Email: [cgsr@mku.ac.ke](mailto:cgsr@mku.ac.ke). Tel: 254709153000, if you have any inquiries concerning your rights as a study participant.

I appreciate your help with this crucial project.

#### **CONSENT**

I've read, understand, and have had a chance to ask questions about the material presented. I am aware that my participation is entirely optional and that I may stop at any moment, for any reason, and without incurring any fees. I am aware that a copy of this permission form will be sent to me. I freely consent to participate in this research.

Participant's signature \_\_\_\_\_ Date \_\_\_\_\_  
Investigator's signature \_\_\_\_\_ Date \_\_\_\_\_

## Appendix II: Research Questionnaire

The questions below are for the purposes of analyzing the influence of technology adoption in project management on the performance of agricultural development projects: a case of the Galana Kulalu irrigation project. Your opinions as reflected in this questionnaire are important to this study and was held in confidentiality. Therefore, you are requested to fill this questionnaire in the most free and honest way possible.

Do not write your name on the questionnaire. Thank you in advance for your time and cooperation.

Please tick or fill in the blank spaces where appropriate to you

### SECTION A: BACKGROUND INFORMATION OF THE RESPONDENTS

1. What is your gender? (*Please tick*) Male  Female
2. What is your age bracket? (*Please tick*)  
 18 – 35 years       36 – 55 years       Above 55 years
3. What is your highest level of education? (*Please tick*)  
 Primary School  O’level  Certificate/Diploma  Bachelor’s Degree  Others   
 If others  please specify.....
4. For how long have you worked at Galana Kulalu (*Please tick*)  
 Native  1 – 3 years  4 to 6 years  Over 7 years

**Objective 1: To assess how the implementation of Management Information Systems (MIS) influences the efficiency of technology adoption in the Galana Kulalu Maize Irrigation Project.**

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The use of MIS has improved efficiency in operations within the project.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MIS adoption has enhanced the speed of decision-making processes in the project.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

MIS has contributed significantly to improving communication among project stakeholders.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Training on MIS tools has been sufficient to support efficient technology use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Objective 2: To investigate the impact of different financing structures on the successful adoption of technology.**

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The current financing structure supports effective adoption of technology.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Availability of funding impacts the ability to adopt new technology within the project.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The funding model in place is flexible enough to address emerging technology needs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Changes in financing impact the continuity of technology use within the project.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Objective 3: To assess the extent to which stakeholders engage with technology-driven initiatives aimed at enhancing food security.**

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Stakeholders actively participate in technology-driven initiatives for food security.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There is sufficient communication between stakeholders and project management regarding technology use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stakeholders are well-informed about the benefits of technology adoption for food security.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Stakeholders provide constructive feedback on technology initiatives related to food security.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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**Objective 4: To assess the extent to which adoption of enterprise resource planning (ERP) systems on project performance relates to enhancing food security.**

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
ERP adoption has improved project resource management efficiency.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The ERP system has facilitated better tracking of project goals related to food security.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ERP usage has positively impacted the project's overall performance in enhancing food security.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Training and support for ERP system use have been adequate for staff members.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### Appendix III: Interview Guides

The questions below are for the purposes of analysis of technology adoption on food security in agricultural project performance: a case of the Galana Kulalu maize irrigation project. Your opinions as reflected in this questionnaire are important to this study and was held in confidentiality. Therefore, you are requested to fill this questionnaire in the most free and honest way possible.

Do not write your name on the questionnaire. Thank you in advance for your time and cooperation.

#### Bio Data

1. Please tick your gender

Male

Female

2. What is your highest academic level attained?

Diploma

Bachelors

Masters

Others(specify) \_\_\_\_\_

#### Section 1: Management Information System (MIS) and Technology Adoption

1. How do you ensure the accuracy and relevance of information within your MIS?

.....

2. How would you evaluate the **system quality** of your current MIS in terms of performance and reliability?

.....

3. How do you measure the **service quality** provided by the MIS support team?

.....

4. How satisfied are you with the **user satisfaction** levels concerning the usability and functionality of your MIS?

.....

### **Section 2: Financing Structures and Adoption of Technology**

1. What are your main sources of **access to capital** for adopting new technology in your organization?

.....

2. How does the **cost of capital** affect your decision-making process regarding technology adoption?

.....

3. What methods do you use for **financial risk management** when adopting new technologies?

.....

4. Are there specific **investment incentives** or subsidies that have encouraged your organization to adopt new technologies?

.....

### **Section 3: Stakeholder Engagement in Technology Adoption**

1. How does your organization ensure effective **information sharing** among stakeholders during technology adoption?

.....

2. How are stakeholders involved in the **decision-making** process for technology adoption?

.....

3. How do you maintain **partnerships with parties** such as vendors or consultants during technology adoption?

.....

**Section 4: Adoption of Enterprise Resource Planning Systems (ERP)**

1. How does your **organizational culture** impact the adoption of ERP systems?

.....

2. What are the ongoing **maintenance costs** associated with your ERP system?

.....

3. How would you describe the **system complexity** of your ERP system?

.....

**Section 5: Food Security**

1. How does your organization contribute to ensuring **food availability** in your region?

.....

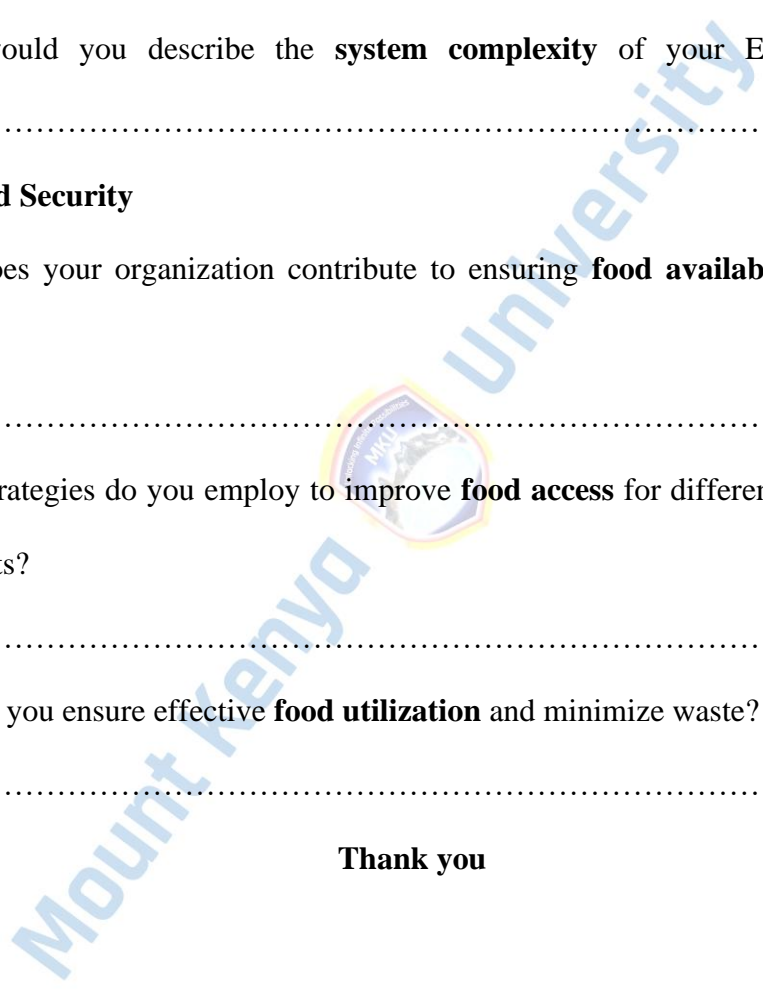
2. What strategies do you employ to improve **food access** for different population segments?

.....


3. How do you ensure effective **food utilization** and minimize waste?

.....

**Thank you**



## Appendix IV: ERC Letter

  
**Mount Kenya University**

REF: MKU/ISERC/4347 Date: 06 September 2024  
TO: MUTUKU MULI  
REG: MSCPM/2023/46725

Dear Sir/Madam,


**RE: ANALYSIS OF TECHNOLOGY ADOPTION ON FOOD SECURITY IN AGRICULTURAL PROJECTS PERFORMANCE: A CASE OF THE GALANA KULALU MAIZE IRRIGATION PROJECT**

This is to inform you that **Mount Kenya University** has reviewed and approved your above research proposal. Your application approval number is **3067**. The approval period is **06/09/2024 - 05/09/2025**.

This approval is subject to compliance with the following requirements:

- i. Only approved documents including informed consents, study instruments, MTA will be used
- ii. All changes including amendments, deviations and violations are submitted for review and approval by **Mount Kenya University**
- 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 **Mount Kenya University** 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 **Mount Kenya University** 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 prior to 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 **Mount Kenya University**

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

Yours sincerely,  
  
Dr. Alfred Owino, PhD  
Chairman, Mount Kenya University ISERC

**MOUNT KENYA UNIVERSITY**  
**ETHICS REVIEW COMMITTEE**  
P. O. Box 342 - 01000,  
THIKA

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Main Campus, General Kago Road, P.O. Box 342-01000 Thika.  
Cell: +254 709 153 000 | +254 709 153 200

## Appendix V: Introductory Letter



### DIRECTORATE OF GRADUATE STUDIES

MSCPM/2023/46725

6<sup>th</sup> September, 2024

*National Commission for Science Technology & Innovation (NACOSTI)  
Off Waiyaki Way, Upper Kabete,  
P.O Box 30623- 00100  
NAIROBI, KENYA*

Dear Sir/Madam,


**RE: MUTUKU MULI- REGISTRATION NO. MSCPM/2023/46725**

The purpose of this letter is to introduce the above named student who is pursuing **Master of Science in Project Management** in the **Department of Management** in the school of **Business and Economics**.

The title of the research is "Analysis of Technology Adoption on Food Security in Agricultural Projects Performance: A Case of the Galana Kulalu Maize Irrigation Project." It has been cleared by the University's Ethics Review Committee (Certificate attached) and now has to proceed to the field to collect data between **September, 2024 and November, 2024**.

Any assistance accorded to the student will be highly appreciated.

Thank you.

  
**Dr. Samuel M. Karenga, Ph.D**  
**Director, Graduate Studies**  
Enc.

Mount Kenya University  
P.O. Box 342-01000, Thika  
Office of the Director  
Graduate Studies

Main Campus, General Kago Road, P.O. Box 342-01000 Thika.  
Cell: +254 709 153 000 / +254 709 153 200  
Email: info@mkcu.ac.ke, Web: www.mkcu.ac.ke  
Chartered and ISO 9001 : 2015 Certified Institution.  
**Unlocking Infinite Possibilities**

**Appendix VI: Nacosti Permit**



## Appendix VII: Field Data



### COUNTY GOVERNMENT OF TANA RIVER

Ministry of Education  
State Department of Basic Education



Email: [info@tanariver.go.ke](mailto:info@tanariver.go.ke)  
Website: [www.tanariver.go.ke](http://www.tanariver.go.ke)  
When replying please quote:

County Director of Education  
P. O. Box 29-70101 Hola  
Kitui

REF: CGTR/CTY/EDU/RESEARCH/GEN/64/VOL.IV/56

18<sup>th</sup> September, 2024

MUTUKU MULI  
MOUNT KENYA UNIVERSITY  
MSCPM/2023/46725

#### RE: RESEARCH AUTHORIZATION

The county director of education is in receipt of your letter dated **18/September/2024** and a copy of your research license from NACOSTI Ref No: 123713 of License Number **NACOSTI/P/24/4138** dated **12/September/2025** requesting for authority to carry out research on **“ANALYSIS OF TECHNOLOGY ADOPTION ON FOOD SECURITY IN AGRICULTURAL PROJECTS PERFORMANCE: A CASE OF THE GALANA KULALU MAIZE IRRIGATION PROJECT”**.

Permission is hereby granted to carry out the research for the period ending **12/September/2025** as requested.

You are kindly advised to deposit a copy of the final research report to this office.


COUNTY GOVERNMENT OF TANA RIVER  
DIRECTOR OF EDUCATION  
24<sup>th</sup> AUG 2024  
P.O. BOX 29-70101  
HOLA

Amabu Aisha  
County Director  
Tana River

## Appendix VIII: Similarity Index

# MUTUKU MULI

## ANALYSIS OF TECHNOLOGY ADOPTION ON FOOD SECURITY IN AGRICULTURAL PROJECTS PERFORMANCE: A CASE OF THE ...

 PROJECT  
 MASTERS  
 Mount Kenya University

### Document Details

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99 Pages  
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Mount Kenya University

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