THE EFFICACY OF PRODUCT FOOD SAFETY STANDARDS AND QUALITY MANAGEMENT SYSTEMS AMONG SMALLHOLDER FARMERS IN KENYA

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THE EFFICACY OF PRODUCT FOOD SAFETY STANDARDS AND QUALITY MANAGEMENT SYSTEMS AMONG SMALLHOLDER FARMERS IN KENYA

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Doctor in Business Administration (DBA)

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Abstract

THE EFFICACY OF PRODUCT FOOD SAFETY STANDARDS AND QUALITY MANAGEMENT SYSTEMS AMONG SMALLHOLDER FARMERS IN KENYA

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The recognition of global product food safety standards and quality management systems has resulted in smallholder farmers in Kenya taking great strides to incorporate change management processes to become competitive and access international markets to improve their net returns and change livelihoods. The purpose of this study was to explore the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. An explanatory sequential mixed method design was adopted to allow a comparative impact study to determine the efficacy prior and post implementation of product food safety standards and quality management systems among smallholder farmers in Kenya. The study combined quantitative and qualitative research methodologies. Quantitative data was first collected using primarily closed-ended questionnaires administered to 215 smallholder farmers randomly selected from four purposively chosen sub-counties of Meru county. This was followed by interviews to collect qualitative data from 8 key stakeholders in the agricultural sector of Kenya. The Statistical Package for Social Sciences (SPSS) version 20 was used to obtain study findings that addressed the research objectives. The thematic framework approach was used to analyze the qualitative data. The study results suggest that smallholder farmers have benefited extensively from implementing product food safety standards and quality management systems by accessing new markets. Smallholder farmers estimated annual farm produce sales above Kes 100,000 have increased from 3.3% to 28.4% after adopting good agricultural practices. However, 31.2% of the respondents felt the cost of such programs was a challenge, and another 31.2% felt a challenge getting technical expertise to implement the change management process. Based on the findings of the study, it is recommended that smallholder farmers undertake initiatives to establish and implement product food safety standards and quality management systems to improve their business processes, gain access to international markets, and improve livelihoods.

Keywords: Food safety standards, Quality Management Systems, Smallholder Farmers, Agriculture

Declaration

I declare that this thesis has been composed solely by myself and that it has not been submitted, in whole or in part, in any previous application for a degree. Except where states otherwise by reference or acknowledgment, the work presented is entirely my own.

AI Acknowledgment

Non-Use of AI:

I acknowledge that I have not used any AI tools to create, proofread or produce any text or ideas related to any draft or final versions of the thesis.

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Dedication

This study is dedicated to my dear wife Charity, my lovely children Jesse and Stanley, and aunty Esther, who have encouraged me throughout the doctorate journey to achieve the highest level of accomplishment in my academic qualifications. I bless the Almighty God from deep within my heart for my family.

"You don't choose your family. They are God's gift to you, as you are to them." – Desmond Tutu.

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insights on agricultural change management processes prior and post implementation of the product food safety standards and quality management systems.

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List of Abbreviations

AFA HCD	Agriculture and Food Authority Horticultural Crop Directorate
ASDS	Agricultural Sector Development Strategy
BRC	British Retail Consortium
CAC	Codex Alimentarius Commission
CBO	Community Based Organizations
CSR	Corporate Social Responsibility
ERSWEC	Economic Recovery Strategy for Wealth and Employment Creation
EU	European Union
FAO	Food and Agriculture Organization
FPEAK	Fresh Produce Exporters Association of Kenya
GAP	Good Agricultural Practices
GDP	Gross Domestic Product
GMP	Good Manufacturing Practices
HACCP	Hazard Analysis and Critical Control Point
IGAD	Intergovernmental Authority on Development
ISO	International Standards Organization
KARI	Kenya Agricultural Research Institute
KEBS	Kenya Bureau of Standards
KEPHIS	Kenya Plant Health Inspectorate Service
KRDS	Kenya Rural Development Strategy
MTISP	Medium Term Investment Strategic Plan

NAIPs	National Agricultural Investment Plans
NNAPF	National Nutrition Action Plan Framework
QMS	Quality Management Systems
SDGs	Sustainable Development Goals
SPSS	Statistical Package for Social Studies
SWOT	Strengths, Weaknesses, Opportunities and Threats
UREC	Unicaf Research Ethical Committee
WHO	World Health Organization

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CHAPTER 1: INTRODUCTION

Kenya is a developing lower middle-income country with an emerging market with dynamic growth and business opportunities that have positioned it as an averagely industrial nation ahead of its other East African community peers (GIZ, 2023). Agriculture continues to play an important role in the rural economy of Kenya. The country of Kenya is divided by the 2010 constitution into units of devolved governments commonly referred to as county governments. Agriculture has been fully devolved under the county government as an essential service provision in ensuring food security. According to a recent study by the Food and Agriculture Organization (FAO, 2023), agriculture in Kenya is considered large and complex, employing more than 40 per cent of the total population, out of which 70 per cent or more are rural people.

Furthermore, the agriculture sector is considered a key sector to Kenya's economy, contributing directly 20 per cent of the Gross Domestic Product (GDP) and another 27 per cent contribution indirectly through linkages with other sectors in the public, parastatals, non-government and private organizations. The agriculture sector in Kenya also accounts for 65 per cent of Kenya’s export earnings (IFAD, 2023). In addition, it provides more than 80 per cent of livelihood directly and indirectly to the Kenyan population through employment, income and food security needs (FAO, 2023).

Trade liberalization in Kenya in the 1990s and the formation of export promotion programs are major success factors that have resulted in the promotion of agriculture and horticulture exports to international markets, mainly in the EU, UK and Middle East (Githiga et al., 2022). However, the recent global market trends, as further mentioned by the author, have posed new challenges threatening the participation and sustainability of Kenyan exports because of increased competition

and compliance with regulatory standards such as product food safety standards and quality management systems.

Smallholder farmers in Kenya are the main drivers of the country's agricultural production, accounting for 70 per cent of the marketed agricultural production (Raithatha, 2019). The smallholder farmers live and cultivate on farms with average land sizes smaller than 2 hectares (FAO, 2023). However, the distribution of farmland sizes for smallholder farmers can vary depending on the agroecological and democratic conditions as well as the economic and technological factors prevalent from county to county. According to FAO (2023), many of the smallholder farmers in Kenya are not wealthy and have limited access to markets and services. Nevertheless, despite these constraints, they produce food for a substantial proportion of the world's population. In addition, smallholder farmers in Kenya have gone to great lengths to identify and establish global product food safety standards and quality management systems to improve their operating and production structures, enabling them to gain access to more profitable markets and improve their livelihoods.

Generally, there seems to be an increased awareness and recognition of the smallholder farmer's efforts in Kenya to optimize production and access international markets to improve their returns and livelihoods. As a result, smallholder farmers in Kenya have formed robust forward and backward linkages to global markets that promote the values and practice of implementing product food safety standards and quality management systems (Mercy et al., 2010). Product food safety standards and quality management systems are tools used to improve and regulate the quality and safety of agricultural products for marketing services across borders (Shaw et al., 2014). Therefore, smallholder farmers in Kenya have proliferated in response to the changes in the global agri-food

systems (Lee et al., 2012) to reduce risks in the food supply chains against potential contamination. As a result, smallholder farmers assessed as compliant with product food safety standards and quality management systems are then considered to show safer agri-food systems than those not evaluated.

Currently, in Kenya, the primary product food safety standards and quality management systems that smallholder farmers have implemented include Global Gap Certification, Organic Certification, HACCP and ISO 9001 Quality Management Systems. It is expected that more compliance standards for smallholder farmers will continue being introduced in Kenya as the battle continues for enhanced global food value chain structures, agri-food safety and quality standards.

However, according to Lee et al. (2012), the increased demand for product food safety standards and quality management systems has continuously brought ongoing debates about whether they work as a barrier for smallholder farmers and thus hinder poverty reduction in developing countries. The determination and establishment of product food safety standards and quality management systems are considered not cheap but rather costly and time-consuming because of the rigorous implementation processes in the sustainability of the requirements of the standards (Podger et al., 2018).

The study, consequently, considers the complex and important role that agriculture plays in the rural economy of Kenya. Also, the study considers that smallholder farmers in Kenya are the main drivers of the country's agricultural production and play a unique role that integrates into the larger diversity of the national economy. The study further considers that smallholder farmers in Kenya have gone to great lengths to incorporate change management processes that recognize global product food safety standards and quality management systems in their farm operations.

According to the literature review, such changes give smallholder farmers access to the international markets, which are more profitable, leading to increased sales returns and improved livelihoods. Nevertheless, though deemed beneficial, implementing product food safety standards and quality management systems is burdensome and costly to sustain in the long term.

Therefore, the study sought to identify the problem gap arising from the change management process through a comparative analysis exploring efficacy prior and post implementation of product food safety standards and quality management systems by smallholder farmers in Kenya. Once the problem gaps have been identified and problem solutions from the research findings identified and implemented, the smallholder farmers will participate sustainably in the international markets and improve their livelihoods.

The approach and application of the study will provide more hard evidence to the existing studies on the value of implementing product food safety standards and quality management systems among smallholder farmers in Kenya. In addition, the study also determines if the amount of time, effort and money spent on the change management process for such programs by smallholder farmers in Kenya is justifiable.

Statement of the Problem

It is estimated that 80% of the agricultural output in Kenya is from 7.5 million smallholder farmers with land sizes between 1-5 acres (FTMA, 2022). In addition, only 4% of all fresh fruits and vegetables produced by smallholder farmers in Kenya are exported to international and regional markets, while over 90% are consumed locally (FPEAK, 2021). Following the recent opportunities created for smallholder farmers in Kenya to access more international markets, there is an increase

in the number of smallholder farmers in Kenya undertaking change management process decisions towards implementing product food safety standards and quality management systems (Jacobi et al., 2020).

However, there is also rising concern about whether implementing product food safety standards and quality management systems works as a barrier for smallholder farmers in Kenya, thus hindering efforts towards poverty reduction (Kamara et al., 2019). The determination and establishment of product food safety standards and quality management systems are considered not cheap but rather costly and time-consuming because of the rigorous implementation processes in the sustainability of the requirements of the standards (Podger et al., 2018). Nevertheless, according to the literature review, once the barriers or problem gaps are resolved, implementing product food standards and quality management systems is expected to benefit smallholder farmers in Kenya. The benefits to the smallholder farmers can range from improved structural governance, enhanced efficiency in establishing commercial and technical services, and more accessibility to markets for improved livelihood.

Generally, there is limited literature evidence that exclusively focuses on the relationship between product food safety standards and quality management systems with major consideration to the industry structure (Lee et al., 2012), which may affect both the smallholder farmers and the markets consuming the agri-food products. However, many smallholder farmers in Kenya have gone to great lengths to incorporate a change management process that identifies and establishes product food safety standards and quality management systems. The change management process is done in the hope that implementing global agri-food systems will improve farm production

performance, aid smallholder farmers in accessing more profitable markets, and improve their livelihoods.

Although Podger et al. (2018) consider implementing product food safety standards and quality management systems a costly and rigorous programme, the Food Safety Authority of Ireland, on the other hand, argues that implementing procedures relating to food safety standards and quality management systems provides cost-effective systems that allow for control of food throughout the supply chain to the final consumer (FSAI, 2020). Therefore, smallholder farmers are supposed to benefit by saving businesses money in the long run, avoiding poisoning consumers, increasing food safety standards, ensuring compliance with the law, and promoting teamwork and efficiency during production.

Smallholder farmers, however, still face challenges and constraints that hinder them from optimizing the opportunities available in the regional and international markets (FAO, 2015b). These constraints range from market integration, constraints that inhibit production and consistency of supply, limited access to capital and input resources, and diversification, among others.

Therefore, this study seeks to identify problem gaps in the change management process by presenting an impact comparative on the efficacy of smallholder farmers in Kenya prior and post implementation of product food safety standards and quality management systems. Once the problem gaps are identified and solved, smallholder farmers in Kenya are expected to benefit from the change management process through higher productivity, lower production costs, higher enterprise and farm incomes, higher disposable incomes, and consequently greater investments on farms that improve the welfare of household members.

Purpose of the Study

The purpose of the study is to explore the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. Smallholder farmers in Kenya have gone to great lengths to change their business model architecture to incorporate globally recognized product food safety standards and quality management systems to become competitive and access international markets to improve their livelihoods (Doherty & Kittipanya-Ngam, 2021). Smallholder farmers, who are a vital part of the global agricultural community, live in rural areas, and agriculture is their primary source of livelihood (IFAD, 2013). However, compliance with product food safety standards and quality management systems is costly and often deemed disproportionately burdensome for smallholder farmers (Maguire-Rajpaul et al., 2020).

A mixed method approach was used to determine the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. Furthermore, an explanatory sequential mixed research design was adopted to mix quantitative and qualitative methods for collecting and analyzing data to understand the research problem and answer the research questions (Creswell & Clark, 2018). Therefore, the study investigated the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya prior and post implementation to determine the benefits realized from such programs. In addition, the smallholder farmer's organization and change management process was also investigated to establish if there have been improvements in their operating and production activities to gain access to more profitable markets and improve their livelihoods. Finally, the study sought to ascertain if the time, effort, and money spent on such programs are justifiable to Kenya's smallholder farmers and improve their livelihoods.

Research Aims and Objectives

The study sought to identify and present an impact comparative on the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya prior and post implementation and determine the benefits realized from such programs. The study also identified and discussed the inherent and potential challenges arising from the change management process by smallholder farmers to implement product food safety standards and quality management systems. Finally, the study sought to determine solutions to the problem gaps identified and explore the possibility of upgrading smallholder farmers in Kenya to improve their livelihoods further.

Nature and Significance of the Study

Globally, there is a rapid demand on the food value chain to produce food that meets internationally approved product food safety standards and quality management systems (FAO, 2015a). Smallholder farmers have multiplied in response to the changes in the global agri-food systems to reduce risks in the food supply chains against potential contamination. Furthermore, smallholder farmers assessed as compliant with product food safety standards and quality management systems are generally considered to show safer systems than those not assessed, thus able to penetrate more markets and improve livelihoods.

Only 4% of all fresh fruits and vegetables produced by smallholder farmers in Kenya are exported to international and regional markets (FPEAK, 2021), while over 90% are consumed locally. However, recent opportunities have been created for smallholder farmers in Kenya to access more international markets such as the USA, UAE and more.

On this basis, the study explored and presented a comparative impact analysis of the efficacy of smallholder farmers in Kenya prior and post implementation of product food safety standards and quality management systems. The study used a methodological repertoire commonly referred to as mixed method research with design frameworks that include both quantitative and qualitative methods. In addition, the study sought to identify and use grounded literature theories that can meaningfully guide the design and implementation of mixed-method evaluations. In other words, theoretical frameworks were identified from the literature and refined through a statistical analysis of data collected that primarily compared the efficacy prior and post implementation of product food safety standards and quality management systems among smallholder farmers in Kenya and then refined through an analysis of empirical mixed method research evaluations.

According to an article by the Food Safety Authority of Ireland (2018), the implementation of procedures relating to product food safety standards and quality management systems provides cost-effective systems that allow for control of food from ingredients right through to production, storage and distribution to sale and service of the final consumer. Also, industrial manufacturers benefit when they use products from smallholder farmers that have implemented product food safety standards and quality management systems as an input process since they are guaranteed to maintain a desirable business reputation since the products in the supply chain are considered safe (Thomas & Funlade, 2023). Therefore, during such challenging periods, such as the outbreak of COVID-19, pandemic situations can be contained since consumers are feeding on products supplied by smallholder farmers that have implemented product food safety standards and quality management systems.

According to Humphrey (2017), other additional benefits are that smallholder farmers that have implemented product food safety standards and quality management systems are allowed to access international markets and thus increase food exports by contributing to the profitable high-value foods that increase their net incomes and improve household livelihoods. Hence, the smallholder farmers in Kenya that have embraced the implementation of product food safety standards and quality management system as a change management process can be deemed as enhancing transformation in the local domestic market by changing the composition of food consumed in the international markets, thus creating more opportunities to improve livelihoods.

Another significant benefit for smallholder farmers that have undertaken the change management process by implementing product food safety standards and quality management systems is that they can gain tremendous knowledge on global food safety and quality management system requirements that increase the confidence of buyers, and thus supporting smallholder farmers inclusions into markets that make a significant contribution to their business models.

The national Government is responsible for developing strategic policies that address critical issues affecting the agricultural sector in Kenya (Wangu et al., 2021). Therefore, the study will also serve as an additional source of knowledge that the national Government can use for reference when liberalizing policies for the agricultural sector in Kenya.

Consequently, smallholder farmers are expected to benefit wholesomely by saving businesses money in the long run, avoiding poisoning consumers, increasing food safety standards, ensuring compliance with the law, and promoting teamwork and efficiency during production.

However, it is worth noting that according to Podger et al. (2018), establishing product food safety standards and quality management systems is considered rather costly and time-consuming

because of the rigorous implementation processes and the sustainability of the requirements of the standards. Furthermore, according to FAO (2015), even after implementing the product food safety standards and quality management systems, smallholder farmers still face challenges in optimizing fully the advantages presented in the regional and export market. The challenges can range from constraints to market integration, constraints that inhibit production and consistency of supply, limited access to capital and input resources, and diversification, among others.

Therefore, the study explored the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya to determine the benefits realized from such programs. In addition, the study further explored the challenges smallholder farmers face when carrying out change management decisions and the possibilities of upgrading smallholder farmers in Kenya to improve their livelihoods further. Finally, the approach and application of the study provide more hard evidence to the existing studies. Therefore, the study validated the impact of change management after implementing product food safety standards and quality management systems among smallholder farmers in Kenya to justify the amount of time, effort and money spent on such a program.

Research Questions

Based on the problem, research purpose, aims, and objectives outlined above, this study sought to answer the following research questions;

RQ1. To what extent have smallholder farmers in Kenya benefited from the implementation of product food safety standards and quality management systems?

RQ2. What are the key enablers/drivers in the implementation of product food standards and quality management systems for smallholder farmers in Kenya?

RQ3. What are the challenges faced by smallholder farmers in Kenya in the establishment and implementation of product food safety standards and quality management systems?

RQ4. What are the factors that have contributed to majority of the smallholder farmers in Kenya not implementing product food safety and quality management systems?

RQ5. What can the government do to encourage more farmers in Kenya to implement product food safety standards and quality management programmes?

Hypotheses

In the context of the study, good agricultural practice (GAP) refers to the implementation of product food safety standards and quality management systems. Therefore, in consideration of the research objectives and the research questions, the study also sought to test the following hypotheses:

Hypothesis 1a

H_0: There is no significant association in farmers' knowledge about the importance of good agricultural practices before and after implementation of product food safety standards and quality management programmes; versus,

H_1: There is a significant association in farmers' knowledge about the importance of good agricultural practices before and after implementation of product food safety standards and quality management programmes

Hypothesis 1b

H_0: There is no significant change in farmers' knowledge about the importance of good agricultural practices before and after implementation of product food safety standards and quality management programmes; versus

H_1: There is a significant change in farmers' knowledge about the importance of good agricultural practices before and after implementation of product food safety standards and quality management programmes

Hypothesis 2a

H_0: There is no significant association between the farmers' knowledge about important farm-related activities before and after implementation of product food safety standards and quality management programmes; versus,

H_1: There is a significant association between the farmers' knowledge about important farm-related activities before and after implementation of product food safety standards and quality management programmes

Hypothesis 2b

H_0: There is no significant change in farmers' knowledge about important farm-related activities before and after implementation of product food safety standards and quality management programmes; versus,

H_1: There is a significant change in farmers' knowledge about important farm-related activities before and after implementation of product food safety standards and quality management programmes

Hypothesis 3a

H_0: There is no significant association between the farmers' knowledge about where to sell farm produce, importance of keeping farm records and documented procedures before and after implementation of product food safety standards and quality management programmes; versus,

H_1: There is a significant association between the farmers' knowledge about where to sell farm produce, importance of keeping farm records and documented procedures before and after implementation of product food safety standards and quality management programmes

Hypothesis 3b

H_0: There is no significant change in farmers' knowledge about where to sell farm produce, importance of keeping farm records and documented procedures before and after implementation of product food safety standards and quality management programmes; versus,

H_1: There is a significant change in farmers' knowledge about where to sell farm produce, importance of keeping farm records and documented procedures before and after implementation of product food safety standards and quality management programmes

The study used literature studies to conceptualize the theoretical and conceptual frameworks, as well as questionnaires and interviews to obtain data for statistical analysis to verify and test solutions from the study.

Chapter Summary

Chapter 1 presented an overview of the research topic and the nature of the research problem. The background to the problem was explained to provide a foundation for the study. The problem statement was also presented and discussed, identifying the need for the study. The purpose of the study identified the study method and overarching goals pursued throughout the study. The research aims and objectives were also explained in the study section. A brief outline was also presented in Chapter 1 on the nature and significance of the study to discuss the proposed study methods, design, data collection and analytical procedures adopted in the research. The significance of the study demonstrated the contributions made in the field of study. Research questions that aligned with the problem and purpose statements were also presented.

Chapter 2 of the study presents a detailed discussion of the literature review with topics and sub-headings specific to the dissertation.

CHAPTER 2: LITERATURE

Introduction

This literature review chapter provides an overview of the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. Smallholder farmers in Kenya have gone to great lengths to change their business model architecture to incorporate globally recognized product food safety standards and quality management systems to become competitive and access international markets to improve their livelihoods (Doherty & Kittipanya-Ngam, 2021). Smallholder farmers, who are a vital part of the global agricultural community, live in rural areas, and agriculture is their primary source of livelihood (IFAD, 2013). However, compliance with product food safety standards and quality management systems is costly and often deemed disproportionately burdensome for smallholder farmers (Maguire-Rajpaul et al., 2020).

The literature review in chapter 2 addresses the impact comparative on the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya prior and post implementation. Chapter 2 also sought to determine the benefits and challenges that smallholder farmers realize following the change management decision to implement agri-business system compliance programmes. The researcher reviewed published literature and research relating to smallholder farmers and global agri-food standards and quality management systems in this chapter. Further, a comparative impact analysis is presented to determine efficacy on smallholder farmers prior and post implementation of product food safety standards and quality management systems. In addition, the study examined whether smallholder farmers in Kenya have improved their operating and production activities to gain access to more

profitable markets and improve their livelihoods after undertaking organisational or change management processes. Finally, the study also investigated if the time, effort, and money spent on such programmes are justifiable to Kenya's smallholder farmers and improve their livelihoods.

There are six main descriptive components of discussion to the chapter's structure: the introduction section, a description of the search strategy, the theoretical and conceptual framework, the field description, empirical studies and research gap, and finally, the chapter summary. The field description further addresses the following components: the agriculture sector in Kenya, the smallholder farmer component, global product food safety standards and quality management systems component, and the comparability variables to evaluate the efficacy of smallholder farmers prior and post implementation of product food safety standards and quality management systems. The chapter structure is summarized in Table 1 below.

Table 1

Literature Review Structure

Section 1	
Introduction:	Summary of purpose statement A brief description of the logical organization of structures of the literature review
Section 2	
Literature Search Approach	List of relevant keywords and databases Library databases accessed and search engines used List of key search terms and combinations of search terms Scope of the literature review (years searched, type of literature and sources searched)

Section 3

Theoretical Framework

Conceptual Framework

Section 4

Field/Industry Description:

Agriculture in Kenya:

Overview of agriculture sector in Kenya

Barriers to agricultural productivity in Kenya

Efforts by the national Government to promote Kenya's agricultural sector

Application of theory of change to the agricultural sector in Kenya

Smallholder Farmers:

Significance of smallholder farmers to agricultural growth and development

Hindrances faced by smallholder farmers

Initiatives to improve the livelihood of smallholder farmers

Commercializing and market participation by smallholder farmers

Impact of Covid-19 on smallholder farmer's participation in implementing sustainable agriculture

Horticulture and smallholder farmers in Kenya

Global Agri-Food:

- Product food safety standards and quality management systems – trends and new understandings in the global food industry
- Overview of product food safety standards and quality management systems
- Smallholder farmer's compliance with product food safety standards and quality management systems
- Smallholder farmer's participation in the fresh export market
- Impact of product food safety standards and quality management systems on smallholder farmers
- Principles and protocols on implementation of product food safety standards and quality management system among smallholder farmers
- Summary of principles and requirements of product food safety standards to be implemented by smallholder farmers
- Summary of principles and requirements of quality management systems to be implemented by smallholder farmers

Comparability Variables to Evaluate Efficacy of Product Food Safety Standards & Quality Management Systems:

- Smallholder farmer household
- Production

	Labour, land and other capital Income and consumption Market and innovation Future of smallholder farmers
Section 6 *Summary*	Ties all literature review concepts, emphasising how the literature supports the study and how knowledge is extended in the discipline.

Literature Search Approach

The literature search approach explores the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. A thorough investigation of the literature was carried out to compile data for the study. The literature reviewed included current peer-reviewed articles, journals, dissertations, books, and conference papers. The researcher also used several library databases and search engines such as ProQuest, Google Scholar, Academic Search Premier, British Library, ResearchGate, E-Journals, Research Scientific Innovation Society, JSTOR, ScienceDirect, NATURE and SAGE Journals. The keywords used for the search were *smallholder farmers, agriculture, theoretical framework, conceptual framework, theory of change, social science theory, certification systems, change management, conceptualization models, agri-food standards, food standards, product food safety standards, and quality management systems, among others.* The reference search primarily consisted of references from peer-reviewed articles and scholarly research sources published mainly within the last five years from internet downloads. Some of the peer-reviewed journals used in the review included *Journals on Food and Nutrition,*

Journals on Cogent Social Science and Food and Science, Journals Earth and Environmental Science, Journals on Development Studies Research, Journals on Educational Review, International Journal of Social Economics, Journals on European Food and Feed Law Review, Journals of Business Management, Journals on Agriculture & Food Security, Journals on Sustainability, Journals on Advances in Developing Human Resources, The International Journal of Quality & Reliability Management among others.

Finally, search terms and combinations of terms used in this chapter included: *who is a smallholder farmer, the role of smallholder farmers, the continued importance of smallholder farmers today, food safety impacts at the farm level, integration of food standards and smallholder farmers, agriculture and smallholder farmers at a crossroads, how small-scale farmers cope with conflicting institutions to ensure market participation, the impact of quality management systems to smallholder farmers, and effects of food standards on smallholder farmers.* Approximately 230 peer-reviewed articles were studied for this chapter, and 151 related directly to smallholder farmers' change management process, smallholder participation in the international market, and smallholder farmers' compliance with product food safety and quality management systems.

Theoretical Framework

The study uses the theoretical framework to enhance thoroughness, consistency, precision, accuracy, and trustworthiness (Brockie et al., 2019; Callaghan, 2017). In addition, the theoretical framework provides a basis for the acceptance and justification of the study by offering a basis for data analysis of various variables and further presenting an explanation of such variables (Okemba, 2018). Therefore, in the study, the theoretical framework is considered a tool that guides the

identification of a theory or theories used as a strategic approach (Roth et al., 2018) to convey and provide a lens or signpost on how to process new knowledge (Grant & Osanloo, 2014). That is why a theoretical framework is an important aspect of research.

The study explores the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. The theoretical framework adopted in the study is the Theory of Change (ToC), which is the rationale of the research, problem statement, purpose, meaning and research questions (Lederman & Lederman, 2017) when performing an impact comparative on the efficacy of smallholder farmers in Kenya prior and post implementation of product food safety standards and quality management systems. ToC correlates to the study objective, making it easier to solve the thesis problem (Okemba, 2018). Furthermore, ToC enables the study to explore the principles for change, how to implement organizational changes effectively, and the importance and role of changes, among other facets. In other words, ToC is a tool that can evaluate design interventions or assess the designs of interventions (Mayne, 2017). Therefore, using the ToC approach, a structured analysis with specific aims is established to determine the efficacy of global system implementations relating to product food safety standards and quality management systems among smallholder farmers in Kenya.

The study also incorporated the social theory model to supplement and provide additional in-depth analysis of the ToC as a change management tool. Therefore, the study sought to explain further the smallholder farmers proliferated response to the changes and demands in the global agri-food systems to reduce risks in the food supply chains against potential contamination and eventually increase their returns and improve livelihoods (Lee et al., 2012).

Theory of Change

Smallholder farmers' development has received much attention in the developing world in the context of stimulating and transforming rural development to increase farm returns and improve household livelihoods (Chamberlain, 2019). Extensive literature, according to the author, has identified various challenges that smallholder farmers face when trying to access international markets ranging from access to land and water resources, limited mechanization, limited financial resources, poor infrastructure and limited technical and commercial knowledge, to mention a few.

According to Chamberlain (2019), notwithstanding the challenges faced by smallholder farmers in developing countries to access international markets and consistently supply the right volumes and quality of farm products, a holistic, robust and practical application of the Theory of Change (ToC) designed to guide smallholder farmers and stakeholders sustainably in the agri-food supply chain structure, is lacking.

According to the literature, a theory of change (ToC) can be defined as " …a purposeful model of how an initiative, such as a policy, a strategy, a programme, or a project, contributes through a chain of early and intermediate outcomes to the intended result" (Serrat, 2017). Therefore, the ToC can be viewed as a complex decision-making process that can help business owners and entrepreneurs navigate complex management changes to achieve strategic organizational goals. According to John W. Gardner, as further mentioned by Serrat (2017), the strategy to achieve a business intention or goal and achieve the planned results constitutes the ToC.

According to Omore et al.(2019), ToC evolved from the field of programme theory in the 1960s to the current emergence of analysing the theories geared towards motivating initiatives that work for social and political changes. Further, the author states that ToC is considered to have no

single definition or a set methodology; however, because of its flexibility, it can be applied across several disciplines and according to the user's needs. According to Mayne and Johnson (2015), as further cited by the author, ToC has been used by different organizations for planning, impact assessment and intervention, programme design, monitoring, measuring and evaluation processes.

The rationale for using the ToC approach, according to Vogel (2023), as captured by Omore et al.(2019), is that "every programme is packed with beliefs, assumptions and hypotheses about how change happens… about the way humans work, or organisations, or political systems, or ecosystems; and ToC is about articulating these many underlying assumptions" (Omore et al., 2019, p. 901). Furthermore, the ToC supposedly empowers all smallholder farmers to make well-informed decisions on managing their farm operations using standards such as product food safety standards and quality management systems to access international markets for increased income and improved household livelihoods. Therefore, the process of establishing and developing the ToC is corporate and participatory, requiring all stakeholders and target partners to be involved in the entire ToC approach cycle.

The study applied the theory of change (ToC) as a theoretical framework to explore efficacy of prior and post implementation of product food safety standards and quality management systems among smallholder farmers in Kenya. Emphasis was placed on how and why the ToC initiatives work and how they are applied widely across various business contexts to develop, implement, and evaluate development programs (Silva et al., 2015; Vogel, 2012). Using the ToC as a logical result-oriented framework, the study focused on the smallholder farmer's delivery process to achieve the change management process goals from the farm inputs and activities to the desired outputs generated. In other words, ToC looks at the strategic picture in the entire change management

process and determines multiple points of interventions that the smallholder farmer may require as a precondition to achieve an immediate and long-term outcome. Therefore, ToC can be viewed from another angle as a mechanism that enables smallholder farmers to think more deeply when making critical management decisions, such as the implementation of product food safety standards and quality management systems in business operations.

Nevertheless, there is still no common consensus in the literature on the definition of ToC (Clark & Apgar, 2019; Mayne, 2017; Stein & Craig, 2012). ToC is a broad program theory analysis that first emerged in the United States in the 1990s in the background of improving evaluation theory and practice in the field of community initiatives (Stein & Craig, 2012). Later, in the 1970s, it grew and was used as a logical planning model for development practice (Clark & Apgar, 2019). ToC has remained a conscious and creative visualized management exercise that rationalizes ambition and gives business owners time to reflect on the management goals and objectives to be achieved over time (Serrat, 2017).

According to the literature, the advantages that accrue from applying ToC to business owners and the smallholder farmers in Kenya can be summarized as follows; (a) the development of a joint understanding between an initiative and failure to take a creative initiative, (b) bridging of business gaps between current and futuristic goals and purposes, (c) formulation of strong plans of business action, (d) empowerment of employees to become more involved and active in the achievement of corporate goals, (e) fostering of collaboration between all stakeholders in the value chain from the farm-to-market consumer, (f) identification of resources and its application before engaging into a processing activity, (g) clarification within the management roles on the derived lines of responsibility and communication, (h) enhanced focus on core activities and priorities to

support organizational developmental initiatives, and finally (i) ability to build a robust business framework for monitoring and evaluation business processes.

Purpose and Steps to Developing a Theory of Change

ToC is a widely used theoretical framework with varying purposes (Callaghan, 2017). A seven-step structured process is used in the framework of ToC to build consensus around the study objectives and approach and explore the complexity and systematic changes experienced by smallholder farmers in Kenya to explain the efficacy of product food safety standards and quality management systems. The steps adopted from the Hivos approach (Clark & Apgar, 2019) provide a comprehensive guideline to determine the efficacy of product food safety standards and quality management systems among smallholders in Kenya. Therefore, the study sought to establish the smallholder farmers' technical understanding of the process, explore the ToC thinking process, and develop literacy levels on how the change happens. The process encompasses understanding the management change pathway prior and post implementation of product food safety standards and quality management system. ToC thinking process encompasses a less formal and often implicit way of thinking. In contrast, the need to develop and enhance literacy levels is a complex and nuanced understanding of how change happens. Borrowing from Stein and Craig (2012), the alignment of the three approaches is modelled and shown in Figure 1.

Figure 1

Smallholder Decision-making Process

Note: Adapted from *Understanding Theory of Change in International Development*, by Stein & Craig, 2012, p. 5.

The study incorporated ToC as the theoretical framework structured in a seven-step layout process, as shown in Figure 2, formulated by Van Es, Guijt, and Vogel (2015), as mentioned by Clark & Apgar (2019).

Figure 2

Seven Steps to Developing a ToC

Note: Adapted from *Understanding Theory of Change in International Development*, by Stein & Craig, 2012, p. 1.

Step 1: Purpose of ToC

The purpose of ToC is a design phase where the study explores the smallholder farmer's common understanding, agreement, and ownership to implement the product food safety standards and quality management systems. In addition, the study looks at the differences in smallholder farmers' opinions. Then, it further encourages conversations that will look at varied perspectives and build consensus on the adopted change management approaches and pathways. Therefore, using the ToC approach, the study explores the perceived smallholder farmer vision of how the management changes bring success and the necessary preconditions for success.

ToC provides a basis for evaluating smallholder farmers' planning tools when implementing product food safety standards and quality management systems. Therefore, this allows the objects and planning activities on the pathway to change to be explored in the study. In addition, ToC provides the basis for evaluating the communication tools used by smallholder farmers to assess the intended outcomes and delivery strategies for the proposed change processes and preconditions for success. ToC also becomes a tool to monitor and evaluate the efficacy of product food standards and quality management systems amongst smallholder farmers to justify the effectiveness of management changes by looking at the impacts and associated outcomes. Finally, ToC provides a foundational framework to test the validity of assumptions used in the study, especially how contextual factors before the management changes influence smallholder farmers' target objectives and strategy implementation.

The study sought to evaluate the efficacy prior and post implementation of product food safety standards and quality management systems among smallholder farmers in Kenya. Therefore, ToC, when used well, supports the dynamic process of learning and reflections to understand the

impact pathways that have evolved based on the experiences of the smallholder farmers implementing the change management process. Thus, the ToC approach becomes a basis that allows smallholder farmers to adjust further and improve, therefore enhancing farmers' livelihoods through increased income and poverty reduction.

Step 2: Impact Vision

The ToC approach facilitates the evaluation of the smallholder farmer's desired impact by performing an in-depth analysis of the target outcome and outputs to achieve the objective. Therefore, the study explores the impact vision of change to understand how the change process contributes to solving the research statement problem. By evaluating the efficacy of product food safety standards and quality management systems, the emphasis becomes on the contribution of the management change process to improve the livelihood of the smallholder farmers. The study looks at the advantages of the ToC approach, allowing smallholder farmers to implement global agri-food standards and access international markets. Also, the ToC approach avails a platform for smallholder farmers in Kenya to voice and showcase their abilities to compete and negotiate effectively with their counterparts in other global regions, among other advantages.

Step 3: Understanding Context Dynamics

The ToC approach allows the study to explore the smallholder farmer's context dynamics when implementing product food safety standards and quality management systems. Thus, ToC becomes a tool to get as much information as possible while exploring the statement problem from

many perspectives based on a solid understanding of the smallholder farmer's context when implementing the change process.

Some of the ToC facilitation tools used to understand smallholder farmer's context of operation includes the following:

Tool 1: Problem tree analysis

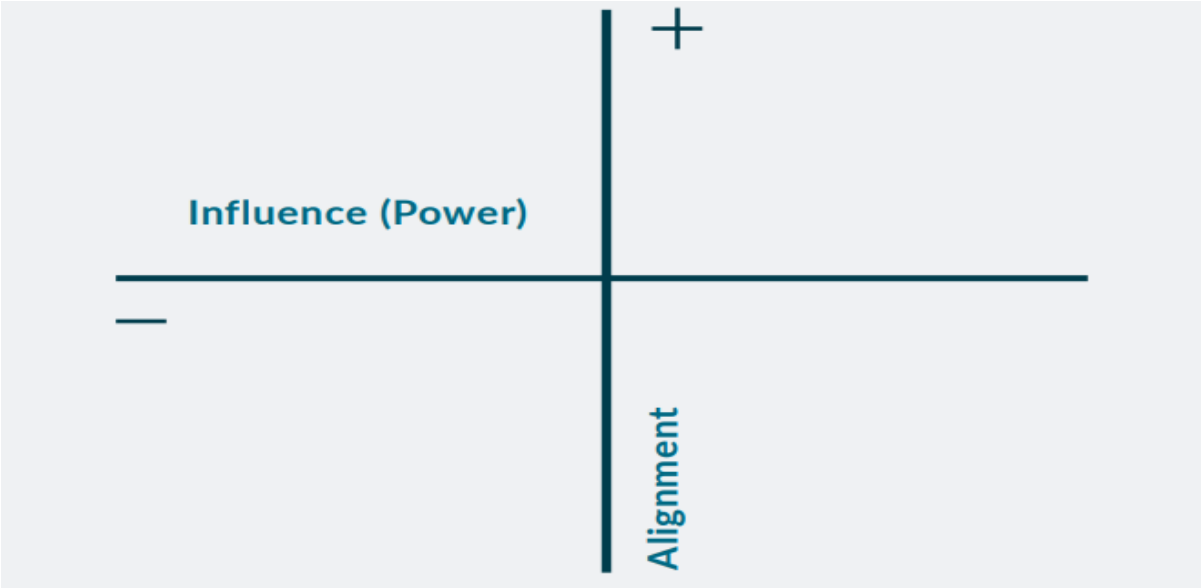
The smallholder farmers are gathered in a group formation to deliberate and break down the problem or challenge they seek to address. First, the smallholder farmers think about the cause and effects, prioritize object factors, and focus on improving their understanding of the problem. The smallholder farmer can then come up with interconnected and contradictory causes and thus seek to identify solutions or pathways that support the change management process. ToC, in other words, enables the study to focus on the smallholder farmer's present situation and understand the context in which product food safety standards and quality management systems are to be implemented to achieve the desired goal. Therefore, through the problem tree analysis, the study evaluates the central issues and arguments at each stage of the change implementation process and further gives information on the required resources to make a strong case or solution to solve the problem. The overall objective of using the problem tree analysis in the ToC approach to evaluate the efficacy of product food safety standards and quality management systems is to build a shared sense of purpose, understanding and action emanating from a process of group discussion and analysis.

Tool 2: Alignment and Influence Matrix

In this case, the study encourages reflection on the vision of change based on how the smallholder farmers are aligned to the statement problem through brainstorming. The reflections are identified and then positioned in a matrix, as shown in Figure 3.

Figure 3

Alignment and Influence Matrix



Note: Adapted from *Unpacking the Impact of International Development: Resource Guide 2. Seven Steps to Theory of Change.*, by Clark & Apgar, 2019, p. 4.

The alignment axis depicts how likely a smallholder farmer is to promote the change process. In contrast, the influence axis shows how much power or influence a smallholder farmer has to support or block the change process.

Therefore, the study using the alignment and influence matrix determines how smallholder farmers select participating stakeholders involved in the change management process while implementing product food safety standards and quality management systems.

Tool 3: Network Mapping

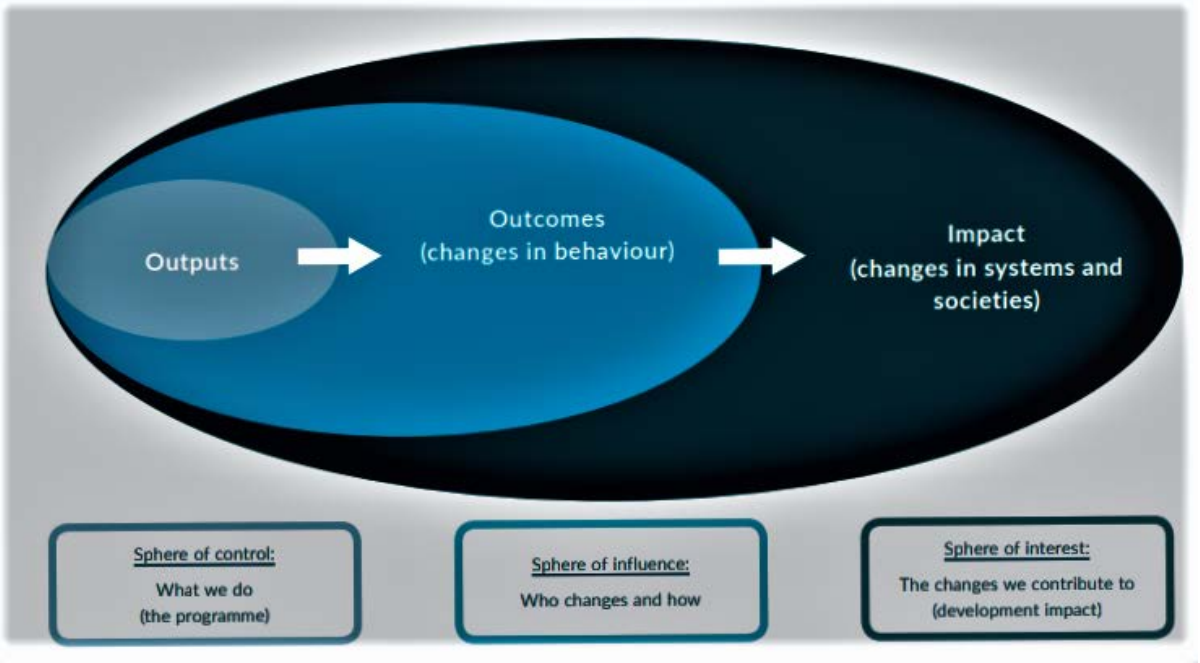
ToC approach in network mapping enables the study to identify and understand the nature of the relationship smallholder farmers have developed and influenced management changes towards implementing global agri-business standards. First, the study looks at smallholder farmers' different relationships and networks to provide insights into the systemic nature of change. Second, the study explores the existing networks and relationships that help smallholder farmers achieve their target goals. In addition, the study determines if these relationships and networks assist in building strength to reach intended outcomes and attract global market players. Finally, the study identifies bottlenecks that hinder smallholder farmers from sharing the outcome of the change process.

Step 4: Outcomes as Changes in Stakeholders

In this next step, the ToC approach uses the information gathered from the context analysis in Step 3. It focuses on the different changes that will promote the intended outcome for smallholder farmers when implementing product food safety standards and quality management systems. In addition, the study explores the smallholder farmers' sphere of control, influence and interest diagrammatically, as shown in Figure 4, inspired by Montague (2000) and mentioned by Clark & Apgar (2019).

Figure 4

Sphere of Control. Influence and Interest



Note: Adapted from *Unpacking the Impact of International Development: Resource Guide 2. Seven Steps to Theory of Change*, by Clark & Apgar, 2019, p. 6.

Therefore, the study explains the main outcome areas impacting a change management process by identifying who needs to do what differently.

Step 5: Mapping Causal Pathways

The study using the ToC approach identifies causal or impact pathways, which are the smallholder farmers' actions to promote the change management process when implementing product food safety standards and quality management systems. Therefore, the study seeks to link

change management outputs to outcomes and impacts and thus determine the efficacy of the change management prior to and post-implementing the agri-business standards.

In summary, mapping the smallholder farmer change process using ToC approaches involves pulling together all insights from previous stages. Therefore, one starts with the smallholder farmer's vision of change to understand the outcomes and impacts. Then, the expected outputs to achieve the smallholder farmer outcomes or resultant effects should be considered.

Step 6: Assumptions

In the ToC approach, the change management process is only robust once the underlying assumptions and causal logic are plausible. Therefore, it implies that when evaluating the efficacy of product food safety standards and quality management systems, the study must reflect on the smallholder farmers' assumptions and identify the evidence supporting the causal linkages. Also, the study looks at empirical evidence from prior ToC interventions and how to determine the different experiences and expertise that inform the smallholder farmer’s thinking process about change management and delivery of intended outcomes. In addition, the study seeks to distinguish contextual and causal assumptions. Contextual assumptions are about an external context. For example, international markets demand that all agri-products be certified to a recognized international food safety standard like Organic Certification and GlogalGap Standards. The causal assumption is about a causal or underlying link. For example, smallholder farmers engage in a change management process by implementing a quality management system like ISO 9001 to improve internal operating capacity and motivate staff members.

Assumptions emanating from the ToC process must be documented, evaluated, and frequently tested to validate or determine if adjustments need to be made based on new understanding gained during the change management process implementation.

Step 7: Evaluation Plan

The study aims to evaluate the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. Therefore, a monitoring, evaluation and learning plan is used to elaborate on the effectiveness and logic of using the ToC approach as a logical framework for the study.

In summary, with the intense rise of global concerns (Lee et al., 2012) on improved food safety, there has been an increase in the number of smallholder farmers in Kenya implementing product food safety standards and quality management systems. Therefore, ToC and other related theories are used to analyze practical levels of efficacy prior and post implementation of product food safety standards and quality management systems by smallholder farmers in Kenya. Furthermore, when implementing a change management process, proper timing is required, considering internal and external stakeholders, namely, employees, management and customers (Okemba, 2018). Therefore, ToC supports the impact comparatives in the smallholder farmer change processes from conceptualization to implementation and describes the efficacy of such an organizational decision.

Assumptions on Theory of Change

The use of the term ToC as a theoretical framework in the study can easily be construed as fuzzy or vague, thus appearing to lack clarity and disconnect from its practical implication for broader social science work (Stein & Craig, 2012). However, addressing this fact in the study is important because its use and approach to the term ToC impact the research analysis of the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya.

Certain aspects of the literature review seem to allow practitioners and scholars to engage with the complexity of change processes. In contrast, others see ToC as more narrowly extending the assumptions of a logical framework (Stein & Craig, 2012). Therefore, the study has incorporated the wider social science theory and research-based evidence to understand how change management happens when presenting an impact comparative on the efficacy of smallholder farmers in Kenya. Hence, practitioners and scholars will be allowed to reflect on whether ToC approaches used as a theoretical framework for the study eventually reveal or oversimplify the complexity of change processes.

There are various definitions of assumptions. An assumption is considered something often referred to as the necessary condition for change or something that exists for a planned change to occur (Stein & Craig, 2012). As further explained by the author, some literature considers ToC an assumption because the theories of change thinking are even more confusing by themselves. However, Weiss (1995) attempts to provide direction on this point by stating that good knowledge available on a particular topic can change its label from an assumption to a fact and move along. Nevertheless, the key challenge remains in assessing the plausibility of an assumption and

determining if it can be used either as a strong theory or as sound evidence. This challenge is and still seems to continue to be a debatable matter.

Case Studies on the Use of the Theory of Change

1. Use of the Theory of Change to Improve Agriculture in Tanzania

A recent case study was done in Tanzania on improving agriculture using the Theory of Change (ToC) (Omore et al., 2019). The study sought to demonstrate how scarcity of resources makes it challenging for agricultural research to contribute positively towards achieving agricultural developmental outcomes. In summary, the lessons derived from adopting the ToC approach were used to develop and improve an agricultural research programme that was needed for implementation to achieve greater impact. The ToC approach initiated research programme was then applied and tested in the Tanzania region of Maziwa Zaidi as an integrated intervention change management process to catalyse and transform smallholder farmers within the value supply chain. Notwithstanding the challenges encountered when implementing the change management process, the ToC was considered useful as a management tool for planning, monitoring and measuring process activities, enhancing communication among participants, managing complexities within the entire value chain system, and deriving continual improvement initiatives for future programmes.

According to Omore et al. (2019), the study on the ToC was carried out in view of the complexities and challenges encountered in research when evaluating agricultural development policies. Alston (2010) and Barnett & Gregorowski (2013), as cited by the author, using the ToC as a guide to a change management process is critical to deriving lessons pertinent to any research

work and having a greater impact on the achievement of organizational target goals for continual improvement. Change management processes as a focal variable in ToC focus more on outcome-based efforts in a demonstrable way to contextualize logical frameworks to achieve the set corporate objectives.

The concept adopted in the use of the ToC in this case study is similar to the decision made by smallholder farmers in Kenya when embracing a change management process on the implementation of product food safety standards and quality management systems to access international markets to achieve the goals of better returns and improve household livelihood. The author further cites Earl, Carden and Smutulo (2001), who link outcome mapping to the social science behaviours of adopters (individuals) within the supply value chain to track specific process activities that impact intended outcomes. The concept is very similar to the study of the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya, where all parties in the agri-food supply chain have to formulate contractual agreements to optimize goal achievements at individual and organizational levels to achieve target goals. In other words, the smallholder farmer needs to be confident that the objectives of implementing product food safety standards and quality management systems are well understood and planned behaviours managed well, adding value to the entire process.

Therefore, in the case study on improving agriculture in Tanzania, ToC was adopted as an outcome-based satisfactory approach to influence changes when designing a research proposal to monitor, measure and evaluate the impact of agricultural development projects among smallholder farmers in Tanzania. Using the ToC approach, the design of the research proposal provided a robust framework that enabled the channelling of evidence-based solutions to address the smallholder

farmer's challenges sustainably, involving all stakeholder participation. Following the success of the ToC approach development programme, the programme design was further implemented in other research programmes on livestock, fish and dairy. The ultimate objective of using ToC in the research programmes was to ensure that smallholder farmers in Tanzania are catalysed through the change management initiatives into an inclusive value chain development of sustainable goals by the United Nations of reducing poverty, eliminating hunger and improving the management of natural resources.

According to Omore et al.(2019), the lessons learnt from the case study in Tanzania on improving agriculture using the ToC include the following.

Visioning and Designing Involvements

The ToC approach facilitated a better understanding of term definitions and agreements affecting key changes along the impact pathway in the research programme. Varied drivers of change were explicitly expressed, and the underlying assumptions and hypotheses were exemplified throughout the ToC approach process.

Improved Communication on a Common Purpose

The application of the ToC approach enhanced collaboration and openness among different partners and actors, as evidenced by the joint publications and communications while capturing linkages for innovation and value chain upgradations and during the syntheses for the policy forum in the research programme. The ToC approach crystallized as a product of thinking about outcomes

facilitating mutual understanding for complementary roles in testing interventions and how agreed goals are arrived at in the research programme.

Managing of Complexities

Interlinkages were clarified along the impact pathways, resulting in a better appreciation of the research programme's roles and complexity. Proposed changes in the research programme were prioritized and monitored over a period of time while managing the partner's expectations and contributions. The ambitious nature of the programme goals were clarified during a reflection workshop, emerging changes were scored, and additional time was given for monitoring the changes being established for adoption.

Efficiency, Flexibility and Sustainability

The partners and stakeholders also proved the ToC approach to be flexible and holistic for planning, designing, measurement and evaluation in the research programme. As a result, critical gaps were identified in the goal achievement process, and critical changes were prioritized to address the objectives of the research programme. Another observation in the research programme when using the ToC approach was the realization that critical and positive changes were not only catalysed but were also sustained.

Furthermore, the ToC approach allowed the research programme to formulate and respond to specific prioritized questions and hypotheses mapped to the assumptions, thus enhancing efficiency for the programme researchers. In addition, the application of concerted, comprehensible

and coordinated efforts resulted in efficiency improvement at all levels, making it possible for the research outcomes to be used for whatever period and by whosever.

In conclusion, the case study on the use of ToC to improve agriculture in Tanzania is consistent with the study on the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. In both instances, the ToC approach helped clarify, contextualize and communicate the critical issues that needed to be addressed by the different participants within the complex supply value chain. As a result, stakeholder involvement, participation, and capacity building were identified for the value chain development. The broader socio-political context was factored in the case study to help improve agriculture in Tanzania and the study on the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya.

2. Theory of Change -Business Model Design for Smallholder Farmer Support in South Africa

This case study, funded by the Netherlands Enterprise Agency, also presents another practical illustration of applying the Theory of Change (ToC) approach, which integrates smallholder farmers in commercial value chains (Chamberlain, 2019). The case study uses the ToC to challenge a generally accepted theory that when smallholder farmers are provided with the right farm input and skills, productivity will increase, leading to improved income levels, enhanced national and household food security and thus, improved livelihoods. However, as explained further by the author, many smallholder programmes that have leaned on this generalized thinking have struggled to integrate smallholder farmers successfully and sustainably. Therefore, a holistic

approach to a change management process that embraces the ToC needs to be identified and adopted, engaging the smallholder farmers in support programmes that contribute to their development. The ToC approach is one of its kind, where the roles and responsibilities of the stakeholders take specific value chain approaches that address the technical considerations envisioned in the business model when implementing a change management decision process, like implementing product food safety standards and quality management systems.

The case study using the ToC approach to design business models for smallholder farmer's support in South Africa is similar to that of the study on the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. In both cases, smallholder farmers using the ToC approach must formulate their objectives to support the change management decision process. The smallholder farmers are looking primarily for risk mitigation by diversifying into a strategic direction that increases their incomes and improves household livelihoods. Further, the business models look beyond the mere financial benefits and also consider social-related benefits such as food safety, education for all households for community enhancements, and the national Government and county per capital growth.

In the case study modelling business designs using ToC, Chamberlain (2019) states that several critical elements which must be subsequently taken into account when designing the business structure that the smallholder farmers work with to achieve the success of the change management decision process. Therefore, it implies stakeholder participation in the entire agri-business value chain, driven by only developmental motivations, is unlikely to be successful if other critical elements impacting the change management process are not considered.

The methodology and approach towards implementing the product food safety standards and quality management systems should embrace the ToC approach to ensure the full integration of the farm's ultimate production, that is, the crop as the final product, and all other activities inherent in the value supply chain from farm to consumer. Consequently, the smallholder farmer's overall objective of embracing the ToC approach and identifying resources required to support the ToC approach, such as financial support, employee capacity building and other service engagements, should be enhanced throughout the agri-food value supply chains for the success of the change management process. For example, the author seems to imply that the assessment of the entire agri-food supply chain and the objective of the smallholder farmers to implement product food safety standards and quality management systems to access international markets and increase income to improve livelihood becomes crucial to formulating the organizational business model.

Chamberlain (2019) recommends that the ToC approach roll-out plan starts with a pilot run that tests the working of the change management programme. Smallholder farmers, for example, can then determine and evaluate all the participants involved in the change management process for adaptation. In the case study on the use of ToC to design a business model for smallholder farmers' support, regular evaluation and monitoring activities were carried out to ensure that the programme remained on track to collectively achieve the goals agreed upon by all the participants and partners. Consequently, using the ToC approach, smallholder farmers opt for the change management process to maintain the commercial relationships created throughout the agri-food supply chain for sustainable returns that improve their livelihoods.

Nevertheless, the ToC approach to support the smallholder farmer's change management decisional process may not be as straightforward as the literature presents. For example, when

determining the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya, all participants in the agri-food value chain must engage in an interactive process to enhance the adaptation and achieve the objectives of the change management process. Therefore, regardless of the structure pursued by the smallholder farmers and the stage of the participant's involvement in the agri-food supply chain, all the concerned parties need a flexible in-take approach to planning and implementing the change management process.

For example, in the case study on the use of the ToC to design a business model for smallholder farmers in South Africa, the author emphasizes the involvement of smallholder farmers from an early stage to share the objectives and potential challenges since unexpected occurrences are inevitable and can occur when least expected. In addition, shared decision-making in the ToC approach allows for building trust and transparency in the change management process, increasing the success of the participant's partnership within the value supply chain. Thus, the smallholder farmers should view the ToC approach as a long-term strategy with essential management expectations and, therefore, give time for the change management processes to grow and yield tangible results. In addition, all the participants in the value chain should approach the ToC approach with an attitude of willingness, assumed ability and the readiness to try and innovate to make the change management process workable and most likely to succeed. In other words, the outcome of the smallholder farmers should be a cohort empowered by all participants within the agri-food supply chain to increase sales returns and ultimately improve household livelihoods.

According to Chamberlain (2019), the lessons learnt from the case study on the use of ToC to design a business model to support smallholder farmers in South Africa include the following.

Formulation of a ToC Model with a Business and Social Impact that Improves and Secures Livelihood for Smallholder Farmers

At the basis of every change management decisional process embeds an envisioned outcome impacting all the stakeholders in the value supply chain. Therefore, smallholder farmers embracing the ToC approach to implement a change management process must be aware of the participants' different expectations to achieve the intended goals successfully. In the case study of designing business models to support smallholder farmers in South Africa, the underlying principles supporting the business model allowed the vision and mission of the change management process to be well understood by all participants and practical steps taken to ensure sustainable farming, leading to improved livelihoods (Breuer, Fichter, Lüdeke-Freund, & Tiemann, 2018) as cited by Chamberlain (2019).

It implies that the ToC approach to support the change management process objectives captures both an economic business aspect, that is, increased income through accessibility to lucrative markets, and a social impact aspect in the form of improved household livelihoods.

Smallholder farmers in the case study used the ToC approach to design business models to support smallholder farmers in South Africa, who were generally interested in how they could improve their livelihoods. The objective of improving livelihoods is similar to the goal captured in the study, which is to determine the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. However, adopting the ToC approach as a change management process to improve livelihoods depends on the particular context envisioned by the smallholder farmers. In both the case studies on the use of the ToC approach to design a business model to support smallholder farmers in South Africa and the study on the

efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya, three livelihood options are considered. That is, (a) an increase in yields and prices for crops grown by smallholder farmers, (b) an increase in the profitability margins for value crops sold in lucrative markets, and (c) an increase in the area under production for safe and sustainable farming.

Therefore, the smallholder farmers instigating the change management process use the ToC approach to plan and model a business case that considers all the costs and opportunities available to achieve the target objectives. However, in all aspects, the current and potential costs must never outweigh the expected income, as this would defer the goal of improving the smallholder farmer's livelihoods. Hence, it is paramount for smallholder farmers to ensure that the change management decision process achieves a reliable and predictable income for food security and the sustainability of the business and household livelihoods.

Further, improved and secured smallholder livelihoods require all participants in the value supply chain to understand and address the challenges faced by smallholder farmers when using the ToC approach to manage the change management process. According to Okunlola, Ngubane, Cousins, & du Toit (2016), as Chamberlain (2019) mentioned, improved livelihood of smallholder farmer's households does not necessarily equate to commercialising farm output to international markets. Therefore, other stakeholders in the agri-food supply chain can also remain contented with the opportunity to merely work to achieve management goals and objectives for the smallholder farmer, which is also crucial for the long-term sustainability of the change management process and, thus, the improvement of livelihoods.

Formulation of a ToC Model that Creates Agri-food Business Opportunities for Smallholder Farmers

In the case study of using the ToC to design a business model to support smallholder farmers in South Africa and the study to determining the efficacy of product food safety standards and quality management systems, the process transformation of the smallholder farmer's operations into an agri-food business structure is a crucial objective of performing the change management process. In other words, smallholder farmers expect to make some gains, such as their social image, even if financial profit is not anticipated at the onset when making a change management decision. Other agri-food business opportunities when using the ToC to drive the smallholder's change management process may include (a) increasing the market share of the overall business, (b) ethical business opportunity to drive a social objective that impacts the community, for example, achieving an agri-food certification such as Fair Trade or UTZ, and (c) creation of smallholder farmers business structures that are efficient and effective because of embracing globally recognized agri-food management standard, among others.

Therefore, using the ToC approach to drive the smallholder farmer’s change management process is not a corporate social responsibility activity (CSR) but rather part of the core business operation for a long-term business opportunity and the business solution for increased sales returns and improving household livelihoods.

Other examples relating not relating to smallholder farmers to demonstrate the broader use of ToC include the intervention in a ToC analysis in a business case approach in the DFID Democratic Republic of Congo as an integral step for drawing a program on logic thinking linking road-building and development (Vogel, 2012), and the use of the ToC approach in an illustration

and concept analysis to improve the nutritional diets of children by providing training and information to mothers (Mayne, 2017).

Social Science Theory

The use of social science theory is considered ideal in the study to contextualize and understand the evidence base used when applying the ToC approach (Callaghan, 2017; Stein & Craig, 2012). In other words, social changes depend on behavioural change. For example, the concept of management theory derived from social science theory provides a helpful framework for understanding smallholder farmers' managerial processes and employee supervision styles. It also gives an insight into how smallholder farmers make organizational decisions during resource-constraint times. Therefore, social science theories provide a bedrock of solid pillars that can help understand how smallholder farmers deal with challenges faced when undertaking a change management process when implementing product food safety standards and quality management systems in their operations.

Therefore, efforts in the study go towards identifying and understanding the different smallholder farmers relevant to the problem being addressed and central to the theory of change (Clark & Apgar, 2019). In addition, social science theory helps sharpen one’s thinking by providing new ways of looking at smallholder farmers' philosophy that ultimately improves how the ToC is applied in the study.

The study, therefore, attempts to integrate ToC with social science theories to bring a better understanding and an in-depth view of smallholder farmers' managerial behavioural aspects that are also critical for assessing analytic models (Callaghan, 2017). In addition, social theory assumptions

such as rational arguments and incentives assumed to offer an effective means to change behaviour will also be challenged. Finally, the study explores other literature supporting collaborative efforts that promote long-term sustainable management structures and are thus worth the hard work of change management (Chambers, 2019).

The following section presents a simplistic presentation of a few examples from different social science disciplines that are applicable in explaining the relevance of social science theories to the study. The key emphasis in the use of these illustrations is to appreciate the construct of the smallholder farmer's change management decisions and the social behaviour in terms of the construct of ideas, propositions, underlying logic, assumptions and boundary conditions when establishing and implementing product food safety standards and quality management systems to access international markets (Bhattacherjee, 2023).

Agency Theory

According to Bhattacherjee (2023), the agency theory is presented as a two-party relationship, for example, between the smallholder farmer and their employees. Initially propagated by Ross (1973), the agency theory aims to optimize contracts and agreements between different stakeholders to help minimize the effects of organizational goal incongruence. The agency theory is applied at the individual or organizational level. The theory assumes that social human beings, in our context, smallholder farmers and their employees have self-interest, which must be well managed when executing a change management process, and in addition, that people are boundedly rational and risk averse.

To contextualize the agency theory, the principal is the smallholder farmer, who decides to perform the change management process to implement the product food safety standards and quality management systems. In contrast, the employees, on the other hand, who implement the process change to actualize the objectives of the change management process are regarded as agents. An example of goal incongruence which must be well managed and avoided when executing a change management process is where the principal (smallholder farmer) wants the managerial decision to implement the product food safety standards and quality management systems to be done quickly and effectively, whereas, the agents (employees) want to work at their own pace, avoiding risks, and seeking self-interest such as personal pay, over the corporate interest.

Therefore, the smallholder farmer must seek to understand the nature of the problems and challenges encountered when implementing a change management process to achieve the targeted objectives when implementing the product food safety standards and quality management systems to access international markets for better returns and improvement of livelihoods. Some recommendations to manage the incongruence goals between the smallholder farmer and employees include issuing outcome-based contracts, such as commissions paid upon completion of farm production tasks or a contract that combines behaviour-based agreements, such as monthly salary and outcome-based income. Ideally, the smallholder farmer should put effort into ensuring that problems do not arise with the employees that make work not done, thus derailing efforts to achieve the objectives of the change management process to access international markets when implementing product food safety standards and quality management systems. In addition, employee skills should be well-matched to the tasks at hand to achieve organizational goals. The

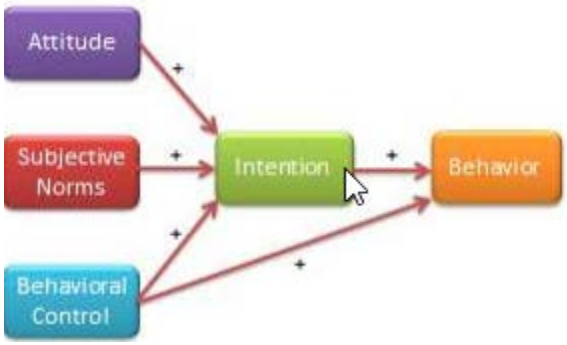
structure and mechanism of task assignments should be flexible, programmable, and hence more observable by the smallholder farmer and employee.

Theory of Planned Behaviour

Azjen (1991), as mentioned by Bhattacherjee (2023), postulated the theory of planned behaviour (TPB). The TPB is widely used in understanding individual behaviours regarding conscious, reasoned choices shaped by cognitive thinking and social pressure. TPB assumes that behaviour is a factor of one's intention and subjective norm and, therefore, a function of the person's attitude and perception, as diagrammatically presented in Figure 5 below.

Figure 5

Theory of Planned Behavior



Note: Adapted from *Social Science Research - Principles, Methods, and Practices*, by Bhattacherjee, 2023, p. 39.

According to the literature, the author further defines attitude as a person's positive or negative feelings about performing a behaviour. In the study context, the smallholder farmers

perform a behaviour resulting in a change management process to implement product food safety standards and quality management systems to access international markets for better returns and improve house livelihood. The performance of this behaviour is a summation of the smallholder farmer's belief that the consequential effects of the change management decision to implement the product food safety standards and quality management systems will achieve a desirable consequence to access international markets and get better returns that improve their livelihoods. Therefore, the subjective behavioural norm of the smallholder farmer is whether the employees and other stakeholders in the food supply chain system, in their subconscious mind, expect the smallholder farmer to proceed and actualize the decision to implement the costly and involving behaviour change to establish the food safety standards and quality management systems in the farm operations.

The smallholder farmer will, therefore, have to engage a behavioural control mechanism that is both internal and external to deal with his subjective perception of the thought-out-expected responses to achieve the intended goal of the change management process to implement the product food safety standards and quality management systems in farm operations. For example, internal behaviour may include the smallholder farmer's ability to perform the intended behaviour to implement product food safety standards and quality management systems or external behaviour relating to the facilitating resources needed to implement product food safety standards and quality management as a change management process.

Innovation Diffusion Theory

According to Bhattacherjee (2023), the innovation diffusion theory (IDT) was first studied by Gabriel Tarde, a French sociologist, but later further developed by Everett Rogers (1962) after observing 508 studies on diffusion. IDT, in simplicity, explains how innovation is adopted within a people of probable adopters about (a) innovation, that is, new technologies, (b) time, that is, the duration to diffuse a process, (c) communication channels, for example, mass media; and (d) social systems, such the environment to enhance the learning of new ideas.

Rogers (1995), as cited by the author, suggests innovation to encompass (a) knowledge, that is, when adopters first learn about the innovation through communication channels like the media, and (b) persuasion, that is, when the early adopters try the innovation, (c) decision, that is, when the innovation is either accepted or rejected by the adopters, (d) implementation, that is, the initial operationalization of the innovation, and finally (e) confirmation, that is, the use of the innovation to its fullest potential. Figure 6 is a diagrammatic illustration of the innovation process for better visualization and understanding.

Figure 6

Innovation Process

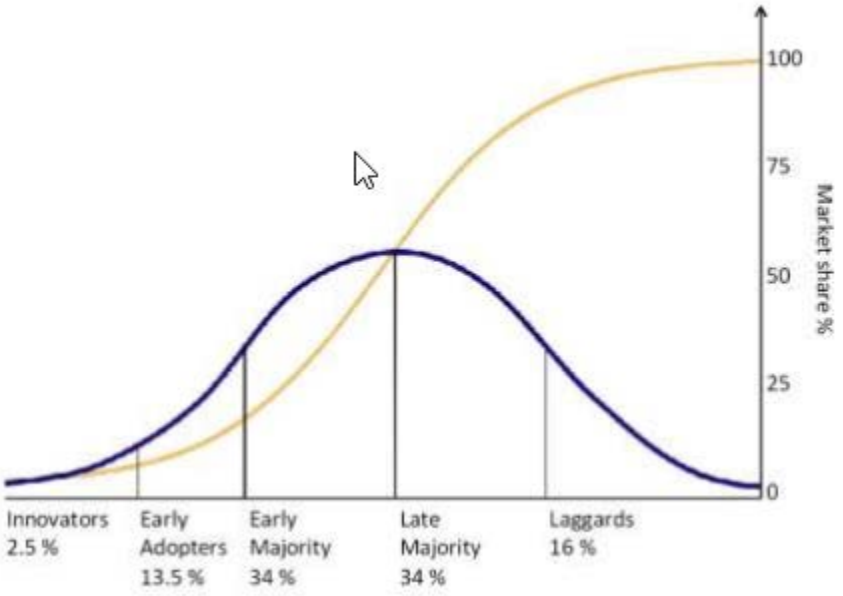
Note: Adapted from *Social Science Research - Principles, Methods, and Practices*, by Bhattacherjee, 2023, p. 41.

In the context of the study to determine the efficacy prior and post implementation of product food safety standards and quality management systems, the smallholder farmer that instigates the change management process exhibits the desire to adopt a way of farming operations that is creative and innovative to give access to the international market and improve sales returns. Therefore, the smallholder farmer creatively comes up with new ways of adopting technology in alignment with global food agri-systems in the hope that the adopters, who in this case are the individual employees, the organization and other players in the entire supply chain, will adopt the change process to implement the product food safety standards and quality management systems to increase farm sales returns that improve household livelihoods.

The diffusion processes of alignment to the change management process to implement the product food safety standards and quality management systems could start off slow among the early adopters; however, it is expected to increase in adoption as the innovative solution is being embraced by more adopters within the entire food agri-system supply chain from farm to market and then the final consumer. Another factor that critically affects the diffusion rate of implementing the change management process to implement the product food safety standards and quality management system is the leadership style of the smallholder farmer driving the change procedure. Therefore, how employees view and value the leader will motivate people to change their behaviour positively or negatively. Nevertheless, a normal distribution S-shaped curve is derived from the cumulative adoption pattern, as shown in Figure 7 below.

Figure 7

Diffusion S-Sharped Curve



Note: Adapted from *Social Science Research - Principles, Methods, and Practices*, by Bhattacherjee, 2023, p. 41.

Adopters within the global agri-food systems value chain are not identical and, therefore, can be classified as; (a) innovators, for example, the strategic smallholder entrepreneur farmer, (b) early adopters, for example, the players in the international market that understands the value of consuming produce from a farm that has implemented product food safety standards and quality management systems, (c) early majority, for example, strategic and technical staff employed and working closely with the smallholder farmer entrepreneur, (d) late majority, for example, middle management workers who take a while to understand the larger strategic approach to the change

management process to implement the product food safety standards and quality management systems, and (e) the laggers, for example, lower management employees who may not understand the strategic direction of the smallholder farmers to implement a product food safety standard and quality management system in the farm operations.

According to the literature review on IDT, the smallholder farmer's innovation characteristics can be presumed to shape the adopter's innovation view in the following ways: (a) expected benefit to be derived from implementing a global product food safety system and quality management systems, (b) the extent to which efficiency and effectiveness are derived farm operations after implementation of the product food safety standards and quality management systems. (c) The complexity and trialability of embracing a globally recognized product food safety standard and quality management systems enable trial runs and tests to be carried out on the food products before delivery to the international market. Smallholder farmers are assured of increased income because global markets reject less farm produce. Finally, (d) observability given the extent to which the smallholder farmer can use the results from the change management process to enhance farm continual improvement programmes.

However, IDT has been criticised for presuming that all innovations will be beneficial and will diffuse seamlessly across the adopters. The presumption may not be true even for smallholder farmers and associate adopters in the agri-food supply chain after the smallholder farmer executes the change management process to implement the product's food safety standards and quality management system in farm operations. Further, IDT also presumes that the farm operations would immediately become efficient and effective, which may not be the case in a business organisational framework since other factors may need to come into place and be replaced by better innovations.

Nevertheless, irrespective of the smallholder farmer’s underlying reason to perform a change management process to implement the product food safety standards and quality management systems, the success of the entire change process depends upon the smallholder farmer's ability to motivate employees and positively impact their social behaviours and attitude towards new product change and ideas.

General Deterrence Theory

The general deterrence theory (GDT) was formulated in the eighteenth century by Cesare Beccaria and Jeremy Bentham, as cited by Bhattacherjee (2023). GDT sought to explain why some people engage in deviant, criminal or anti-social behaviours. GDT holds that people naturally and freely choose deviant behaviours based on a rational cost-benefit calculation that engenders personal gains or pleasure that can be controlled by increasing the cost of engaging in such behaviours in the form of punishments or understanding the chances of apprehension.

In the study context, when determining the efficacy of product food safety standards and quality management systems, the smallholder farmer should focus on the situational factors that could hinder the achievement of task objectives when deciding to do a change management process. Therefore, personal situation factors such as the individual values of the smallholder farmer and their employees, the need for money and personal affluence, and also the environmental context, such as the role of other stakeholders in the supply value chain, all play a critical role in the success of the change management process to implement a global agri-food system.

To achieve the objectives of the change management decision-making process to access international markets to increase farm produce returns, smallholder farmers should focus on how

to avert criminal behaviours of whatever nature in the farming activities when implementing the product food safety standards and quality management systems. Smallholder farmer's employees, for example, should avoid gang-like activities and insider trading, among others, and avoid stealing from the organization so that all stakeholders in the agri-food supply chain can mutually benefit from the change management decision process.

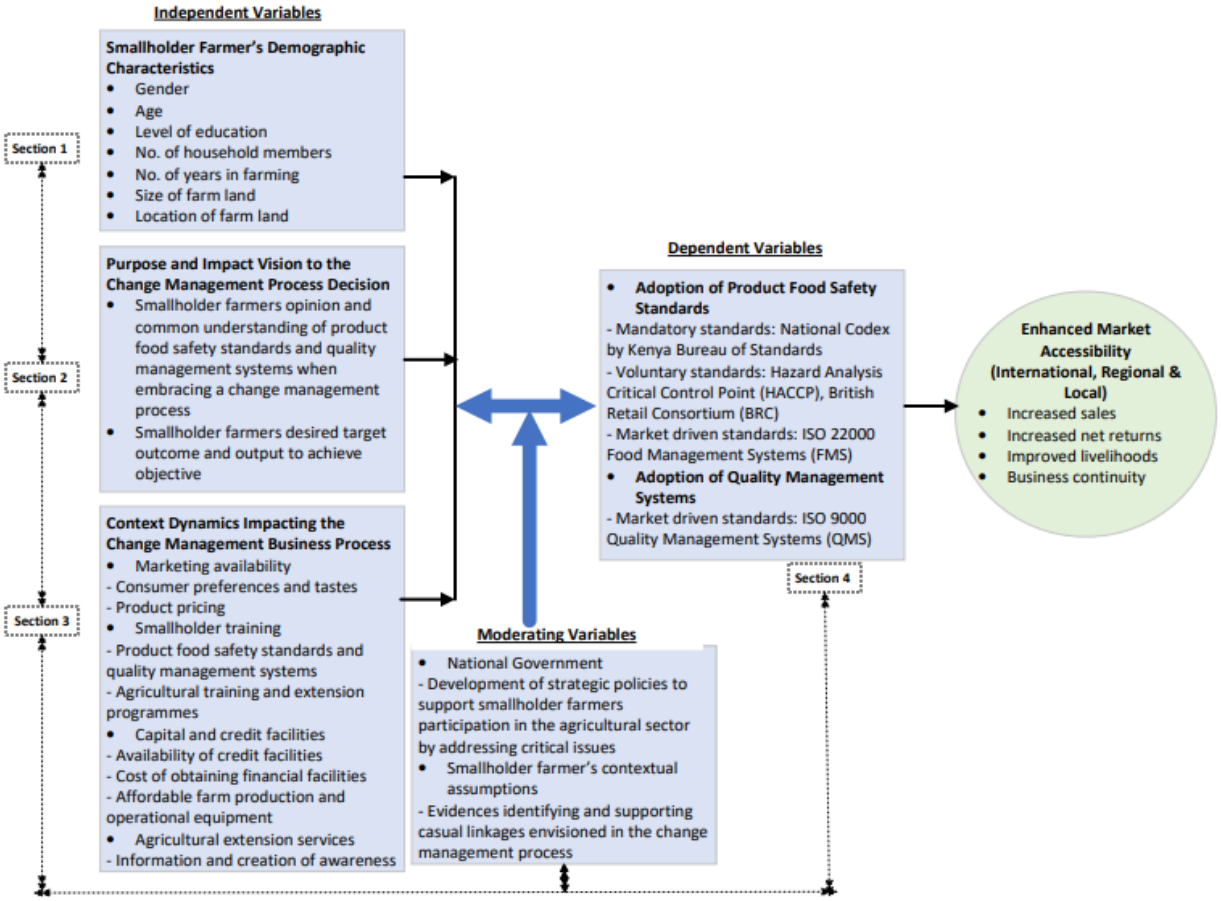
Conceptual Framework

The study adopted a conceptual framework to guide further and bring out the aspects of the research on how they interlink when exploring the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. The conceptual framework views the interrelated components and variables to address the research objectives and aims to solve the problem in the study (Guntur, 2019).

Below is the conceptual framework on the efficacy of product food safety standards and quality management systems adopted in the study for smallholder farmers in Kenya.

Figure 8

Conceptual Framework on Efficacy of Product Food Safety Standards and Quality Management Systems among Smallholder Farmers in Kenya



As shown in Figure 8 above, the conceptual framework sought to address the smallholder farmers' development when adopting a change management process that stimulates and transforms business activities to increase returns and improve household livelihoods. The demographic characteristics shown in Section 1 of the conceptual framework impact the smallholder farmer's economic activities when embracing the change management process to implement product food safety standards and quality management systems in the farm operations. In other words,

smallholder farmers' economic development processes are considered intrinsically related to the demographic variables in the study. Section 2 of the conceptual framework shows the purpose and impact vision to explore and determine the smallholder farmer's common understanding, agreement, and ownership to implement the product food safety standards and quality management systems. In other words, the smallholder farmer’s opinion differences are looked at from varied perspectives to build consensus on the adopted change management approaches and pathways to achieve a desired target outcome, output or objective. Section 3 of the conceptual framework enables gathering as much information as possible based on a solid understanding of the smallholder farmer's context when implementing the change process. Some of the ToC facilitation tools used to understand smallholder farmers’ context of operation include (a) gathering smallholder farmers into group formations to deliberate and break down the problem or challenge they seek to address when implementing the change management process, (b) the reflection on the vision of change based on how the smallholder farmers are aligned to the statement problem through brainstorming, and (c) in network mapping that enables the study to identify and understand the nature of the relationship smallholder farmers have developed and influenced management changes when implementing product food safety standards and quality management systems.

Therefore, notwithstanding the challenges faced by smallholder farmers in developing countries such as Kenya to access international markets and consistently supply the right volumes and quality of farm products, the smallholder farmers, when implementing product food safety standards and quality management systems, seek to encourage conversations that look at varied perspectives and build consensus on the adopted change management approaches and pathways.

Therefore, using the ToC approach, the study explores the perceived smallholder farmer vision of how the management changes bring success and the necessary preconditions for success.

Further, the national government's role as a moderating variable in the conceptual framework becomes critical to the success of the change management process for smallholder farmers since the government is responsible for developing strategic policies that address critical issues affecting the agricultural sector in Kenya. In addition, the conceptual framework highlighted the smallholder farmers' assumptions and sought to identify the evidence supporting the causal linkages to determine the different experiences and expertise that inform the farmers' thinking process about change management and delivery of intended outcomes.

Following the successful implementation of product food safety standards and quality management systems as a change management process, the smallholder farmers, as shown in Section 4 of the conceptual framework, are expected to benefit from cost-effective structures on the control of food from ingredients right through to production, storage and distribution to sale and service of the final consumer, and also access international markets and thus increase food exports by contributing to the profitable high-value foods that increase their net incomes and improve household livelihoods. The directions of the arrows show the interlinkage between the key variables of the study.

Methodology

The study extensively used varied literature reviews to guide and substantiate discussions on ToC obtained through a mixture of systematic internet-based search and other acceptable searching methods. In addition, the personal knowledge of key research stakeholders was also

engaged to enhance the broader findings towards understanding and solving the study's problem statement (Turner, 2017).

Change is diverse and can be triggered by forces internally or externally. Smallholder farmers in Kenya have gone to great lengths to change organizational models to establish and implement global product food safety standards and quality management systems. The change in organizational models is meant to improve their operating and production activities to gain access to more profitable markets and improve their livelihoods. Therefore, following the change management process, the study seeks to identify and present an impact comparative on the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya prior and post implementation and determine the benefits realized from such programs. Since change is diverse and occurs in varied forms, it implies that the best method of implementing change will be tied to the type of change applied. The following section discusses agriculture in Kenya from a general perspective to give a context to the significance and contribution of smallholder farmers in Kenya.

Agriculture in Kenya

Agriculture in Kenya is often considered the backbone of Kenya’s economy, critical for national development, food security, and fighting against hunger (Atela et al., 2018). Therefore, the agriculture sector provides a captivating expanse to research the role of agribusiness in promoting food security in Kenya and the improvement of household incomes (Wangu et al., 2021). Historically, white settlers who owned large-scale farms dominated agriculture production in Kenya, producing cash crops such as horticulture products, coffee, and livestock. On the other hand,

smallholder farmers have historically engaged in rain-fed cultivation of products such as maize and beans using traditional farming systems and shifting production. After Kenya achieved independence from Britain in 1963, the Government of Kenya pursued agricultural development and land management policies intended to promote the conservation and regeneration of natural resources such as soil and water. These agriculture policies led to various agro-industries and farmer cooperatives in Kenya that supplied farmers with labour and raw materials. In addition, public investments were made by the national Government, which led to the establishment of national research organizations such as the Kenya Agricultural Research Institutes (KARI) in the late 1970s.

However, in the late 1980s, the national Government was faced with a financial and administrative crisis that affected the agriculture sector in Kenya in keeping up with the global advancement in farming technology (IMF, 2021). After that, agricultural extension services were recognized as a market-oriented agricultural development strategy and public-private partnerships leading to improved crop varieties (GoK, 1994, 1996). Subsequently, other national development plans, such as the Economic Recovery Strategy, were rolled out, targeting market-oriented technological transformation in the agriculture sector (GoK, 2003). In addition, the Strategy for Revitalising Agriculture (2004—2014) development plan was also rolled out to transform traditional agricultural systems into modernized agriculture and an input-intensive and capitalistic model (AMADPOC, 2011). These national development plans aim to sustain the agriculture sector and revive the national economy.

In 2010, Kenya's new constitution ordered the creation of county governments with a mandate to enact support policies following the recognition of agriculture as a key pillar of the country's economy and food security (GoK, 2010). Since then, the national Government has

continued supporting reforms in the agricultural sector that are aligned with emerging technological opportunities. As a result, notable improvements have emerged in community-based organizations (CBOs), promoting smallholder farmers, farmer groups and cooperatives, farmer network support systems, and information sharing that are aligned with technological advancements.

Consequently, as a result of the development processes and transitions that have taken place in Kenya since independence, the agricultural sector's contribution in Kenya to GDP is 33 per cent, driven mainly through horticulture and cash crops, accounting for 40 per cent of employment and 65 per cent of economic export earning (Birch, 2018; USAID, 2021). Seventy-eight per cent of the agricultural production land is dominated by smallholder farmers with a land size of 0.2 and 3 hectares (Birch, 2018). Therefore, agriculture in Kenya plays a vital role in the rural economy, and the rural communities rely mainly on agriculture for food security and livelihood (Wangu et al., 2021). Although many smallholder farmers in the agriculture sector are poor, historical agriculture analysis in sub-Saharan Africa rates Kenya as one of the few countries to record steady growth, especially in horticulture production (Birch, 2018). However, in recent times, agricultural activities have experienced stagnation, with smallholder farmers and related agriculture enterprises facing challenges in growing their businesses and improving the quality of farm products (USAID, 2021).

Barriers to Agricultural Productivity in Kenya

However, notwithstanding the developmental advancements in the agriculture segment, Kenya still wrestles with food security issues (Wangu et al., 2021). In 2011, the national Government reported that 10 million people were habitually food insecure (GoK, 2011). In addition, approximately 4 million people were reported (WFP, 2016) to have consumed food

lacking nutritional diversity, primarily made of staples with oil flavours and green vegetables. In 2018, an estimated 2.4 million people in Kenya depended on relief food aid (FAO, 2021). Moreover, the national Government was driven to make nutrition and food security among the critical and vital targets in its 'Big-Four Agenda' following the persistent food crisis in the country, which advocated for an increased role of the private players and actors in the agricultural sector (KEPSA, 2017).

Birch (2018) identifies six cluster principle barriers to agricultural productivity in Kenya: land and population pressures, agricultural research and development and extension, markets, climate change, soil fertility and land degradation, and public expenditure.

Barrier 1: Land and population pressure

Production land is exceptionally constrained for smallholder farmers as farm sizes become smaller and land distribution becomes more concentrated.

Barrier 2: Agricultural research and development and extension

Government budgetary expenditures have fallen over time, and smallholder farmer extension advises reducing while, on the other hand, extension services favour wealthier farmers.

Barrier 3: Markets

Transaction costs relating to market information and processing have increased, notwithstanding improved accessibility to physical markets. As a result, in many instances, the

government has deviated from investments that would have been more effective and efficient in enhancing productivity through market intervention.

Barrier 4: Climate change

Agricultural production and resultant impacts on crops have been significantly affected by the change in temperature and variability of rainfall.

Barrier 5: Soil fertility and land degradation

There is an increase in land degradation and poor adoption, particularly by smallholder farmers, adversely affecting farm-sustainable land management practices.

Barrier 6: Public expenditure

The government's commitment to subsidy schemes is regressive and distortionary, with minimal efforts to meet African Union pledges on agricultural public spending.

Efforts by the National Government to Promote Kenya's Agricultural Sector

Kenya is considered a leading destination for investors in the region with varied investment opportunities in agriculture and agri-business, spanning from crop and animal production, agro-processing, and marketing for local and export consumption (AMADPOC, 2011). Through the Kenya Vision 2030 (Wangu et al., 2021), the national Government has developed strategic policies that address critical issues affecting the agricultural sector in Kenya following the failure of liberalized policies in agriculture under the World Bank-led Structural Adjustment Program (SAP)

of the 1980s. The developmental strategic policies initiated include Poverty Reduction Strategy Paper (PRSP), 2001-2004, the Economic Recovery Strategy for Wealth and Employment Creation (2003-2007) (ERSWEC), the Ministry of Livestock and Fisheries Development Strategic Plan 2003 – 2007, the Strategy for Revitalizing Agriculture, 2004 – 2014, the National CAADP Compact, the Medium Term Investment Strategic Plan (MTISP), the Kenya Rural Development Strategy (KRDS), 2002-2017 and the Agricultural Sector Development Strategy (ASDS) 2010-2020 (GoK, 2018b).

The national Government initiated several critical policies to improve the investment culture in the agriculture sector. These policies include; (a) improvement of rural infrastructure so that farm produce is transported at a low cost, (b) expanding of export markets for agricultural commodities through the promotion of regional trade, (c) improving access of agricultural lands to local and foreign investors, (d) promoting the use of irrigation in farming activities that reduce agri-inherent risks, (e) reducing the costs of doing agri-business by improving co-ordination of sector ministries and harmonizing license acquisition procedures, (f) encouraging smallholder farmers investment initiatives to reduce poverty and promote food security, (g) increased allocation of national resources to at least 10% of the national budget to facilitate the achievement of 6% annual growth in the agriculture sector, and (h) review of foreign aid policies to improve economic sector productivity, especially in the agriculture sector.

Given the efforts by the national Government to promote the agriculture sector in Kenya, several smallholder farmers have embraced inclusivity business initiatives in the recent past across the country. The national Government has targeted smallholder farmers in Kenya with policy interventions to reduce poverty by building their livelihoods and increasing farm productivity

(Ajwang et al., 2019). In addition, the national Government has also put efforts into developing policies to modernize crop production and marketing through innovation. However, the failure of the national Government to implement intervention policies successfully makes it difficult for Kenya to meet the UN's (2015-2030) Sustainable Development Goals (SDGs) of (a) no poverty, (b) zero hunger, (c) good health and well-being, (d) decent work and economic growth, (e) reduced inequalities, (f) responsible consumption and production, (g) climate action, and (h) life on land (UN, 2015).

Application of Theory of Change to the Agricultural Sector in Kenya

There is a need to transform the agricultural sector in Kenya, which is driven by the national Government, county governments, and private sector if 100 per cent of food security aspirations and sustainability are maintained in the next decade. The theory of change (ToC), according to NAIP (2019), used as a theoretical framework in the study, is grounded in the belief that food security and the creation of a pathway requires a dynamic, commercially driven and modernized approach that supports sustainable economic growth in the context of change or devolution. Furthermore, the national Government's central goal through the agricultural sector is to make nutritious food available and affordable to all Kenyan households. Therefore, there has to be a change management approach aligned to the developmental phase process of ToC in the national Government, where smallholder farmers are integrated, developed and promoted to improve productivity and access market opportunities with reasonable prices to optimize returns for sustainability.

The application of ToC to the agricultural sector in Kenya is evident in the adoption of the National Nutrition Action Plan Framework (NNAPF) designed to transform smallholder farmers (GOK, 2018a). For example, a ToC approach to improving the agricultural sector includes (a) the support of smallholder farmers and creating a market transformation designed to shift smallholder farmers from small producers to market-oriented output that focuses on long-term food security and nutrition, (b) the creation of an ecosystem of all stakeholders in the agricultural sector that ultimately supports smallholder farmers across the entire agricultural supply chain, (c) creation of focused food emergency responses to address 100 per cent food security initiatives through the establishment of national household food resilience measures that benefit Kenyans who are food insecure.

Therefore, according to the objects detailed in the NNAPF to transform the agricultural sector using the ToC approach and achieve 100% food security, (a) 3.3 million smallholder farmers' average participating income will increase from Kes. 465/ day to Kes. 625/day over five years, (b) national GDP is expected to increase by 33 per cent from Kes. 3.7 trillion to Kes. 3.9 trillion with the ToC transformation, (c) the average number of food-insecure people in Kenya will reduce from an average of 2.7 million down to a range of 0-1.3 million in the short term.

Since the study sought to determine the efficacy of smallholder farmers in Kenya prior and post implementation of product food safety and quality management systems, a detailed explanation of a smallholder farmer's nature, roles, and characteristics is presented in the next section.

Smallholder Farmer

There is no universally agreed definition of a smallholder farmer due to the varying factors across many countries and regions, such as land ownership, agricultural production size and activities, living standards, sharing of family labour, agroecology, demography and socio-economic factors (Andrade, 2016; IFAD, 2013; Kamara et al., 2019; RSA, 2012). In addition, gender equality is also a crucial disparity when considering what constitutes a smallholder farmer. For example, some women farmers in sub-Saharan Africa are more disadvantaged than men since they do not have equal access to agricultural resources. In other instances, women farmers are not allowed to own titles for their farmland and are often paid a lower wage than their male counterparts men gender (Muzari, 2016).

Smallholder farmers' land size and scale vary tremendously from one country to another (Paloma et al., 2020; Rapsomanikis, 2015). For example, the Food and Agricultural Organization (FAO) classify farms with less than 2 hectares as smallholder farmers. In Australia, a smallholder farmer is considered one with a farm size of 0.5 to 500 hectares (Andrade, 2016; Hammoudi et al., 2015). In Bangladesh and Viet Nam, the average farm size for a smallholder farmer is 0.24 and 0.32, respectively (Rapsomanikis, 2015). Smallholder farmers in the African continent are considered to own less than 5 hectares (Hammoudi et al., 2015; Kamara et al., 2019). In other instances, the term smallholder is viewed as problematic because it gives a sense of class-based differences of farmers engaged in relatively small-scale agricultural production activities (Cousins, 2016).

Globally, there are 500 million smallholder farmers and 2 billion people depending on their livelihoods (IFAD, 2013; Kamara et al., 2019; Rapsomanikis, 2015). Moreover, smallholder

farmers are vital in economic development and are considered the backbone of farming in many low-income countries in Africa, like Kenya (Actionaid, 2014; Guta Regasa et al., 2020; Kamara et al., 2019; Paloma et al., 2020; RSA, 2012). Therefore, creating platforms where smallholder farmers can participate in sustainable agricultural supply chains leads to considerable benefits such as poverty reduction, gender equality, and a healthier environment (Andrade, 2016). Sustainable agriculture (FAO, 2014) encompasses several variables that are important to enhance improvements for the smallholder farmer's operations, that is, (a) more involvement of the smallholder farmers to adopt agro-ecological farming practices, (b) income and costs to be balanced equitably, and (c) stakeholders involvement with services such as certification of agri-systems, should be enhanced for the benefit of smallholder farmers.

However, smallholder farmers produce food with limited external input (IFAD, 2013). Moreover, many smallholder farmers are from low-income families and are marginalized in terms of capital and assets, resources, market accessibility, information and technology. Also, many smallholder farmers are poor, food insecure and have limited access to markets (Rapsomanikis, 2015). Therefore, as argued by other scholars and practitioners, smallholder farmers face barriers that prevent them from producing sufficient produce that hinder growth in profitability (Paloma et al., 2020).

Nevertheless, notwithstanding the challenges smallholder farmers face in accessing productive resources, smallholder farmers are the main drivers of agricultural activities in many Sub-saharan economies, contributing significantly to agricultural production, food security, and biodiversity (Actionaid, 2014; Kamara et al., 2019). Moreover, in Africa, smallholder farmers are an increasing source of food supply to many developing urban areas (IFAD, 2013).

Significance of Smallholder Farmers to Agricultural Growth and Development

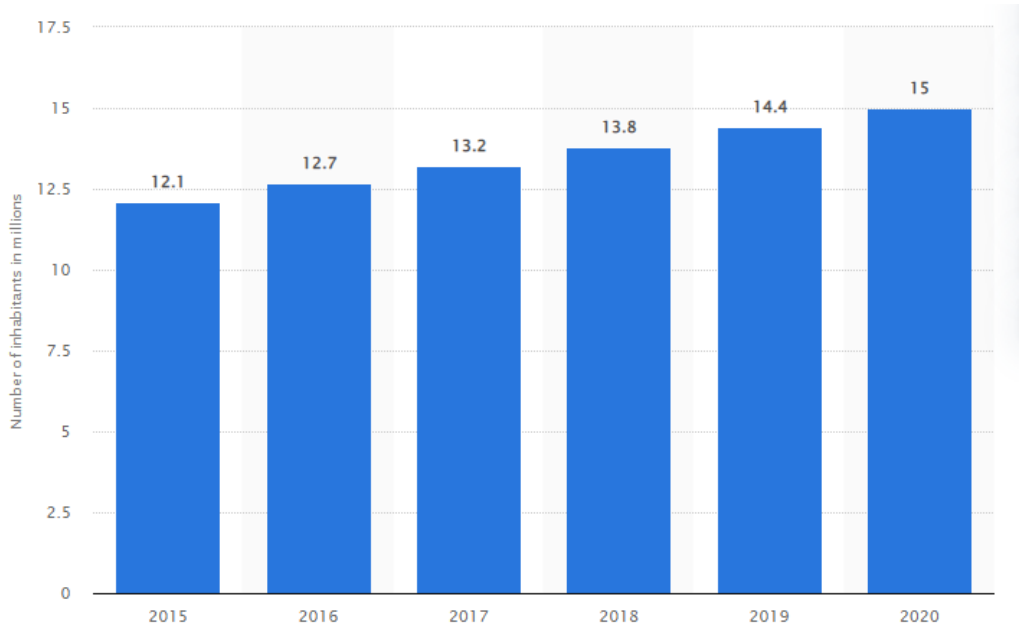
Smallholder farmers live in poverty and have challenges accessing sustainable agricultural farm inputs, supply chains and sustainable markets (Andrade, 2016). Nevertheless, despite the encounters faced in accessing critical production resources and farming services, smallholder farmers contribute significantly to Africa's agricultural production, biodiversity, and food security (Kamara et al., 2019). Therefore, there is a need for a more deliberate focus in the next decade to promote smallholder farmers' productivity and ensure food security and nutrition to escape poverty and fuel economic growth (NEPAD, 2013).

Smallholder farmers also play a vital role in the societal transition of livelihoods by enabling the sustainability of resilience and equitable food system structures that tackle poverty and environmental issues (Andrade, 2016; FAO, 2014). Therefore, smallholder farmers have a greater adaptation to agroecological farming since they now participate in determining, establishing and implementing agriculture sectorial governance systems.

In the coming decades, the agriculture sector will be required to transform significantly to meet the growing food demands of an increasingly urbanized population. For example, in the case of Kenya, as shown in Figure 9, 15 million people in 2020 lived in urban, which is 27.8 per cent of the entire country's population compared to the previous years.

Figure 9

Number of inhabitants in Urban Areas in Kenya



Note: Adapted from *Urban Population in Kenya 2015-2020*, by Faria, 2021, p. 1.

However, notwithstanding the interrelated risks and challenges faced by smallholder farmers, national Governments have increased resources to develop and promote smallholder farmers' role in a broader context towards achieving food security and nutrition with a growing population. Moreover, the unique role of smallholder farmers also integrates into the broader

diversity of the national economy and agrifood value chain, contributing to inclusivity growth and employment generation (UN, 2015). Therefore, smallholder farmers are empowered to manage resources sustainably and, thus, create safety nets and measures through farm employment that cause improved livelihoods. Also, the inclusivity of smallholder farmers supports patterns of economic growth, cushioning the short-term impacts in cases of transition to non-farming activities.

Hindrances Faced by Smallholder Farmers

Smallholder farmers face challenges that hinder them from accelerating growth to contribute effectively to strategic food security goals and compete effectively in marketplaces (Kamara et al., 2019; RSA, 2012). Some of the encounters commonly faced by smallholder farmers include:

Encounter 1: Climate Change

Smallholder farmers have faced climate change, with hazardous variables ranging from high temperatures, bushfires, floods, droughts, soil salinity and shifts in rainfall patterns (Kipkoech et al., 2015; Paloma et al., 2020). Climate change has negatively impacted smallholder farmers' crop production, threatening food security and improved livelihoods.

Encounter 2: Access to and Ownership of Capital Assets for Food Production

Smallholder farmers most often need capital assets in the form of natural, physical, financial and human labour to increase food production and improve their livelihoods. However, many smallholder farmers are considered poor, lacking land tenure security and formal title on land

ownership, making it challenging to invest adequately in sustainable agricultural practices. In addition, many smallholder farmers lack physical assets such as machinery, irrigation, technical equipment, building facilities and financial assets to make significant investments to improve farming production. They, therefore, rely on local tools such as hoes and machetes for agricultural production. Furthermore, a lack of finance to purchase fertiliser, seeds, pesticides, and herbicides resulted in poor crop production outputs.

Moreover, the lack of accessibility to irrigation water denies the smallholder farmer the opportunity to reduce poverty (Sinyolo et al., 2014). Finally, the smallholder farmer's human capital, which is relied on massively, is limited in education and technical skills and, therefore, a severe obstacle to accessing and implementing technological advancements in farming production (RSA, 2012). Thus, the smallholder farmers will undertake low-risk activities that lead to low-yield agricultural produce, thus fueling a perpetual cycle of poverty due to little or no profits from farming activities (Paloma et al., 2020).

Encounter 3: Road Infrastructure, Storage and Marketing Facilities

Many smallholder farmers, especially in rural areas, are still experiencing challenges to proper road infrastructure and poor physical and institutional infrastructure, making it challenging to transport inputs and produce. A flawed road system makes it difficult for smallholder farmers to access valuable agricultural information. Post-harvest losses for many smallholder farmers are also high due to inadequate storage and processing facilities. Accessibility to distribution markets by smallholder farmers is also tricky, making optimising returns from farm production challenging. Poor quality of farm produce reduces the smallholder farmer’s ability to

negotiate and bargain effectively in marketplaces and, therefore, often selling the product at lower profit margins that compromise livelihoods' well-being (Paloma et al., 2020). Produce purchased at farmgate prices by intermediary parties due to limitations in accessing the final market also denies smallholder farmers the opportunity to optimize returns.

Encounter 4: Admittance to Financial Services

Many smallholder farmers lack the security financial institutions need to secure loans and savings accounts (Paloma et al., 2020). Therefore, smallholder farmers find securing the capital and credit required for farm development challenging. Also, in rural areas where financial services are available, it is constrained and thus unable to meet all the demands of the smallholder farmers (Demirguc-Kunt & Klapper, 2012). The lack of accessibility to financial services makes it challenging for smallholder farmers to grow and compete effectively in the national and international markets.

Encounter 5: Global Food Standards and Competition

Smallholder farmers who want to access international markets must meet global regulations on sanitary and phytosanitary requirements, global food safety standards, and quality management systems, which can be a major challenge (Kamara et al., 2019). Different countries of export destinations have minimum standards that the smallholder farmers must meet if the intention is to sell products internationally. In addition, the produce price set by the smallholder farm must be competitive in the international markets. Therefore, smallholder farmers must access valuable

information relating to global markets. Although, more often, smallholder farmers, especially in developing countries, have challenges accessing financial support, they will have to rely extensively on donor agencies and private-public sectors for assistance to access global markets.

Initiatives to Improve the Livelihood of Smallholder Farmers

Many countries in sub-Saharan Africa have developed national policies targeted towards increasing public expenditure in the agricultural sector to promote economic growth through smallholder farmers to eradicate poverty and enhance food security. For example, the 2019-2024 National Agricultural Investment Plans (NAIPs) in Kenya aimed at sustainable agricultural transformation and food security sought the interests of farmers in establishing and implementing agriculture policies (NAIP, 2019). In addition, governments are encouraging private sectors to elevate the livelihood of smallholder farmers through active participation in public-private partnerships. Examples of national Government public-private partnership initiatives in Kenya include the Shinyanga Soil Conservation Program and the Push-Pull technology in Kenya (Actionaid, 2014).

National governments are positioning smallholder farmers in long-term visions for agricultural development by sounding the aspiration to eradicate poverty and move towards prosperity and improved livelihoods through social and economic transformation (AU, 2015). Therefore, as part of national Governments' agendas to achieve economic growth and development in the agriculture sector, smallholder farmers are being encouraged to modernize by embracing science, technology, and innovation to increase productivity for food security and improve profitability for prosperity and better livelihoods (Actionaid, 2014; NEPAD, 2013).

Many smallholder farmers in sub-Saharan Africa operate in stressful environments with climate adaptation challenges, poor access to technology, credit facilities, markets, and other institutional issues, making it difficult to adapt to climate changes. However, smallholder farmers are encouraged to embrace climate-smart agriculture and green economy initiatives for sustainable development. Therefore, sustainable agroecological approaches are being developed as responses to climate change to promote adaptation measures that build the smallholder farmers coping strategies and resilience (Ngeve et al., 2014; Rhodes et al., 2014). In addition, regional initiatives such as policy and regulatory frameworks encouraging adaptation to climate-smart agriculture by smallholder farmers have also been developed to address climate change. Examples of regional initiatives designed on climate-smart agriculture, according to FAO (2015), as mentioned by (Kamara et al., 2019, p. 14054), include (a) the East African Community to address climate change, (b) the signing of a Memorandum of Understanding between the European Union and the Intergovernmental Authority on Development (IGAD) in support of the development of an IGAD climate change strategy, (c) the East African Sub-regional Platform to scale up climate-smart agriculture, among others.

National governments have also developed frameworks to mobilize smallholder farmers into various types of cooperatives, especially in rural areas, as a critical source of livelihood. For example, the article by the agriculture, forestry and fisheries in the Republic of South Africa (2012) explains that the mobilization of smallholder farmers into cooperatives occurs at two levels, namely at the primary and secondary levels. The primary level is presented as where the smallholder farmer is mobilized, having single or multiple roles that provide different services to farmers or at the secondary level, where an already existing cooperative is mobilised to address the needs of primary

cooperatives. Examples of service provision by secondary-level cooperatives include (a) assistance towards achieving compliances in product food safety standards and quality management system, (b) strengthening bargaining powers due to advantages in producing economies of scale, (c) provision of market intelligence information, improve logistical planning, and (d) provision of communal storage facilities.

National governments have enacted institutional reforms to encourage land transfer ownership to smallholder farmers to undertake agricultural activities (Paloma et al., 2020). Therefore, promoting land rights and transferring land ownership to smallholder farmers brings in a willingness to undertake farming activities, thus leading to increased productivity and improved livelihoods.

Smallholder farmers are also given access to risk management tools through collaborative efforts with the private sector, donor and national Government that increase their resilience to a range of adverse conditions such as market prices and climate change (Bryan et al., 2013). Therefore, smallholder farmers are encouraged through index-based insurance initiatives to limit their exposure by taking up insurance covers that mitigate risks against productivity and market volatility.

The national Government has also deliberately linked smallholder farmers to institutional agencies with modern agrifood value chains to improve agricultural productivity, nutrition and food security (Paloma et al., 2020). As a result, smallholder farmers are systematically coordinated through institutional mechanisms that allow them to link to markets, reduce transactional costs, increase their bargaining power, and improve access to real-time information and communications. Further, youth are encouraged to farm to foster agricultural growth and promote overall national

development. Therefore, agricultural training programs have been enhanced to address young farmers' needs. In addition, national Government initiative programs such as the Youth Enterprise Development Fund (GOK, 2020) are being promoted to give young farmers access to financial and non-financial services to champion the cause of youth for a collective future.

Therefore, to summarize the various initiatives explained to improve the livelihood of smallholder farmers, there is a global need for significant changes in the agri-food sector to meet the demand for food nutrition, food safety and food security goals. Consequently, the involvement and development of smallholder farmers are essential in achieving agri-food objectives, including establishing and implementing product food safety standards and quality management systems. Furthermore, smallholder farmers are deemed capable of implementing global food safety standards. Therefore, the study sought to evaluate the efficacy of product food safety standards and quality management systems and justify if the change management pathway increases profitability and improves smallholder farmers' livelihoods. Therefore, the initiatives mentioned play a role in removing barriers to improve efficiency and profitability in smallholder farmer operations.

Commercializing and Market Participation by Smallholder Farmers

Smallholder farmers make change management decisions to implement product food safety standards and quality management systems to optimize the commercialization of agricultural production and participate effectively in national and international markets. Commercialization of smallholder farming can be defined as "… the transformation from subsistence production (production for own consumption) to production for sale of surplus products and services (Melchior & Newig, 2021, p. 2)." In other words, the volume of farm produce is marketable to earn a surplus

or profit from agricultural production that improves smallholder farmers' livelihood and boosts economic growth. Therefore, smallholder farmers must focus mainly on market demands when making production decisions to optimize returns from farm activities to earn income, improve food security, and create employment opportunities (Guta Regasa et al., 2020).

The literature review extensively highlights the vast majority of smallholder farmers in rural areas, who often use traditional agriculture methods and family labour as management practices in their farms. On the other hand, national Governments consider smallholder farmers to have the potential to transit from rural farmers to development experts (Melchior & Newig, 2021). Numerous studies have been conducted by authors such as Kamara et al. (2019) in the publication of "The Relevance of Smallholder Farming to African Agricultural Growth and Development" and Wangu et al. (2021) in the publication of "Inclusive Business for Smallholders' Household Food and Nutrition Security", highlighting the limitations of smallholder farmers commercializing rural agriculture to understand the potential approaches to promote agricultural growth and market accessibility. Some of the limitations identified that are a hindrance to smallholder farmer commercialization included (a) limited access to water for irrigation, (b) inefficient use of farm production systems, (c) limited access and information on markets, (d) low return on investments (ROI) from farm activities, (e) production risk exposures from climatic changes, (f) unskilled labour shortages. The impact of such limitations is the increased poverty and uncertainty of food security.

Studies by authors such as Gc & Hall (2020) in the article "The Commercialization of Smallholder Farming—A Case Study from the Rural Western Middle Hills of Nepal" have further affirmed that for smallholder farmer activities to be of commercial value and profitable (a) modern technological advancements need to be introduced and adopted, (b) there have to be beneficial

engagements with markets, (c) smallholder farmers must have access to farm inputs suppliers and related agri-business service providers and (d) adaptation of high-value techniques on crop production. In addition, smallholder farmers also need to embrace mediating factors such as adequate crop insurance and government subsidies that promote agricultural activities. According to Jelata et al. (2009), as Melchior & Newig (2021) mentioned, the commercialization of agricultural production is generally considered a complex and long-term process. Therefore, smallholder farmers are leveraged through different interventions by the private sector, private-public partnerships, and national Governments to operate in an environment that optimizes commercialization and improves household livelihoods in the short, medium, and long term.

When addressing market participation efforts among smallholder farmers, linkages to markets are essential, and therefore, factors that hinder surplus produce being sold must be addressed adequately. According to a study by Guta Regara et al. (2020) on 240 smallholder farmer vegetable producers, market participation was significantly influenced by factors such as distance to the marketplace, age of head of the household and family size, labour, education literacy, and access to market information. Therefore, institutional intervention services and national policy implementations are needed to enable smallholder farmers to participate in marketing effectively.

Impact of Covid-19 on Smallholder Farmer's Participation in Implementing Sustainable Agriculture

The study sought to evaluate the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. In addition, the study determined how smallholder farmers' participation contributes to sustainable agricultural systems necessary for

accelerating food production, reducing poverty, and improving household livelihoods through increased income. There has been unprecedented stress on the agricultural sector following the Covid-19 pandemic caused by the new coronavirus (SARS-Cov-2) infection that affected the world population (Abid & Shang, 2021; Bulgari et al., 2021). As a result, smallholder farmers' lifestyles have changed positively and negatively (Sumekar et al., 2021). In this case, positive impact refers to strengthening social structures where people came together in brotherhood ties to deal with Covid-19-related issues as one unity front. However, at the same time, negative impact refers to the interrelated limitations within communities where, for example, agricultural produce from smallholder farmers could not be absorbed in markets and, therefore, potentially be a food crisis or threat. Therefore, smallholder farmers' efforts to access markets and farm inputs became constrained following restrictions on movements, thus creating labour shortages for planning and harvesting, drastically affecting the country's agricultural sector's development (Siche, 2020).

Since the effect of the Covid-19 pandemic will be apparent in the foreseeable long term, there is a need for smallholder farmers to further evaluate ToC approaches since the reality of the Covid-19 pandemic and the national food crisis cannot be considered independent activities. In addition, national Governments and agricultural stakeholders must change strategies to ensure the negative impact of Covid-19 on smallholder farmers does not spread, thus increasing poverty and hindering growth in household livelihood incomes.

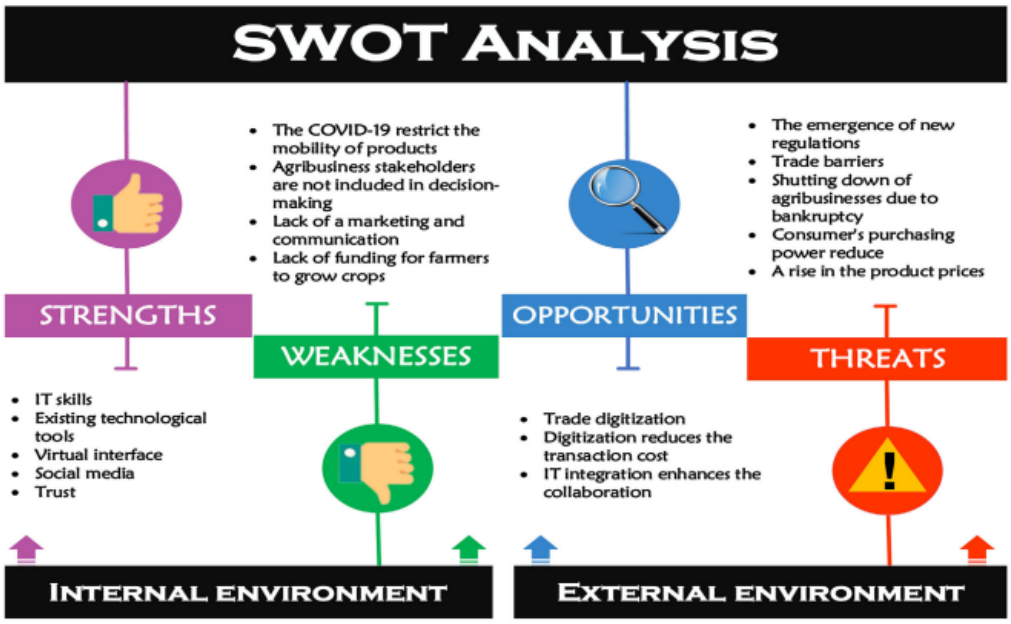
A study was conducted to analyze the effect of the Covid-19 pandemic on smallholder farmer’s activities on agricultural food. Data was collected from the Bureau of Statistics in Pakistan and the Food Agricultural Organization, as well as literature reviews and magazines from policy documents on the agricultural sector (Abid & Shang, 2021). The study results, which used a SWOT

analysis as shown in Figure 10, revealed that the Covid-19 pandemic mainly impacted the demand for food supply by smallholder farmers and food security nationally and globally. In addition, it was recommended from the study that national Governments and policyholders in the agricultural sectors should invest in technology that enables smallholder farmers to prevent food crises during the Covid-19 pandemic by contributing to the sustainable and workable flow of agricultural and farm products along the food supply chains.

SWOT analysis in the chapter mentions the evaluation of strengths (S), weaknesses (W), opportunities (O) and threats (T) on the impact of Covid-19 on the smallholder farmers' ability to meet food supply and demand and combat food insecurity. As mentioned in Figure 10 below, SWOT analysis is a commonly used management tool that provides a framework for strategy formulation and decision-making (Sammut-Bonnici & Galea, 2015).

Figure 10

Covid-19 SWOT Analysis Model on the Agriculture Sector



Note: Adapted from *Impact of COVID-19 on agricultural food: A Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis*, by Abid & Shang, 2021, p. 6.

Horticulture and Smallholder Farmers in Kenya

Kenya's national economy is driven mainly by horticultural exports comprising vegetables, fruits and flower production throughout the year. In addition, the global demand for horticultural products has increased over the years, with fruits accounting for about 600 million metric tons and vegetables accounting for 1 billion metric tons annually (Irandu, 2019). Further, in a study carried out by the author on the top 10 trading partners, the results revealed that Great Britain had the highest value of Kenya's horticultural products than other European Union countries. In addition, Kenya's competitive advantages in the horticultural sector stemmed from the fact that the physical

and economic factors complement that of the Northern Hemisphere with the ability to provide traditional and exotic fruits and vegetables throughout the year.

The history of fresh fruits and vegetable horticulture goes back to the colonial days when Kenya was a British colony. After independence in 1963, horticulture in Kenya continued to grow, posting impressive growth while providing more opportunities for smallholder farmers to supply produce for export in the European and other markets.

The horticultural sector is one of Kenya's leading foreign exchanger earners, employing 6 million Kenyans directly and indirectly. However, because of the Covid-19 pandemic situation, the horticultural sector recorded a mixed performance, with horticultural exports declining, as shown in Figure 11, from 328.3 metric tonnes in 2019 to 313.6 metric tonnes in 2020 (KNBS, 2021). In addition, the decline in exports drastically affected the livelihood of smallholder farmers in Kenya.

Figure 11

Exports of Fresh Horticulture Produce

	Cut Flowers		Fruits		Vegetables		Total	
Year	Volume '000 Tonnes	Value KSh billion	Volume '000 Tonnes	Value KSh billion	Volume '000 Tonnes	Value KSh billion	Volume '000 Tonnes	Value KSh billion
2016.....	133.7	70.8	48.7	7.3	78.8	23.4	261.2	101.5
2017.....	160.0	82.2	56.9	9.0	87.2	24.1	304.1	115.3
2018.....	161.2	113.2	75.6	12.8	85.8	27.7	322.6	153.7
2019.....	173.7	104.1	81.9	13.2	72.7	27.2	328.3	144.6
2020*	146.0	107.5	105.1	18.4	62.6	24.2	313.6	150.2

Note: Adapted from *Economic Survey*, by KNBS, 2021, p. 141.

The horticulture sector in Kenya has continued facing stiff competition from other members in the East Africa Community and Egypt, causing production costs to increase. To promote the

horticulture sector highly, with smallholder farmers as the leading players, the national Government has continued to market fresh fruits and vegetables, including improving logistics and infrastructure like expanding the major international airports in Kenya (WorldBank, 2016). As a result of the good trading relations established by Kenya and key market partners in Great Britain and the European Union, 27 per cent of overall exports in the Netherlands and 45 per cent of overall exports in Great Britain comprise Kenya's fruit horticultural products (Irandu, 2019). Therefore, this requires smallholder farmers, the leading players in the horticultural sector, to comply with global product food safety standards and quality management systems to participate more actively in the international markets. As a result, the household income among smallholder farmers increases, poverty is reduced, and global food security is increased (Dyck et al., 2012).

The following section introduces product food safety standards and quality management systems and their efficacy in the smallholder farmers' change management process.

Trends and New Understandings of Product Food Safety Standards and Quality Management Systems in the Food Industry

The recent transformation in the global agri-food industry has significantly changed the role of smallholder farmers and how farmers establish, determine and implement product food safety standards and quality management systems (Lee et al., 2012). Furthermore, European markets have further continued to desire a year-round supply, thus increasing the demand trend for fresh horticultural products (Krause et al., 2016). Therefore, smallholder farmers require a transformation and change management approach (ToC) for the sustainability and equitable application of product food safety standards and quality management systems (Jacobi et al., 2020). Further, smallholder

farmers need to know the different frameworks for product food safety standards and quality management systems. Such dimensional frameworks include social-ecological resilience, food security, environmental and production performance, right to food, and poverty and inequality to validate if decisions to change management in farming approaches add value and improve households' livelihood.

Smallholder farmers need to ensure food production, distribution, and consumer consumption are economically and ecologically sustainable in the long term. However, achieving product food safety standards and quality management systems may appear far for smallholder farmers, though arguably (Jacobi et al., 2020) it is highly productive and generates more income to eradicate poverty. Therefore, smallholder farmers must embrace integrative approaches of product food safety standards and quality management systems that result in optimised interactions and maximise food productivity from production to consumer consumption and food sustainability. Given such approaches, the study sought to evaluate the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. Furthermore, the study undertakes a comparative approach prior and post implementation of product food safety standards and quality management systems for smallholder farmers.

Previous literature reviews indicate that smallholder farmers in Kenya have faced numerous challenges when complying with the strict product food safety standards and quality management systems (Ajwang, 2020). Therefore, as a result, some smallholder farmers have inevitably exited the process, opting to supply local and national markets with less stringent agrifood standards. On the other hand, the same author mentions that there has been a general increase in the number of smallholder farmers implementing product food safety standards and quality management systems.

As a result, smallholder farmers who are compliant with the regulatory process often accrue more benefits from accessibility to more international markets, thus increasing income and reducing poverty. In addition, compliance agencies to assist smallholder farmers have increased, helping overcome the historical compliance problems farmers experienced.

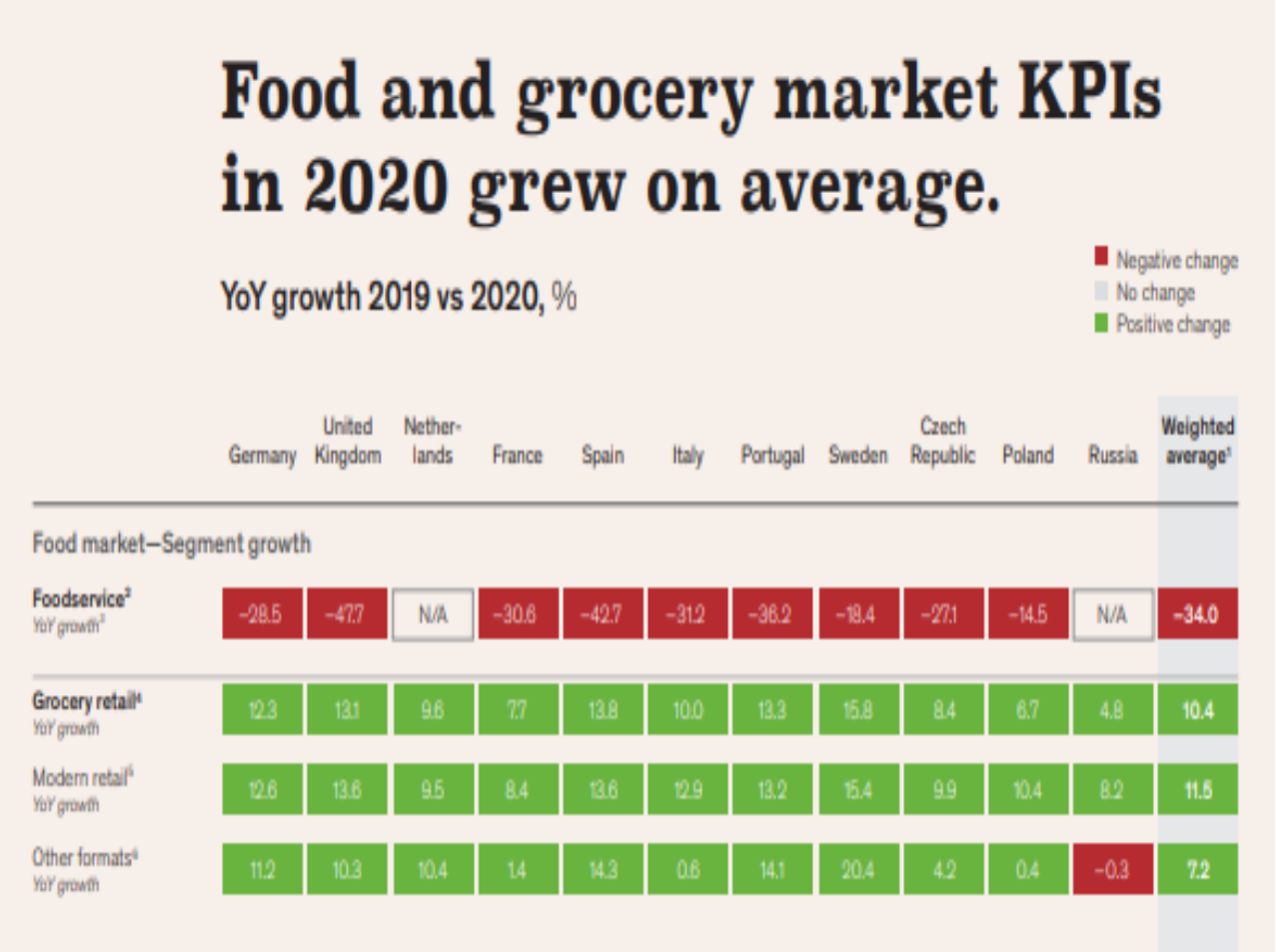
The implementation of product food safety standards and quality management systems must not be viewed by smallholder farmers as restrictive, thus underpinning global agrifood compliance objectives. Furthermore, agrifood standards and quality management system regulators must not operate from a position of power where smallholder farmers implement standards and system procedures through sanctions and punishment (Hammoudi et al., 2015), disregarding the high financial costs incurred to participate in the compliance regime.

A recent study on the transformation of food systems in Indonesia was carried out on 300 smallholder farmers (Toiba et al., 2020). The study results show that smallholder farmers' income increased following the establishment and implementation of product food safety systems and quality management systems. In addition, following the stabilization of consumer prices and demands, the planning process by smallholder farmers becomes easy, thus improving overall decision-making. Also, household incomes increased as smallholder farmers embraced the new food chain supply system based on product safety standards and quality management systems.

Globally, there is a fast growth of modern food retailers. For example, in Indonesia, hypermarkets, supermarkets, and convenience stores increased annually by 182 per cent within a decade in 2009 (Dyck et al., 2012). Furthermore, according to the article on the state of retail and grocery food stores in Europe 2021 (Herbert et al., 2021), despite the challenges resulting from the Covid-19 pandemic, grocery retail increased by an average of 10.4 per cent, as shown in Figure 12.

Figure 12

Food and Grocery Market KPIs in 2020



Note: Adapted from *Disruption and Uncertainty – The State of Grocery Retail 2021: Europe.*, by Herbert et al., 2021, p. 16.

Previous research and literature studies have documented the impact of growth in the retail food industry on smallholder farmers in developing countries and consumers in international markets (Dyck et al., 2012). In addition, there has been a growing movement of people and horticultural commodities in the modern globalized economy of the 21st century (Cork et al., 2016). Consequently, there is a greater risk in how food production is handled from one country to another,

calling for an effective coordinated response and surveillance of food safety regulations from smallholder farmers to consumers. Such regulations have largely been established and implemented through product food safety standards and quality management systems. Forty-six per cent of foodborne ailments are associated with fresh produce (Laury-Shaw et al., 2015a). Nevertheless, the same author explains that smallholder farmers can cause a positive change in food safety if workshops were frequently carried out on Good Agricultural Practices (GAP) that encompass product food safety standards and quality management systems. The author affirmed the positive change in smallholder farmers' knowledge, behaviour and attitude towards product food safety standards and quality management systems from the survey conducted on 134 smallholder farmers pre and post GAP workshops.

Overview of Product Food Safety Standards and Quality Management Systems

Product food safety standards and quality management systems have become a key public issue in the last 20 years following economic globalization and changes in food pattern consumption and consumer awareness (Hammoudi et al., 2015). As a result, food safety from farm production to consumption has become increasingly complex, with greater chances of the spread of pathogenic development and contamination. Therefore, food safety by smallholder farmers must be ensured and managed well throughout every stage of the supply chain. Consequently, national Governments and the global food industry have been compelled to develop management control and enforcement measures, leading to the growth and evolution of stringent and complex product food safety standards and quality management systems that stakeholders such as smallholder farmers must embrace and comply with.

However, on the contrary, introducing product food safety standards and quality management systems has also been viewed as creating challenges for smallholder farmers who lack sufficient resources to ensure compliance with agro-food standards and thus hinder access to the lucrative global market and major national markets. Such challenges to comply with product food safety standards and quality management systems mainly prevalent in developing countries like Kenya include the lack of necessary infrastructure, capital and technical support. Therefore, this section of Chapter 2 provides an overview of the development and growth of product food safety standards and quality management systems in the past two decades and their impact on smallholder farmers in the context of the horticultural sector.

World Health Organization (WHO) defines foodborne ailments as “diseases, usually either infectious or toxic in nature, caused by agents that enter the body through the ingestion of food” (WHO, 2007, p. 1). Therefore, every person is potentially at risk of contracting foodborne illness in developed and developing countries. The global incidences of food ailment in 2005, as mentioned in WHO's (2007) report, highlights 1.8 million people alone who died primarily from consuming contaminated food. Therefore, following the progressive increase of globalization and increasing complexities in food supply chains, product food safety standards and quality management systems have transcended to new heights. Smallholder farmers are now compelled to implement global agro-food standards to access international markets. Hence, the study sought to evaluate the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. The study compares smallholder farmers' efficacy prior and post implementation of product food safety and quality management systems. Successful implementation of product food safety standards and quality management systems is supposed to prevent smallholder farmers from

supplying unsafe products that can propagate the outbreak of foodborne ailments spreading in the regional and global markets. In principle, smallholder farmers need to ensure that no harm is caused to consumers who prepare or eat their farm produce according to its intended use.

The past two decades have experienced massive development and growth in establishing and implementing product food safety standards and quality management systems in the national Government, smallholder farmers, and the food industry (Hammoudi et al., 2015). However, failure to adhere to global food safety standards has had far-reaching consequences for food chain stakeholders, including smallholder farmers. Therefore, compliance with product food safety standards and quality management systems has grown enormously since 2000 and has become an essential requirement for smallholder farmers to access international markets.

In 2001, the Commission of the European Communities, through the European Governance White Paper (EU, 2001), laid out principles that changed the general way food safety management was articulated. The policy recognized the need to integrate efficiency as a risk management operation in the food supply chain. In addition, the policy further established a position that affected all stakeholders, such as smallholder farmers, that they are primarily responsible for ensuring food safety throughout their operations. A governance structure termed the General Food Law (EC R 178/02) was later introduced in the following year, 2002, as an additional regulatory framework of food safety, resulting in the introduction of the concept of traceability. Traceability, in this case, is defined as “the ability to trace and to follow a food... through all stages of production, processing and distribution” (Hammoudi et al., 2015, p. 49). For example, the final consumers of horticultural products can trace the products back to the smallholder farmer using a one-step forward and one-step back approach as presented in the regulatory framework to identify the immediate consumer

of the products supplied by a smallholder farmer. Therefore, the traceability process requires smallholder farmers to implement a global product food safety standard and quality management systems for products sold in the international market. The traceability process is one of the factors that also triggered the study's interest in evaluating efficacy prior and post implementation of product food safety standards and quality management systems among smallholder farmers in Kenya.

A UK due diligence clause was further introduced into the UK Food Safety Act in 2006. The clause specified that “it shall be a defence for the person charged to prove that he took all reasonable precautions and exercised all due diligence to avoid the commission of the offence by himself or by a person under his control” (UK, 2006, p. 3). The clause had far-reaching consequences, requiring international markets of horticultural products to take individual responsibility to prevent harm from produce procured from any stakeholders in the food supply chain, such as the smallholder farmers. Therefore, the legislative requirements introduced in key market zones for Kenya in the UK and EU to closely monitor the entire food value chain led to the development of privately driven and international product food safety standards and quality management systems such as the ISO 9001 family of standards on Quality Management Systems (QMS), Good Manufacturing Practices (GMP), Good Agricultural Practices (GAP) and the Hazard Analysis and Critical Control Point (HACCP) standards, among others (Hammoudi et al., 2015). As a result, suppliers in the food industry, such as smallholder farmers, must comply with the full range of private and international standards governing food production, processing, and distribution. Compliance with product food safety standards and quality management systems allows smallholder farmers to demonstrate their capabilities to maintain good hygiene, quality

control practices and risk management systems when supplying produce for international markets. In addition, to demonstrate full compliance, certification schemes have also been introduced to require smallholder farmers to be audited by third parties as a management tool for worldwide harmonization under the International Standards Organization (ISO).

The following section further explores smallholder farmers' compliance and modus operandi of product food safety standards and quality management systems.

Smallholder Farmer's Compliances to Product Food Safety Standards and Quality Management Systems

The roles and expectations of smallholder farmers have been changing over time in the broader context of economic development. In addition, product food safety standards and quality management systems are proliferating as a requirement in response to the changes in the global agrifood system (Lee et al., 2012). Product food safety standards and quality management systems are developed to comply with tightened food regulations that reduce risk and costs in the complicated food supply chain, which has otherwise raised anxiety among consumers. Therefore, the study evaluating the efficacy of product food safety and quality management systems embraces the shift to view the smallholder farmer as one capable of dynamically optimising and changing the country’s overall economy and the livelihood of the smallholder farmer’s household. Furthermore, the study recognizes the need for smallholder farmers in Kenya to move up and embrace deliberate action plans for supporting sustainable farming (Paloma et al., 2020). For example, policies that scale up the smallholder farmer’s compliance with product food safety standards and quality management systems that promote high-value agriculture should be enacted, thus ultimately

enhancing linkages to global markets that improve profitability and household livelihoods. Also, in addition to smallholder farmers being lifted to greater prosperity, there are deliberate action plans to ensure that global food security, nutrition, and health are being addressed adequately.

Before global food safety standards and quality management systems emerged, smallholder farmers functioned under a basic fundamental uncontrolled food safety system (Ajwang, 2020). Agricultural chemicals were applied on crops indiscriminately, pesticide waste disposal systems, chemicals storage facilities, and produce handling were poorly done at farm levels. Therefore, it was necessary to introduce global product food safety standards and quality management systems to improve smallholder farmers' basic operating protocols. As a result, European food safety standards were introduced in the 1980s and 1990s as an impetus to food safety systems and equally allowed smallholder farmers to trade globally (Campbell, 2005). Therefore, this implies that smallholder farmers targeting international markets must implement product food safety standards and quality management systems and thus upgrade farm production facilities and skills, leading to increased production costs. As a result, many smallholder farmers exit implementing global product food safety standards and quality management systems since the barrier of entry into international markets is costly and thus increases poverty levels.

As widely discussed in literature reviews, smallholder farmers' compliance with global product food safety standards and quality management systems can be viewed in two dimensions: private and public regulatory pathways (Ajwang, 2020). In the case of the private regulatory pathway, enforcement for compliance with product food safety standards and quality management systems by international market players like retailers is done through power. Market information will escalate from the retailer to the exporter and then to the smallholder farmer. As a result,

smallholder farmers are threatened with being blocked from accessing markets due to non-compliance. However, smallholder farmers are incentivized to comply with product food safety standards and quality management systems through market access, thus leading to improved incomes and, therefore, better livelihoods. In addition, smallholder farmers are also trained in establishing, determining, implementing, and maintaining product food safety standards and quality management systems to constantly meet the demands of international markets. Unfortunately, as the same author mentioned, non-compliance with product food safety standards and quality management systems is still high because many smallholder farmers lack the financial capability to improve farm facilities. Nevertheless, according to Ajwang (2020), little attention has been given by scholars and researchers to the public regulatory pathway when compared to the private regulatory pathway.

On the other hand, the public regulatory pathway comprises the national Government deploying regulatory agencies to provide formal oversight of the private regulatory pathways. The public regulatory agencies will oversee both the exporter and the smallholder farmers' compliance with product food safety standards and quality management systems. In addition, formal regulatory agencies will also intervene during the food safety crisis to stop further contamination of on-farm produce destined for international markets. Exporting to global markets will only resume once the public regulatory agencies have carried out audits and certifications on smallholder farmers and export companies. Such regulatory agencies in Kenya include the Agriculture and Food Authority Horticultural Crop Directorate (AFA HCD), responsible for issuing horticultural export licenses, and the Kenya Plant Health Inspectorate Service (KEPHIS), responsible for the issuance of phytosanitary certificates for food safety.

Smallholder Farmer's Participation in Fresh Export Markets

Increasing smallholder farmers' participation in the horticultural fresh export markets is an important sustainable development opportunity (Andrade, 2016). However, the increased demand for product food safety standards and quality management systems compliance has raised intense debate about whether it benefits smallholder farmers or is a barrier and, thus, a hindrance to poverty reduction in developing countries like Kenya. Depending on context and circumstance, Loconto (2013) mentioned by Andrade (2016) that implementing product food safety standards and quality management systems can be barriers or catalysts for smallholder access to sustainable markets. On the other hand, food safety standards and quality systems requirements can be costly. Thus, smallholder farmers may not have the means to make initial and ongoing investments. Therefore, the study sought to evaluate the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. The study maps out the benefits and challenges smallholder farmers face in Kenya prior and post implementation of product food safety standards and quality management systems. In addition, the study sought to understand the change management approach in line with smallholder farmers' theory of changes (ToC) when implementing product food safety standards and quality management systems to access international markets. Thus, the study discussed variables such as the global market concentration for agrifood supply and its demand to improve the livelihood of smallholder farmers in Kenya.

Scholars have mixed reactions to whether the literature exhaustively focuses on the relationship between smallholder farmers, product food safety standards, quality management systems, and the agri-food market structure (Lee et al., 2012). However, understanding the smallholder farmer and the change management process to implement a product food safety

standard and quality management system provides a framework to capture the diverse conditions in the contemporary global agri-food market to improve the livelihood of farmer households. In addition, the inclusivity of smallholder farmers' management roles and governance structures is understood better, and so is how they interact with the global agri-food market to improve livelihoods.

Ideally, the accessibility of smallholder farmer horticultural products to international markets in developing countries has been a major theme of debate (Kirsten et al., 2013), as mentioned by Hammoudi et al.(2015). As a result, many developing countries like Kenya have engaged in past and current strategies emphasizing smallholder farmers' integration into high-value fresh markets with better export benefits and business returns. In addition, smallholder farmers, as witnessed in the last two decades, have diversified their agricultural production from traditional export cash crops such as coffee and tea to horticultural fresh produce exports such as fruits, green beans, peas and Asian vegetables.

To participate in the export market, smallholder farmers must comply with global product food safety standards and quality management systems relating to phytosanitary requirements, hygiene and pesticide residues (Okello, 2011). Therefore, the duty of exercising due diligence was transferred to the hands of other stakeholders in the food chain, such as the smallholder farmer, to protect consumers. The European market responded by coming up with stringent food safety protocols affecting smallholder farmers in developing countries. In return, smallholder farmers were given access to the high-value European markets, thus increasing household incomes on successful compliance.

The European Union (EU) is the major importer of fresh vegetables and fruits from Kenya, predominantly grown by smallholder farmers dating back to the 1960s (Hammoudi et al., 2015). As early as then, Kenya developed institutions that ensured smallholder farmers complied with product food safety standards and quality management systems to access the international market.

Impact of Product Food Safety Standards and Quality Management Systems on Smallholder Farmers

Based on data from a recent study conducted on 300 horticultural farmers in Indonesia (Toiba et al., 2020), smallholder farmers globally are most likely to face the same impact when establishing and implementing product food safety standards and quality management systems when trying to access global markets. In addition, the models adopted by international fresh produce markets have resulted in significant changes in the food procurement systems and structures that have trickled downstream, impacting how smallholder farmers carry out farm activities. Smallholder farmers in developmental emerging countries such as Kenya are now required to standardize their farm activities to globally accepted practices.

However, smallholder farmers are often marginalized when viewed alongside emerging technological advancements or institutional developments (Otsuka et al., 2016), as Toiba et al. (2020) mentioned. The author further states that several literature reviews indicate that researchers have tried to understand the impact of market penetrations by smallholder farmers in modern global markets. The author mentions examples such as Hernández et al. (2007), Neven & Reardon (2006), and Rao & Qaim (2011) in Kenya, where the studies revealed that smallholder farmers tended to use more production inputs to comply with product food safety standards than those not

participating in the international markets. The author further mentions Sahara et al. (2015) in Indonesia & Briones (2015) in the Philippines, with similar results of excessive use of production input as those revealed in Kenya. Therefore, such smallholder farmers would be willing to pay more to implement the product food safety standards and quality management systems to increase their net incomes following access and supply to international markets.

Studies have also been carried out in the context of modern market food penetration by smallholder farmers in developing countries and the potential impact on consumer food security. Literature review in the context of relationships confirms that the joint coordination and collaborations between the retail market and smallholder farmers in developing countries can increase food security in the global market (Caillavet et al., 2015). In addition, several literature studies also affirm that poverty reduction among smallholder farmers in developing countries reduced once their products penetrated the global food retail market (Maertens et al., 2012). On the contrary, other studies have revealed that modern retailers in the international markets prefer dealing with large-scale producers because smallholder farmers do not have the required capital, human resources, and capacity to supply adequately (Otsuka et al., 2016), as mentioned by Toiba et al. (2020). Consequently, inequality in the rural areas exacerbates among the smallholder farmers.

Principles and Protocols on Implementation of Product Food Safety Standards and Quality Management Systems Among Smallholder Farmers

Generally, food consumed in the marketplace is expected to cause no harm to consumers under the anticipated conditions of use (Oloo, 2011). In addition, smallholder farmers are now exporting high-value foods, thus increasing food trade and consumption from developing countries

to international markets, leading to improved livelihoods (Humphrey, 2017). However, on the other hand, the author mentions that smallholder farmers' opportunities to enter and expand their participation in the international markets are still being hindered by the food safety crisis and changing global food safety requirements. A typical example threatening smallholder farmers is the requirement of the new risk-based farm preventive controls demanding additional capital investment in equipment, food safety controls and increased intensive interactions between producers and suppliers.

In Kenya, many food agency institutions have been established and charged with the responsibility of ensuring smallholder farmers' activities are well-coordinated and farm products are free from harm. Examples of such agencies involved in food safety management include Kenya Plant Health Inspectorate Services (KEPHIS), Kenya Bureau of Standards (KEBS), AFA Horticultural Crops Directorate (AFA-HCD), Kenya Agricultural Research Institute (KARI), Government Chemist's Department, among others. Food agencies primarily function to ensure that good agricultural practices are maintained according to globally acceptable standards throughout the supply chain, including awareness among smallholder farmers.

According to Oloo (2011), most of the food safety standards and quality management systems adopted in Kenya by smallholder farmers as good agricultural practices are universal ones, such as International Organization of Standardization (ISO) and Codex Alimentarius Commission (CAC). In addition, some food safety standards can be mandatorily required by the national Government or voluntarily adopted privately by smallholder farmers. Examples of mandatory standards include the National Codex by the Kenya Bureau of Standards, forming policy. In contrast, examples of private voluntary standards, normally market-focused, include ISO 9001

Quality Management Systems, Hazard Analysis Critical Control Point (HACCP), and British Retail Consortium (BRC) food management systems. When producers compete in global international markets, private voluntary standards are required and can become a precondition to establishing a long-term supplier-beneficial relationship. Product food safety standards and quality management systems programmes are designed to reduce poverty and inequality among smallholder farmers in Kenya by improving farming performance (Humphrey, 2017). Ideally, global food safety initiatives should not be a means to exclude smallholder farmers from the wide range of international markets.

Summary of Principles and Requirements of Product Food Safety Standards to be Implemented by Smallholder Farmers

Food safety is generally considered a foundational pillar of trust for smallholder farmers desirous of participating in the international market (Ramful, 2017). Therefore, this section summarizes the principles and requirements of product food safety standards to enhance understanding when comparing efficacy by smallholder farmers prior and post implementation of the food safety standards. Furthermore, the article by PIP Coleacp (2011) on sustainable development of the ACP horticultural industry and the article on food safety and good hygiene practices by Ramful (2017) summarises the principles of hygiene and food safety management for stakeholders such as smallholder farmers as follows:

Requirement 1: Understanding and Implementation of Concepts in Good Agricultural Practices

Good Agricultural Practices (GAP), according to Ramful (2017), ideally ensure that smallholder farmers adopt farm practices that are environmentally, economically, and socially sustainable, leading to food safety and quality foods of fruits and vegetables at primary production. Therefore, the smallholder farmers participating in the international markets must understand and know GAP and demonstrate the implementation of GAP protocols in all aspects of farming activities. GAP protocols, according to Ramful (2017), involve the joint responsibility of the smallholder farmer, managers, and employees and include (a) protocols on work and worker conditions, (b) knowledge of land management and sustainability, (c) protocols on crop handling and protection, (d) protocols on water management, (e) protocols on animal husbandry and protection, (f) protocols on the use of fertilizer and agro-chemicals, (g) protocols on produce harvests and transportations, and (h) protocols on product and process traceability.

Some of the proven advantages of smallholder farmers implementing GAP, according to the author, include (a) improved nutrition because farm products are produced in a safe, healthy, and quality manner, (b) farmworkers are motivated because the working conditions are good and safe, (c) the smallholder farmer feels in control of all farm activities, and hence risks are at minimal, (d) farm produce yields increase, and wastages are minimized due to improved production methods, (e) smallholder farmers can fetch better prices in the international markets because of improved quality, and finally, (f) improved farm sustainability if realized in all farm activities.

Requirement 2: Basic Understanding of Food Safety Concepts

Smallholder farmers must have a basic understanding that people fall ill from food eaten with dangerous micro-organisms and toxic chemicals (COLEACP, 2011). WHO (2007) estimated that 1,800,000 people die each year from foodborne diseases. Therefore, it implies that the cost of human suffering is high and most vulnerable to infants, children, pregnant women, and elderly people. Furthermore, foodborne illnesses can undermine the national economy and international markets and increase poverty among smallholder farmers. Safety is all about reliability and trustworthiness. Therefore, when accessing the international markets, smallholder farmers must guarantee food hygiene and safety, provide correct information to all food industry stakeholders, and maintain continuity of responsibility throughout farming activities.

Requirement 3: Understand Key Food Safety Concepts

Product food safety standards and good agricultural practices require smallholder farmers to understand key food safety concepts such as hazard, risk, and crisis. In brief, a hazard is a physical or biological substance that can potentially cause harm to health. In contrast, a risk is the probability of consuming contaminated food, causing an adverse health effect (COLEACP, 2011). Therefore, the smallholder farmer must assess the levels of risks throughout the production stages, including working conditions, procedures, work instructions, and practices. The most recommended assessment method by mandatory and private voluntary standards to determine hazards and risks is the Hazard Analysis Critical Control Point (HACCP) food management system.

According to food safety standards, food hygiene is another critical food safety concept that must be well understood. Smallholder farmers primarily produce fruits and vegetables consumed

in raw form; therefore, hygiene as a food conformity practice is critical for such products. Thus, smallholder farmers must handle fruits and vegetables correctly during storage and transportation. For example, failure to maintain the right temperature and humidity can cause products to develop pathogenic microorganisms and spoil. In addition, cross-contamination of fruits and vegetables during harvesting must be avoided so as not to cause severe food harm.

Smallholder farmers must understand the concept of the food chain. Product food safety standards consider it the goal of all stakeholders to ensure food safety, health, and nutrition throughout the supply chain.

Finally, smallholder farmers are required to understand the concept of traceability. Traceability is the process of identifying product information in all stages of production in space and time. A smallholder farmer participating in the international market should set up a traceability system for food safety.

Requirement 4: Understand your Role in Ensuring Food Safety

Smallholder farmers should understand their roles in ensuring food safety for accountability and good agricultural practices. The European Regulation of Food Safety spells out as follows the smallholder farmers' responsibilities and obligations as stakeholders in the global food industry (Regulation-EU, 2002): (a) food hygiene conditions must be met at all stages of production, (b) all products (fruits and vegetables) in the marketplace have to comply with food safety standards, (c) all products must adhere to the traceability concept for food safety, (d) non-compliant products must be able to be withdrawn immediately, and consumers warned of the crisis, (e) food industry stakeholders must cooperate with food agents and authorities and keep them informed as necessary

at all times. According to COLEACP (2011), the European international markets endeavour to keep food safety standards and regulations as simple and flexible as possible in anticipation that all producers in the food industry, such as smallholder farmers, will take up the responsibility of food safety starting with themselves.

Requirement 5: Food Hygiene

According to the European food regulations, food hygiene is defined as "the measures and conditions necessary to control hazards and ensure fitness for human consumption of a foodstuff taking into account its intended use" (COLEACP, 2011, p. 30). Therefore, it implies that smallholder farmers should guarantee the harmlessness of fruits and vegetable products supplied to international markets and consumed according to their intended use. In other words, smallholder farmers must ensure that all food is acceptable for human consumption at all stages and levels within the food supply chain.

Requirement 6: Food Risk

As mentioned below, smallholder farmers must ensure that all fruits and vegetables are free from all forms of food risks.

a. Biological risk

Food contaminated by pathogenic organisms such as worms or microorganisms such as fungi, bacteria, and viruses is considered a biological risk. Therefore, smallholder farmers are responsible for ensuring that food is not contaminated at the source for any reason.

b. Chemical risk

Food harm is primarily associated with and caused by chemical risks. Chemical risk can exist naturally in food products, be added during food processing, or migrate from food packaging materials. Harmful chemicals can cause immediate acute food poisoning or, if repeated severally in low doses, can cause cancer. Therefore, smallholder farmers are expected to be aware of and control chemicals that would otherwise cause harm to fruits and vegetables sold in the international market.

c. Physical risk

Physical risks pose less problems than biological and chemical risks. Nevertheless, smallholder farmers must control physical risks as they can also cause serious food harm to consumers. An example of a food-related physical risk includes an unintentional foreign body in a food product, such as a metal fragment or a natural object like a fishbone, insects, mussel shells, stones, wood splinters, and others. Physical food risk contamination can occur at any stage of the smallholder farmers' production process, including packaging. In addition, the gravity of the food risk will depend on the origin and nature of the foreign body and the consumers' health and age. For example, a child would choke more quickly on a foreign food product than an older person. Therefore, smallholder farmers are primarily responsible for ensuring that the products they supply in international markets are free from such food risks.

Requirement 7: Handling and Preservation of Fruits and Vegetables

After the smallholder farmers have harvested fruits and vegetables from the farm, the products need to be preserved and stored correctly until consumption. For example, product food safety standards require the handling and preservation of fruits and vegetables to cover post-harvest activities such as packaging to distribution without any development of microorganisms that would cause food harm to consumers of the products. This requirement is critical for smallholder farmers to remain competitive in the export market.

Requirement 8: Implementation of The HACCP System (Food Management System)

HACCP stands for Hazard Analysis and Critical Control Point and is a rational and systematic strategy that ensures the safety of food products on the premise that prevention is better than cure (COLEACP, 2011). HACCP is one of the product food safety standards recognized globally as a tool that guarantees food safety. The HACCP system ideally ensures that the smallholder farmers' fruits and vegetables are inspected during production instead of the finished product using a logical scientific approach that highlights any food hazards and suggests measures to guarantee food safety. Therefore, smallholder farmers are required to familiarize themselves with the principles of the HACCP system to participate effectively and boost the confidence of trading partners and consumers in the international export market.

Summary of Principles and Requirements of Quality Management Systems to be Implemented by Smallholder Farmers

"Quality is a measure of excellence or a state of being free from defects, deficiencies and significant variations" and hence "a complex characteristic of foods that determines its value and acceptability by consumers" (Ramful, 2017, p. 4). Therefore, quality can be considered a choice as opposed to a result of change because the smallholder farmer chooses inputs, raw materials, workers' knowledge, skills and competencies, and process controls, all of which are determinants of quality. In addition, the author also mentions that a product that complies with the consumer's specific requirements, whether subjectively or objectively determined, can also be considered a good quality product.

Historically, the concept of product quality evolved from the International Standard ISO 9000, which defines quality "as the degree to which a set of inherent characteristics fulfils requirements" (COLEACP, 2011, p. 8). Therefore, it implies that the quality of a farm product is broader, addressing the food safety aspect of fruits and vegetables and other related services, such as information about the product. Thus, it is paramount for smallholder farmers to understand the principles of quality management systems to optimize product returns from sales in the international markets to improve household livelihoods and reduce poverty.

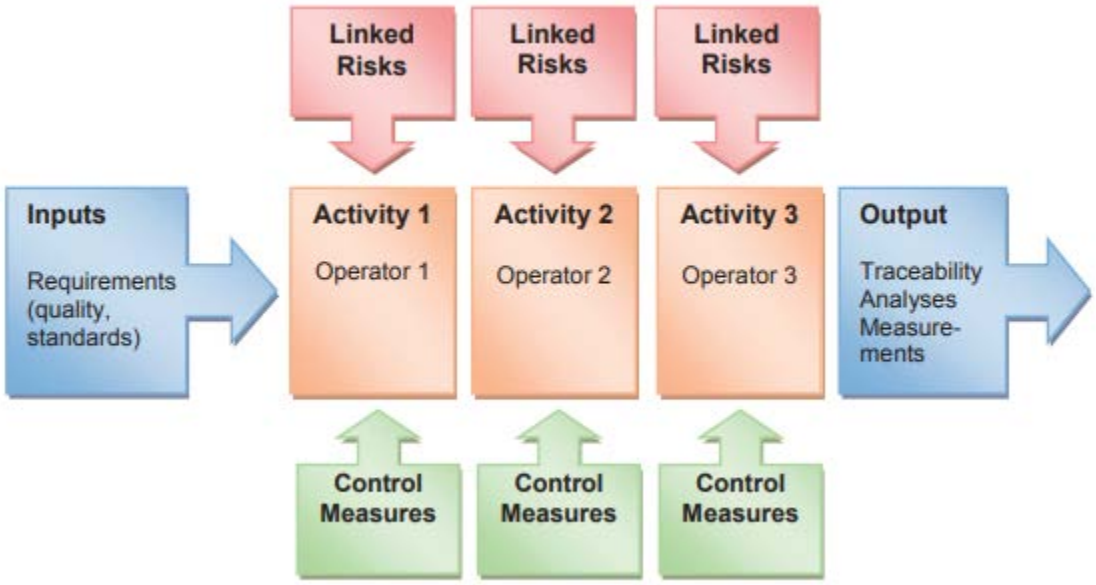
Smallholder farmers must build their reputation in international markets by demonstrating the ability to be quality responsible based on implementing quality assurance schemes such as Quality Management Systems (ISO 9001) and Food Management Systems (ISO 22000). Therefore, it implies that if smallholder farmers do not implement quality management systems, then resources such as money, time, people, materials, and equipment will be considered waste. As a result, farm

fruit and vegetable products will also be regarded as dangerous and rejected in the international markets because they are risky health to consumers. Furthermore, according to Ramful (2017), without quality management systems, (a) the food industry cannot provide confidence in food safety, (b) the export market cannot build a reputation for products received from smallholder farmers, (c) the food industry cannot guarantee prevention of errors against unsafe products; and finally, (d) smallholders farmers risk facing legal actions and fines that can eventually close down the farm operations. With quality management systems, (a) the food business can prevent food-related illness and unnecessary deaths, (b) the smallholder farmer as a stakeholder in the food chain is protected against loss of reputation and false allegations, (c) smallholder farmers can improve farm yields and reduce post-harvest losses leading to increased income, (d) smallholder farmers find it easy to comply with standards and technical regulations, and finally, (e) smallholder farmers have more opportunities to increase participation to wider international markets.

The author, in summary, presents the requirements for quality management systems (ISO 9000) implemented by smallholder farmers as a concept of chain processes of activities that transform input data into output data, as shown in Figure 13.

Figure 13

Smallholder Farmers Production Process Approach



Note: Adapted from *Principles of Hygiene and Food Safety Management*, by COLEACP, 2011, p. 20.

Figure 13 above is a production process system approach from the ISO 9000 quality management standard adopted by smallholder farmers of sequential activities by different farming operations players to meet the international markets' internal and external needs. An example of a process input can be information or raw materials requiring complex processes and different skills to attain a designated output objective like a quality fruit and vegetable that satisfies consumers in the international market. Therefore, in other words, a quality management system can be viewed as a concept of food safety systems that the smallholder farmer must conceive and implement to meet a regulatory or contractual objective to produce safe and suitable food in the international markets.

Comparability Variables Used in the Study to Establish Efficacy Prior and Post Implementation of Product Food Safety Standards and Quality Management Systems by Smallholder Farmers

The study sought to determine the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. The study, therefore, highlights comparatives on the efficacy of the smallholder farmer prior and post implementation of product food safety standards and quality management systems. In addition, the study allows researchers and food industry stakeholders to determine the food safety and quality of fruits and vegetables produced by smallholders in Kenya and the effectiveness of national regulations and global food standards under which they operate. Finally, once the comparability variables on the efficacy of product food safety standards and quality management systems are determined, the study suggests recommendations for strengthening the inherent weaknesses identified within the smallholder farmer operations.

The model used in the study to determine the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya has been adopted from a survey carried out by the Food and Agricultural Organization of the United Nations (FAO) to determine the economic lives of smallholder farmers based on an analysis of household data from nine countries namely, Albania, Bangladesh, Nicaragua, the Plurinational State of Bolivia, Ethiopia, Kenya, Nepal, Tanzania and Viet Nam. However, the design and structure of the comparative study on the efficacy of product food safety standards and quality management systems conducted on smallholder farmers in Kenya significantly limit the nature of the expressions earlier used and

further avoid contradicting the legal or development status of any country, territory or boundaries used in the survey study by FAO.

The study collected comprehensive data from 225 smallholder farmers or participants who implemented product food safety standards and quality management systems for fresh fruits and vegetables designated for the international market. The data set of variables used for comparability has been standardized and systematically determined based on the key profiles that impact management changes among smallholder farmers prior and post implementation of product food safety standards and quality management systems.

To give a summary overview of the profile of the target participants in the study, smallholder farmers in Kenya mainly operate as entrepreneurs in their farms and leased farms. Capital to manage farming activities is raised from multiple sources to invest in productive assets like farming. Therefore, assets such as a bicycle or simple farming tool implements are vital to the smallholder farmer. The activities of smallholder farmers are geared towards increasing income from the sale of fruits and vegetables to improve household livelihoods and reduce poverty. Many smallholder farmers have decided to implement product food safety standards and quality management systems to access international markets for better returns. The smallholder farmers are faced with many decisions to make, such as (a) what fruits and vegetables to target for international markets, (b) what farm inputs are best to use and how to use them, (c) when to plough the land, plant seeds and when to harvest, (d) how to optimize sell of crops in the international market and which to sell in the local markets, among others. In some instances, the smallholder farmer's decision-making process occurs in an economic environment where market food safety demands

are high and subject to many adverse risks, such as price fluctuations and weather challenges. Such challenges tend to pose significant implications for smallholder farmer's livelihoods.

The comparative report on the efficacy prior and post implementation of product food safety standards and quality management systems analyses different smallholder farmers' economic data and how the change management decision impacts the farmers' livelihoods. The main sections of the study analysis, as depicted in Table 2, include (a) smallholder focus on their farms, families and homes, (b) production yields, technology and farm inputs, (c) labour, (d) income earned and impact on household status, (e) smallholder farmer participation in the international market, and finally, (f) the future of smallholder farmers.

Table 2

Comparative Variables and Reporting Criteria on the Efficacy of Product Food Safety Standards and Quality Management Systems (Prior and Post Implementation) Among Smallholder Farmers in Kenya

Ref.	Comparative Variables	Reporting Criteria
1	Smallholder Farmer Household	1.1 The average number of smallholder farmers per target region 1.2 The average farm size per smallholder farmer household 1.3 The average number of smallholder family members supported by a smallholder farmer 1.4 The average number of smallholder farmer households with internal running safe water and sanitation facilities (a flush toilet) 1.5 The average number of smallholder farmer households built with bricks and using electricity
2	Production	2.1 The average farm size per smallholder farmer 2.2 The average number of crops cultivated per smallholder farmer 2.3 The average volume (yield) of gross production harvested per smallholder farmer 2.4 The average volume (yield) of the net output harvested per smallholder farmer 2.5 The average cost of farm input (seeds, fertilizer, chemicals) in a smallholder farm per acre

		2.6 The average application of farm input (seeds, fertilizer, chemicals) in a smallholder farm per acre
3	Labour, Land and Other Capital	3.1 The average number of family labourers and non-family labourers in a smallholder farm per acre 3.2 The percentage proportion of skilled labour and non-skilled labours in the smallholder farm 3.3 The average labour cost in a smallholder farm per acre 3.4 The average number of seasonal workers and permanent workers engaged in a smallholder farm per growing season 3.5 The average number of farm supervisors in a smallholder farm per acre 3.6 The proportion of men to women workers in a smallholder farm per acre 3.7 Identify the type of other capital assets in the smallholder farm (e.g. irrigation system, tractors, livestock and other machinery)
4	Income Earned and Consumption	4.1 The proportion of gross income earned from smallholder farmers' crops sold in the international export market and income earned from other markets 4.2 The average gross income earned in a smallholder farm per acre 4.3 The average gross income earned in a smallholder farm per household 4.4 The average percentage proportion of smallholder farmer income allocated to household food and other activities 4.5 The average cost incurred in a smallholder farm per acre
5	Market and Innovation	5.1 The average percentage proportion of fruits and vegetables sold from smallholder farmers sold in the international export market and local markets 5.2 The average yield sold to the market per annum 5.3 The mode of transportation of fruits and vegetables from the smallholder farmer production site to the market 5.4 Is the level of market information received by the smallholder farmer satisfactory?
6	The Future of Smallholder Farmers	6.1 At what phase did the smallholder farmer consider themselves a business or an entrepreneur? 6.2 At what stage did the smallholder farmers consider themselves farming in an intensive manner? 6.3 What is the level of innovative technology in the smallholder farm? 6.4 How do the smallholder farmers consider their short- and long-term future?

Based on the comparative data collected to determine the efficacy of smallholder farmers prior and post implementation of product food safety standards and quality management systems, the study will illustrate if the change management decision by the smallholder farmer improves the net earnings and returns and, ultimately the livelihood of smallholder farmer households. Finally, by examining the different dimensions mentioned by the smallholder farmers and literature reviews, the study also determines if the time, effort, and money spent on such programs are justifiable to Kenya's smallholder farmers and improve their livelihoods.

Empirical Studies and Research Gaps Identified

The study gives attention to empirical literature previously explored to provide meaning to the thesis topic and research questions highlighted in the research topic in Chapter 1. The study, with the aid of empirical literature, examined the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya to answer the research questions, which include (a) to what extent have smallholder farmers in Kenya benefited from the implementation of product food safety standards and quality management systems, (b) what are the key enablers/drivers in the implementation of product food standards and quality management systems for smallholder farmers in Kenya, (c) what are the challenges faced by smallholder farmers in Kenya in the establishment and implementation of product food safety standards and quality management systems, (d) what are the factors that have contributed to majority of the smallholder farmers in Kenya not implementing product food safety and quality management systems, and finally, (e) what can the government do to encourage more farmers in Kenya to implement product food safety standards and quality management programmes.

Therefore, in answering the research questions, problem gaps were identified. Once resolved, the smallholder farmers will have access to international export markets and benefit through increased incomes and reduced poverty, culminating in improved welfare of household members.

Below are examples of comparative empirical literature reviews by different scholars and researchers similar to the current study on the efficacy of product food standards and quality management systems among smallholder farmers in Kenya.

Empirical Literature Review- #1

A comparative study was carried out on enhancing sustainable livelihoods among smallholder farmer systems in Western Kenya (Fuchs et al., 2019). The thesis topic is very similar to the current study on how to increase the adaptivity capacity of smallholder farmers and enhance their livelihoods through context-specific agricultural training in line with their preferences and change management theory. In addition, the income earned by the smallholder farmer was further analysed following the adoption of Good Agricultural Practices (GAP) using product food safety standards and quality management systems. A total of 183 smallholder farmer households participated in the study. Preliminary focus-group discussions were initially conducted to collect data on crop harvest, sales, soil fertility, irrigation, and farm input type. Also, questionnaires were administered to determine the average education of smallholder farmers, income levels, physical assets, land acreage, mode of farm operations, and group accomplishment.

The findings of the empirical literature showed that the smallholder farmers had positive outcomes in horticultural farming, and overall farm operations improved after adopting good

agricultural practices that included compliance with product food safety standards and quality management systems. However, some research gaps were identified in the comparative study on enhancing sustainable livelihoods effectively in smallholder farmer systems in Western Kenya, which are critical for the current study. The research gaps include the following.

(i) When smallholder farmers invest in a change management process, they generally expect the investment decision to bring high net returns. However, from the comparative empirical study, other factors, such as climate and agroecological differences beyond the control of the smallholder farmers, affected expectations. Therefore, further research needs to be conducted to identify challenges outside the smallholder farmers' change management process and establish how they affect expectations to improve livelihood and household income.

(ii) In the empirical study, smallholder farmers were expected to have further promoted horticulture if the requirements for reliable production were met. However, some smallholder farmers who realized high profitability did not re-invest the returns in farm activities to improve their livelihoods further. Moreover, on further investigation, such smallholder farmers were found to be risk-averse to uncertain environmental conditions and opted not to continue farming. Therefore, there is a need to undertake further research and explore why the smallholder farmers who have implemented a change management process would opt out from continued participation in the international export markets to optimize their revenues and improve their livelihood and household income. Furthermore, what factors contribute to the smallholder farmers' unwillingness to participate further in the international export market?

(iii) The empirical study findings revealed that smallholder farmers who incorporated good agricultural practices affirmed that horticultural farming to improve livelihood is only meaningful when production requirements for food safety standards and quality are met. Therefore, there is a need to carry out further research and establish if similar findings are prevalent among smallholder farmers in Kenya who have implemented product food safety standards and quality management systems as a strategic change management decision to enhance accessibility in the international markets.

Empirical Literature Review- #2

Another empirical study was conducted on smallholder farmers from the Rural Western Middle Hills of Nepal to promote agricultural growth and commercialization among smallholder farmers to increase income, reduce poverty and improve livelihoods (Gc & Hall, 2020). The empirical study is similar to the current research study on the efficacy of product food safety standards and quality management systems, focusing on increased income, reducing poverty, and improving livelihoods among smallholder farmers in Kenya. A total of 202 surveys of smallholder farmer households were conducted to establish, among other sets of criteria, how agricultural markets were accessed and the impact on smallholder farmers following the introduction of good agricultural practices on food safety and quality management systems. The research approach comprised mixed-method research using quantitative and qualitative methods involving focus group discussions, informant interviews and observations to collect data. The research findings revealed that fruits and vegetable products by smallholder farmers that implemented product food safety standards and quality management systems gave positive and profitable market results. In

addition, smallholder farmers could introduce new technologies, receive meaningful market information and interact effectively with input and service providers, among other positive changes.

However, the following research gaps were identified from the empirical literature on the survey conducted on smallholder farmers from Rural Western Middle Hills of Nepal, which is critical for addressing in the current study in Chapter 2.

(i) Further research needs to be carried out to establish the extent to which national Governments get involved in the commercialization of smallholder farmers' produce to increase household net income further and reduce poverty. Some of the additional initiatives for consideration by national Governments could include business development training and knowledge of global market compatibilities, among other subsidies.

(ii) Further research needs to be carried out on smallholder farmers to establish risk profiles that assist in reducing fears of production failure and uncertainty of sales after production and to motivate active participation in the international market to increase household income and reduce poverty.

(iii) Further research needs to be carried out on the private sector and other stakeholders in the food industry to enhance additional sustainable developmental programs for smallholder farmers that make agricultural services more effective and beneficial in the short, medium, and long term.

(iv) Further research needs to be conducted to investigate and determine how to curb labour shortages due to male outmigration to urban towns and address the youth's lack of interest in agricultural activities to make agriculture more attractive and profitable.

(v) Further research needs to be conducted on aligning agricultural programs to local micro-climate and smallholder farmers' needs. As a result, appropriate crops and farm production can be enhanced to advance the agricultural sector. Also, the additional research should address how product food safety standards and quality management systems integrate with government policies and programs to improve labour provision critical for household poverty elevation. Such research studies can strengthen product food safety standards and quality management systems so that such programs and policies do not present a barrier to smallholder farmers' agricultural development.

Empirical Literature Review- #3

Another empirical study was carried out in Eastern Cape Province, South Africa, to determine the performance and functionality of business planning of smallholder farmers' agricultural enterprises following the adoption of quality management systems (Sonandi et al., 2021). In addition, the study also sought to determine factors that may cause success or failure in smallholder farmer business enterprises after implementing quality management systems. The empirical literature is similar to the current study in Chapter 2 since the focus is on the smallholder farmers' efficiency due to adopting a globally recognized food safety standard and quality management system.

The empirical study used mixed-method research to collect quantitative and qualitative data from smallholder farmers who had adopted quality management systems and those who had not implemented the principles of quality management systems. Questionnaire research tools were used

to collect quantitative data, and qualitative data were collected using semi-structured interviews and the review of internal documentation.

The empirical study findings revealed that business planning performance specifically was lowest at 23.32 per cent against the world-class standard indexed at 100 per cent because of a lack of adequate skills. Failure by the smallholder farmers to plan adequately had a complementary effect on the smallholder farmers' operations. In addition, cultural behaviours and lack of sufficient management planning also affected the successful implementation of quality management systems. Therefore, this suggests that when evaluating the efficacy of quality management systems, the focus should not be on whether the smallholder farmer agriculture enterprises adopted quality management systems. Instead, the processes supporting the business planning function after implementing quality management systems could be benchmarked against world-class standards to determine the effectiveness of the internationally recognized standard. In addition, the study recommended that continuous process improvement from the quality management system should continue being promoted, and interventions should be carried out to address shortcomings arising from the process flow.

However, the following research gaps were identified in the empirical study to determine the impact of business planning on smallholder farmers' enterprises implementing quality management systems.

(i) Further research is needed to determine if there is a strong statistical correlation between effective business planning and the size of the farmland.

(ii) There is a need to research further the immediate interventions required for smallholder farmers in Kenya before and after implementing quality management systems to enhance food safety in the international market.

(iii) There is a need for further research on practical and workable initiatives that stakeholders in the food industry can encourage for smallholder farmers' excellent performance in the international markets.

(iv) The empirical research only focused on the business planning functions of smallholder farmers who have implemented quality management systems. Therefore, further research should also be conducted to investigate other critical agricultural disciplines for the successful implementation of quality management systems by smallholder farmers in Kenya, such as household dynamics.

The empirical literature reviews have been summarized in Table 3 below for ease of reference.

Table 3

Summary of Empirical Literature Reviews

SN	Author's Name/ Year	Research Title	Purpose	Findings	Limitations
Empirical Literature Review #1	Fuchs et al., 2019	How to Effectively Enhance Sustainable Livelihoods in Smallholder Systems: A Comparative Study from Western Kenya	How to increase the adaptivity capacity of smallholder farmers and enhance their livelihoods through context-specific agricultural training in line with their preferences and change management theory.	(i) When smallholder farmers invest in a change management process, they generally expect the investment decision to bring high net returns. However, from the comparative empirical study, other factors, such as climate and agroecological differences	(i) How can challenges outside the smallholder farmers' change management process be identified, and how do they affect expectations for improving livelihood and household income?

				beyond the control of the smallholder farmers, affected expectations. (ii) Smallholder farmers were expected to have further promoted horticulture if the requirements for reliable production were met. However, some smallholder farmers who realized high profitability did not re-invest the returns in farm activities to improve their livelihoods further. (iii) Smallholder farmers who incorporated good agricultural (implementation of product food safety standards and quality management systems) practices affirmed that horticultural farming to improve livelihood is only meaningful when production requirements for food safety standards and quality are met.	(ii) How to identify what factors contribute to the smallholder farmers' unwillingness to participate further in the international export market?
#2	Gc & Hall, 2020	The Commercialization of Smallholder Farming—A Case Study from the Rural Western Middle Hills of Nepal	To promote agricultural growth and commercialization among smallholder farmers to increase income, reduce poverty and improve livelihoods.	(i) The research findings revealed that fruits and vegetable products by smallholder farmers that implemented product food safety standards and quality management systems gave positive and profitable market results. (ii) Smallholder farmers could introduce new technologies, receive meaningful market information and interact effectively with input and service providers, among other positive changes.	(i) There is still the need to establish the extent to which national Governments get involved in the commercialization of smallholder farmers' produce to increase household net income further and reduce poverty. (ii) Further research needs to be carried out on smallholder farmers to establish risk profiles that assist in reducing fears of production failure and uncertainty of sales after production to motivate active participation in the international market to increase household income and reduce poverty.

					(iii) Further research needs to be carried out on the private sector and other stakeholders in the food industry to enhance additional sustainable developmental programs for smallholder farmers that make agricultural services more effective and beneficial in the short, medium, and long term. (iv) Further research needs to be conducted on aligning agricultural programs to local micro-climate and smallholder farmers' needs.
#3	Sonandi et al., 2021	Lack of business planning: A barrier to successful implementation of total quality management in South African agricultural small-, micro- and medium-sized enterprises	To determine the performance and functionality of business planning of smallholder farmers' agricultural enterprises following the adoption of quality management systems. In addition, the study also sought to determine factors that may cause success or failure in smallholder farmer business enterprises after implementing quality management systems.	Failure by the smallholder farmers to plan adequately had a complementary effect on the smallholder farmers' operations. In addition, cultural behaviours and lack of sufficient management planning also affected the successful implementation of quality management systems.	(i) There is a need to determine if there is a strong statistical correlation between effective business planning and the size of the farmland. (ii) There is a need to research further the immediate interventions required for smallholder farmers in Kenya before and after implementing quality management systems to enhance food safety in the international market. (iii) There is a need for further research on practical and workable initiatives that stakeholders in the food industry can encourage for smallholder farmers' excellent performance in the international markets. (iv) The empirical research only focused on the business planning functions of smallholder farmers who have implemented quality management systems. Therefore, further research should also be conducted to investigate other critical

					agricultural disciplines for the successful implementation of quality management systems by smallholder farmers in Kenya, such as household dynamics.

The empirical literature reviews align with the study's objectives to explore the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya to gain access to international markets, increase earnings, improve household income, and thus reduce poverty. In addition, the study looked at the smallholder change management process and its correlation to the smallholder farmers' technical approach to farming and the improved commercialization strategies to access the international export markets. Finally, the study sought to identify solutions to the research gaps. When implemented and closed accordingly, smallholder farmers have considerable potential to improve their livelihood incomes and reduce household poverty.

Chapter Summary

This section summarizes the key thoughts and points presented in Chapter 2. In the chapter, smallholder farmers are mentioned as a vital part of the global agricultural community living in rural areas, and agriculture is their primary source of livelihood (IFAD, 2013). Therefore, establishing and implementing product food safety standards and quality management systems among smallholder farmers constitute a change management process crucial in enhancing good agricultural practices and accessing the international markets. According to Doherty & Kittipanya-Ngam (2021), smallholder farmers in Kenya have gone to great lengths to change their business

model architecture to incorporate globally recognized product food safety standards and quality management systems. The chapter further explained how smallholder farmers' adoption of global agri-food standards demonstrated adherence to good agricultural practices that enable them to become competitive and access international markets that increase incomes and improve their livelihoods.

Chapter 2 explained the literature methodology search used to compile data to explore the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. Approximately 230 peer-reviewed articles were studied and primarily related directly to smallholder farmers' change management process, smallholder participation in the international market, and smallholder farmers' compliance with product food safety and quality management systems. The literature reviewed presented in Chapter 2 included current peer-reviewed articles, journals, dissertations, books, and conference papers. The researcher also used several library databases and search engines such as ProQuest, Google Scholar, Academic Search Premier, British Library, ResearchGate, E-Journals, Research Scientific Innovation Society, JSTOR, ScienceDirect, NATURE and SAGE Journals. Other keywords used in Chapter 2 for the search included smallholder farmers, agriculture, theoretical framework, theory of change, social science theory, certification systems, change management, conceptualization models, agri-food standards, food standards, product food safety standards, and quality management systems, among others. As further explained in Chapter 2, the reference search primarily consisted of references from peer-reviewed articles and scholarly research sources published mainly within the last five years from internet downloads. Some of the peer-reviewed journals used in the review included Journals on Food and Nutrition, Journals on Cogent Social Science and Food and Science, Journals

Earth and Environmental Science, Journals on Development Studies Research, Journals on Educational Review, International Journal of Social Economics, Journals on European Food and Feed Law Review, Journals of Business Management, Journals on Agriculture & Food Security, Journals on Sustainability, Journals on Advances in Developing Human Resources, The International Journal of Quality & Reliability Management among others. Other search terms and combinations of terms used in Chapter 2 included: who is a smallholder farmer, the role of smallholder farmers, the continued importance of smallholder farmers today, food safety impacts at the farm level, integration of food standards and smallholder farmers, agriculture and smallholder farmers at a crossroads, how small-scale farmers cope with conflicting institutions to ensure market participation, the impact of quality management systems to smallholder farmers, and effects of food standards on smallholder farmers.

The literature review in Chapter 2 provided a comprehensive review of research literature on the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. The literature review in Chapter 2 addressed the impact comparative on the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya prior and post implementation to determine the benefits realized from such programs. In addition, the study explored smallholder farmers' change management processes to determine if such decisions improved their operating and production activities to gain access to more profitable markets and improve their livelihoods. Finally, the study investigated if the time, effort, and money spent on such programs are justifiable to Kenya's smallholder farmers and improve their livelihoods. However, according to Maguire-Rajpaul et al. (2020), compliance with

product food safety standards and quality management systems is costly and often deemed disproportionately burdensome for smallholder farmers.

In Chapter 2, the researcher provided the theoretical framework to enhance thoroughness, consistency, precision, accuracy, and trustworthiness (Brockie et al., 2019; Callaghan, 2017) and guide in the identification of the theories used (Roth et al., 2018) to convey and provide a lens or signpost on how to process new knowledge from the study (Grant & Osanloo, 2014). The theoretical framework presented in Chapter 2 was the Theory of Change (ToC). ToC was explained as a rationale for the research, problem statement, purpose, meaning and research questions (Lederman & Lederman, 2017) when performing an impact comparative on the efficacy of smallholder farmers in Kenya prior and post implementation of product food safety standards and quality management systems. In addition, ToC, as explained in Chapter 2, correlated the study objective, making it easier to solve the thesis problem (Okemba, 2018) and explore the principles for change, how to effectively implement organizational changes, and the importance and role of changes, among other facets. In other words, ToC was used as a structured analytical tool to establish specific aims to determine the efficacy of global system implementations relating to product food safety standards and quality management systems among smallholder farmers in Kenya to improve their livelihood.

The researcher presented in Chapter 2 the Hivos approach (Clark & Apgar, 2019), which is a seven-step structured process approach framework of ToC to build consensus around the study objectives and direction. The seven-step structured process approach explained in detail included (a) Purpose of ToC, (b) Impact Vision, (c) Understanding Context Dynamics, (d) Outcomes as Changes in Stakeholders, (e) Mapping Causal Pathways, (f) Assumptions, and (g) Evaluation Plan. In addition, the complexities and systematic changes experienced by smallholder farmers in Kenya

were also examined to explain the efficacy of product food safety standards and quality management systems. The process encompasses understanding the management change pathway prior and post implementation of product food safety standards and quality management system. Therefore, when implementing change management, proper timing is required, considering internal and external stakeholders, namely, employees, management and customers (Okemba, 2018). ToC supports the impact comparatives in the smallholder farmer change processes from conceptualization to implementation and describes the efficacy of such an organizational decision.

A case study on the use of the ToC to improve agriculture in the Tanzania region of Maziwa Zaidi was presented in the chapter (Omore et al., 2019). The case study, in summary, demonstrated how scarcity of resources makes it challenging for agricultural research to contribute positively towards achieving agricultural developmental outcomes. The lessons derived from adopting the ToC approach in the case study were used to develop and improve an agricultural research programme that was needed for implementation to achieve greater impact. The researcher was able to conclude in the chapter that the concept adopted in the use of the ToC in this case study was similar to the decision made by smallholder farmers in Kenya when embracing a change management process on the implementation of product food safety standards and quality management systems to access international markets to achieve the goals of better returns and improve household livelihood.

According to Omore et al.(2019), the lessons learnt in the chapter from the case study in Tanzania on improving agriculture using the ToC included (a) visioning and designing stakeholder involvements, (b) improved communication on a common purpose, (c) managing complexities, and, (d) enhanced efficiency, flexibility and sustainability of process activities.

In Chapter 2, the researcher also incorporated a literature review on the social theory model to supplement and provide additional in-depth analysis of the ToC as a change management tool to explain the smallholder farmers' proliferated response to the changes and demands. The use of social science theory was described in the chapter as ideal to contextualize and understand the evidence base used when applying the ToC approach (Callaghan, 2017; Stein & Craig, 2012). In other words, social changes depend on behavioural change. It also gives an insight into how smallholder farmers make organizational decisions during resource-constraint times. Therefore, in the chapter, the researcher explained how the social science theories provided a bedrock of solid pillars that can help understand how smallholder farmers deal with challenges faced when undertaking a change management process when implementing product food safety standards and quality management systems in their operations.

A simplistic presentation of different social science disciplines applicable in explaining the relevance of social science theories to the study was described in the chapter. The key emphasis in the use of these illustrations was presented in the chapter to appreciate the construct of the smallholder farmer's change management decisions and the social behaviour in terms of the construct of ideas, propositions, underlying logic, assumptions and boundary conditions when establishing and implementing product food safety standards and quality management systems to access international markets (Bhattacherjee, 2023).

According to Bhattacherjee (2023), the agency theory, in summary, was presented in the chapter as a two-party relationship between smallholder farmer and their employees. As explained, the agency theory is applied at the individual or organizational level. The theory assumes that social human beings, in our context, smallholder farmers and their employees have self-interest, which

must be well managed when executing a change management process, and in addition, that people are boundedly rational and risk averse.

According to Azjen (1991), as mentioned by Bhattacherjee (2023), in summary, the theory of planned behaviour (TPB) was presented in the chapter as widely used in understanding individual behaviours regarding conscious, reasoned choices shaped by cognitive thinking and social pressure. As explained, TPB assumes that behaviour is a factor of one's intention and subjective norm and, therefore, a function of the person's attitude and perception. The smallholder farmer has to engage a behavioural control mechanism that is both internal and external to deal with his subjective perception of the thought-out-expected responses to achieve the intended goal of the change management process to implement the product food safety standards and quality management systems in farm operations.

According to Bhattacherjee (2023), the innovation diffusion theory (IDT) was presented in the chapter, in simplicity, to explain how innovation is adopted within a people of probable adopters about (a) innovation, that is, new technologies, (b) time, that is, the duration to diffuse a process, (c) communication channels, for example, mass media; and (d) social systems, such the environment to enhance the learning of new ideas. Therefore, the smallholder farmer creatively comes up with new ways of adopting technology in alignment with global food agri-systems in the hope that the adopters, who in this case are the individual employees, the organization and other players in the entire supply chain, will adopt the change process to implement the product food safety standards and quality management systems to increase farm sales returns that improve household livelihoods.

Further, the general deterrence theory (GDT) was explained in the chapter as a concept that sought to explain why some people engage in deviant, criminal or anti-social behaviours. GDT holds that people naturally and freely choose deviant behaviours based on a rational cost-benefit calculation that engenders personal gains or pleasure that can be controlled by increasing the cost of engaging in such behaviours in the form of punishments or understanding the chances of apprehension. As highlighted in the chapter, when determining the efficacy of product food safety standards and quality management systems, the smallholder farmer should focus on the situational factors that could hinder the achievement of task objectives when deciding to do a change management process.

In chapter 2, the researcher also adopted a conceptual framework to guide further and bring out the aspects of the research on how they interlink when exploring the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. The conceptual framework views the interrelated components and variables to address the research objectives and aims to solve the problem in the study (Guntur, 2019).

All in all, Chapter 2 primarily focused on the gaps in the literature reviews on the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. The chapter discussed the problem gaps necessary to answer the research questions in the literature review. Several research gaps were identified during the literature reviews that needed attention in the study evaluating product food safety standards and quality management systems among smallholder farmers in Kenya. The research gaps highlighted in the chapter that called for further research work were summarized as follows:

(i) Smallholder farmers engaged in the change management process when implementing the product food safety standards and quality management systems seem to be clear that they would realize higher net returns and improve their livelihoods. However, the literature review revealed that many smallholder farmers were not aware and did not consider how to deal with critical factors beyond their controls that worked against the objects of the change management process, such as climate and agroecological differences.

(ii) Several smallholder farmers considered risk-averse to uncertain environmental conditions did not re-invest the returns from sales in the international markets and opted not to continue farming.

(iii) There was a dismal level of involvement and commitment of national Governments in the commercialization of smallholder farmers' produce and initiatives to train and provide knowledge on global markets. In addition, the smallholder farmer risk profile needs to be improved to reduce fears of production failure and uncertainty of sales after production and to motivate active participation in the international market to increase household income and reduce poverty.

(iv) The roles of the private sector and other stakeholders in the food industry did not seem to fully meet the smallholder farmers' expectations of realising a sustainable development program to make agricultural services more effective and beneficial in the immediate and short term.

(v) The smallholder farmers' change management process was affected significantly following labour shortages due to male outmigration to urban towns and the lack of interest by the youth in agricultural activities.

(vi) Finally, more research studies need to be carried out to align agricultural programs with local micro-climate and smallholder farmer needs so that appropriate crops and farm production can be enhanced to improve earnings and reduce poverty.

Once the research gaps are investigated and resolved, as explained in the chapter, the smallholder farmers will have more access to international markets and benefit through increased incomes and reduced poverty, culminating in improved welfare of household members. Therefore, for a better understanding of the study and in answering the research questions relating to the efficacy of product food safety standards and quality management systems of smallholder farmers in Kenya, agriculture in Kenya, which is considered the backbone of Kenya's economy, is critical for national development dealing with national food security and fighting against hunger (Atela et al., 2018) was examined in detail. Furthermore, the researcher explained in Chapter 2 the significance of smallholder farmers to agricultural growth and development in Kenya despite the challenges faced in accessing sustainable agricultural farm inputs, supply chains, and sustainable markets (Andrade, 2016). In addition, Chapter 2 delved into explaining the recent transformation in the global agri-food industry that has significantly changed the role of smallholder farmers and how farmers establish, determine and implement product food safety standards and quality management systems (Lee et al., 2012). The roles and expectations of smallholder farmers were also explained, showing how they have been changing over time in the broader context of economic

development following the proliferation of product food safety standards and quality management systems in response to the changes in the global agrifood system. The principles and requirements of product food safety standards and quality management systems to be implemented by smallholder farmers were analysed in the chapter as a foundational pillar of trust for smallholder farmers desirous of participating in the international market (Ramful, 2017). These include (a) Understanding and implementation of concepts in good agricultural practices, (b) Basic understanding of food safety concepts, (c) Understanding key food safety concepts, (d) Understanding roles in Ensuring Food Safety, (e) Food hygiene, (f) Food risk, (g) Handling and preservation of fruits and vegetables, (h) Implementation of the HACCP System (Food Management System); and finally, (i) Understanding of quality management systems.

Finally, the researcher explained in Chapter 2 the comparatives used in the study when determining the efficacy of the smallholder farmer prior and post implementation of product food safety standards and quality management systems. These include (a) smallholder focus on their farms, families and homes, (b) production yields, technology and farm inputs, (c) labour, (d) income earned and impact on household status, (e) smallholder farmer participation in the international market, and finally, (f) the future of smallholder farmers. Based on the comparative data collected, the study illustrated whether the change management decision by the smallholder farmer improves net earnings and returns.

Key literature reviews in Chapter 2 are summarized in Table 4 below.

Table 4:

Summary of Key Literature Reviews

Author	Title	Source	Findings
(Doherty & Kittipanya-Ngam, 2021)	The Role of Social Enterprise Hybrid Business Models in Inclusive Value Chain Development	https://www.proquest.com/scholarly-journals	Introduction: Smallholder farmers in Kenya have gone to great lengths to change their business model architecture to incorporate globally recognized product food safety standards and quality management systems to become competitive and access international markets to improve their livelihoods
(Mayne, 2017)	Theory of Change Analysis: Building Robust Theories of Change	DOI: 10.3138/cjpe.31122	Theory of Change (ToC): ToC is a tool that can evaluate design interventions or assess the designs of interventions, with specific aims to determine the efficacy of global system implementations relating to product food safety standards and quality management systems among smallholder farmers in Kenya. Further, according to Serrat (2017), ToC can be viewed as a complex decision-making process that can help business owners and entrepreneurs navigate complex management changes to achieve strategic organizational goals.
(Callaghan, 2017)	Contemporary insights from Social Sciences Theory: Implications for Management	DOI: 10.4102/sajbm.v48i4.41	Social Science Theory: The use of social science theory is considered ideal in the study to contextualize and understand the evidence base used when applying the ToC approach.
(Guntur, 2019)	A Conceptual Framework for Qualitative Research: A Literature Studies	DOI: 10.33153/capture.v10i2.2447	The study adopted a conceptual framework to guide further and bring out the aspects of the research on how they interlink when exploring the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. The conceptual framework views the interrelated components and variables to address the research objectives and aims to solve the problem in the study.
(Atela et al., 2018)	Farmers' agency and experiences of agricultural change in rural Kenya: Insights from exploratory fieldwork.	Retrieved from https://opendocs.ids.ac.uk	Agriculture in Kenya: Agriculture in Kenya is often considered the backbone of Kenya's economy, critical for national development, food security, and fighting against hunger.

(Wangu et al., 2021)	Inclusive Business for Smallholders' Household Food and Nutrition Security: Disconcerting Results from an Analysis of a French Bean Agri-investment in Kenya	DOI: 10.1177/2455133321994209	Barriers to Agricultural Productivity in Kenya: However, notwithstanding the developmental advancements in the agriculture segment, Kenya still wrestles with food security issues. Efforts by the National Government to Promote Kenya's Agricultural Sector: Through the Kenya Vision 2030, the national Government has developed strategic policies that address critical issues affecting the agricultural sector in Kenya following the failure of liberalized agricultural policies under the World Bank-led Structural Adjustment Program (SAP) of the 1980s.
(Kamara et al., 2019)	The Relevance of Smallholder Farming to African Agricultural Growth and Development	DOI: 10.18697/ajfand.84.BLFB1010	Smallholder Farmer: There is no universally agreed definition of a smallholder farmer due to the varying factors across many countries and regions, such as land ownership, agricultural production size and activities, living standards, sharing of family labour, agroecology, demography and socio-economic factors Significance of Smallholder Farmers to Agricultural Growth and Development Smallholder farmers live in poverty and have challenges accessing sustainable agricultural farm inputs, supply chains and sustainable markets (Andrade, 2016). Nevertheless, despite the encounters faced in accessing critical production resources and farming services, smallholder farmers contribute significantly to Africa's agricultural production, biodiversity, and food security.
(NAIP, 2019)	2019-2024 NATIONAL AGRICULTURE INVESTMENT PL AN	Retrieved from https://www.agck.or.ke/Downloads/NATIONAL-AGRICULTURE-INVESTMENT-PLAN-NAIP	Initiatives to Improve the Livelihood of Smallholder Farmers: Many countries in sub-Saharan Africa have developed national policies targeted towards increasing public expenditure in the agricultural sector to promote economic growth through smallholder farmers to eradicate poverty and enhance food security.
(Melchior & Newig, 2021)	Governing Transitions towards Sustainable Agriculture—Taking Stock	DOI: http://dx.doi.org/10.3390/su13020528	Commercializing and Market Participation by Smallholder Farmers:

	of an Emerging Field of Research		Commercialization of smallholder farming can be defined as "… the transformation from subsistence production (production for own consumption) to production for sale of surplus products and services. Smallholder farmers make change management decisions to implement product food safety standards and quality management systems to optimize the commercialization of agricultural production and participate effectively in national and international markets.
(Abid & Shang, 2021) (Bulgari et al., 2021)	Impact of COVID-19 on agricultural food: A Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis The Impact of COVID-19 on Horticulture: Critical Issues and Opportunities Derived from an Unexpected Occurrence	DOI: http://dx.doi.org/10.1002/fft2.93 DOI: http://dx.doi.org/10.3390/horticulturae7060124	Impact of Covid-19 on Smallholder Farmer's Participation in Implementing Sustainable Agriculture: There has been unprecedented stress on the agricultural sector following the Covid-19 pandemic caused by the new coronavirus (SARS-Cov-2) infection that affected the world population. As a result, smallholder farmers' lifestyles have changed positively and negatively. Smallholder farmers' efforts to access markets and farm inputs became constrained following movement restrictions, thus creating labour shortages for planning and harvesting, drastically affecting the country's agricultural sector's development.
(Irandu, 2019)	Factors influencing growth of horticultural exports in Kenya: a gravity model analysis	DOI: http://dx.doi.org/10.1007/s10708-018-9888-x	Horticulture and Smallholder Farmers in Kenya: Smallholder farmers, the leading players in the horticultural sector, must comply with global product food safety standards and quality management systems to participate more actively in the international markets. As a result, the household income among smallholder farmers increases, poverty is reduced, and global food security is increased.
(Jacobi et al., 2020)	A new understanding and evaluation of food sustainability in six different food systems in Kenya and Bolivia	DOI: http://dx.doi.org/10.1038/s41598-020-76284-y	Trends and New Understandings of Product Food Safety Standards and Quality Management Systems in the Food Industry: The recent transformation in the global agri-food industry has significantly changed the role of smallholder farmers and how farmers establish, determine and implement product food safety

			standards and quality management systems.
(Hammoudi et al., 2015)	Food Safety, Market Organization, Trade and Development	Publisher: Springer International Publishing 2015	Overview of Product Food Safety Standards and Quality Management Systems: Product food safety standards and quality management systems have become a key public issue in the last 20 years following economic globalization and changes in food pattern consumption and consumer awareness.

CHAPTER 3: RESEARCH METHOD

Introduction

The purpose of the study was to explore the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. Smallholder farmers in Kenya have gone to great lengths to change their business model architecture to incorporate globally recognized product food safety standards and quality management systems to become competitive and access international markets to improve their livelihoods (Doherty & Kittipanya-Ngam, 2021). Smallholder farmers, who are a vital part of the global agricultural community, live in rural areas, and agriculture is their primary source of livelihood (IFAD, 2013). However, compliance with product food safety standards and quality management systems is costly and often deemed disproportionately burdensome for smallholder farmers (Maguire-Rajpaul et al., 2020).

Chapter 3 consists of the research approach, including the research instruments, data collection and related research collection techniques, the population and sampling techniques used to determine research participants in the study, formal consent approving the use of human participants, confidentiality statements and research validations. Chapter 3 also provides insight into this study's mixed method research design.

A mixed method research approach was used to determine the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. Furthermore, the explanatory sequential mixed research design was adopted as a procedure for mixing quantitative and qualitative methods for collecting and analyzing data to understand the research problem and answer the research questions (Creswell & Clark, 2018). The study investigated the efficacy of product food safety standards and quality management systems among

smallholder farmers in Kenya prior and post implementation to determine the benefits realized from such programs. In addition, the smallholder farmer's organization and change management process was also investigated to establish if there have been improvements in their operating and production activities to gain access to more profitable markets and improve their livelihoods. Finally, the study also ascertains if the time, effort, and money spent on such programs are justifiable to Kenya's smallholder farmers and improve their livelihoods.

Letters of approval from the research participants, the Unicaf Research Ethical Committee (UREC) and the National Commission for Science, Technology and Innovation (NACOSTI), a national Government authority in Kenya, were obtained to protect the use of humans in the study. The mixed approach research method using both questionnaires and interviewing smallholder farmers, upon their voluntary acceptance, gives valuable information to evaluate the efficacy of smallholder farmers prior and post implementation of product food safety standards and quality management systems.

This chapter also uses the mixed method research approach to guide the study and exemplify the researcher's role when answering the research questions. In addition, the chapter explains the researcher's selection of the research participants and the methodological strategies used, validation for the study analysis, and ethical considerations for smallholder farmers who participated in the study. The study further gives attention to empirical literature previously explored to provide meaning to the thesis topic and highlight the research questions. Finally, the study, with the aid of empirical literature, examines the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya to answer the research questions, which include (a) to what extent have smallholder farmers in Kenya benefited from the implementation of product

food safety standards and quality management systems, (b) what are the key enablers/drivers in the implementation of product food safety standards and quality management systems for smallholder farmers in Kenya, (c) what are the challenges faced by smallholder farmers in Kenya in the establishment and implementation of product food safety standards and quality management systems, (d) what are the factors that have contributed to majority of the smallholder farmers in Kenya not implementing product food safety and quality management systems, and finally, (e) what can the government do to encourage more farmers in Kenya to implement product food safety standards and quality management systems programmes.

Therefore, in answering the research questions, problem gaps were identified. Once resolved, the smallholder farmers would have access to international export markets and benefit through increased incomes and reduced poverty, culminating in improved welfare of household members. In addition, the study also contributes to the scientific knowledge base by paying attention to the empirical literature previously explored, research gaps, and future research recommendations identified to provide meaning to the thesis topic and research questions highlighted in the research topic.

Research Approach

The study sought to recognize the impact of the theory of change among smallholder farmers by exploring the principles of change, how to implement organizational changes effectively, and the importance and role of changes (Mayne, 2017). The study used quantitative and qualitative data to understand the research problem and answer the research questions. Therefore, the study adopted a mixed method approach to determine the efficacy of product food

safety standards and quality management systems among smallholder farmers in Kenya. Apparently, most social science studies stop short of fully embracing either qualitative or quantitative methodologies as stand-alone approaches (Brockett et al., 2019). Subsequently, the mixed approach methodology is used in conjunction with statistical analysis to analyse and interpret the surveyed data collected from the study participants.

There is still no common consensus in the literature on how the change management approach initiatives among smallholder farmers work across various business contexts to develop, implement, and evaluate development programs (Clark & Apgar, 2019; Mayne, 2017; Silva et al., 2015; Stein & Craig, 2012; Vogel, 2012). Furthermore, according to Brockett et al.(2019), no empirical data directly integrates a natural phenomenon to explain the change management process by smallholder farmers to establish and implement product food safety standards and quality management systems in their business operations. Therefore, the study considered the human factors and their complexities when mapping the smallholder farmer's change management process to compare efficacy prior and post implementation of product food safety standards and quality management systems.

The mixed method approach has recently gained impetus among educational researchers because it offers a framework for combining quantitative and qualitative methods in social and behavioural sciences (Creswell, 2012; Timans et al., 2019). The mixed method research can be considered as "…one that planfully juxtaposes or combines methods of different types (qualitative and quantitative) to provide a more elaborated understanding of the phenomenon of interest (including its context) and, as well, to gain greater confidence in the conclusions generated by the evaluation study" (Johnson et al., 2016, p. 119). The mixed method research approach is also

defined as a procedure for "… collecting, analyzing, and "mixing" both quantitative and qualitative methods in a single study… to understand a research problem" (Creswell, 2012, p. 535). According to Timans et al. (2019), other terms are also used to designate data collecting using different analytic methods in an empirical study, synonymous with mixed approach methods such as triangulation, combining, and multiple methods.

The rising popularity of the mixed approach method in social and behavioural science makes it the preferred research method to use when engaging smallholder farmers to determine the efficacy prior and post implementation of product food safety products and quality management systems. Looking at the emerging trends and the critical reviews of emerging practices of combining research methods, the mono-method approaches of using either quantitative or qualitative approaches take the combining methods more seriously in social sciences (Timans et al., 2019).

However, Timans et al. (2019) argue that the mixed method approach still seems to have problematic issues. For example, some researchers have designed standardized methodological frameworks when combining quantitative and qualitative research methods. However, this standardization is unfortunate since activities such as the codification of features of research practices should not be standardized. Therefore, the logic of combining quantitative and qualitative approach methods in a study cannot offer the same benefits.

Nevertheless, mixed method research, also known as mixed research, is becoming increasingly articulated and acceptable as a third major research approach alongside quantitative and qualitative research (Johnson et al., 2016). The author further mentions that there might not be a solitary demarcating criterion for mixed method research; however, its importance as a research approach may be experienced in a narrow and broader sense. Therefore, mixed method research

can also be considered a knowledge approach to theories and practices that attempt to consider multiple viewpoints, positions, standpoints, and perspectives of quantitative and qualitative research (Johnson et al., 2016). In this case, the quantitative approach seeks to obtain accurate and reliable measurements that allow statistical analysis. In contrast, the qualitative approach intends to understand the complex reality and the meaning of actions in the given context (André Queirós et al., 2017).

Historically, mixed method research in the social and behavioural sciences started with researchers who believed that quantitative and qualitative methods and viewpoints were useful in addressing research questions (Johnson et al., 2016). Therefore, though mixed methods research is not new, it can be considered in recent times as a research paradigm with a growing number of members that have ascended in response to the currents of qualitative and quantitative research. Furthermore, social science literature reviews with articles such as those of Campbell and Fiske (1959), as mentioned by Johnson et al. (2016), formalize the practice of using mixed method research by introducing the idea of triangulation. Triangulation implies using one or more research approach methods to explain variance in the result of an underlying phenomenon when solving a research problem. Further, the author also mentions Bouchard (1976), who argued that the convergence of findings emanating from two or more methods enhances the belief that the results of a study are more valid and not methodological artefacts. Finally, a literature review by Webb, Campbell, Schwartz, and Sechrest (1966), as mentioned by Johnson et al. (2016), confirms that where we have two or more independent measurement processes, the ambiguity of its interpretation is significantly reduced.

Accordingly, in the study, the researcher used a mixed method research approach to solve the research problem and answer the research questions. Data collected from smallholder farmers on product food safety standards and quality management systems that are inherently biased will be cancelled out when used in conjunction with data from other sources or research methods. Therefore, the use of mixed method research in the study can be summarised to have the following advantages: (a) the researcher is more confident with the result findings, (b) creativity is stimulated when collecting data, (c) data collected for the study is richer, (d) integration and synthesis to empirical theories are enhanced, (e) contradictions are uncovered, (f) it also can serve as a decisive indicative test for competing theories due to its comprehensiveness, among others.

According to a mixed method research study conducted on 158 enrolled postgraduate nurses in a nursing program at Adelaide University to identify professionalism in nursing, variables such as personal values, attitudes and beliefs were highlighted as key constructs in the understanding of the nursing professionals (Philippa et al., 2021). The characteristics emphasized among the nurses are comparable to those of smallholder farmers who have embraced a change management process by implementing global product food safety standards and quality management systems to access international markets. The change management process for smallholder farmers starts to develop before and at a point of entry into the new markets, where theory and practice combine to form an understanding of the role and level of professionalism required to participate in the new market. Therefore, this justifies the objectives of the study to compare and explore the efficacy of smallholder farmers in Kenya prior and post implementation of product food safety standards and quality management systems. Using the mixed methods approach in the study would expand and strengthen the understanding of the smallholder farmer’s change management by collecting,

analysing, and interpreting quantitative and qualitative data in a single study to solve the research problem and answer the research questions.

Below are some case study examples on the use of the mixed approach method done on smallholder farmer's research:

Case Study 1: Attitudes and Perception of Technology Adoption of Smallholder Farmers in Western Kenya (Nyairo, 2020)

A mixed method approach was used in an exploratory study to assess the smallholder farmer's attitudes and perceptions in Kakamega county, Kenya, towards agricultural technologies. In addition, key variables predicting the smallholder farmer's adoption of agricultural innovations in seven sub-counties in Kakamega county were explored.

In the case study, data to probe the attitude, values and practice of smallholder farmers' adoption of technology was collected from 245 smallholder farmers participants using questionnaires for quantitative data, followed by focus group interview discussions to collect qualitative data. Data collected from the quantitative questionnaire tool tested two hypotheses, whereas data from the four informal focus groups elicited an in-depth understanding of the smallholder's adoption of technology.

The quantitative data collected was analysed and used in the case study to estimate the social-demographic variables using a binary logistic regression model to determine the adoption of agricultural innovation. After that, qualitative data was also analysed and used to elicit an in-depth understanding of smallholder farmers' perception of technology adoption.

In conclusion, the case study recommended that the mixed method was a valuable research approach to determine the smallholder farmer's perspective on agricultural extension activities and technology adoption in farming activities.

Case Study 2: Smallholder Farmer's Socio-economic Influence and Organic Agriculture Farming Perceived Benefits (Areri et al., 2022)

The case study adopted a mixed method research approach to investigate the influence of smallholder farmer’s socio-economical characteristics on the adoption of organic farming in Kisii County, Kenya. According to IFOAM (2020), cited by the author, organic farming works under four principles: care, health, fairness and ecology. In addition, organic farming enables smallholder farmers to integrate biological, cultural, and mechanical farming, which allows the cycling of resources, ecological balance, and biodiversity conservation.

The specifics of the agricultural technology adopted focused on smallholder farmers, their households and socio-economic factors in Kisii county. The case study collected data from eight sub-locations within Kisii county, where farming is the primary source of livelihood for smallholder farmers. A mixed method research approach was adopted in the case study, where quantitative data was collected from 306 smallholder farmer households, and qualitative data was collected from randomly selected key informants in the agricultural sector. Both closed and open-ended questionnaires were used to collect quantitative data, whereas interview research instruments were used to collect qualitative data.

The case study results using the mixed method research revealed that farm size, income, family size, and age largely influenced the smallholder's socio-economic characteristics in the adoption of organic farming.

Case Study 3: Interaction Between Pests, Production of Mixed-Maize Crop and Food Security among Smallholder Farmers in Mwea West, Kenya (Constantine et al., 2021)

The case study adopted a mixed method research approach among smallholder farmers in Mwea West, Kirinyaga county, Kenya, to investigate the interactions between pests, mixed-maize crop production and food security. According to the author, crop pests are considered a serious challenge and threat to food security globally, leading to massive potential losses among smallholder farmers. The researcher used a semi-structured mixed method approach comprising questionnaires for quantitative data collection and interviews for qualitative data from 32 randomly selected smallholder households.

After data analysis was done on the quantitative and qualitative data sets, the results from the case studies revealed that smallholder farmers' net income is affected significantly by pests that reduce production yield.

Research Design

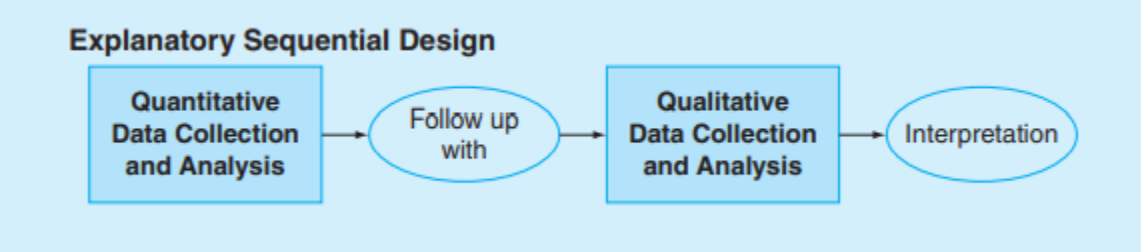
According to Creswell (2002), mixed method research builds strength in a study by incorporating both quantitative and qualitative data. According to Miles and Huberman (1994), as Creswell (2002) mentions further, the study will have a powerful mix when quantitative data and quantitative data are combined to solve the research problem. Also, further quoted by the author,

Greene and Caracelli (1997) refer to the use of both quantitative and qualitative data to present a complex picture or solution to address the social phenomenon in a research study. The use of quantitative collected data enables numbers to be statistically analysed to produce results that allow the researcher to assess the magnitude and frequency of trends. At the same time, the use of qualitative collected data involving the use of people's actual words enables the study to provide a complex picture of the situation as many perspectives of the research participants are analysed.

Many types of mixed designs are advanced in literature (Creswell & Clark, 2018). Having identified the mixed research approach method for the study, the researcher decided to select the explanatory sequential design, as shown in Figure 14, as the research strategy to solve the research problem and answer the research questions.

Figure 14

Explanatory Sequential Design



Note: Adapted from *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative.*, by Creswell, 2012, p. 541.

The study focuses on the comparatives of efficacy prior and post implementation of product food safety standards and quality management systems among smallholder farmers in Kenya while also recognizing the need to collect prospective data from the actual words of the participants.

Therefore, quantitative data is collected to formulate the comparative analysis, whereas qualitative data is collected to analyse the views and perceptions of the smallholder farmers.

The explanatory sequential research design allows quantitative and qualitative data to be collected sequentially in two phases (Creswell & Clark, 2018). Quantitative data is collected first in the study, followed by qualitative data to explain and elaborate further on the quantitative results. The study focuses on comparatives in efficacy prior and post implementation of product food safety standards and quality management systems among smallholder farmers in Kenya. Therefore, the rationale for using the explanatory sequential design is justified in the following manner. Firstly, quantitative data and results are determined to provide a basis for comparability in understanding the general picture of the research problem in determining efficacy prior and post implementation of product food safety standards and quality management systems among smallholder farmers in Kenya. Secondly, the researcher can return to the participants and collect additional qualitative data. The qualitative data is then further analysed, especially for exceptional, significant or outlier variables based on the quantitative data earlier analyzed, to refine, extend, and further explain the research problem's general picture. In other words, quantitative data collected is first analysed. After that, a small qualitative component, typically of exceptional, significant and outlier variables, is analysed in the study's second phase to refine the quantitative data results.

According to Creswell and Clark (2018), the advantages of the use of the explanatory sequential design can be summarized as follows: (a) the design offers a robust quantitative research orientation, (b) it is a straightforward design to implement conducted in two separate phases, that is, quantitative and then qualitative, for the same type of data, (c) final report written is clearer to the readers as the quantitative section is presented first then the qualitative report, and finally, (d)

the design aligns itself to emergent approaches since the second phase can be modified and adapted based on the outcome of the initial quantitative phase.

Researchers consider the explanatory sequential design research to have challenges in its application, which are summarized as follows: (a) the design can be time-consuming in the implementation of the two-phase, and (b) it is not easy to state in advance the participants to be selected in the second qualitative phase until the initial quantitative phase is completed, (c) the design requires the researcher to specify who can best be selected to explain the qualitative phase.

An example of explanatory sequential design research is done in a study by Ivankova and Stick (2007), as mentioned by Creswell and Clark (2018). A doctorate program in educational leadership collected quantitative data from 278 current and former students, followed by survey responses from four qualitative case studies. The study is a good illustration of an explanatory sequential mixed research design where quantitative data collected is analysed first. Afterwards, the four case studies are used as follow-ups to gain greater insight and understanding of important predictors of student persistence.

Below are some case study examples on the use of an explanatory sequential research design done on smallholder farmers' research:

Case Study 1: Attitudes and Perception of Technology Adoption of Smallholder Farmers in Western Kenya (Nyairo, 2020)

The sequential design research was considered a suitable model in the case study to investigate the attitudes and perceptions of smallholder farmers in Western Kenya regarding the adoption of technology. Therefore, the case study first utilized the quantitative phase of data

collection to investigate the innovation aspect of the research and then the qualitative phase of data collection to further broaden the research investigation. Using the sequential design incorporating the quantitative and qualitative paradigm was considered a consistent and pragmatic perspective for the case study since the framework offered a worldview presenting different views that enriched the research findings.

Similar to the study determining the efficacy of product food safety standards and quality management systems of smallholder farmers in Kenya, quantitative data was collected, analysed and interpreted to address the research questions. After that, qualitative data was also examined, and the results were used to support the quantitative findings further, thus offering a broader and more profound investigation of the study.

Case Study 2: A Research-note to Study Adoption of Sustainable Agricultural Practice among Smallholder Farmers (Sattar et al., 2017)

The case study provides a research note on the processes and outcomes used by an explanatory sequential design research model for mixed method data analysis among smallholder farmers in selected regions of Pakistan and China to evaluate the adoption of sustainable agricultural practices. The case study acknowledges that the sequential design research method can be done in different ways, and the researcher can choose to start with either the quantitative or qualitative research approach to collect baseline data for the research.

In the case study on adopting sustainable agricultural practices among smallholder farmers in selected regions of Pakistan and China, subsets of quantitative and qualitative data were collected at regular intervals that reflected the expected outputs for good and poor performance indicators.

Therefore, the use of explanatory sequential design research in the case studies resulted in the complementary use of qualitative and quantitative research approaches in monitoring agricultural systems that helped deliver detailed explanations of the unsuspected issues and outcomes of the case study.

Population and Sample of the Research Study

Study Area

Kenya’s export earnings account for 65 per cent of agricultural cash crop activities, including the horticulture sector with fruits and vegetables (Associates, 2017). Further, the main export markets for Kenya’s horticultural fruits and vegetables are comprised of countries in the European Union, namely Holland, Germany, France, the United Kingdom, and Switzerland. In addition, other recent target market destinations that have focused on enhancing production efficiency and diversities include non-traditional countries such as the Middle East, Japan, China, New Zealand, and Australia.

According to a horticultural study done by the Kingdom of the Netherlands mapping the production of fruits and vegetables in Kenya (Associates, 2017), Kenya's temperate and tropical weather conditions make it generally conducive for the development and production of fruits and vegetables for both export to international markets and domestic markets. Figure 15 shows the boundary of smallholder farmers' dominance in Kenya's major growing areas.

Figure 15

Production Cluster of Fruits and Vegetables in Kenya

Note: Adapted from *Horticulture Study Phase 1: Mapping of Production of Fruits and Vegetables in Kenya.*, by Associates, 2017, p. 8.

Further, Table 5 below shows a detailed inventory of fruits and vegetables in Kenya and their destination export markets grown within the major growing areas in Kenya. Meru county, highlighted in red, dominates as the main production area in Kenya, where every type of fruit and vegetable sold in international and domestic markets can be found. Therefore, on this basis, the

study selected Meru county as the statistical sample region to determine the efficacy of product food safety standards and quality management systems of smallholder farmers in Kenya.

Table 5

Inventory of Major Fruits and Vegetables in Kenya

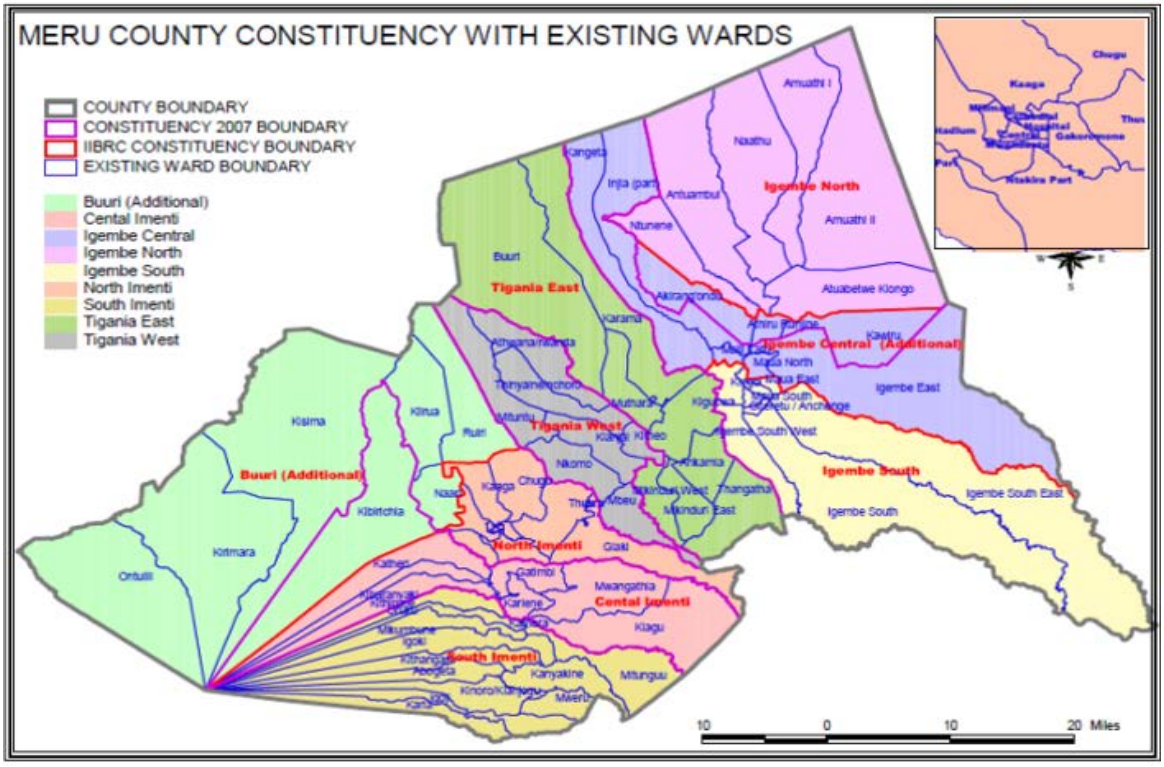
S No	Horticultural Products	Where they are grown	Exported Volumes MT -2015	Export Destinations
	FRUITS			
1	Avocado	Muranga, Thika, Makueni, Embu, Nyeri, Meru, Kisii, Eldoret, Bungoma, Subukia, Nakuru and Naivasha.	31,227	United Kingdom, France, Netherlands, Germany, Belgium, Sweden, Djibouti, Middle East, South Africa, Australia, China
2	Mango	Makueni, Kwale, Kilifi, Machakos, Nyeri, Embu, Meru, Bungoma, and Elegy Market.	14,048	United Kingdom, Germany, Holland, France, Japan and Middle East
3	Passion fruit	Thika, Nyeri, Embu, Meru, Trans-Nzoia, Usain Gishu, Kwale, Elegyo Marakwet and Laikipia	404	United Kingdom, France, Germany, United Kingdom, France, Germany,
	VEGETABLES			
S No	Horticultural Products	Where they are grown	Exported Volumes MT -2015	Export Destinations
1	Fine beans	Kirinyaga, Muranga, Meru, Machakos, Narok, Kiambu, Taita Taveta, Embu, Nyeri, Bomet, Makueni , Kajiado	23	United Kingdom, France, Netherlands, Germany, Belgium, Russia, Djibouti, Middle East
2	Extra Fine beans			
3	Snow Peas	Meru, Nyandarua, Laikipia, Taita Taveta, Kiambu, Narok, Baringo, Nyeri, Trans Nzoia, Nakuru	17	United Kingdom, France, Netherlands, Germany, Belgium, Djibouti, Saudi Arabia, United Arabs Emirates
4	Sugar Snaps	Meru, Trans Nzoia, Taita Taveta produce 98% of sugar snap grown. Other counties include Uasin Gishu, Narok, Elgeyo Marakwet, Laikipia, Nyeri	17	United Kingdom, France, Netherlands, Germany, Belgium, Russia, Djibouti, Middle East
5	Tender stem broccoli (TSB)	Meru, Nyandarua, Laikipia, Kiambu, Narok, Thika, Nyeri, Naivasha, Nakuru, Migori, Siaya	627	United Kingdom, France, Netherlands, Germany, Belgium, Russia, Djibouti, Middle East
6	Snow Mangetout	Kirinyaga, Muranga, Meru, Machakos, Narok, Kiambu, Taita Taveta, Embu, Nyeri, Bomet, Makueni , Kajiado	2,607	United Kingdom, France, Netherlands, Germany, Belgium, Russia, Djibouti, Middle East
7	Runner beans	Grown by large-scale growers in Meru, Nyandarua and Migori.	391	United Kingdom, France, Netherlands, Germany, Belgium, Djibouti, Saudi Arabia, United Arabs Emirates
8	Aubergines	Nyeri, Makueni, Meru, Kwale, Muranga, Machakos, Naivasha, and Nakuru	994	United Kingdom, France, Netherlands, Germany, Belgium, Russia, Djibouti, Middle East
9	Baby corn	Makueni, Kirinyaga, Machakos, Laikipia counties account for 94% of production	75	United Kingdom, France, Netherlands, Germany, Belgium, Djibouti, Saudi Arabia, United Arabs Emirates
10	Baby carrot	Meru, Nyandarua, Laikipia, Taita Taveta, Kiambu, Narok, Thika, Nakuru, Nyeri	10.5	United Kingdom, France, Netherlands, Germany, Belgium,
11	Baby courgettes	Makueni, Kirinyaga, Machakos, Laikipia, Naivasha, Meru, Nyandarua, Embu	14.5	United Kingdom, France, Netherlands, Germany, Belgium,
S No	Horticultural Products	Where they are grown	Exported Volumes MT -2015	Export Destinations
12	Baby Leeks	Makueni, Kirinyaga, Machakos, Laikipia, Naivasha, Nyeri, Meru, Nyandarua.	9	United Kingdom, France, Netherlands, Germany, Belgium,
13	Chillies	Makueni, Kirinyaga, Machakos, Laikipia, Naivasha Meru, Nyandarua, Embu	926	United Kingdom, France, Netherlands, Germany, Belgium, Russia, Djibouti, Middle East
14	Irish potatoes	Central highlands mainly Nyandarua, Nyeri, Meru, Kiambu. Other areas are Elgeyo Marakwet, Nakuru, Narok, Bomet, Muranga, Baringo and Uasin Gishu	131	Vibrant domestic and regional market

Note: Adapted from *Horticulture Study Phase 1: Mapping of Production of Fruits and Vegetables in Kenya.*, by Associates, 2017, p. 5.

According to an article on the county government (Meru-County, 2022), Meru county, formerly Eastern Province, is one of the 47 counties in Kenya. Meru county borders Isiolo county to the North, Tharaka/Nithi county to the East, Nyeri county to the South West and Laikipia county to the West. It lies between 0° 6′ North and 0° 1′ South and between latitudes 37° West and 38° East. The total area of Meru county is 7,006 Km2, with 972.3 Km2 gazetted as a forest. Meru county has an estimated population of 1.55 million people. The physical and topographic features of Meru county are largely influenced by the coastal climate, especially the mountain's eastern slopes, with altitudes ranging from 300m to 5,199m above sea level. Meru county has many rivers and streams originating from Mount Kenya and Nyambene streams that people depend on for agriculture and domestic use. The average temperature in Meru county ranges from 8c at the minimum to 32c, the highest, with annual rainfall ranging between 300mm per annum in the lower midlands to 2500mm in the South East. The rainfall patterns comprise long rains from mid-March to May and short rains from October to December. Meru county is further divided into nine sub-counties for administrative purposes, as shown in Figure 16.

Figure 16

Meru County



Note: Adapted from *Meru GIS Maps, retrieved from* https://meru.go.ke/county-maps/.

Setting and Sampling Procedures

All samples have some utilities when estimating the size of the target population (Schreuder et al., 2001). In addition, according to the author, the researcher has to determine the sampling strategy, which encompasses the sample design, an estimator of the population quantity and a defined target population to make it possible to extrapolate a solution that will solve the research problem. Sampling from a broader view may be probabilistic or non-probabilistic. Probabilistic sampling "is one for which every unit in a finite population has a positive probability of selection, not necessarily equal to that of other units" (Schreuder et al., 2001, p. 281; Tansey, 2007).

Therefore, through probabilistic sampling, the researcher can estimate the relationship of the sample to the population of subjects from which the sample is drawn.

Examples of probabilistic sampling, according to Tansey (2007), include (a) simple random, that is, subjects chosen in random order from a list of members of the population, and (b) stratified random, that is, the population list is intentionally manipulated so that certain important categories of subjects randomly selected are not excluded from the sample through chance. Essentially, the sample ensures the study can be generalized to the wider group from which the sample was drawn. In addition, randomness in probabilistic sampling ensures that the sample was not selected in a biased manner and did not relate to the variables being used in the study.

On the other hand, sampling can take an alternative form of non-probability sampling techniques where the samples are drawn from a larger population without requiring random selection (Tansey, 2007). In other words, the researcher can subjectively decide which units of the population to include in the sample, which is a key distinguishing characteristic of non-probability sampling compared to probability sampling. However, though the researcher has greater control of the selection process, the non-probability sampling techniques are severely limited to generalising the findings to the wider population. Also, there is a chance that the research findings will be compromised because the subjectivity of the non-probability sampling technique introduces an aspect of biased selections.

Nevertheless, according to Tansey (2007), the non-probability sampling technique also has its advantages, especially where the study aims not to generalize about the larger population. Types of non-probability sampling approaches (Tansey, 2007) include convenience sampling, also known as availability or accidental sampling, where the researcher selects available respondents regardless

of characteristics until the required sample size has been achieved. Another type of non-probability sampling is quota sampling. In this case, the researcher ensures certain characteristics are present in the sample in proportion to their distribution in the wider population, thus overcoming some of the weaknesses in convenience sampling. Another type of non-probability sampling is purposive sampling, where the study's purpose and the researcher's knowledge of the broader population guide the selection process. It is assumed (Kidder et al.,1991), as Tansey (2007) mentioned, that with an appropriate strategy and good judgment, researchers can select the units to be included in the study and thus develop samples that suit the study needs. Finally, another type of non-probability sampling is snowball/chain-referral sampling, commonly used when the population of interest is not fully visible, and there are difficulties posed when compiling a list of the population. Therefore, snowball or chain-referral identifies an initial set of relevant respondents who suggest other potential subjects with similar characteristics. The process continues until the researcher is satisfied that there is a large enough sample size representation of the larger population for the purpose of the study. However, the researcher needs to ensure that the set of respondents is sufficiently diverse so that the sample is not skewed unreasonably in any particular direction.

The study adopted a mixed method approach to determine and evaluate the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. Generally, many research methodologies have emerged over the years to accommodate the different forms of data likely to arise (Leedy & Ormrod, 2015). In other words, no research methodology exclusively leads to a better understanding of the unknown.

The study's target population comprised smallholder farmers aged between 20 and 75 years. The sampling design encompassed both probability sampling techniques for quantitative data

collection and non-probability sampling techniques for qualitative data collection. The study's sample size targeted 225 participants, with 215 smallholder farmers participating in the quantitative survey and 10 key stakeholders in the agricultural sector being interviewed for the qualitative survey. The researcher used the contacts, relationships, and networks developed over ten years of active professional engagement in the horticultural industry to enhance participants' identification, selection, and recruitment process for the study.

Since the precise number of smallholder farmers in Meru county engaged in the production of fruits and vegetables for the international and domestic markets was unknown, the study used the estimation of the sample size formula for an infinite population (Adhikari, 2021) to determine the number of participants to engage for the quantitative survey.

$$\text{Sample size (n)} = \frac{Z^2 \cdot p(1-p)}{e^2}$$

n = Sample size
Z= Critical value of the desired confidence level (95%) is 1.96.
e= Margin of error/ desired level of precision (5%)
p= Maximum probability of variation in the distribution (80%-85% of smallholder farmers assumed to be engaged in the production of fruits and vegetables)

$$\text{Sample size (n)} = \frac{1.96^2 \; X \; 0.83(1-0.83)}{0.05^2} = 215 \text{ participants}$$

Meru county has an estimated population of 1.5 million (GOK, 2019) distributed among the 9 sub-counties. Therefore, using purposive selection, 4 sub-counties were selected as the sample area for the quantitative data collection in the study. The sample size is proportionately determined based on the ratio of the total population in the respective sub-county, and the number of

smallholder farmers to be administered questionnaires for the quantitative survey, as shown in Table 6, randomly determined.

Table 6

Population in Meru by Sub-county

Meru sub-county	Population	Purposive Selection	Proportionate Sample Size
Buuri	157,360	157,360	43
Igembe Central	221,442	221,442	60
Igembe North	169,317		
Igembe South	161,646		
Imenti Central	133,818		
Imenti North	177,567		
Imenti South	206,506	206,506	55
Tigana East	109,309		
Tigana West	208,953	208,953	57
Total	**1,545,918**	**794,261**	**215**

In the case of qualitative data collection, there are various factors that determine the amount of qualitative data to collect and the number of people to consider for the interview phase (Baker & Edwards, 2012). In the study, the saturation issue was not applicable or most appropriate because the participants were key stakeholders and informants. As such, these were not homogeneous and plentiful, but a few purposively selected participants to share key information pertinent to validating the study findings and better understanding the research objectives and aims when solving the research problem.

Therefore, 10 key stakeholders in the agricultural sector in Kenya were targeted and purposively selected for face-to-face and telephone interviews for qualitative data collection as follows: (a) Government agencies: Horticultural Crop Development Authority- 4 participants,

Ministry of Agriculture- 1 participant, and Kenya Plant Health Inspectorate Authority- 1 participant), (b) Horticultural Exporting Companies- 2 participants, and (c) Agricultural Extension Officers – 2 participants.

The study methodology adopted ensured that any bias in how participants responded to the inquiries in the survey was minimized.

Materials/Instrumentation of Research Tools

Instrumentation of research tools or instruments is used in research studies as strategies for fact findings for data collection. Examples of the instrumentation of research tools for data collection include questionnaires, interviews, reading and observation (Annum, 2017). Further, the research must ensure the instrument used to collect data for the study is valid, reliable and appropriate. In addition, the author states that whatever procedure is used to collect data, the researcher must ensure that the quantitative research tool or qualitative research is critically checked or examined to ensure that the instrument is likely to give the expected results for the study.

Once approval was granted by UNICAF Research Ethical Committee (UREC) and the National Commission for Science, Technology and Innovation (NACOSTI), a national Government authority in Kenya, data collected was used to determine the comparatives of the efficacy prior and post implementation of product food safety standards and quality management systems among smallholder farmers in Kenya. The study adopted a mixed method approach and used the explanatory sequential design to solve the research problem and answer the research questions. The explanatory sequential research design allows quantitative and qualitative data to be collected sequentially in two phases (Creswell, 2012; Creswell & Clark, 2018). That is, quantitative data is

collected first in the study using questionnaires. Then, qualitative data is collected using face-to-face and telephone interviews to explain and elaborate further in-depth on the quantitative results.

Quantitative Research Tools

The questionnaire is the most common quantitative tool or technique for collecting data for a quantitative research study (Annum, 2017). The author further explains that the questionnaire is a systematically prepared document with a set of questions for answers that elicit the participant's responses for information necessary for the quantitative research. Once collected and analysed, the quantitative data provide insight into the nature of the research problem under study.

Also, the questionnaire is further defined as a document "…containing questions and other types of items designed to solicit information appropriate for analysis" (Babbie, 2013, p. 231). Questionnaires are used primarily in survey research and experiments, field research, and other modes of observation. Therefore, the questionnaire research tool for the study has been identified, located and modified from an existing instrument (Bihn et al., 2019; Laury-Shaw et al., 2015b) because developing a new questionnaire for data collection calls for more knowledge to construct, scale, design and format, and thus time-consuming. Furthermore, the questionnaire as a data collection tool for quantitative data is ideally connected to many modes of observation in social research. Therefore, it is essential for field research, among other data-collection activities (Babbie, 2013).

The effective use of the questionnaire will depend on the formulation and administration of the questions, the delivery process of the questionnaire to the target population, and the method of contacting the participants to answer the questionnaire. Since the research participants are not

obligated to respond to the questionnaires, the researcher has to plan how best to influence them to submit accurate information to the questions administered.

Questionnaires are usually designed as structured or unstructured documents. Structured questionnaires guide the answer; therefore, the researcher controls the answers given by the respondents. The questions are generally short and dichotomous in structure, requiring the respondent to tick out an item from a list of responses. The respondent may also be required to choose from a multiple-choice option by selecting an answer close to their own opinion. Ideally, in structured questionnaires, the respondent's choice of answers is limited to the set of optional answers provided.

The unstructured questionnaire consists of open-ended questionnaires that permit the respondents to freely answer the questions in their own words. Additional spaces within the questionnaire's frame allow the respondent to respond to the questionnaire with their opinion.

In the study to explore the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya, the questionnaire was used as the research tool to collect quantitative data. The study sought to compare efficacy prior and post implementation of product food safety standards and quality management systems among smallholder farmers in Kenya. The questionnaire asked the smallholder farmers to answer closed-ended questions to collect quantitative data. The closed-ended questions are widely used because they provide greater uniformity of responses than open-ended ones and are easier to process during data analysis. Smallholder farmers were asked to answer a list of provided questions pertinent to the study. In addition, the Likert scale (Babbie, 2013) formated the smallholder farmers' responses into

categories such as strongly agree, agree, disagree or strongly disagree or perhaps approve, strongly approve, and so forth; hence, it is easy to transfer directly into the computer format.

In the study, the questionnaires were worded in a simplified English language and administered to 215 smallholder farmers for quantitative data collection. The smallholder farmers identified to participate and respond to the quantitative research tool were randomly selected from the four purposively selected sub-counties of Meru county, namely, Buuri, Imenti South, Igembe Central, and Tigana West. In addition, the researcher was present to clarify any question where necessary, as worded in the questionnaire. Agricultural government agencies, such as Horticultural Crop Development Depots, Ministry of Agriculture County Offices, Agricultural Extension Officers, Horticultural Export Companies, and key stakeholders in Meru County, were used to assist the researcher in identifying smallholder farmers for the study. According to Babbie (2013), though sometimes discussed and considered controversial, paying participants for the study is common. However, the smallholder farmers identified to participate in the study were not considered for compensation after responding to the questionnaire.

Qualitative Research Tools

There are different types of qualitative research tools; therefore, the research tool chosen must be aligned and able to address the research objectives (Trigueros, 2017). Thus, the qualitative research tool adopted in the study was arrived at after considering (a) the research plan, (b) the target population to be observed, and finally, (c) the variables desired to be observed in the research tool.

According to Eladio (2016), as cited by the author, the survey and the interview are the most common instruments for collecting research data in a qualitative investigation. However, Trigueros (2017) further explains, as mentioned below, research tools that can be used to collect qualitative data.

Direct Observation

Direct observation as a research tool for qualitative research is used when the research topic and objectives are not well defined. Qualitative data is gathered by writing down the information about a phenomenon as the event occurs. Ideally, the direct observation qualitative research tool requires the researcher to observe the events of the phenomenon for a while, after which he will have better ideas to formulate the research problem, objectives and questions for further investigation.

After that, the researcher categorizes the observations into structured and unstructured observations. Structured observation requires an observation guide, and usually, it does not consider the participant, behaviour or environment where it takes place. Therefore, according to Scribano and Zacarias (2013), as cited by the author, the researcher, after selecting the variables to be observed, is required to compare the information gathered periodically for reliability.

In contrast, unstructured observation does not require an observation guide and can either consider the participants, behaviour or environment where the phenomenon occurs or ignore it altogether.

Interviews

Interviewing is a popular qualitative research instrument used by researchers to collect qualitative data by asking questions and getting answers from the research participants for the study. Further, there are various ways of conducting interviews to collect information for qualitative research study: individual, face-to-face, and group interviews. In addition, asking and answering questions for the qualitative research can be facilitated using devices like telephones or other electronic devices like a computer.

Research interviews, as mentioned earlier, are the most common research tool for qualitative data collection tools to explore individual respondents' views, beliefs, experiences, and motivations (Gill et al., 2008). According to the author, qualitative research interviews are believed to provide a deeper understanding of a social phenomenon than data collected from purely quantitative methods using questionnaires. Therefore, research interviews are most appropriate where the study requires detailed insight from individual respondents.

Gill et al. (2008) mention that there are three fundamental types of research interviews: structured, semi-structured, and unstructured. The structured research interview essentially involves verbally administrating questionnaires. A list of questions is asked with little or no variation or scope of follow-up questions to the responses that may warrant further elaboration. Therefore, structured research interviews are relatively easy and quick to administer and can be used to clarify further specific questions that are unclear to the respondents. Conversely, unstructured research interviews are performed with little or no organization. Unstructured research interviews can start with open-ended questions and then progress based on the initial response by the respondent. Therefore, unstructured research interviews can be time-consuming and sometimes challenging to

manage. Hence, such is used only where significant in-depth study is required. Finally, the semi-structured interview consists of questions that assist the researcher in defining areas to be explored or the participating parties diverge to pursue an idea or response in detail. The flexibility of the semi-structured research interview allows for elaborating or discovering information pertinent to the researcher and the participants.

In the study to explore the efficacy of product food safety products and quality management systems among smallholder farmers in Kenya, qualitative data was collected by interviewing key stakeholders and informants within the agricultural sector to explain and elaborate further in-depth on the quantitative results. In accordance with the International Ethical Guidelines for Health-related Research Involving Humans (CIOMS, 2016), participants are informed of the confidentiality protections of their information collected for the study. Therefore, the names used in the analysis section of the qualitative data collected are not the actual names of the research participants.

The study adopted an explanatory sequential mixed methods design, a two-phase process. In this two-phase process, quantitative data is collected first, and then qualitative data is collected next to help explain and elaborate on the quantitative results (Creswell, 2012; Creswell & Clark, 2018). Therefore, the qualitative phase builds upon the initial quantitative phase, focusing primarily on the exceptional items and outlier variables arising from the quantitative analysis.

Thus, with this in mind, the study used interviewing as the research tool to collect qualitative data from other key stakeholders and informants within the agricultural sector. Accordingly, the study targeted 10 participants for face-to-face and telephone interviews for in-depth case analysis selected from key stakeholders and informants. The participants to use the qualitative research tool

were to be constituted as follows: (a) 4 participants from the Horticultural Crop Development Authority, (b) 1 participant from the Ministry of Agriculture, (c) 1 participant from the Kenya Plant Health Inspectorate Authority, (d) 2 participants from the Horticultural export companies, and finally, (e) 2 participants from the Agricultural extension officers. In addition, appointments were booked with the respective government offices and horticultural companies to conduct one-to-one physical and telephone interviews with the target participants. However, only 8 participants responded positively to the qualitative research study.

As earlier explained, there are various factors that determine the amount of qualitative data to collect and the number of people to consider for the interview phase (Baker & Edwards, 2012). In the study, the saturation issue is not applicable or most appropriate because the participants were key stakeholders and informants. As such, these were not homogeneous and plentiful, but a few purposively selected participants to share key information pertinent to validating the study findings and better understanding the research objectives and aims when solving the research problem.

Therefore, the study relied on interviews with designed open-ended questions that did not restrict the respondent's views when collecting qualitative data. The interview process involved asking key stakeholders or informants in the agricultural sector in Kenya one or more open-ended questions to best voice their experience. At the same time, the researcher recorded their answers for further analysis (Creswell, 2012). The collected data was then transcribed and entered into a computer file. Finally, the smallholder farmer participant's conversation was audiotaped so that the information could be transcribed into words for analysis purposes.

According to Creswell (2012), the interview as a qualitative data collection research tool has some advantages. These advantages include (a) the provision of information when the

researcher cannot directly observe participants, thus permitting participants to describe detailed personal information, and (b) the researcher or interviewer has better control over the type of information required from the participants. In addition, the researcher can ask specific questions to elicit more information from the research participants. Some disadvantages of the use of the interview as a qualitative data collection tool include (a) the interviews can provide information filtered through the views of the researcher, (b) the data collected can be deceptive since it provides the perspective of the participant's response, (c) how participants respond can also be affected by the presence of the researcher, (d) participants responses to interview questions may not be articulate and clear, and (e) during the interview, the researcher will be required to ask questions while at the same time give attention to the conversation of the participants which can be confusing. Attention may spring from emotional outbursts, and icebreakers may be used to encourage the participants to talk.

Operational Definition of Variables

The study sought to determine the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. Therefore, the study is a comparative analysis of efficacy prior and post implementation of product food safety and quality management systems among smallholder farmers in Kenya. The study uses a mixed method approach and adopts an explanatory sequential research design that allows the use of both quantitative and qualitative data collection methods to obtain solutions to the research questions and solve the research problem.

Therefore, the study first collected quantitative data from 215 smallholder farmers in Meru county and then interviewed 8 key stakeholders in the agricultural sector in Kenya to explain the

results from the quantitative results. According to Creswell and Clark (2018), using both the quantitative and qualitative research approaches is justifiable since the results from the quantitative results are refined and give more elaborate findings of the research problem.

Consequently, operational variables become critical since they communicate the quantitative phase used by the researcher in the study when comparing the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. Therefore, the study entails the consideration of measurable factors called variables that are subject to change due to smallholder farmers' change management processes or circumstances when implementing product food safety standards and quality management systems. Variables in a research study explain variances that occur in a change created due to manipulation. In other words, variables are names given to variances critical to the research and explain the research process that determines the nature and direction of the study (Olayemi, 2017). Also, variables become central in the research process because the research title is actually made up of variables and thus focal to the study. Cohen, Manion and Morrison (2007), as mentioned by Olayemi (2017), describe a variable as an operationalized construct in which the researcher is interested because it dictates the subsequent development of a measurement instrument to access the variable.

The variables in the quantitative phase of the study primarily focused on the attributes of the smallholder farmer prior and post implementation of product food safety standards and quality management systems. The variables for measurability purposes are presented in an easy and straightforward manner that the smallholder farmers can quickly respond to when filling out the questionnaire for quantitative data collection and later for statistical analysis.

The questionnaire was used in the study as the research tool for quantitative data collection. The questionnaire was divided into six sections, namely, (a) demographic, (b) Importance of good agricultural practice, (c) farm activities, (d) farm sales, records and documented procedures, (e) challenges faced by smallholder farmers after the implementation of good agricultural practices and finally (f) open-ended section for any other information that help enhance good agricultural practices when implementing product food safety standards and quality management systems. Besides Section F of the questionnaire, varying variables defined the characteristics or attributes of each section.

For example, (a) in the section on demographics, we had the variables: gender, age, education, marital status, household number, land size, designation, and farm location. (b) in the section on the importance of good agricultural practices, we had the variables: the importance to know market requirements, the importance to know the requirements of product food safety standards, the importance to gain access to new markets, the importance to know why buyers reject farm produce in the marketplace, and finally, the importance to ensure you receive higher prices for farm produce, (c) in the section farm activities, we had the variables: to know infectious diseases and how they spread on the farm, to know how to reduce product food safety risks on the farm, to know the importance of cleaning and sanitizing the farm and farm produce, keeping domestic animals away from the farm and harvest area, and finally, monitoring and testing water quality, (d) in the section on farm sales, records and documented procedures, we had the variables: which market to sell farm produce, estimated farm produce sales per year, keeping farm produce sales records, keeping farm produce records for more than 3 years, and finally, keeping of documented procedures of farm activities, (e) in the section to know the challenges faced by the smallholder

farmer after implementing standards of good agricultural practices, we have the variables: is understanding of the standard of good agricultural practices a challenge on the farm, is the financial cost of implementing the standards on good agricultural practices a challenge on the farm, and finally, is it a challenge to get a technical expert to implement the standards of good agricultural practices on the farm.

Variables are measurable and can change or be manipulated and controlled by the research in a study (Parveen, 2017). In addition, variables exhibit differences in quality. Further, an operational definition will look at the variable in terms of the techniques or operations used to measure it. For example, in the study to determine the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya, the variables in the respective sections required the participants to choose the appropriate category from the list of alternatives presented in the questionnaires. In the questionnaire, the researcher considered good agricultural practices as an abstract concept and therefore defined it to mean the implementation of product food safety standards and quality management systems for better understanding by the smallholder farmer's participants. Thus, variables used in the study are considered important since they focus on the research and make the findings valid.

Types of Variables Considered in the Study

A quantitative research study's variables are usually numeric and represent a measurable quantity (Parveen, 2017). According to Parveen (2017), variables can be classified into:

1. **Quantitative vs Qualitative**

Quantitative variables are numeric and distinct since they represent a measurable quantity, such as the number of smallholder farmers in Meru county. On the other hand, qualitative variables are considered to take the form of names or labels.

2. **Univariate vs Bivariate Data**

When one variable is used in a study, the researcher is considered to be using univariate data. For example, an investigation is conducted, and the sole purpose is to determine the average weight of the participants. Since the research only works with one variable, weight, the data is classified as univariate. On the other hand, where an investigation seeks to know the relationship between two or more variables, for example, height and weight, the data is classified as bivariate.

Therefore, in the study to determine the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya, the data is classified as bivariate since we are dealing with more than two variables to solve the research problem.

Further, according to Olayemi (2017) and Parveen (2017), the operational variables can be categorised into types as explained below:

1. **Categorical Variables**

Categorical variables, also known as discrete variables, vary in kind rather than in amount, level, quantity or degree. In addition, categorical variables are associated with specific categories, such as the sex of the smallholder farmer, male or female. The respondent's sex is recognized as the category, and the male or female members are assigned the same value. Categorical variables are further divided into:

(a) Nominal variables

These are categories with two or more categories but with no intrinsic order showing no measurement, for example, gender. Nominal variables assign numbers as labels with no meaning other than as identified.

(b) Ordinal variables

These variables have two or more categories that can be ranked or ordered, for example, income level. For example, the smallholder farmer with the highest income level from sales of farm produce can be awarded score 1, and the next be awarded score 2.

(c) Dichotomous variables

These variables have only two categories that could have similar features to nominal variables but no intrinsic order, for example, smallholder farmer's cadre of staff with subsets like the senior and junior staff. Variables can be observed or unobserved if the dichotomous variable represents another variable. Also, a dichotomous variable can either be used as dependent or independent.

(d) Polychotomous variables

These variables have two or more categories of subsets, such as educational qualifications.

Further, Parveen (2017), Table 7 below highlights the differences between discrete and continuous variables:

Table 7

Difference between Discrete and Continuous Variables

Ref.	Discrete Variable	Continuous Variable
1	Assumes a finite set of data and a countable value of numbers	Assumes an infinite set of data and an unaccountable value of numbers
2	Complete set of range of specified numbers	Incomplete set of range of specified numbers
3	Values of numbers obtained from counting	Random determination of values of numbers that measure something
4	Independent values	Assumes any value in a given range of numbers
5	Graphically represented using isolated points	Graphically represented using connected points

2. Continuous Variables

Continuous variables vary based on the magnitude and, therefore, can be measured by scales based on quantity, degree or amount. In other words, a continuous variable can take any value, including decimals, contrary to which it becomes a discrete value. Therefore, continuous variables, also known as quantitative variables, can be divided further into the following classes:

(a) Interval variables

An interval variable is a quantitative variable that can be measured along a continuum using a scale and has a numeric value, such as cold chain temperature, measured in Celsius or Fahrenheit.

(b) Ratio Variables

Ratio variables have features of order or magnitude. The ratio variable also has an absolute or true zero value. The ratio is regarded as having the most informative level of measurement because it possesses the qualities of ordinal, nominal and interval scales. An example of a ratio variable is the weight of farm produce harvested from the farm. Ratio and interval scales are sometimes treated alike depending on the statistical test.

3. Independent and Dependent Variables

An independent variable, also known as the input variable, is a variable that can be manipulated to see its effect on another variable. In other words, independent variables are what the researcher uses to affect a dependent variable.

A dependent variable, also known as an outcome or criterion variable, represents another variable's presumed effect or consequence. In other words, since the dependent variable depends on the independent variable, the dependent variable will respond to the independent variable. The dependent variable will change to the variations of the independent variable. Therefore, no variable can automatically be apportioned as independent or dependent.

To summarise this section, the study investigated the importance of variables applied in the quantitative phase of the study to determine the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. The operational variables were explained as the basic ingredients of every research study, and failure to clearly define variables at the commencement of the study can affect the outcome of the research results. Therefore, the operational variables in the study become critical since they communicate the

quantitative phase used by the researcher in the study when comparing the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. In addition, the researcher explained that the variables in the quantitative phase of the study primarily focused on the attributes of the smallholder farmer prior and post implementation of product food safety standards and quality management systems. Therefore, the variables vital for measurability purposes were presented easily and straightforwardly so that the smallholder farmers could quickly respond when filling out the questionnaire for quantitative data collection and later for statistical analysis.

The section also explained that the questionnaire used in the study as the research tool for quantitative data collection was divided into six sections, namely, (a) demographic, (b) importance of good agricultural practice, (c) farm activities, (d) farm sales, records and documented procedures, (e) challenges faced by smallholder farmers after the implementation of good agricultural practices and finally (f) open-ended section for any other information that help enhance good agricultural practices when implementing product food safety standards and quality management systems. Besides Section F of the questionnaire, varying variables define the characteristics or attributes of each section.

The section also explained that variables are measurable and can change or be manipulated and controlled by the research in a study. Therefore, the variables used in the study are considered important since they focus on the research and make the findings valid.

Finally, the section explained the importance and types of variables: qualitative and quantitative, discrete and continuous, univariate and bivariate. Other variables also mentioned were independent, dependent, nominal, ordinal, interval and ratio scales.

Study Procedures and Ethical Assurances

To conduct the study properly, the researcher observed the established procedures of the Unicaf Research Ethical Committee (UREC) and that of the National Commission for Science, Technology and Innovation (NACOSTI), a national Government authority in Kenya. As a result, letters of approval from the research participants, UREC and NACOSTI, were obtained to authenticate the use of humans in the study. Furthermore, the established procedures from UREC guided the ethical considerations of conducting the study with regards to participants, data collection and data analysis.

The area identified for the study was selected based on a horticultural research study done by the Kingdom of the Netherlands mapping the production of fruits and vegetables (Associates, 2017), that highlighted Kenya's temperate and tropical weather conditions make it generally favourable for the development and production of fruits and vegetables for both export to international markets and domestic markets. The research study by the Kingdom of the Netherlands detailed an inventory of fruits and vegetables in Kenya and their destination export markets grown within the major growing areas in Kenya. Meru county dominates Kenya's main production area, where every type of fruit and vegetable can be found and sold in both international and domestic markets. Therefore, on this basis, the study selected Meru county as the statistical sample region to determine the efficacy of product food safety standards and quality management systems of smallholder farmers in Kenya.

Meru county is one of the 47 counties in Kenya. It borders Isiolo county to the North, Tharaka/Nithi county to the East, Nyeri county to the South West and Laikipia county to the West. Meru county has many rivers and streams originating from Mount Kenya and Nyambene streams

that people depend on for agriculture and domestic use. Meru county is further divided into nine sub-counties for administrative purposes.

The study's target population was comprised of smallholder farmers aged between 20 and 75 years in Meru county. The sampling design encompassed both probability sampling techniques for quantitative data collection and non-probability sampling techniques for qualitative data collection. The study's sample size targeted 225 participants, with 215 smallholder farmers participating in the quantitative survey and 10 key stakeholders in the agricultural sector being interviewed for the qualitative survey. The researcher used the contacts, relationships, and networks developed over ten years of active professional engagement in the horticultural industry to enhance participants' identification, selection, and recruitment process for the study.

Since the precise number of smallholder farmers in Meru county engaged in the production of fruits and vegetables for the international and domestic markets was unknown, the study used the estimation of the sample size formula for an infinite population (Adhikari, 2021) to determine the number of participants to engage for the quantitative survey.

Meru county has an estimated population of 1.5 million (GOK, 2019) distributed among the 9 sub-counties. Therefore, using purposive selection, 4 sub-counties were selected as the sample area for the quantitative data collection in the study. The sample size is proportionately determined based on the ratio of the total population in the respective sub-county and the number of smallholder farmers to be administered questionnaires for the quantitative survey. In the case of qualitative data collection, 10 key stakeholders in the agricultural sector in Kenya were targeted and purposively selected for face-to-face and telephone interviews as follows: (a) Government agencies: Horticultural Crop Development Authority- 4 participants, Ministry of Agriculture- 1 participant,

and Kenya Plant Health Inspectorate Authority- 1 participant), (b) Horticultural Exporting Companies- 2 participants, and (c) Agricultural Extension Officers – 2 participants. However, only 8 participants responded to the qualitative interview to collect qualitative data.

The study methodology adopted in the quantitative and qualitative research approach of data collection ensured that any bias in how participants responded to the inquiries in the survey was minimized.

In summary of the section on research study procedures, ethical issues in the study were considered from as many perspectives as possible when collecting quantitative data from 215 smallholder farmers from Meru county using questionnaires and qualitative data by interviewing the 8 key stakeholders in the agricultural sector of Kenya. Furthermore, the research participants were assured confidentiality concerning any views they expressed in the study.

Ethical Assurances

Research ethics has been defined as "the application of ethical principles to scientific research" (Shery, 2016, p. 100). Furthermore, according to Singleton and Straits (2010), as mentioned by the author, the study must be aware of four challenges when collecting data from the human participants: lack of informed consent, potential harm, deception and privacy issues.

Ethical assurance is an interdisciplinary component of responsible research (Burr & Leslie, 2021). First, according to the author, it provides a critical analysis to establish a practical assessment used to operationalize ethical normative principles, such as fairness, sustainability, accountability and transparency, to identify gaps and limitations in research studies. Secondly, the author explains that ethical assurance provides and explores how ethical assurance is being applied in developing

safety cases for intelligence and autonomous structures by providing a methodology of argument-based assurance. Thirdly, ethical assurance establishes a novel version of argument-based assurance by generalizing the method to incorporate broader social, legal and ethical considerations. Finally, ethical assurance sets an agenda that details the current challenges, questions, and next action steps to serve as a foundation for building an active and interdisciplinary research program that contributes to the ongoing deliberations in governance and policy.

In the study to determine the efficacy of product food safety standards and quality management systems for smallholder farmers in Kenya, ethical assurance presents a unifying structure of numerous practical mechanisms built upon governance that supports inclusive and participatory ethical deliberations of smallholder farmers and key stakeholders in the agricultural sector, while grounded on technical and social realities of the research work. The study further considered integrity and honesty when interacting with smallholder farmers and key stakeholders in the agricultural sector in Kenya. The participant's rights were protected by including directions for completing and submitting both quantitative and qualitative data.

To assure anonymity, the data collected and analysed results were presented in an aggregated format, not identifiable by name. Smallholder farmers and key stakeholders in Kenya's agricultural sector were informed of their rights to participate voluntarily in the study. Quantitative data and qualitative data collected are held in an electronically formatted location for analysis with no indication of their source. The collected data will be secured in the researcher's computer, and the survey site will be closed. The final data will then be removed from the computer and stored in a flash disk and external storage drive for safe custody for a duration of one full year after completion of the study. Then, it will be destroyed.

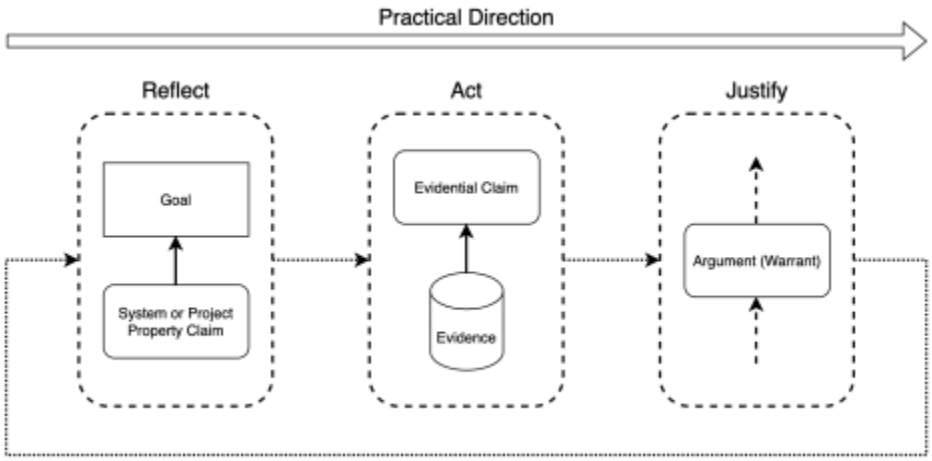
In reference to Burr and Leslie (2021), herein are some of the usefulness of ethical assurance sighted during the study of the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. Firstly, the ethical assurance methodology ensured there was a deliberate interaction with the study participants and an internal reflection that provided a systematic structure for evaluating how the research process flows fulfilled the normative research objectives. Secondly, the ethical assurance process provided a deliberate mechanism for the anticipation of pre-empting potential risks and adverse impacts when interacting with the study participants. Thirdly, the ethical assurance process facilitated transparent communication with the smallholder farmer participants and the selected stakeholders from the agricultural sector in Kenya. Fourthly, the ethical assurance process supports the mechanism of reporting research findings, thus ensuring accountability between the researcher and the research participants. Fifth, the ethical assurance process enabled trust and confidence among the smallholder farmer participants and the selected key stakeholders in the agricultural sector, thus ensuring the adaptation of best practices in the study.

The section below briefly summarises the structure and elements considered for ethical assurance in the study to determine the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. The model detailing the structure and elements of ethical assurance has been borrowed from Burr and Leslie (2021). When engaging the smallholder farmers and selected key in the agricultural sector as participants, the ethical assurance model can be described as an iterative process of reflection, action and justification by the researcher encompassing (a) establishing normative goals that articulate ethical qualities necessary to achieve the set goals during data collection, (b) operationalization of the ethical goals and the

properties required to achieve these goals, and finally, (c) compiling research evidence to prove that the ethical assurance goals have been achieved when collecting data from the research participants. The process used in the study to develop an ethical assurance model is shown in Figure 17 below.

Figure 17

Ethical Assurance Model



Note: Adapted from *Ethical Assurance: A Practical Approach to the Responsible Design, Development, and Deployment of Data-driven Technologies*, by Burr & Leslie, 2021, p. 26.

The ethical assurance model shows a consciously deliberated high-level process plan used in the study to adopt best practices when identifying and engaging the smallholder farmers and the selected key participants from the agricultural section in Kenya connected in the phases of reflect, act and justification. Planning to achieve ethical assurance normative goals was vital to enhance the sustainability of the study when engaging the study participants. For example, during the planning phase towards data collection, the researcher had to go through the Unicaf Research Ethical Committee (UREA) procedures and that of the National Commission for Science, Technology and

Innovation (NACOSTI), a national Government authority in Kenya. Further, as required by UREA, approval letters had to be authenticated before research questionnaires were administered to the smallholder farmers in Meru county. The planning and design execution and operationalization phases for ethical assurance ensure ongoing considerations during data collection and analysis, and the findings are seamless so that the research participants are not exposed to potential harm, jeopardising the study's success.

To summarize this section of ethical assurance, the impact assessment process towards achieving a normative and sustainable ethical approach in the study became vital in ensuring the research goals and objectives are well-steered to protect fundamental human rights, freedom and social justice, even when the study finds are communicated to the public. The ethical assurance model highlighted earlier became a practical direction to enhance reflection, action, and justification of a responsible and governable ethical approach given the human subjects used in the study. Therefore, the researcher confirms that there was a participatory method adopted in the study, as mentioned by Shery (2016), that is,

(a) The participants were not under pressure, and all participation was voluntary.

(b) The participants were given informed consent letters outlining the study's nature and duration.

(c) The participants were permitted to opt out of the study at any time.

(d) All the transcripts were secured for safe custody.

The researcher takes full responsibility for the instrument design and model validation phase of the study, including data collection, data analysis, and reporting of the study results.

Data Collection and Analysis

This section describes the proposed techniques to analyse the quantitative and qualitative data collected for the study. Data analysis can be considered as the process of cleaning, transforming, and modelling data to find useful information that is a solution to the research problem identified in the study (Islam, 2020). Further, data analysis has been described as a complex and enigmatic phase in a qualitative study because it has received the least thoughtful discussion in the literature (Kiger & Varpio, 2020).

Mixed methods data analysis as a field of research is yet to develop an integrated framework of procedures for mixed method data analysis (Rao et al., 2017). Nevertheless, the study used mixed method research to determine the efficacy of product food safety standards and quality management systems. Notwithstanding the lack of an integrated framework for mixed method data analysis, the study considered how quantitative and qualitative research methods and the proposed data analysis techniques integrate to cover multiple views of interviewed key stakeholders in Kenya's agricultural sector and the smallholder farmer responses collected using questionnaires. Table 8 summarizes the issues considered in the study when collecting quantitative and qualitative data.

Table 8

Issues Considered in the Study When Collecting Quantitative and Qualitative Data

Quantitative	Qualitative
1. Demographic 2. Importance of good agricultural practice 3. Farm activities 4. Farm sales, records and documented procedures 5. Challenges when implementing standards of good agricultural practices	1. Demographic 2. Extent smallholder farmers have benefited from implementing good agricultural practices 3. Factors or enablers that make smallholder farmers implement good agricultural practices

	4. Challenges faced by smallholder farmers when implementing good agricultural practices 5. Recommendations to smallholder farmers that want to do a change management process and implement good agricultural practices 6. The extent of government support to encourage smallholder farmers to implement good agricultural practices 7. Social-economic impacts on smallholder farmers that have implemented good agricultural practices 8. How smallholder farmers can acquire knowledge to mitigate embedded risks when implementing good agricultural practices

Good Agricultural Practice for the study encompassed the implementation of product food safety standards and quality management systems by smallholder farmers as determined and recommended by global and national registered authorities, including public and occupational health and environmental safety considerations (Prasad et al., 2015). Therefore, smallholder farmers' agricultural production patterns are aligned with specific practices guided by product food safety standards and quality management systems to ensure humans can consume the food chain safely in local, regional, and international markets.

Qualitative Data Analysis - Thematic Approach for Qualitative Data Analysis

Qualitative data was collected from eight respondents using face-to-face and telephone interviews with key stakeholders in the agricultural sector in Kenya purposively selected, as shown in Table 9.

Table 9

Qualitative Data Collected from Key Stakeholders in the Agricultural Sector in Kenya

Sector		Stakeholder
1.	Government Agencies:	
	Horticultural Crop Authority	4 participants
	Ministry of Agriculture	1 participant
2.	Horticulture Exporting Companies	2 participants
3.	Agricultural Extension Officers	1 participant

The study used a thematic approach to analyse the qualitative data collected from the key stakeholders in the agricultural sector in Kenya. Though widely used and often misunderstood (Kiger & Varpio, 2020), thematic analysis is a useful and accessible tool for a qualitative research study. Kiger and Varpio (2020) define thematic analysis as a practical data analysis approach for qualitative researchers that seek to understand experiences, thoughts, or behaviours across a data set to identify, analyse and report repeated patterns. Further, thematic analysis is distinguished for its flexible use within a wide range of theoretical and epistemological frameworks and in a wide range of study questions, research designs and sample sizes.

The study, in summary, used Braun and Clarke's (2006) thematic approach comprising of a six-step process to analyse the qualitative data collected from key stakeholders in the agricultural sector in Kenya, as shown in Table 10.

Table 10

Steps to Thematic Analysis of Qualitative Data.

Step 1 *Familiarizing yourself with the data*	Repeated and active reading and listening of the data collected.
Step 2 *Generating Initial Codes*	Organize data at a granular, specific level by taking notes on potential data items of interest, questions, connections between data items, and other preliminary ideas. Data extracts are then labelled into relevant codes, making patterns that inform subsequent theme development.
Step 3 *Searching for themes*	Construct themes of broader significance by examining the coded data extracts through analyzing, combining, comparing, and even graphically mapping how codes relate to one another.
Step 4 *Reviewing themes*	The coded data is looked at and placed within each theme to ensure proper fit, and a set of similar questions to the themes is placed in relation to the entire data set.
Step 5 *Defining and naming themes*	Creating a definition and narrative description of each theme, including mentioning why it is important to the broader study question.
Step 6 *Producing the report/manuscript*	The final stage is the final analysis and description of findings, which had already begun through note-taking, describing themes, and selecting representative data extracts in previous steps.

Quantitative Data Analysis

Quantitative data analysis is a statistical process that systematically collects and evaluates measurable and verifiable data (Ameer, 2021). Therefore, the study commences by systematically categorising, summarising, and illustrating observations using a descriptive analysis technique,

making it possible to study the smallholder farmer's efficacy prior and post implementation of product food safety standards and quality management systems. Then, data collected from a sample size of 215 smallholder farmer participants purposively selected is used to make generalizations after data analysis of all smallholder farmers in Kenya. In other words, once the quantitative data is analysed, the study will seek to draw conclusions based on deductive reasoning about a larger group of smallholder farmers in Kenya from the sample of selected study participants. Therefore, the process, technique, findings and conclusion from the quantitative data analysis can be quantified as inferential statistics (Ameer, 2021).

The study proposes using two data analysis types.

Type 1: Descriptive Statistics

Descriptive statistics (James & Simister, 2020), as mentioned by Ameer (2021), is an analytical technique used to describe or present quantitative data in an easily accessible manner that enables the study to illustrate and sum up observations. Therefore, descriptive statistics enable the establishment of a rationale to measure quantitative data collected for the study. Descriptive statistics, the preliminary phase of quantitative data analysis converting observations into numerical figures, is arranged into two well-organized categories.

Frequency Distribution

Frequency distribution entails a logical arrangement that measures quantitative data from high to low.

Graphs

Graphs display data using diagrams showing the relationship between two or more quantities, measurements or indicative numbers.

Type 2: Inferential Statistics

Inferential statistics is an inductive approach and technique that allows the findings from quantitative data collected from a sample to be generalized for a specific faction to the entire population (Ameer, 2021). Ameer further explains that the sample must be a true representation of the population from which they were taken to be considered reliable.

Inferential statistics also enable the use of different instruments to measure the similarity or dissimilarity of data collected and analysed for the study. For example, the dissimilarity of observations found through calculations that occur by chance is called error term.

The study employed the instruments below when analysing data.

Multicollinearity

In the multiple regression model, multicollinearity is defined as… “the event of great inter-correlations among the factors in a multiple regression model” (Shrestha, 2020). In other words, linear relationships between independent variables. Further, according to Young (2017), as mentioned by the author, multicollinearity will occur when several variables are significantly correlated with the dependent variables and each other. Thus, some of the significant variables in the study are made to become statistically insignificant because multicollinearity prompts skewness

or misleading results when the researcher must decide which variable is most viable to use in a statistical model for prediction.

Statistical models with multicollinearity, according to Frank (2001) and Hosmer et al. (2013), as further mentioned by Shrestha (2020), are in most cases considered not to be trustworthy because the analysis may fail to give a clear understanding and accurate representation of the model. Basically, multicollinearity makes some significant variables insignificant, increasing the standard error of the coefficients in the model, which can lead to changes in the results of the analysis and, hence, a problem in interpreting the coefficients.

Also, according to Shrestha (2020), studies further recommend the following steps for detecting multicollinearity, namely, the correlation coefficient, variance inflation factor and eigenvalues and eigenvectors of the standardized design matrix (Young, 2017; Keith, 2015). Therefore, in this study, multicollinearity tests were performed on the quantitative data gathered from smallholder farmers to determine efficacy prior and post implementation of product food safety standards and quality management systems.

The Chi-square Test

The chi-square test is a non-parametric tool that analyses the proportions of categorical outcomes from different independent groups (Kim, 2017). Further, the author explains that the chi-square test is assumed to occur where the sample is usually large. Also, the computation of the chi-square test provides enormous information on how the different independent groups performed in the study. Therefore, the researcher using the chi-square test is enabled to understand the results of research findings in a better manner.

In addition, according to Kim (2017), some of the advantages of the use of the chi-square test include (a) the ease of computation leading to the extraction of detailed information pertinent to the research study, (b) the flexibility to deal with data from two or more multiple groups, and finally, (c) the use of chi-square tests in statistical analysis in which the parametric assumptions cannot be met. The limitations of using the chi-square test include the following: (a) the chi-square test cannot be used in places where the samples are small populations.

Therefore, in the study, chi-square tests were performed on the quantitative data gathered from smallholder farmers to determine efficacy prior and post implementation of product food safety standards and quality management systems.

Wilcoxon Signed-rank Test

The Wilcoxon signed-rank test is a non-parametric statistical formula that matches and compares two related samples to assess if there is a difference in their population mean (Durango & Refugio, 2018). The Wilcoxon signed-rank test can determine if two dependent samples from the same population have the same distribution. Further, when normal distribution cannot be assumed in a population, the Wilcoxon signed-ranked test can also be used as an alternative to the t-test for matched pairs or dependent samples.

According to Durango and Refugio (2018), the following assumptions are considered when a researcher uses the Wilcoxon signed-rank test in statistical analysis: (a) paired data must come from the same population, (b) the pairs are randomly and independently selected, and finally, (c) paired difference calculated to perform the tests are measured on at least an interval scale.

Therefore, in the study, Wilcoxon signed-rank tests were performed on the quantitative data gathered from smallholder farmers to determine efficacy prior and post implementation of product food safety standards and quality management systems.

The t-Test Statistics

The t-Test is a useful statistical instrument for setting up the statistical importance of means between two samples. The t-Test can be applied for two or more sample groups, independently collected or dependent groups, with two identical samples collected for repeated calculations found to be the same. Finally, the t-Test for Pearson is employed for correlation when analysing quantitative data of smallholder farmers collected for the study.

Chapter Summary

In summary, Chapter 3 began by restating the purpose of the study, which was to explore the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. The chapter acknowledged that smallholder farmers in Kenya, who are a vital part of the national economy and the global agricultural community, have gone to great lengths to change their business model architecture to incorporate globally recognized product food safety standards and quality management systems to become competitive and access international markets to improve their livelihoods (Doherty & Kittipanya-Ngam, 2021). Nevertheless, as explained in the chapter, compliance with product food safety standards and quality management systems is costly and often deemed disproportionately burdensome for smallholder farmers (Maguire-Rajpaul et al., 2020). Therefore, to investigate and explore the research objectives explained in the chapter, the

study sought to present a smallholder farmer's comparative of the efficacy prior and post implementation of product food safety standards and quality management systems to determine the benefits realized from such programs. In addition, the smallholder farmer's organization and change management process was explained in the chapter to establish if there have been improvements in their operating and production activities to gain access to more profitable markets and improve their livelihoods. Finally, as explained in the chapter, the study also sought to ascertain if the time, effort, and money spent on such programs are justifiable to Kenya's smallholder farmers and improve their livelihoods.

In Chapter 3, attention to empirical literature was given to provide meaning to the thesis topic and highlights of the research questions when examining the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya to answer the research questions, which include (a) to what extent have smallholder farmers in Kenya benefited from the implementation of product food safety standards and quality management systems, (b) what are the key enablers/drivers in the implementation of product food standards and quality management systems for smallholder farmers in Kenya, (c) what are the challenges faced by smallholder farmers in Kenya in the establishment and implementation of product food safety standards and quality management systems, (d) what are the factors that have contributed to majority of the smallholder farmers in Kenya not implementing product food safety and quality management systems, and finally, (e) what can the government do to encourage more farmers in Kenya to implement product food safety standards and quality management programmes.

In Chapter 3, it was confirmed that the letters of approval from the research participants, the Unicaf Research Ethical Committee (UREC) and the National Commission for Science,

Technology and Innovation (NACOSTI), which is a national Government authority in Kenya, were obtained to protect the use of humans in the study. Human factors and their complexities were explained when mapping the smallholder farmer's change management process to compare efficacy prior and post implementation of product food safety standards and quality management. Therefore, using both questionnaires and interviewing in the mixed approach research to collect quantitative data from smallholder farmers and qualitative data from selected key stakeholders in the agricultural sector, their voluntary acceptance, as explained in the chapter, would enable valuable information to be gathered to evaluate the efficacy of smallholder farmers prior and post implementation of product food safety standards and quality management systems.

In Chapter 3, it was explained why the study adopted a mixed approach social research method, which has gained impetus among educational researchers (Creswell, 2012; Timans et al., 2019), to determine the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. Subsequently, the chapter explained that the mixed approach methodology is used in conjunction with statistical analysis to analyse and interpret the surveyed data collected from the study participants. As further described in the chapter, the rising popularity of the mixed approach method in social and behavioural science makes it the preferred research method to use when engaging smallholder farmers to determine the efficacy prior and post implementation of product food safety standards and quality management systems. Some case study research examples presented in Chapter 3 on the use of the mixed approach method done on smallholder farmer's businesses include (a) the attitudes and perception of technology adoption of smallholder farmers in Western Kenya (Nyairo, 2020), (b) the smallholder farmer's socio-economic influence and organic agriculture farming perceived benefits (Areri et al., 2022), and (c) the

interaction between pests, production of mixed-maize crop and food security among smallholder farmers in Mwea West, Kenya (Constantine et al., 2021). After data analysis was collected from the quantitative and qualitative data sets, the results from the case studies revealed that smallholder farmers' net income is affected significantly due to pests that reduce production yield.

In addition, Chapter 3 described the explanatory sequential design selected for the study to solve the research problem and answer the research questions. The explanatory sequential research design allows quantitative and qualitative data to be collected sequentially in two phases (Creswell & Clark, 2018). Quantitative data is collected first in the study, followed by qualitative data to explain and elaborate further on the quantitative results. Therefore, the rationale for using the explanatory sequential design was justified in Chapter 3. According to Creswell and Clark (2018), the advantages of the use of the explanatory sequential design were summarized as follows: (a) the design offers a robust quantitative research orientation, (b) it is a straightforward design to implement conducted in two separate phases, that is, quantitative and then qualitative, for the same type of data, (c) final report written is clearer to the readers as the quantitative section is presented first then the qualitative report, and finally, (d) the design aligns itself to emergent approaches since the second phase can be modified and adapted based on the outcome of the initial quantitative phase.

However, in Chapter 3, challenges associated with the use of the explanatory sequential design research were summarized as follows: (a) the design can be time-consuming in the implementation of the two-phase, and (b) it is not easy to state in advance the participants to be selected in the second qualitative phase until the initial quantitative phase is completed, (c) the design requires the researcher to specify who can best be selected to explain the qualitative phase.

Some case study examples on the use of an explanatory sequential research design done on smallholder farmer's research were also presented in Chapter 3, that is, (a) the attitudes and perception of technology adoption of smallholder farmers in Western Kenya (Nyairo, 2020), (b) a research-note to study adoption of sustainable agricultural practice among smallholder farmers (Sattar et al., 2017).

Chapter 3 presented the horticultural study by the Kingdom of the Netherlands mapping the production of fruits and vegetables in Kenya (Associates, 2017) and concluded that Kenya's temperate and tropical weather conditions make it generally favourable for the development and production of fruits and vegetables for both export to international markets and domestic markets. Meru county dominates Kenya's main production area, where every type of fruit and vegetable can be found and sold in both international and domestic markets. Therefore, on this basis, the study selected Meru county as the statistical sample region to determine the efficacy of product food safety standards and quality management systems of smallholder farmers in Kenya.

Chapter 3 explained adopting the mixed approach to determine and evaluate the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. The study's targeted population comprised smallholder farmers aged between 20 and 75 years. The sampling design encompassed both probability sampling techniques for quantitative data collection and non-probability sampling techniques for qualitative data collection. The study's sample size targeted 225 participants, with 215 smallholder farmers participating in the quantitative survey and 10 key stakeholders in the agricultural sector being interviewed for the qualitative survey. However, only 8 key stakeholders responded during the qualitative data collection phase.

In Chapter 3, the instruments used to collect quantitative and qualitative data were also explained. The quantitative or qualitative research tool is critically checked or examined to ensure that the instrument is likely to give the expected results for the study. As explained in the chapter, the researcher had to ensure that the instruments used to collect data for the study were valid, reliable and appropriate. In the study to explore the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya, the questionnaire was used as the research tool to collect quantitative data. The questionnaire asked the smallholder farmers to answer closed-ended questions to collect quantitative data. The closed-ended questions are widely used because they provide greater uniformity of responses than open-ended ones and are easier to process during data analysis. Smallholder farmers were asked to answer a list of provided questions pertinent to the study. In addition, the Likert scale (Babbie, 2013) formated the smallholder farmers' responses into categories such as strongly agree, agree, disagree or strongly disagree or perhaps approve, strongly approve, and so forth; hence, it is easy to transfer directly into the computer format.

As explained in the chapter, the questionnaires were worded in a simplified English language and administered to 215 smallholder farmers for quantitative data collection. The smallholder farmers identified to participate and respond to the quantitative research tool were randomly selected from the four purposively selected sub-counties of Meru county, namely, Buuri, Imenti South, Igembe Central, and Tigana West. In addition, the researcher was present to clarify any question where necessary, as worded in the questionnaire.

Further, in the study to explore the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya, the chapter used qualitative data

collected to interview key stakeholders and informants within the agricultural sector to explain and elaborate further on the quantitative results. Thus, with this in mind, the study used interviewing as the research tool to collect qualitative data from other key stakeholders and informants within the agricultural sector. Accordingly, the study targeted 10 participants for face-to-face and telephone interviews for in-depth case analysis selected from key stakeholders and informants as follows: (a) 4 participants from the Horticultural Crop Development Authority, (b) 1 participant from the Ministry of Agriculture, (c) 1 participant from the Kenya Plant Health Inspectorate Authority, (d) 2 participants from Horticultural export companies, and finally, (e) 2 participants from Agricultural extension officers. In addition, appointments were booked with the respective government offices and horticultural companies to conduct one-to-one physical and telephone interviews with the target participants. However, only 8 participants responded positively to the qualitative research study.

Therefore, as explained in the chapter, the study relied on interviews with designed open-ended questions that do not restrict the respondent's views when collecting qualitative data. The interview process involved asking key stakeholders or informants in the agricultural sector in Kenya one or more open-ended questions to voice their experience best. At the same time, the researcher records their answers for further analysis (Creswell, 2012). The collected data is then transcribed and entered into a computer file. Finally, the smallholder farmer participant's conversation is audiotaped so that the information can be transcribed into words for analysis purposes.

The use of operational variables was explained in Chapter 3. Operational variables become critical since they communicate the quantitative phase used by the researcher in the study when comparing the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. Therefore, the study entailed the consideration of measurable factors

called variables that are subject to change due to smallholder farmers' change management processes or circumstances when implementing product food safety standards and quality management systems. Variables in a research study explain variances that occur in a change created due to manipulation. In other words, variables are names given to a variance critical to the research and explain the research process that determines the nature and direction of the study (Olayemi, 2017). Also, variables become central in the research process because the research title is actually made up of variables and thus focal to the study. Cohen, Manion and Morrison (2007), as mentioned by Olayemi (2017), describe a variable as an operationalized construct in which the researcher is interested because it dictates the subsequent development of a measurement instrument to access the variable.

The variables in the study's quantitative phase, as explained in the chapter, primarily focused on the attributes of the smallholder farmer prior and post implementation of product food safety standards and quality management systems. The variables for measurability purposes were presented in an easy and straightforward manner that the smallholder farmers could quickly respond to when filling out the questionnaire for quantitative data collection and later for statistical analysis.

Ethical assurance in Chapter 3 was explained as an interdisciplinary component of responsible research (Burr & Leslie, 2021). As described in the chapter, the study to determine the efficacy of product food safety standards and quality management systems for smallholder farmers in Kenya, ethical assurance presented a unifying structure of numerous practical mechanisms built upon governance that supports inclusive and participatory ethical deliberations of smallholder farmers and key stakeholders in the agricultural sector, while grounded on technical and social realities of the research work. The study further considered integrity and honesty when interacting

with smallholder farmers and key stakeholders in the agricultural sector in Kenya. The participant's rights were protected by including directions for completing and submitting both quantitative and qualitative data. To assure anonymity, the data collected and analysed results are presented in an aggregated format, not identifiable by name. Smallholder farmers and key stakeholders in Kenya's agricultural sector were informed of their rights to participate voluntarily in the study. Quantitative data and qualitative data collected are held in an electronically formatted location for analysis with no indication of their source. The collected data will be secured in the researcher's computer, and the survey site will be closed. The final data will then be removed from the computer and stored in a flash disk and external storage drive for safe custody for a duration of one full year after completion of the study. Then, it will be destroyed.

Finally, Chapter 3 explained the proposed techniques to analyse the quantitative and qualitative data collected for the study. Data analysis can be considered as the process of cleaning, transforming, and modelling data to find useful information that is a solution to the research problem identified in the study (Islam, 2020). Further, as explained in the chapter, data analysis was described as a complex and enigmatic phase in a qualitative research method (Kiger & Varpio, 2020). The chapter presented the use of a thematic approach to analyse the qualitative data collected from the key stakeholders in the agricultural sector in Kenya. Though widely used and often misunderstood (Kiger & Varpio, 2020), thematic analysis is a useful and accessible tool for a qualitative research study.

Also, quantitative data analysis was explained as a statistical process that systematically collects and evaluates measurable and verifiable data (Ameer, 2021). The process, technique, findings and conclusion from the quantitative data analysis can be quantified as inferential statistics

(Ameer, 2021). Descriptive statistics (James & Simister, 2020), as Ameer (2021) mentioned in the chapter, is an analytical technique used to describe or present quantitative data in an easily accessible manner that enables the study to illustrate and sum up observations. Therefore, descriptive statistics enable the establishment of a rationale to measure quantitative data collected for the study. Descriptive statistics, the preliminary phase of quantitative data analysis converting observations into numerical figures, are arranged into frequency distribution and graph displays.

Inferential statistics was explained in Chapter 3 as an inductive approach and technique that allows the findings from quantitative data collected from a sample to be generalized for a specific faction to the entire population (Ameer, 2021). Inferential statistics enables the use of different instruments to measure the similarity or dissimilarity of data collected and analysed for the study. Examples presented in the chapter on inferential statistics used in the study include multicollinearity, the chi-square test, the Wilcoxon signed-ranked test, and the t-Test.

CHAPTER 4: FINDINGS

Introduction

Agriculture continues to play an important role in the rural economy of Kenya. Smallholder farmers in Kenya are the main drivers of the country's agricultural production, accounting for 70 per cent of the marketed agricultural production (Raithatha, 2019). Smallholder farmers in Kenya have gone to great lengths to identify and establish global product food safety standards and quality management systems to improve their operating and production structures, enabling them to gain access to more profitable markets and improve their livelihoods. As a result, smallholder farmers in Kenya have formed robust forward and backward linkages to global markets by embracing change management processes that promote the values and practice of implementing product food safety standards and quality management systems (Mercy et al., 2010).

Product food safety standards and quality management systems are tools used to improve and regulate the quality and safety of agricultural products for marketing services across borders (Shaw et al., 2014). The purpose of this study was to determine the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. Therefore, the researcher sought to identify problem gaps in the study relating to the change management process by presenting an impact comparative on the efficacy of smallholder farmers in Kenya prior and post implementation of product food safety standards and quality management systems. Once the problem gaps are identified and solved, smallholder farmers in Kenya are expected to benefit from the change management process through higher productivity, lower production costs, higher enterprise and farm incomes, higher disposable incomes, and consequently greater farm investments that improve the welfare of household members.

Based on the problem, research purpose, aims, and objectives outlined above, this study seeks to answer the following research questions: (a) to what extent have smallholder farmers in Kenya benefited from the implementation of product food safety standards and quality management systems, (b) what are the key enablers/drivers in the implementation of product food standards and quality management systems for smallholder farmers in Kenya, (c) what are the challenges faced by smallholder farmers in Kenya in the establishment and implementation of product food safety standards and quality management systems, (d) what are the factors that have contributed to majority of the smallholder farmers in Kenya not implementing product food safety and quality management systems, and finally, (e) what can the government do to encourage more farmers in Kenya to implement product food safety standards and quality management programmes?

This chapter presents the study results and data analysis as laid out in Chapter 3 in the research methodology. Data collected using quantitative and qualitative tools were analysed using a process of cleaning, transforming, and modelling data to find useful information that solves the research problem identified in the study (Islam, 2020). The study considered how quantitative and qualitative research methods and the proposed data analysis techniques integrate to cover multiple views of interviewed key stakeholders in Kenya's agricultural sector and the smallholder farmer responses collected using questionnaires.

The first section of Chapter 4 explains the trustworthiness, reliability and validity of the data used in the study for analysis. The trustworthiness of the data collected is vital since data for the research study should be collected precisely, consistently and exhaustively (Nowell et al., 2017) for transferability, credibility, confirmability and dependability (Stahl & King, 2020). The validity of the study variables explained in the chapter emphasises the degree of accuracy and significance of

inference based on the research findings. In contrast, the reliability of the study variables emphasises the amount to which there is no bias, ensuring uniform measurement in the research instruments used.

The second section gives a statistical description and inferential analysis based on the quantitative data collected from the responses of 215 smallholder farmers in Meru county. Descriptive statistics (James & Simister, 2020), as mentioned by Ameer (2021), is an analytical technique used to describe or present quantitative data in an easily accessible manner that enables the study to illustrate and sum up observations. In other words, descriptive statistics enable the establishment of a rationale to measure quantitative data collected for the study. On the other hand, inferential statistics used in the chapter refers to an inductive approach and technique that allows the findings from quantitative data collected from a sample to be generalized for a specific faction to the entire population (Ameer, 2021). Therefore, the research data used in the study must be a true representation of the population from which they were taken to be considered reliable.

The third section constitutes the study results and conclusions based on the detailed statistical descriptives and inferential analysis conducted on the research questions with tables and figures to illustrate the findings.

The fourth section is on the thematic approach used in the study to analyse qualitative data collection from the 8 key stakeholders from the agricultural sector in Kenya. The study sought to give a solution to the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya.

The fifth section is a report evaluating the study findings and deducing their meanings. Finally, the chapter ends with a summary discussion of the key points presented in the entire chapter 4.

The study used a mixed approach research encompassing the collection of quantitative data from smallholder farmers and qualitative data from key stakeholders in the agricultural sector of Kenya to understand the research problem and answer the research questions. Quantitative data were then statistically analyzed to obtain results that were used to assess the magnitude and frequency of smallholder farmers' trends prior and post implementation of product food safety standards and quality management systems. Qualitative data, which used people's actual words, were thematically analyzed to provide a complex picture of the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya.

The results were presented using the explanatory sequential design. That is, a sequential two-phase data collection method (Creswell & Clark, 2018), where quantitative data is collected first in the study, then qualitative data to explain and elaborate further on the quantitative results. Meru county is a dominant agricultural production region in Kenya where every type of fruit and vegetable is sold in international and domestic markets. Therefore, Meru county was selected as the statistical sample region to collect quantitative data from 215 participants to explore the efficacy of product food safety standards and quality management systems of smallholder farmers in Kenya. Additionally, 8 key stakeholders in the agricultural sector were also interviewed for the qualitative survey. The conclusion section shows the study's summary findings alongside the implications for future research on the efficacy of product food safety standards and quality management systems among smallholder farmers.

Trustworthiness of Data

The trustworthiness of the data collected was a vital part and a highly variable experience of the research study (Stahl & King, 2020). The study provided a unique base to collect qualitative data from key stakeholders purposely selected in the horticultural sector in Kenya to offer process-based narrative data closely related to the human experience to explore product food safety standards and quality management systems among smallholder farmers in Kenya. Therefore, the degree of trust attributed to the qualitative data collected was considered imperative in the research study.

According to literature, data analysis in a research study is considered trustworthy when the data is collected precisely, consistently and exhaustively (Nowell et al., 2017). The research procedures used when analysing data should create trustworthiness based on four general criteria: transferability, credibility, confirmability, and dependability, as explained below (Stahl & King, 2020).

Credibility

Qualitative data collected from the key stakeholders in the agricultural sector in Kenya was transcribed and stored in a computer. The researcher's notes written during and after the interview were journaled, and the trends and examined patterns identified during the thematic analysis and the formulated list of codes were further stored in a safe storage drive within a computer.

Transferability

The study to explore and determine the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya was concept-based, giving the research study the cause of transferability. As already highlighted in Chapter 2 of the study, the change management process by the smallholder farmer in Kenya to implement product food safety standards and quality management system based on the theory of change is a strong guide in organizational strategy to convey and provide a lens or signpost on how to process knowledge that enables the smallholder farmer to access more profitable international markets and increase business net returns and thus improve household livelihoods. Therefore, the responses from the interview sessions revealed valuable information in the form of qualitative data on the feelings and observations of the key stakeholders in the agricultural sector in Kenya on the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya.

Dependability

The qualitative data collected by interviewing the key stakeholders in the agricultural sector in Kenya was considered important in the study because the participants' questions were answered honestly to aid the study in determining the efficacy of product food safety and quality management systems among smallholder farmers in Kenya.

Confirmability

The researcher kept a journal with the participant's conclusions derived from the interview qualitative data collected from the key stakeholders in the agricultural sector in Kenya to determine

and explore the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya.

Therefore, the following section explains the rigours and methodical manner used to yield the meaningful and useful results presented in this chapter.

Response Rate

The number of people with whom interviews and responses are completed, divided by the total number of people in the sample, including those who refused to participate and those who were unavailable, is multiplied by 100 to determine the response rate (Fincham, 2008). The response rate measures the extent to which the final data set includes all sample subjects (expressed as a percentage). The quantitative data collected from a sample size of 215 smallholder farmer participants purposively selected is used in the study to make generalizations after data analysis of all smallholder farmers in Kenya. A total of 215 smallholder farmers answered favourably, yielding a response rate of 100 per cent. This study's response rate of 100% was deemed satisfactory because the statistical analysis requires a response rate of at least 50% to commence analysis. In the case of qualitative data collection, 10 key stakeholders in the agricultural sector in Kenya were invited to respond to the interview questions. The number of interviewees that answered favourably was 8, yielding a response rate of 80 per cent. According to Fincham (2008), the study's response rate of 80% is also deemed satisfactory because the statistical analysis to commence analysis requires a response rate of at least 50%. The response rate for the study is summarized in Table 11 below for ease of reference.

Table 11:

Response Rate

Research Approach	Target Population	Respondents	Response Rate
Quantitative (Smallholder farmers)	215	215	100%
Qualitative (Key stakeholders in the agricultural sector in Kenya)	10	8	80%

Pilot Study

The subjects of the study to collect quantitative data were the sub-counties of Buuri, Igembe Central, Imenti South, and Tigana West in Meru county. Before the primary study, the research tools were pre-tested on 20 pre-selected participants with the same characteristics as the target population and excluded from the final analysis. The primary goals of the pilot study were to evaluate the instruments' ambiguity, sensitivity, and appropriateness. In addition, a pre-test on collecting qualitative data was also done on 2 pre-selected participants. The preliminary study assisted in estimating the length of an interview session and improving the tools' accuracy.

Reliability and validity of data

While validity is a measure of the degree of accuracy and significance of inference based on research results, reliability is a measure that reflects the amount to which there is no bias, ensuring uniform measurement across the many items in the instrument (Roberts & Priest, 2006). The methods used to determine validity and reliability in the study are presented in the following section below.

Validity of Study Variables

In the study, the quantitative research instrument was subjected to validity tests to ensure that it measures what it purports to measure and permits appropriate interpretation of the research findings. In other words, the research instrument must be correct and permissible to achieve the goal it was designed to achieve and produce results consistent with reality (Bahariniya et al., 2021). The survey was given a loose pre-test, and the data-gathering methods were built around the conclusions drawn from the pilot study using the following validity measurement methods.

According to Bahariniya et al.(2021), there are different suggested methodologies to measure the validity of the questionnaire data collection tool, namely, face validity, content validity, construct validity and criterion validity. However, in the study, the face validity measurement method was used during the pre-testing phase to ensure the questionnaire instrumental tool measures what it purported to measure and gives the appropriate interpretation of the research findings. Therefore, some words in the questionnaire tool were adjusted after the pre-testing phase to ensure questions appearing in the quantitative data collection tool remained valid for the study with no ambiguity to the smallholder farmer participants during the data collection stage. The face validity measurement test ensured the questionnaire instrument tool remained professionally presented in simple English once the instrument flaws found during the pre-testing were fixed to improve their validity and precision.

The study conclusion was that the questionnaire data collection tool was internally valid because the instrument could answer the research questions without bias (Andrade, 2018).

Reliability of the Variables

All items for quantitative data collection were subjected to a reliability analysis in the study, and the component factor analysis was also validated. In addition, Cronbach's alpha was used in the study as a measure of dependability that illustrates how well the instrument's items are connected (Bonett & Wright, 2015). The reliability statistics are shown in Table 12 below.

Table 12

Reliability Statistics Before and After GAP Implementation

	Cronbach's Alpha			
Variables	**Before GAP**	**Number of Items**	**After GAP**	**Number of Items**
Importance of GAP	0.823	5	0.855	5
Farm Activities	0.734	5	0.696	5
Farm Sales, Records and Documented Procedures	0.685	5	0.689	5
Challenges when implementing standards of good agricultural practices			0.828	3

Reliability Score Before the implementation of Good Agricultural Practice (GAP)

Table 12 shows Cronbach's alpha result before implementing Good Agricultural Practice (GAP). Regarding the importance of GAP variables, the reliability score is 0.823; for farm activities variables, the reliability score is 0.734; and for farm sales, records, and documented procedures, the reliability score is 0.685. Therefore, Cronbach alpha values of 0.7 and above are considered adequate. Thus, this implies that the items under each variable were consistent.

Reliability Score After the implementation of Good Agricultural Practice (GAP)

Table 12 also shows Cronbach's alpha result after implementing Good Agricultural Practice (GAP). Regarding the importance of GAP variables, the reliability score is 0.855; for farm activities variables, the reliability score is 0.696; for farm sales, records, and documented procedures, the reliability score is 0.689; and for challenges when implementing standards of good agricultural practices, the reliability score is 0.828. Therefore, Cronbach's alpha values of 0.7 and above are considered adequate. Thus, this implies that the items under each variable were consistent.

Results

Quantitative Results

The quantitative survey results have been organized into sections that outline the results of the quantitative data analysis. First, the Statistical Package for Social Sciences (SPSS) was used to clean, code, and analyze the data based on each independent variable. After that, the variables were statistically modelled, and the results were summarized in the next section.

Study Variables from the Questionnaire

The formational design and nature of the questions in the questionnaire allowed for the collecting and gathering of both nominal and ordinal data. The questionnaire mainly required the participants to select from a list of options, thus making it simple to complete. In addition, provisions for additional responses were included in the questionnaire to avoid unreasonably limiting the participant's responses.

The questionnaire comprised six sections with a total of 43 in-depth questions that were developed to ensure the rigour and objectivity of data. It is to be noted that before filling out the questionnaire, the participants were directed to the sub-clause that informs that Good Agricultural Practice (GAP) in the questionnaire means the implementation of product food safety standards and quality management systems. The outline of the sections from the questionnaires is shown below.

SECTION A- Demographic

This section comprised demographic variables such as gender, age, level of education, marital status, number of people per household, number of years in farming, size of farming land, position on the farm, and the farm location.

SECTION B- Importance of Good Agricultural Practice

This section contained 10 questions that were divided into the following sections:

i. Market requirements;
ii. Requirements of food safety standards;
iii. Access to new markets;
iv. Why buyers reject farm produce in the marketplace;
v. Receiving higher prices from farm produce.

SECTION C- Farm Activities

This section contained 10 questions that were divided into the following sections:

i. Human infectious diseases and how they spread on the farm;

ii. Product food safety risks on the farms;

iii. Cleaning and sanitizing the farm and farm produce;

iv. Keeping domestic animals away from the farm and harvest area;

v. Monitoring and testing water quality.

SECTION D- Farm Sales, Records and Documented Procedures

This section contained 10 questions that were divided into the following sections:

i. Markets where farm produce was sold;

ii. Estimated sales of farm produce per year;

iii. Keeping farm produce sales records;

iv. Duration of keeping farm produce sales records;

v. Keeping documented procedures of farm activities.

SECTION E- Challenges

This section contained 3 questions about the challenges faced after implementing standards of Good Agricultural Practices.

SECTION F- Additional Responses

The last section of the questionnaire asked the respondent for any additional information that would help enhance good agricultural practices relating to product food safety standards and quality management systems in the farm and marketplace.

Descriptive Statistics of Demographic

Descriptive statistics was used to analyze continuous and categorical data. The findings of the study are presented in diagrams of frequencies and percentages, graphs, and charts.

The Distribution of Age and Gender of Respondents

The mean age of the respondents in the study was 39.35 years, whereby the minimum age was 18 years, and the maximum age was 68 years, as shown in Table 13.

Table 13

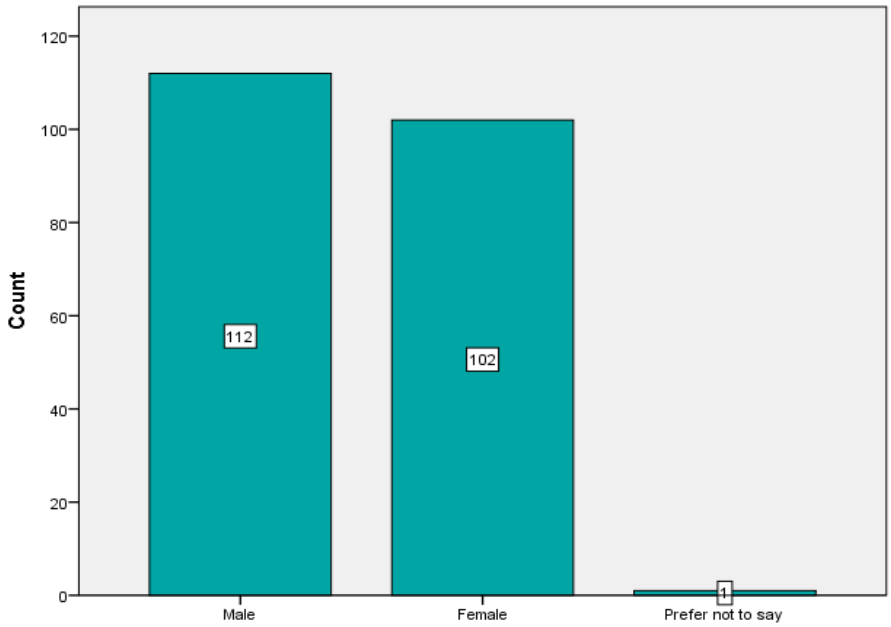
Descriptive Statistics of Age

	N	Minimum	Maximum	Mean	Std. Deviation
Age	215	18	68	39.35	9.933
Valid N	215				

The highest number of respondents in the study were male, with 112 in total, who accounted for 52.1% of the sample population. The female group was 102, who accounted for 47.4% of the sample population. From the total sample of 215 members, only one individual preferred not to state their gender, accounting for 0.5% of the sample population. Figure 18 below shows the distribution of the respondents by gender.

Figure 18

A Graph Showing the Gender of Respondents



Marital Status of Respondents

Table 14 below shows a summary of the marital status of the study's respondents.

Table 14

Marital Status of Respondents

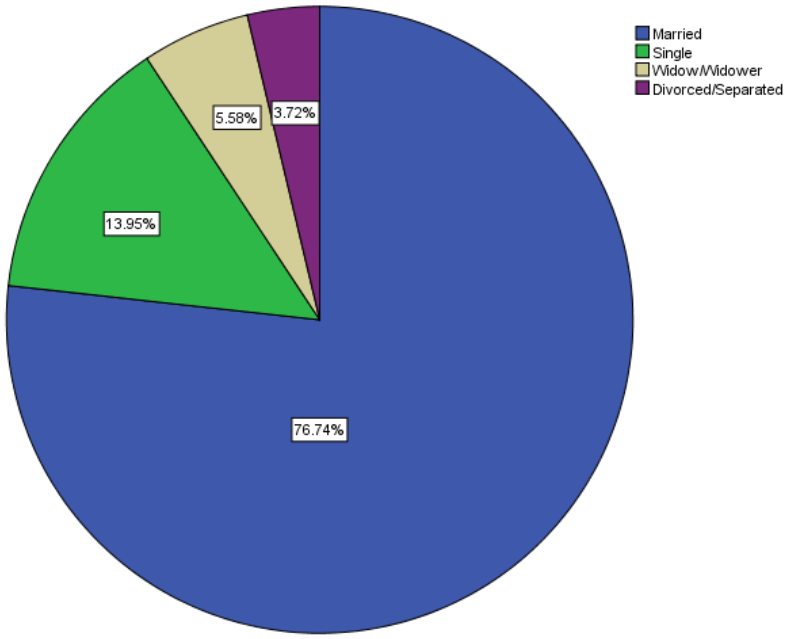
		Frequency	Percent
	Married	165	76.7
	Single	30	14.0
	Widow/Widower	12	5.6
	Divorced/Separated	8	3.7
	Total	215	100.0

Most of the respondents in the study were married (76.7%), followed by single people who accounted for 14.0% of the total sample population. Widow/widower and divorced/separated had the lowest percentage of 5.6% and 3.7%, respectively.

Figure 19 shows the visualization of the respondents' marital status distribution.

Figure 19

Marital Status of the Respondents



The Level of Education of the Respondents

Most respondents, as shown in Table 15, have a formal education. Secondary level of education accounts for 40.5% of the respondents, followed by those with a primary level of education with 28.8%, then 27.9% of the sample population have a college/university education. Few of the respondents (2.8%) have no formal education.

Table 15

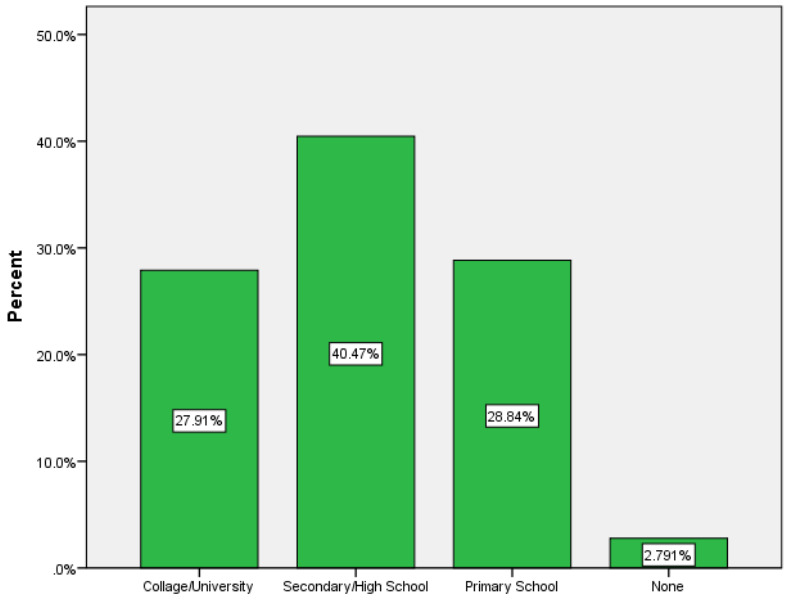
Level of Education

	Frequency	Percent
College/University	60	27.9
Secondary/High School	87	40.5
Primary School	62	28.8
None	6	2.8
Total	215	100.0

The visualization of the distribution of the level of education of the respondents is shown in Figure 20 below.

Figure 20

Level of Education of Respondents



The distribution of the gender of the respondents and their level of education is summarized in Table 16. Of the 112 males, 32 had a college/university education, while 43 had a secondary

school education. The males with primary school education were 35, while only 2 had no formal education. In the female category, out of the 102 population, 28 had a university/college education, 43 had secondary education, and 27 females had primary education. Only 4 females reported not having a formal education, and 1 respondent preferred not to describe the gender but had secondary education.

Table 16

Crosstabulation of Gender of Respondents and Their Level of Education

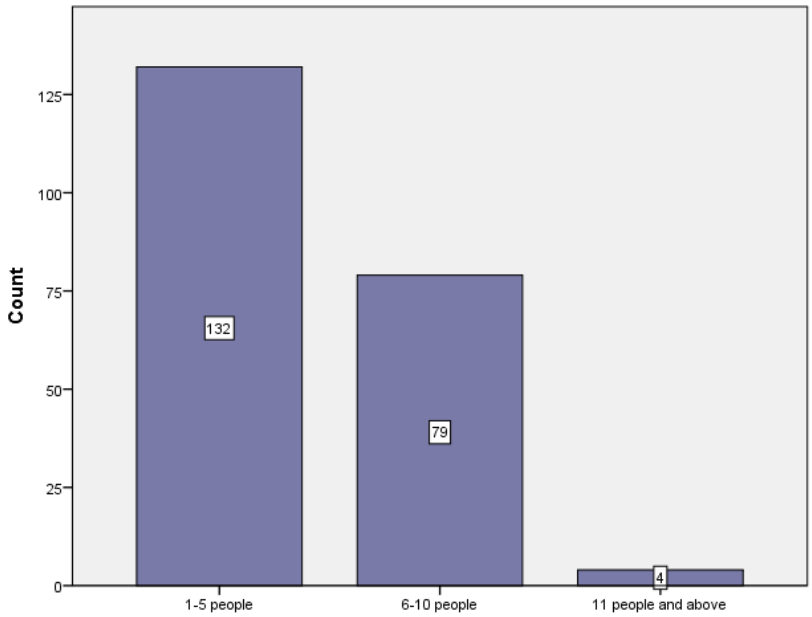
		Level of education				Total
		Collage/ University	Secondary/ High School	Primary School	None	
Gender	Male	32	43	35	2	112
	Female	28	43	27	4	102
	Prefer not to say	0	1	0	0	1
Total		60	87	62	6	215

Respondent's Distribution by Household Numbers

The study established the distribution by household numbers of the respondents. Figure 21 reveals that out of a total population size of 215 respondents, 132(61.4%) had a household size of 1-5 people, 79(36.7%) respondents had 6-10 people, and the remaining 4(1.9%) respondents had 11 and above people.

Figure 21

Household Number of Respondents

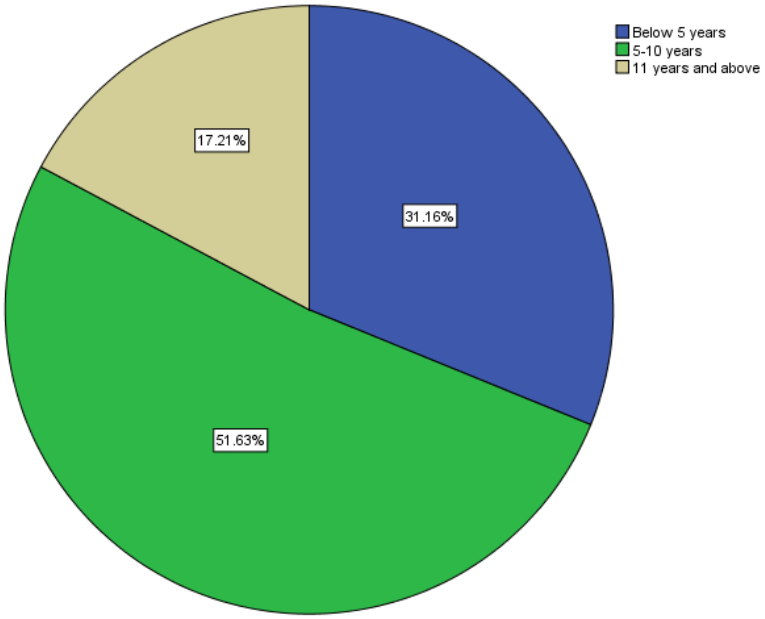


Respondent's Distribution by Number of Years in Farming

The study also established the number of years each respondent has spent in farming. Again, the responses were analyzed, and the results were that most respondents have between 5-10 years in farming, which was 51.63% of the total sample population. About 31.16% had below 5 years in farming, while the remainder of the sample population, 17.21%, were 11 years and above. Figure 22 shows the distribution of the number of years in farming among the respondents.

Figure 22

Number of years in farming

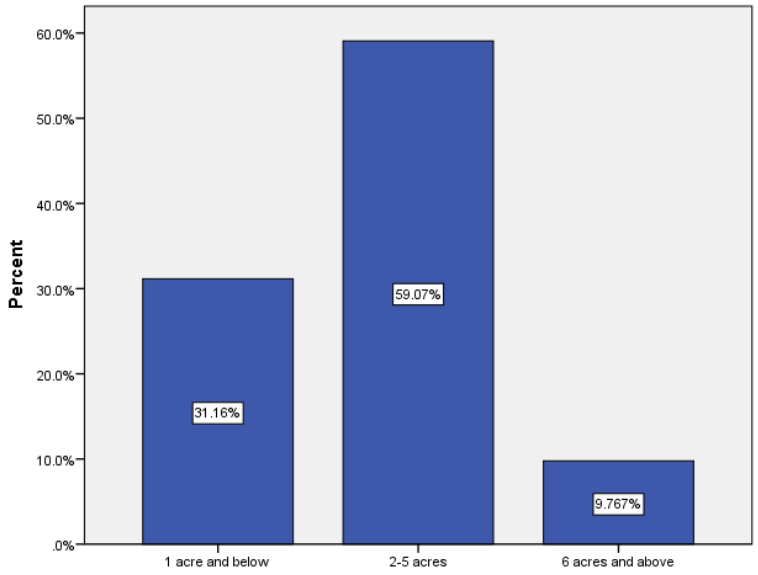


Respondents' Distribution by Size of Farmland

Figure 23 shows the respondents' distribution by the size of the farmland. It was observed that a high proportion of the interviewed farmers had between 2-5 acres of land 59.07%, while those with 1 acre and below occupied 31.16%. On the other hand, 9.76% of the farmers have 6 acres and above.

Figure 23

Size of Farmland

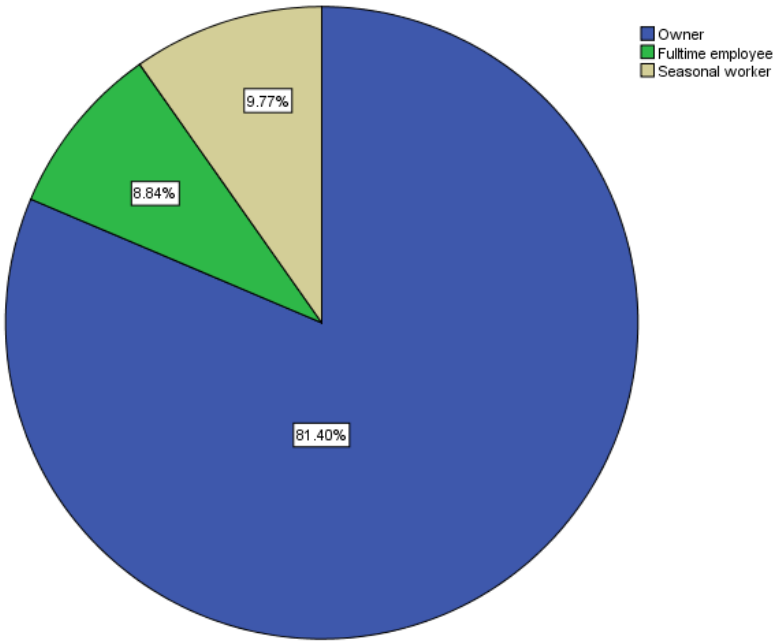


Respondents' Distribution by Position on the Farm

The study also explored the respondents' positions in the respective farms of operations. The responses were analyzed, and the results are as presented in Figure 24, wherein 81.40% of the total respondents owned farming lands, 9.77% worked on the farms as seasonal workers and 8.84% were employed as full-time workers.

Figure 24

Position on the Farm



Respondents' Distribution by Location

The final question on demographic features was to explore the locations in addition to the number of smallholder farmers in the respective sites and the size of the land used for farm operations. The results were also analyzed and presented, as shown in Figure 25 and Table 17. The study was carried out in the four sub-county regions of Meru county. Buuri sub-county had 43 respondents representing 20% of the total sample population, of which 28 respondents had farm sizes of 2-5 acres, 13 had 1 acre and below, and 2 had 6 acres and above. Igembe Central county had 60 respondents representing 27.9% of the total sample population, of which 38 respondents had farm sizes of 2-5 acres, 17 had 1 acre and below, and 2 had 5 acres and above. Imenti South sub-county had 55 respondents representing 25.6% of the total sample population, of which 21 respondents had farm sizes of 2-5 acres, 25 had 1 acre and below, and 9 had 6 acres and above. The

final sub-county was Tigana West, with 57 respondents representing 26.5% of the total sample population, of which 40 respondents had farm sizes of 2-5 acres, 12 had 1 acre and below, and 5 had 6 acres and above.

Figure 25

Locations of the Farms

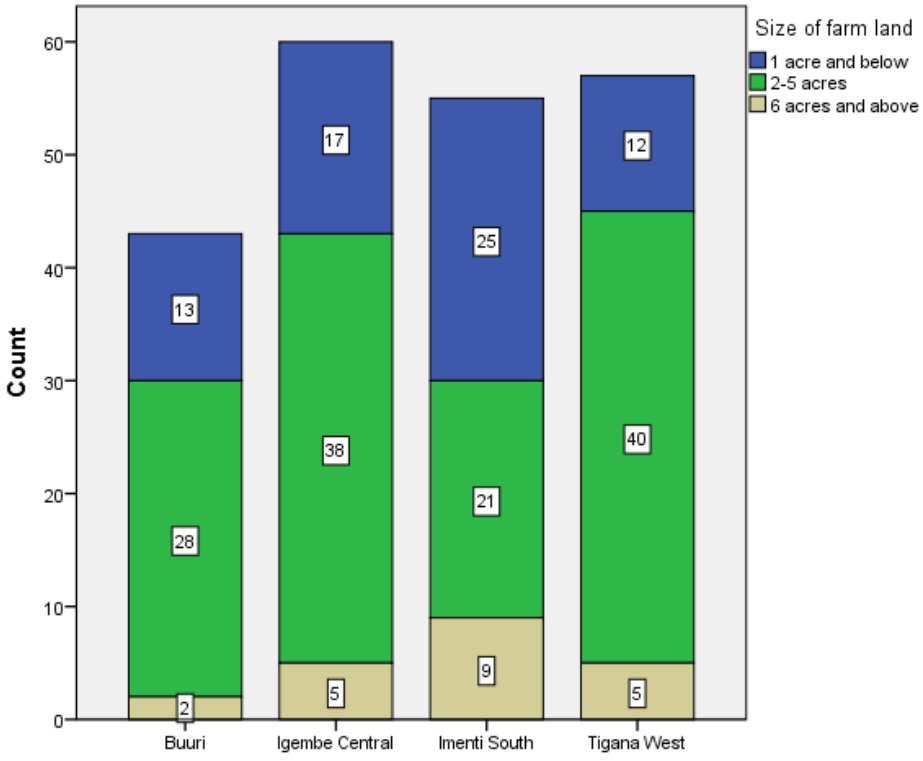


Table 17

Frequency Distribution of Farms in Meru County

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Buuri	43	20.0	20.0	20.0
	Igembe Central	60	27.9	27.9	47.9
	Imenti South	55	25.6	25.6	73.5
	Tigana West	57	26.5	26.5	100.0
	Total	215	100.0	100.0	

Descriptive Statistics of the Importance of Good Agricultural Practice (GAP)

The respondents were asked various questions regarding the importance of Good Agricultural Practices (GAP). The results of the descriptive analysis of the importance of GAP are shown in Table 18 below.

Table 18

Descriptive analysis of the Importance of Good Agricultural Practice (GAP)

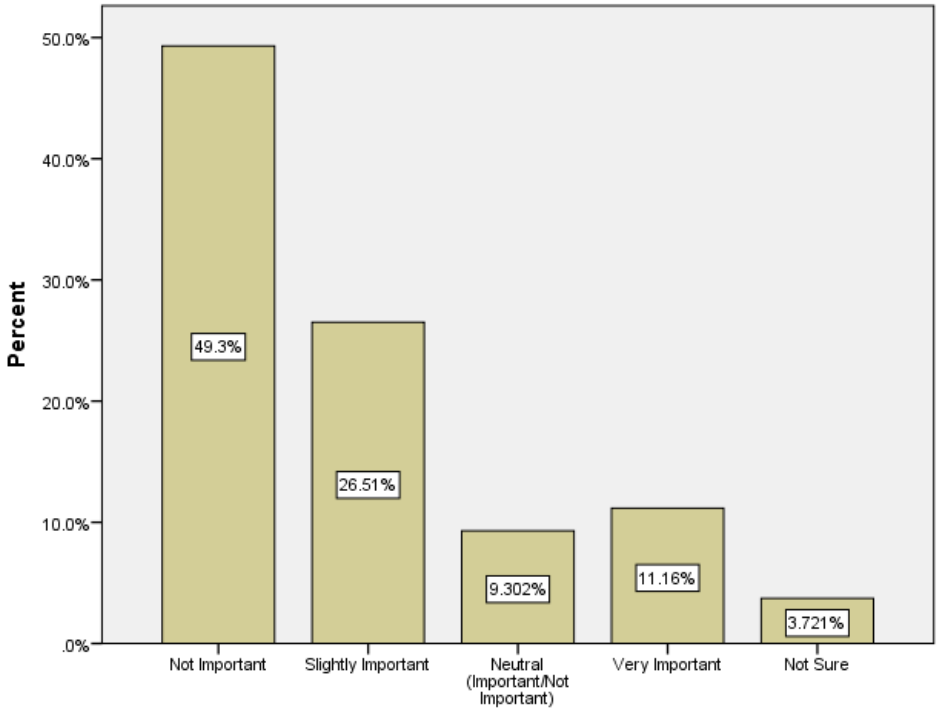
Variable	Not Important	Slightly Important	Neutral	Very Important	Not Sure
Importance to know market requirements (Before GAP)	106(49.3%)	57(26.5%)	20(9.3%)	24(11.2%)	8(3.7%)
Importance to know market requirements (After GAP)	14(6.5%)	22(10.2%)	19(8.8%)	159(74.0%)	1(0.5%)
Importance to know FSS requirements (Before GAP)	79(36.7%)	53(24.7%)	27(12.6%)	36(16.7%)	20(9.3%)
Importance to know FSS requirements (After GAP)	15(7.0%)	21(9.8%)	14(6.5%)	158(73.5%)	7(3.3%)
Importance to gain access to new markets (Before GAP)	79(36.7%)	47(21.9%)	34(15.8%)	41(19.1%)	14(6.5%)
Importance to gain access to new markets (After GAP)	15(7.0%)	23(10.7%)	17(7.9%)	156(72.6%)	4(1.9%)
Importance to know about product rejection (Before GAP)	71(33.0%)	55(25.6%)	26 (12.1%)	38(17.7%)	25(11.6%)
Importance to know about product rejection (After GAP)	22(10.2%)	13(6.0%)	20(9.3%)	151(70.2%)	9(4.2%)
Importance to ensure you receive higher prices (Before GAP)	75(34.9%)	58(27.0%)	29(13.5%)	44(20.5%)	9(4.2%)
Importance to ensure you receive higher prices (After GAP)	14(6.5%)	17(7.9%)	16(7.4%)	162(75.3%)	6(2.8%)

The first question asked was how important was it to know about market requirements before and after the implementation of GAP, as shown in Table 18. About 49.3% of the respondents

answered that before the implementation of GAP, it was not very important to know market requirements, and they were followed closely by 26.51% of them, who felt that it was slightly important. Up to 9.30% had a neutral view, while 11.16% thought it was very important to know market requirements. The remaining 3.72% of the total respondents were not sure. Figure 26 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 18 earlier presented for better understanding.

Figure 26

Importance of Knowing about Market Requirements (Before GAP Implementation)

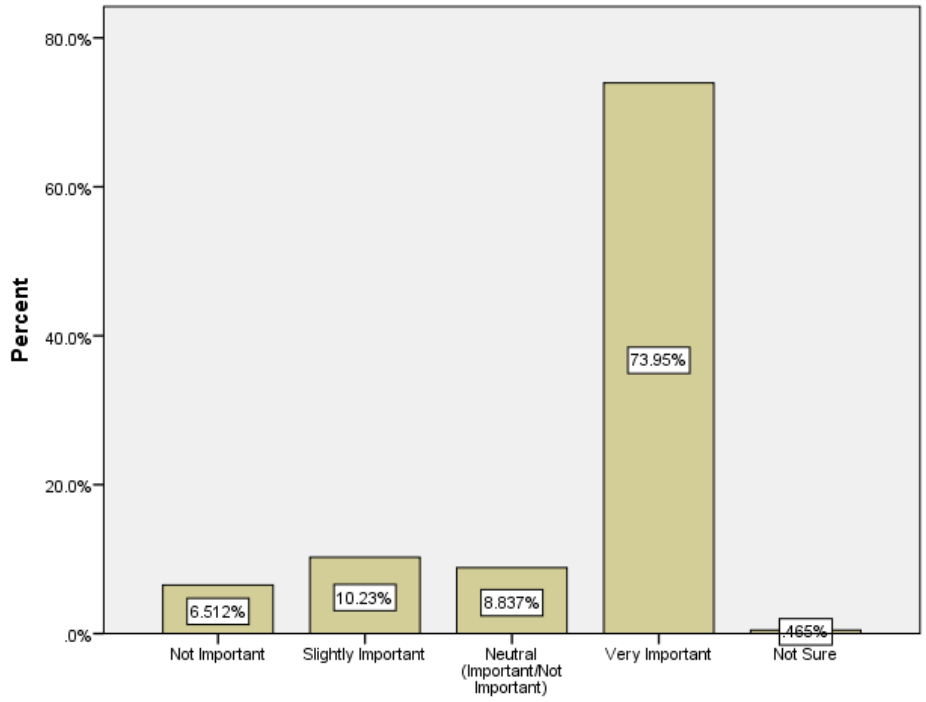


When the same respondents were asked about the importance of market requirements after implementing Good Agricultural Practice (GAP), 73.95% felt it was very important, followed by

10.23% who believed it was slightly important. A total of 8.83% of the respondents had a neutral view, whereas 6.51% felt it was not very important to know market requirements after implementing GAP. Only 0.46 % were not sure if it was important to know market requirements after GAP implementation. Figure 27 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 18 earlier presented for better understanding.

Figure 27

Importance of Knowing about Market Requirements (After GAP Implementation)

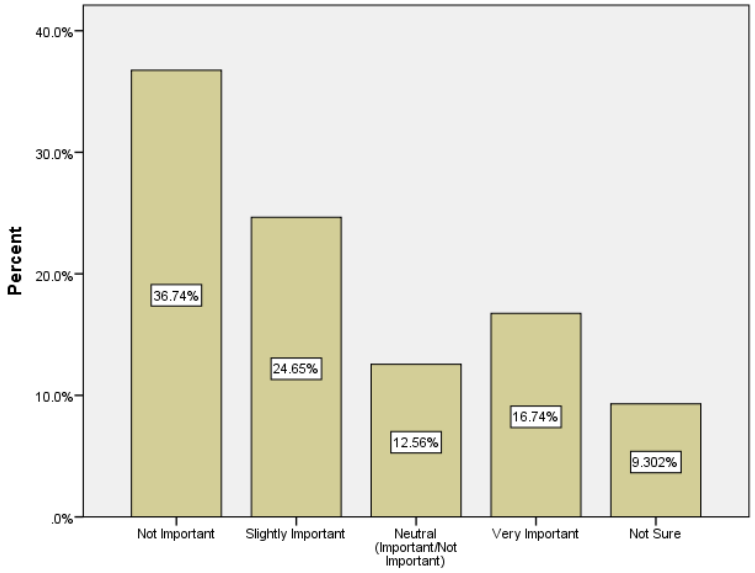


The 215 respondents were asked how important was it to know the requirements of product Food Safety Standards (FSS) before and after the implementation of GAP. From the sample population, 79 respondents (36.74%) felt that before GAP implementation, it was not very important to know the FFS requirements, followed closely by 24.65% who were of the view that it

was slightly important. About 12.56% of the sample population had a neutral view, while 16.74% had the view that it was important to know FSS requirements. The remaining 9.30% were not sure of the importance to know FSS requirements before the implementation of GAP. Figure 28 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 18 earlier presented for better understanding.

Figure 28

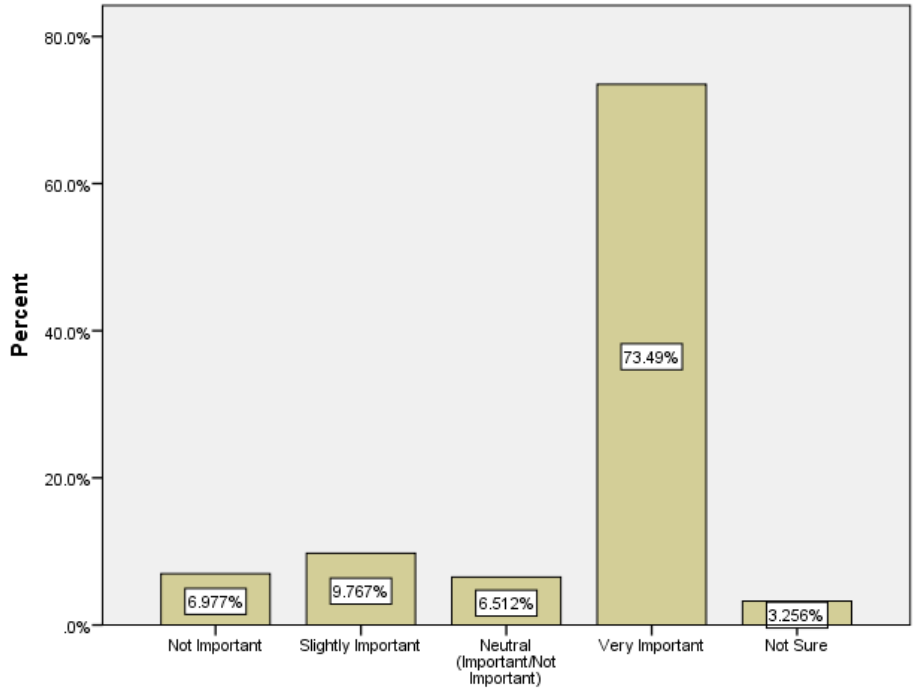
Importance of Knowing FSS Requirements (Before GAP Implementation)



When asked about the importance of knowing FSS requirements after GAP implementation, the views changed significantly. About 73.49% of the respondents now felt it was very important, followed by 9.76% who said it was slightly important. About 6.97% answered that it was not important, while 6.51% had a neutral view, and the remaining 3.25% were still not sure. Figure 29 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 18 earlier presented for better understanding.

Figure 29

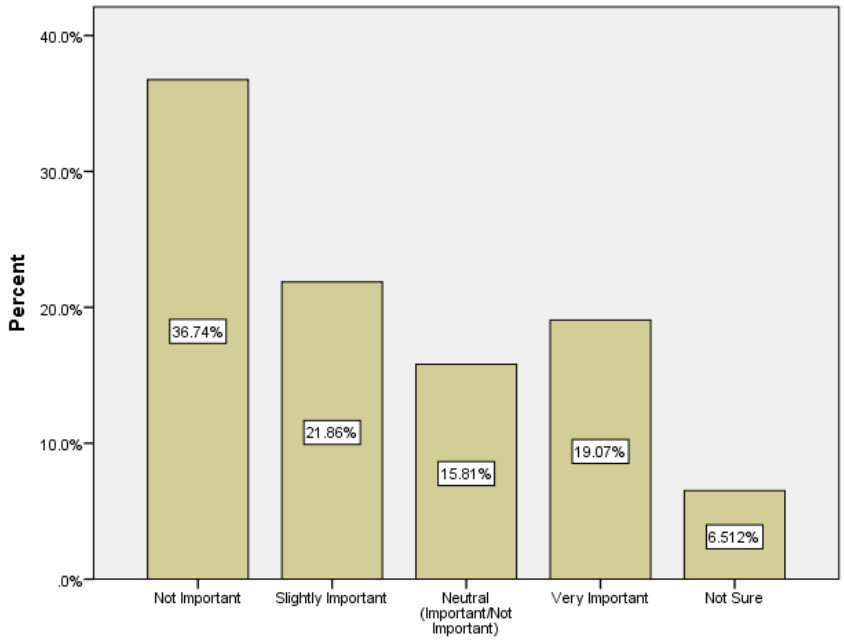
Importance of Knowing FSS Requirements (After GAP Implementation)



When the respondents were asked how important was it to gain access to new markets before the implementation of GAP, 79 out of 215 said that it was not very important, representing 36.74% of the sample population. Those who felt it was slightly important occupied 21.86% of the sample, while 15.81% had a neutral view. From the same selected sample, 19.07% were of the view it was very important to gain access to new markets before GAP implementation, whereas 6.51 % were not sure of this statement. Figure 30 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis. Table 18 earlier presented for better understanding.

Figure 30

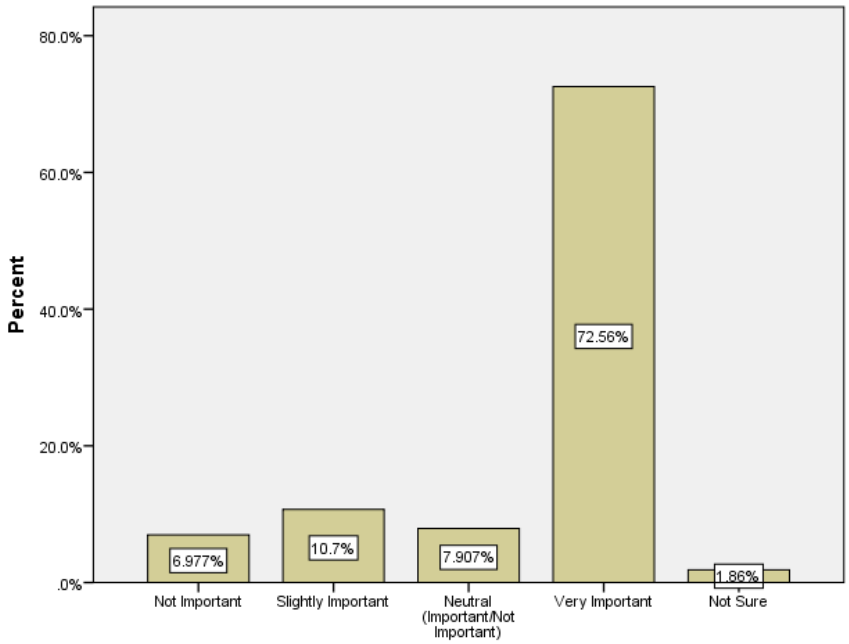
Importance of Gaining Access to New Markets (Before GAP Implementation)



The same question was posted, but in this case, they were asked how important was it to gain access to new markets after the implementation of GAP. The study revealed that 72.12% found it very important, while 10.7% found it slightly important. Also, 17 respondents, representing approximately 7.90% of the sample, had a neutral view. Only 6.97% felt that gaining access to a new market after the implementation of GAP was not important. Also, 4 respondents were not sure about the statement, representing 1.86% of the sample population. Figure 31 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 18 earlier presented for better understanding.

Figure 31:

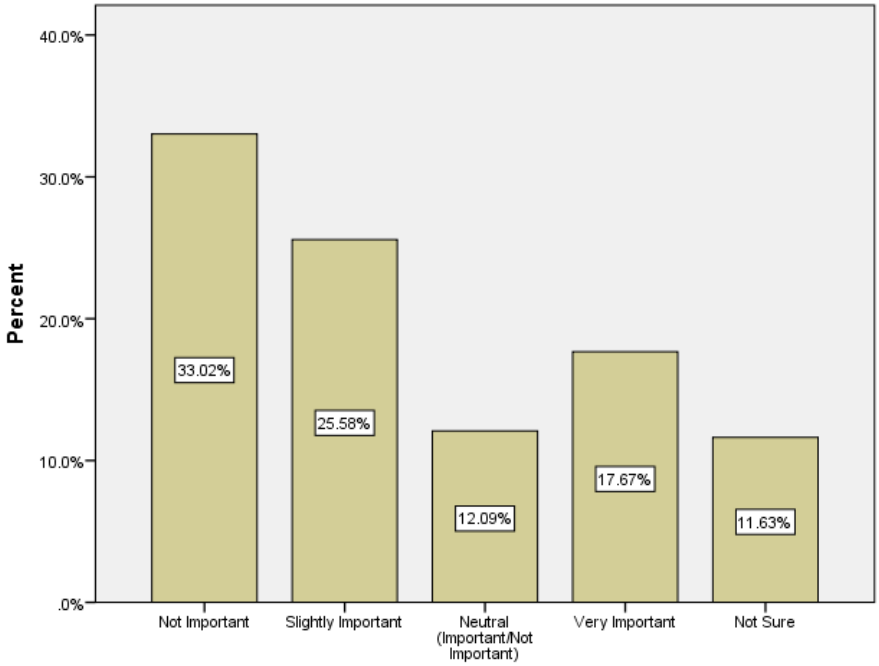
Importance of Gaining Access to New Markets (After GAP Implementation)



The respondents were further asked to explain how important was it to know why buyers rejected farm produce in the marketplace before and after the implementation of GAP. The responses revealed that 33.02% were of the view it was not important, while 25.58% thought it was slightly important to know about product rejection before GAP implementation. In addition, 12.09% of the respondents had a neutral view of this statement, while those who felt it was important to know about product rejection before GAP were 17.67% of the sample. The respondents who were not sure about the statement were 11.63% of the sample population. Figure 32 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 18 earlier presented for better understanding.

Figure 32:

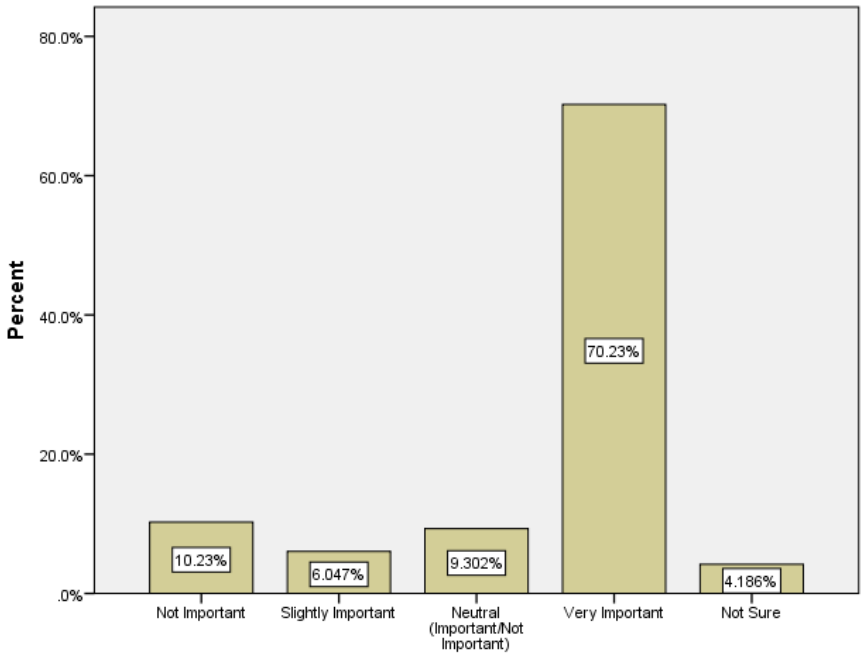
Importance of Knowing about Product Rejection- (Before GAP implementation)



Accordingly, the respondents were also asked the same question, but in this case, after GAP implementation. The responses were such that 70.23% felt that knowing about product rejection after GAP implementation was very important, while 10.23% were of the view it was not important. Those with a neutral view were 9.30%, while those who thought it was slightly important were 6.04%, and 4.18% were not sure how important it is to know why buyers reject farm produce in the marketplace. Figure 33 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 18 earlier presented for better understanding.

Figure 33

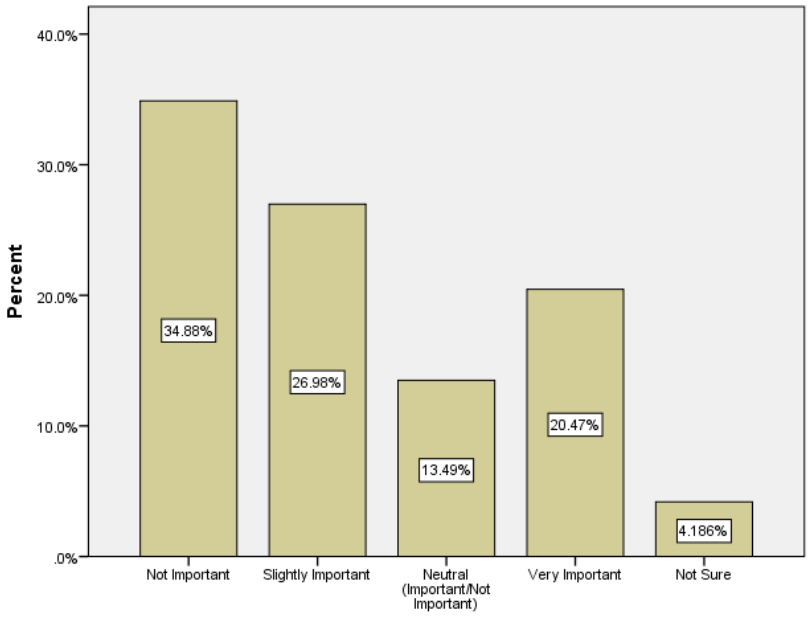
Importance of Knowing about Product Rejection- (After GAP implementation)



The last question that was asked in this section was how important was it to ensure that they received higher prices for farm produce before and after GAP implementation. The results revealed that 34.88% believed it was not important, followed closely by 26.98% who were of the view it was slightly important. Further, 20.47% of the respondents thought it was very important to ensure they received higher farm prices produce before the implementation of GAP. Those with a neutral view were 13.49%, while 4.19% were not sure if it was important to ensure they received higher prices for farm produce. Figure 34 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 18 earlier presented for better understanding.

Figure 34

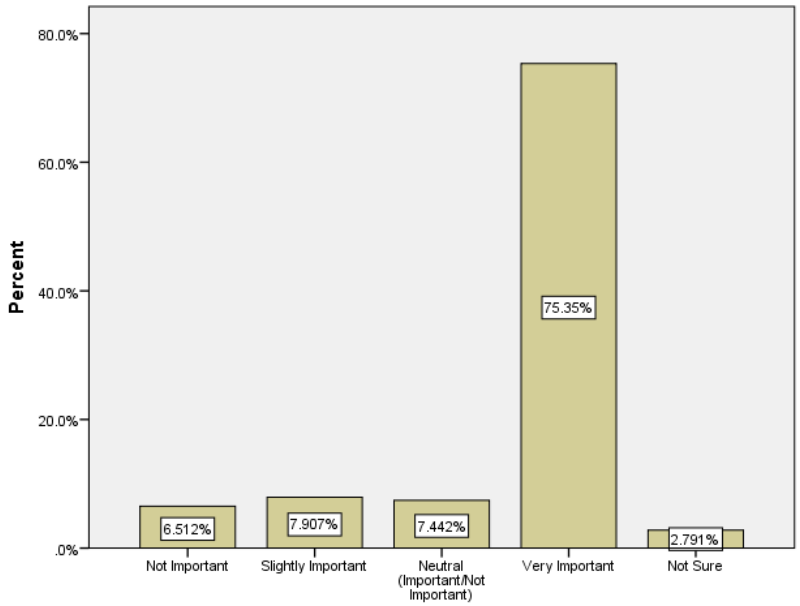
Importance of Ensuring you Receive Higher Prices (Before GAP Implementation)



The same question was asked to the same respondents but, in this case, was on the importance to ensure that they received high prices for their farm produce after the implementation of GAP. About 75.35% said it was very important to ensure they received higher prices for their farm produce. Further, 7.91% were of the view that it was slightly important to receive higher prices for farm produce. About 7.44% had a neutral view, while 6.51% responded it was not important to ensure they received higher prices for farm produce. From their responses, 2.79% were still not sure of the statement. Figure 35 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis. Table 18 was presented earlier for better understanding.

Figure 35

Importance of Ensuring you Receive Higher Prices (After GAP Implementation)



Descriptive Analysis of Farm Activities

The 215 participants were asked several questions concerning their farming activities before and after the implementation of Good Agricultural Practices (GAP). The responses were analyzed and presented as shown in Table 19 below.

Table 19

Responses on Farm Activities

Variable	Yes	No	Not sure
Did you know about human infectious diseases and spread on the farm- (Before GAP Implementation)	33(15.3%)	161(74.9%)	21(9.8%)

Did you know about human infectious diseases and spread on farm- (After GAP Implementation)	187(87.0%)	22(10.2%)	6(2.8%)
Did you know how to reduce product FS risks on farm- (Before GAP Implementation)	47(21.9%)	135(62.8%)	33(15.3%)
Did you know how to reduce product FS risks on farm- (After GAP Implementation)	186(86.5%)	25(11.6%)	4(1.9%)
Did you know the importance of cleaning and sanitizing on farm- (Before GAP Implementation)	63(29.3%)	133(61.9%)	19(8.8%)
Did you know the importance of cleaning and sanitizing on farm- (After GAP Implementation)	195(90.7%)	15(7.0%)	5(2.3%)

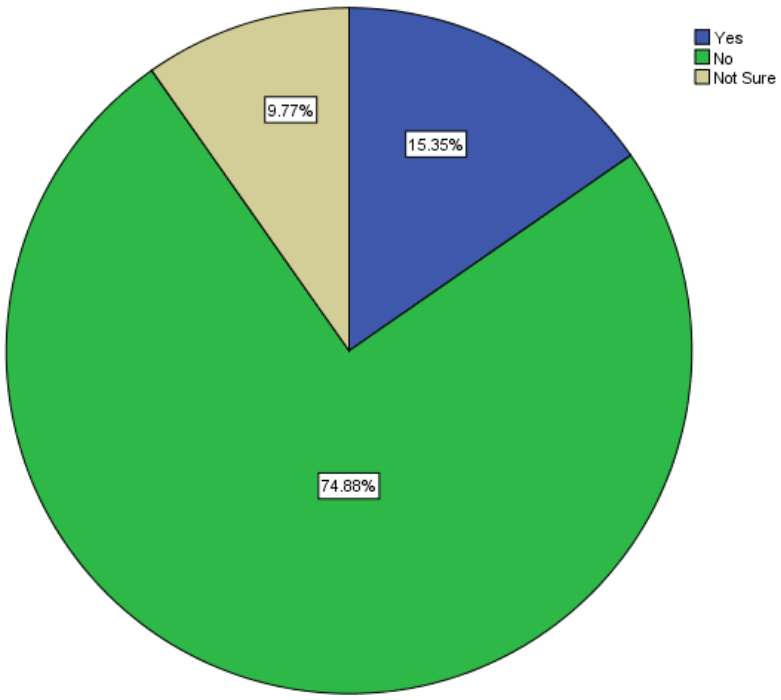
	Always	**Most of Times**	**Sometimes**	**Never**	**Not Sure**
Were domestic animals kept in the farm- (Before GAP Implementation)	35(16.3%)	21(9.8%)	69(32.1%)	87(40.5%)	3(1.4%)
Were domestic animals kept in the farm- (After GAP Implementation)	117(54.4%)	52(24.2%)	33(15.3%)	13(6.0%)	0
Were you monitoring and testing water quality- (Before GAP Implementation)	35(16.3%)	24(11.2%)	50(23.3%)	97(45.1%)	9(4.2%)
Were you monitoring and testing water quality- (After GAP Implementation)	112(52.1%)	39(18.1%)	46(21.4%)	9(4.2%)	9(4.2%)

The first question the respondents were asked in this section was if they knew how human infectious diseases spread on the farm before the implementation of GAP. The results were that 33(15.35%) of the respondents knew how human infectious diseases spread on the farm before the implementation of GAP, while a majority, 161(74.88%), did not agree, and 21(9.77%) were not

sure. Figure 36 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 19 earlier presented for better understanding.

Figure 36

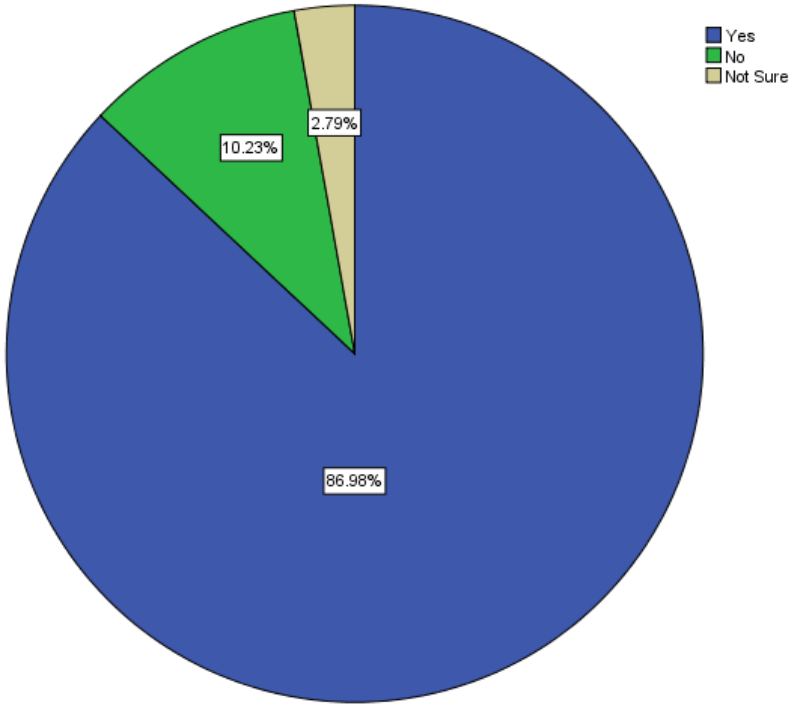
Did you Know about Human Infectious Diseases and Spread on Farm (Before GAP Implementation)



The same question was asked, but in this case, to respond if they knew about human infectious diseases and how they spread on the farm after the implementation of GAP. The results indicated that 187(86.98%) of the respondents agreed they knew about human infectious diseases and how they spread on the farm after the implementation of GAP, 22(10.2793%) disagreed, and 6(2.8%) were still not sure. Figure 37 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 19 earlier presented for better understanding.

Figure 37

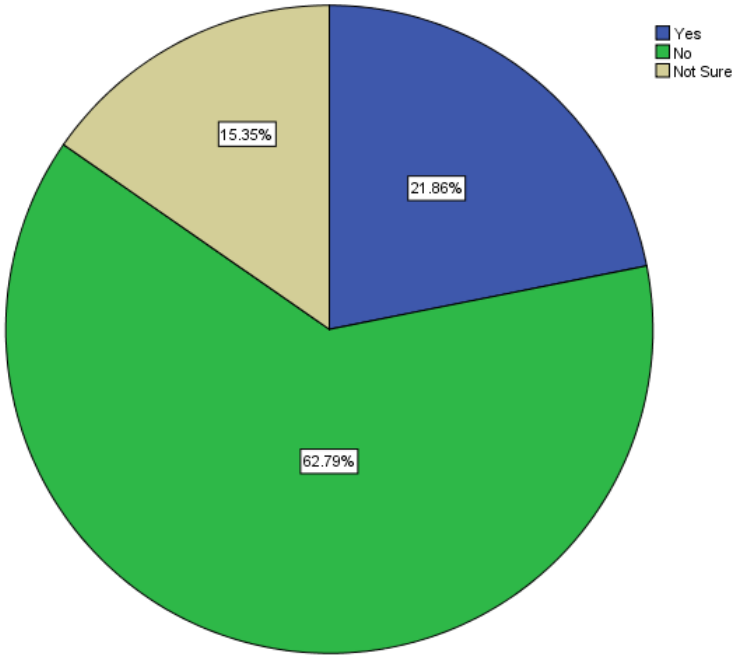
Did you Know about Human Infectious Diseases and Spread on Farm (After GAP Implementation)



The respondents were then asked if they knew how to reduce product food safety risks on the farm before the implementation of GAP. The results indicated that 47(21.86%) agreed to know how to reduce product food safety risks on the farm before the implementation of GAP, 135(62.79%) disagreed, and 33(15.35%) were not sure. Figure 38 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 19 earlier presented for better understanding.

Figure 38

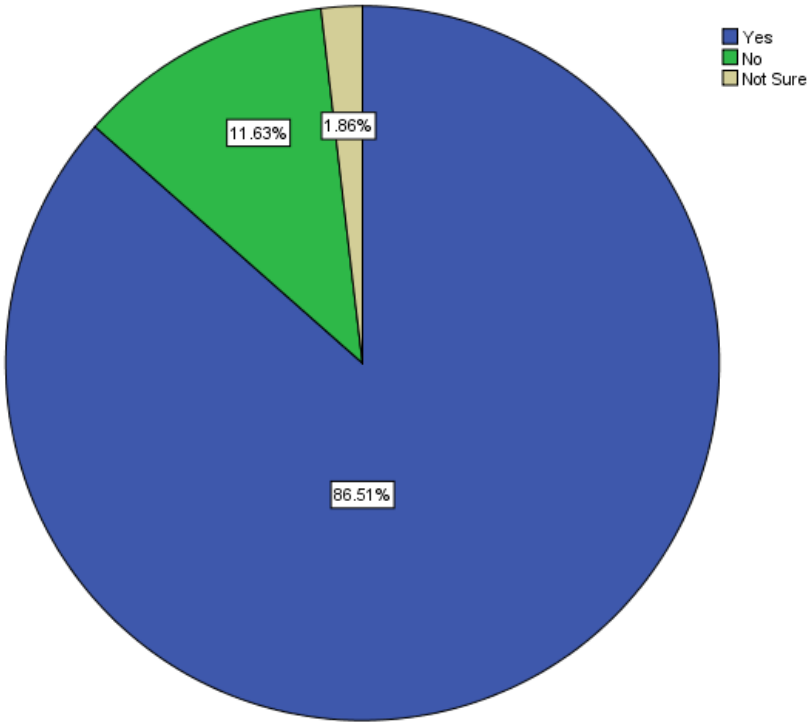
Did you Know How to Reduce Product FS risks on Farm (Before GAP Implementation)



The same question was asked, but in this case, to respond if they now knew how to reduce the produce food safety risks after the implementation of GAP. The results show that 186(86.51%) of the respondents agreed that they know how to reduce the produce food safety risks after the implementation of GAP, 25(11.63%) disagreed, and 4(1.86%) were not sure. Figure 39 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis. Table 19 was presented earlier for better understanding.

Figure 39

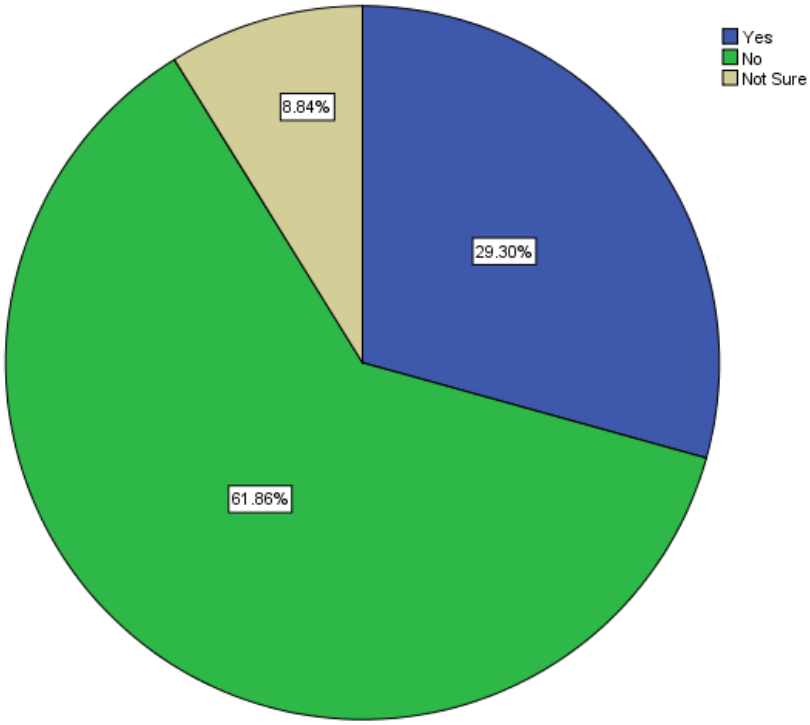
Did you Know How to Reduce Product Food Safety Risks on the Farm (After GAP Implementation)



The respondents were further asked if they knew the importance of cleaning and sanitizing the farm before GAP implementation. The results indicated that 63(29.30%) agreed to know the importance of cleaning and sanitizing the farm, 133(61.86%) did not know, and 19(8.84%) were not sure. Figure 40 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 19 earlier presented for better understanding.

Figure 40

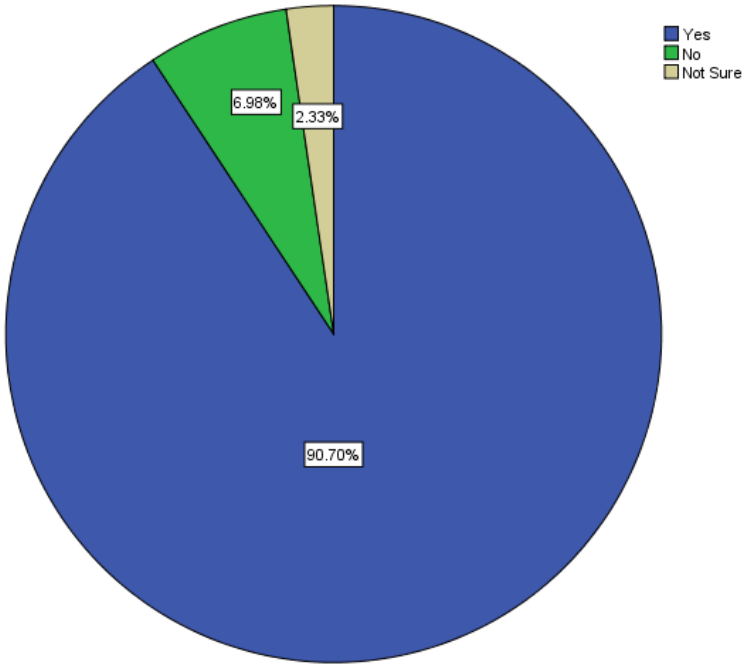
Did you Know the Importance of Cleaning and Sanitizing on Farm (Before GAP Implementation)



The same question was asked, but in this case, to respond if they now know the importance of cleaning and sanitizing the farm after GAP implementation. The results show that 195(90.70%) agreed to know the importance of cleaning and sanitizing on the farm compared to 15(6.98%) who were still not aware of the importance and 5(2.33%) who were not sure. Figure 41 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 19 earlier presented for better understanding.

Figure 41

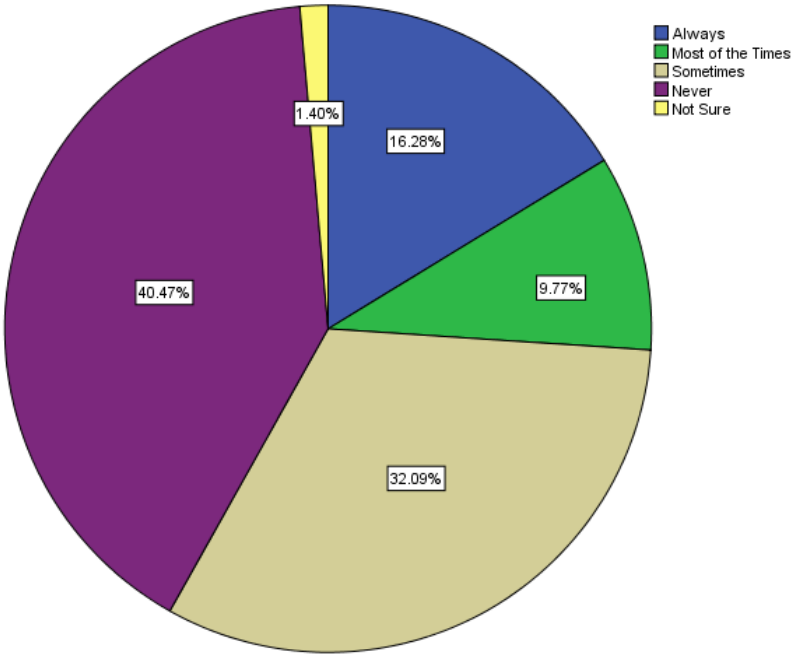
Did you Know the Importance of Cleaning and Sanitizing on Farm (After GAP Implementation)



Further questions were asked, requiring different responses if the respondents were keeping domestic animals away from the farm and harvest areas before the implementation of GAP. The results indicated that 35(16.3%) respondents always kept domestic animals away from the farm and harvest areas before the implementation of GAP, 21(9.8%) most of the time, 69(32.1%) sometimes, 87(40.5%) never kept domestic animals away from the farm and harvest area, and finally, 3(1.4%) were not sure. Figure 42 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 19 earlier presented for better understanding.

Figure 42

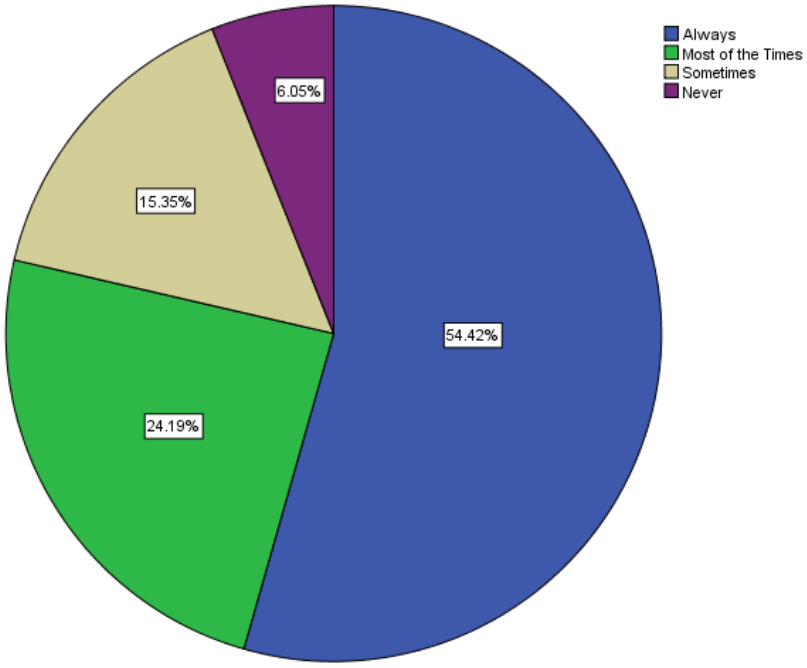
Were domestic Animals Kept in the Farm (Before GAP Implementation)



The same question was asked of the participants, but in this case, they were asked to respond if they were now keeping animals away from the farm and harvest area after GAP implementation. The results changed and showed that 117(54.42%) respondents always kept domestic animals away from the farm and harvest areas after the implementation of GAP, 52(24.19%) most of the time, 33(15.35%) sometimes, and 13(6.05%) never kept domestic animals away from the farm and harvest area. No respondent answered; not sure about the question being asked. Figure 43 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 19 earlier presented for better understanding.

Figure 43

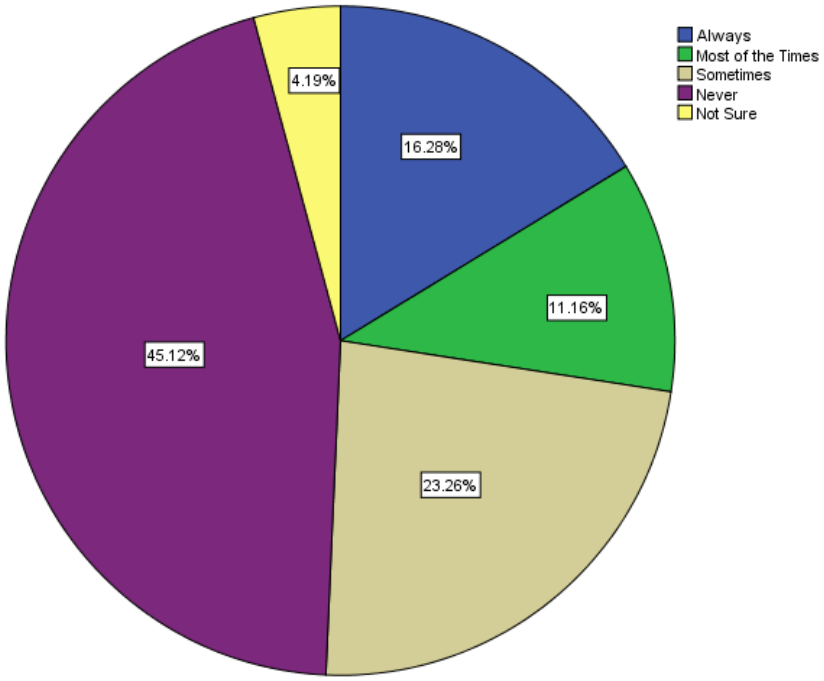
Were Domestic Animals Kept in the Farm (After GAP Implementation)



The study's aim was also to determine the respondents' views on monitoring and testing water quality in the farms before the implementation of GAP. From the results, only 35(16.28%) respondents always monitored and tested water quality before the implementation of GAP, 24(11.16%) most of the time, 50(23.26%) sometimes, 97(45.12%) never monitored and tested water quality before the implementation of GAP. Finally, 9(4.19%) were not sure if they monitored and tested water quality before the implementation of GAP. Figure 44 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 19 earlier presented for better understanding.

Figure 44

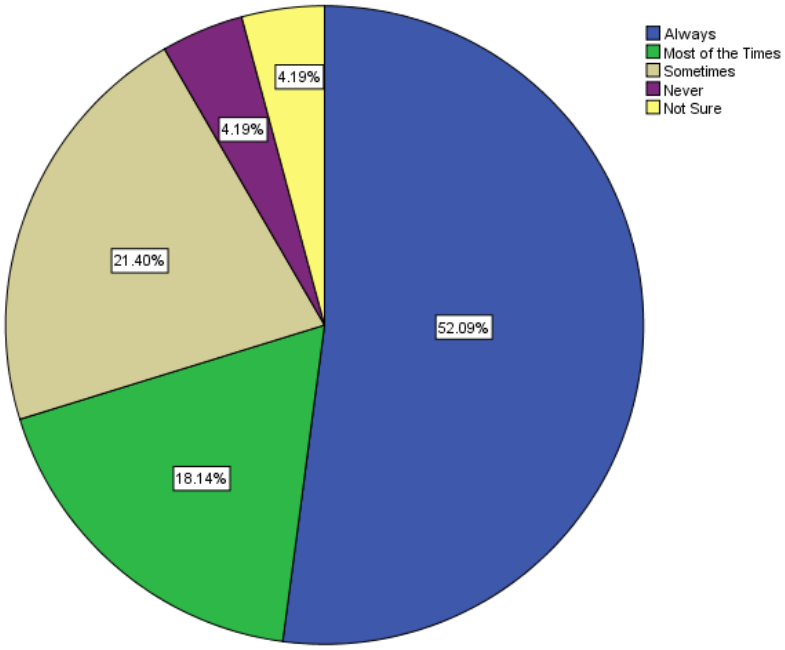
Were you Monitoring and Testing of Water Quality (Before GAP Implementation)



The results were different when the same question was asked, but in this case, to respond to monitoring and testing water quality in the farms after the implementation of GAP. From the results, 112(52.09%) respondents always monitored and tested water quality after the implementation of GAP, 39(18.14%) most of the time, 46(21.40%) sometimes, 9(4.19%) though minimal still never monitored and tested water quality after the implementation of GAP. Finally, 9(4.19%) were still not sure if they monitored and tested water quality after the implementation of GAP. Figure 45 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 19 earlier presented for better understanding.

Figure 45

Were you Monitoring and Testing of Water Quality (After GAP Implementation)



Descriptive Analysis of Farm Sales, Records and Documented Procedures

The 215 participants were further asked several questions concerning their farm sales, records, and documented procedures before and after the implementation of Good Agricultural Practices (GAP). The responses were analyzed and presented as shown in Table 20 below.

Table 20

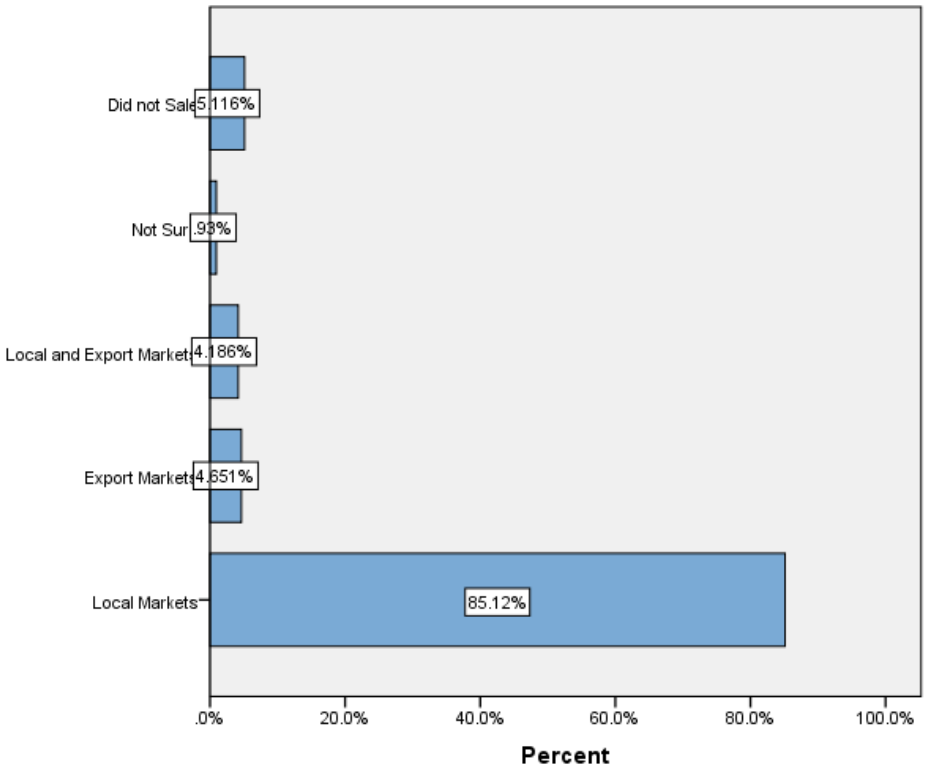
Responses on Farm Sales, Records and Documented Procedures

Variable	Local Markets	Export Markets	Local & Exports Markets	Not sure	Did not Sale
Which markets to sell farm produce- (Before GAP Implementation)	183(85.1%)	10(4.7%)	9(4.2%)	2(0.9%)	5(2.3%)
Which markets to sell farm produce- (After GAP Implementation)	101(47.0%)	10(4.7%)	89(41.4%)	10(4.7%)	5(2.3%)
	Kes.0 - Kes. 19,999	**Kes. 20,000 - Kes. 49,999**	**Kes. 50,000 - Kes. 99,999**	**Kes. 100,000 and Above**	**I Prefer Not to Answer**
Estimated farm produce sales per year- (Before GAP Implementation)	97(45.1%)	62(28.8%)	28(13.0%)	7(3.3%)	21(9.8%)
Estimated farm produce sales per year- (After GAP Implementation)	25(11.6%)	47(21.9%)	54(25.1%)	61(28.4%)	28(13.0%)
	No Records	**Some Records**	**Most Records**	**All Records**	**Not Sure**
Keeping farm produce sales records- (Before GAP Implementation)	114(53.0%)	63(29.3%)	20(9.3%)	11(5.1%)	7(3.3%)
Keeping farm produce sales records- (After GAP Implementation)	24(11.2%)	31(14.4%)	91(42.3%)	67(31.2%)	2(0.9%)
Keeping sales records for more than 3yrs- (Before GAP Implementation)	101(47.0%)	41(19.1%)	21(9.8%)	13(6.0%)	39(18.1%)
Keeping sales records for more than 3yrs- (After GAP Implementation)	26(12.1%)	31(14.4%)	77(35.8%)	69(32.1%)	12(5.6%)
	Always	**Most of Times**	**Sometimes**	**Never**	**Not Sure**
Keeping documented procedures on-farm activities- (Before GAP Implementation)	21(9.8%)	17(7.9%)	78(36.3%)	92(42.8%)	7(3.3%)
Keeping documented procedures on-farm activities- (After GAP Implementation)	96(44.7%)	63(29.3%)	40(18.6%)	14(6.5%)	2(0.9%)

The study sought to explore which markets the respondents sold their farm produce before the implementation of Good Agricultural Practices (GAP). From the results, the largest market the farmers sold their farm produce before GAP implementation was the local market, with 183 respondents representing 85.12% of the sample population. The export markets came second with 10(4.65%), while local and export markets were third with 9(4.18%). About 2(0.93%) respondents were not sure of the markets they sold their farm produce before the implementation of GAP, and the remaining 11(5.11%) reported they did not sell their produce. Figure 46 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 20 earlier presented for better understanding.

Figure 46

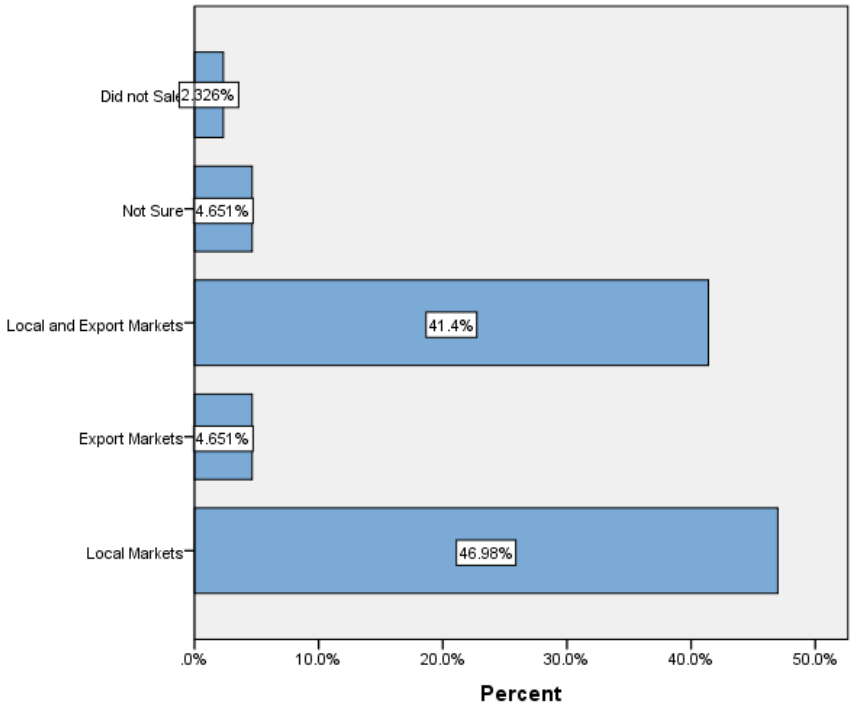
Which Markets to Sale Farm Produce (Before GAP Implementation)



The same question was asked, but in this case, to respond to which markets the respondents sell their farm produce after the implementation of Good Agricultural Practices (GAP). The results changed and showed that the local market had 101 respondents, representing 46.98% of the sample population, export 10(4.65%), and those that sold to both the local and export markets increased to 89(41.4%). The respondents who were not sure and those who did not sell were 10(4.65%) and 5(2.32%), respectively. Figure 47 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 20 earlier presented for better understanding.

Figure 47

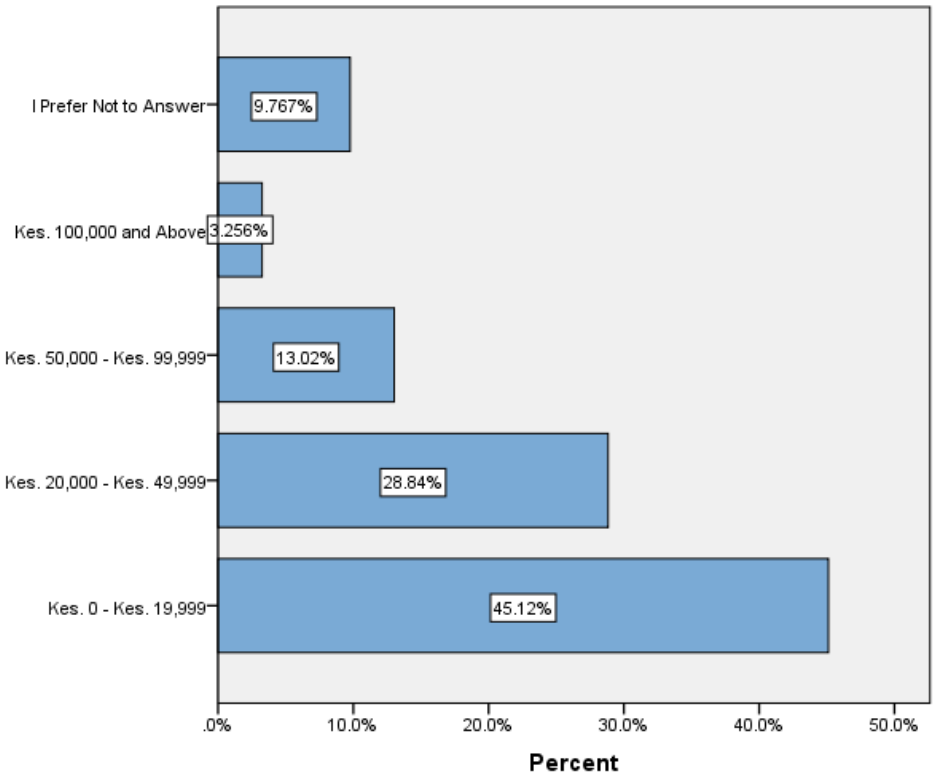
Which Markets to Sale Farm Produce (After GAP Implementation)



The study further sought to explore the estimated farm produce sales per year before the implementation of GAP. From the results, 97(45.12%) respondents made sales below Kes. 19,999 before the implementation of GAP, followed by 62(28.84%) respondents who made sales between 20,000 and 49,999 per year. Furthermore, 28(13.02%) made sales between Kes. 50,000 and Kes. 99,999, and 3(3.35%) made sales above Kes. 100,000. 21(9.76%) respondents preferred not to answer. Figure 48 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 20 earlier presented for better understanding.

Figure 48

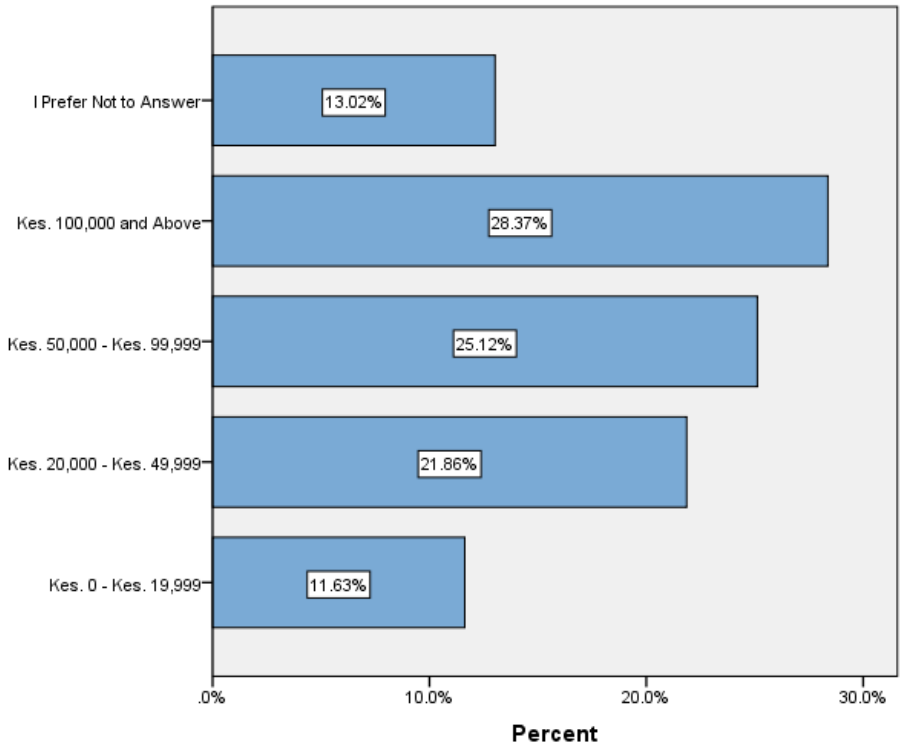
Estimated Farm Produce Sales per year (Before GAP Implementation)



The same question was asked, but in this case, to respond to the question on the farm's estimated farm produce per year after the implementation of Good Agricultural Practices (GAP). From the results, 25(11.63%) respondents made sales below Kes. 19,999 after the implementation of GAP, 47(21.86%) made sales between Kes. 20,000 and 49,999 per year, 54(25.12%) between Kes. 50,000 and Kes. 99,999, significant increase of 61(28.37%) sales above Kes. 100,000. However, there was also an increase to 28(13.02%) respondents who preferred not to answer. Figure 49 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 20 earlier presented for better understanding.

Figure 49

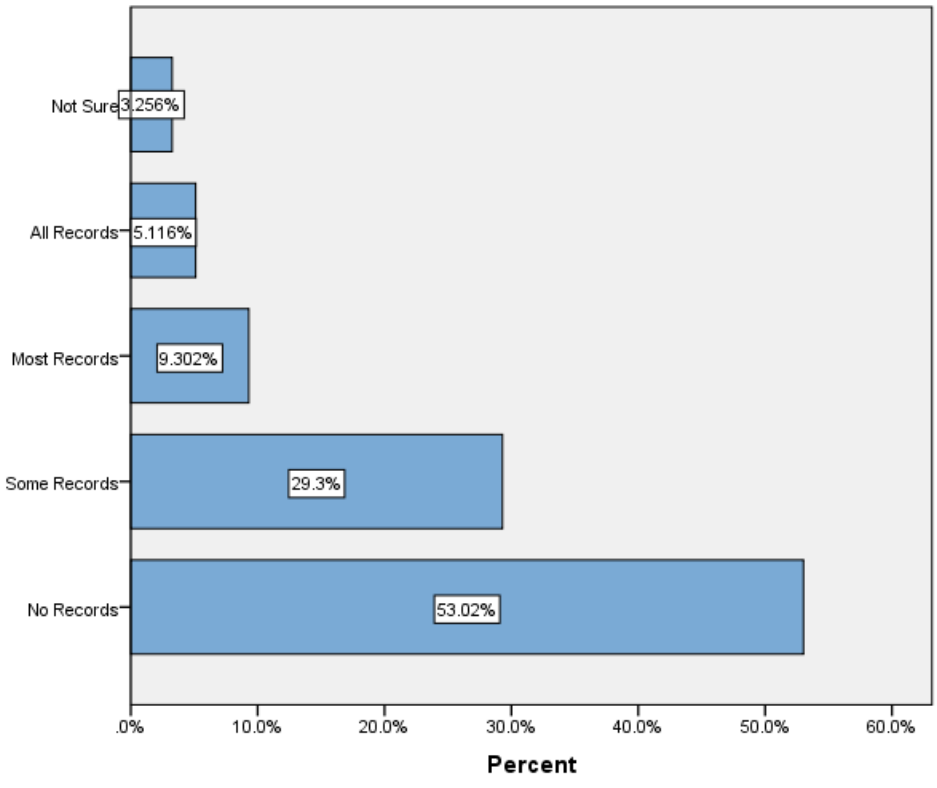
Estimated Farm Produce Sales per year (After GAP Implementation)



The study's aim was also to determine if the respondents were keeping farm produce records before the implementation of GAP. From the results, the keeping farm produce sales records was such that 114(53.02%) respondents had no records before GAP implementation, while 63(29.3%) kept some records. Only 20(9.3%) participants had most of the records, 11(5.11%) had all the records before GAP implementation, and 7(3.25%) were not sure if they kept any records. Figure 50 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 20 earlier presented for better understanding.

Figure 50

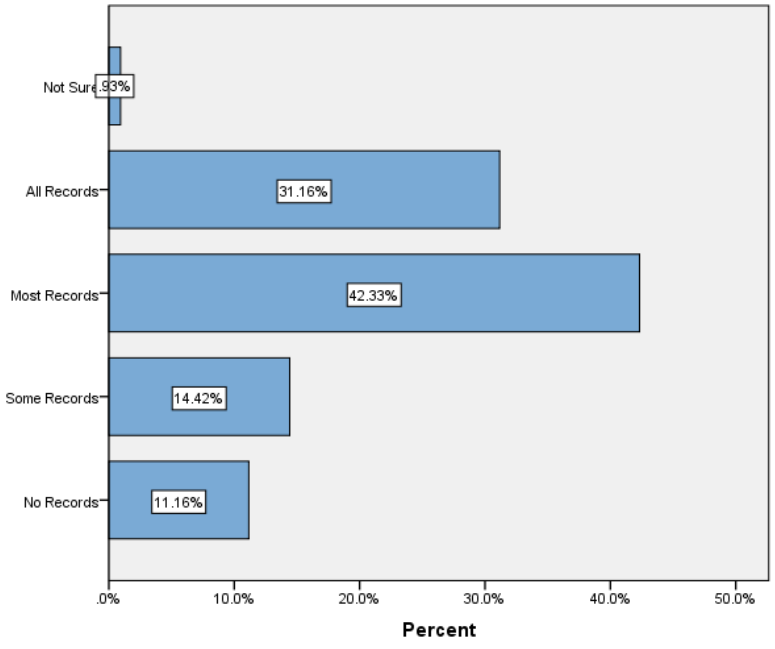
Keeping of Farm Produce Sales Records (Before GAP Implementation)



The results from the respondents changed significantly when asked if farm produce sales records were kept after the implementation of GAP. From the results, 91(42.33%) of the respondents had most of the farm produce sales records, 67(31.16%) kept all the produce sales records, and only 24(11.16%) had no records. Up to 31(14.42%) of the respondents had some produce sales records after the implementation of GAP, while 2(0.93%) of the respondents were not sure if produce sales records were kept after the implementation of GAP. Figure 51 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 20 earlier presented for better understanding.

Figure 51

Keeping of Farm Produce Sales Records (After GAP Implementation)

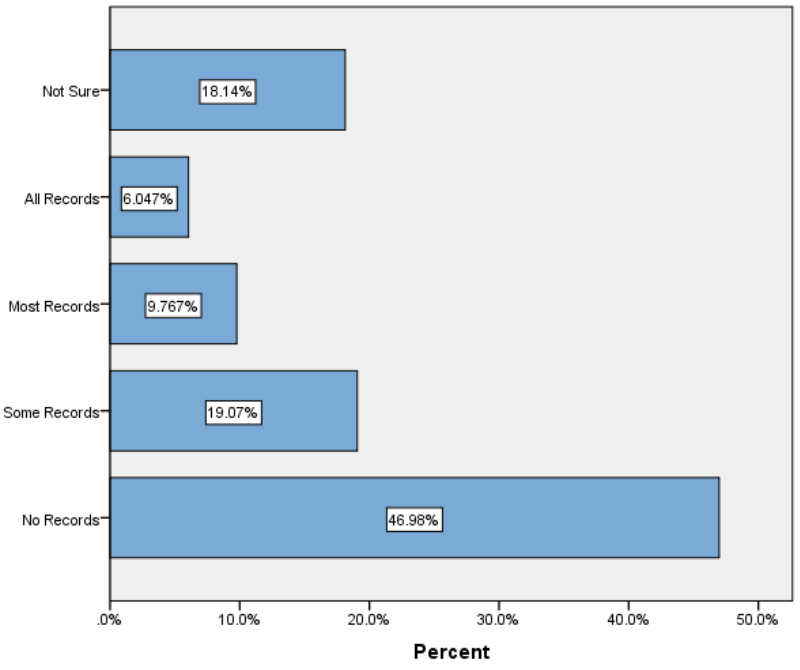


The study further explored if the respondent's farm sales records were kept for more than the 3 years before the implementation of GAP. The results showed that 101(46.98%) of the

respondents had not kept sales records for more than 3 years before the implementation of GAP, while 21(9.76%) and 13(6.04%) had kept most records and all sales records, respectively, for more than 3 years. A total of 41(19.07%) of the respondents kept some produce farm records for more than 3 years, while 39(18.14%) were not sure. Figure 52 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 20 earlier presented for better understanding.

Figure 52

Keeping of Sales Records for More than 3yrs (Before GAP Implementation)

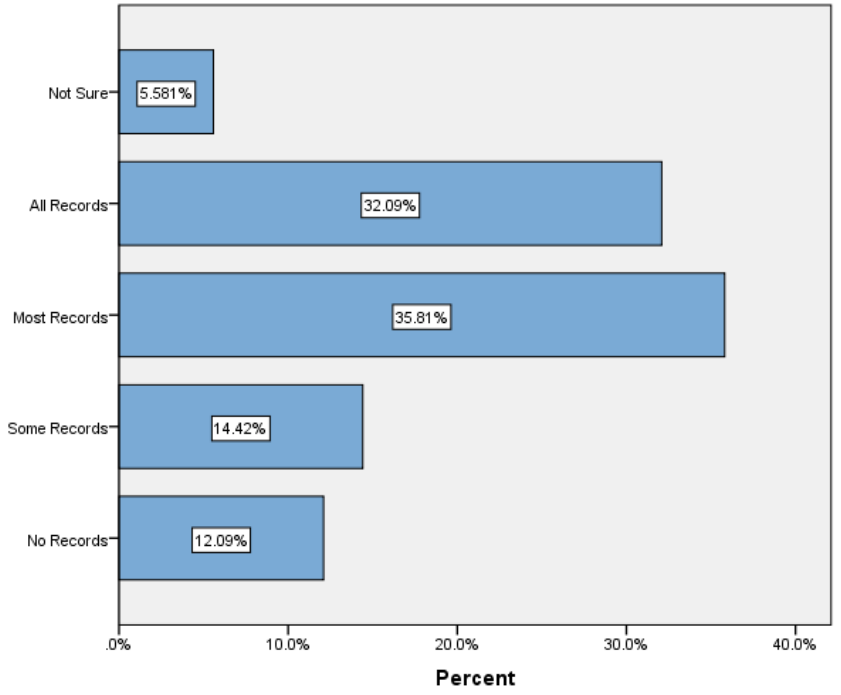


The study asked the same question, but in this case, if farm produce sales records were kept for more than 3 years after the implementation of GAP. The results changed, with 77(35.81%) of the respondents keeping most records and 69(32.09%) keeping all records after the implementation

of GAP. The count of respondents keeping no records after the implementation of GAP reduced to 26(12.09%), and those keeping some records to 31(14.42%). The respondents that were not sure if produce sales records were kept for more than 3 years after the implementation of GAP reduced to 12(5.58%). Figure 53 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 20 earlier presented for better understanding.

Figure 53

Keeping of Sales Records for More than 3yrs (After GAP Implementation)

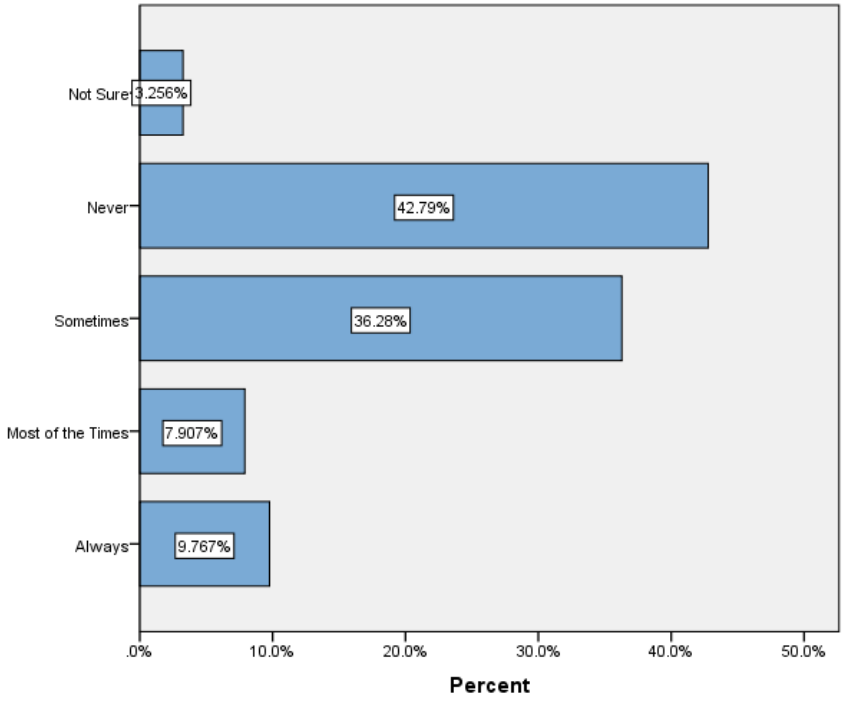


The last question asked the respondents if they were keeping documented procedures of farm activities before the implementation of Good Agricultural Practices (GAP). From the results, 21(9.76%) of the respondents always kept documented procedures of farm activities, 17(7.90%) kept them most of the time, and 78(36.28%) sometimes. On the other hand, about 92(42.79%) of

the respondents never kept documented procedures of farm produce before the implementation of GAP, while 7(3.25%) were not sure. Figure 54 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 20 earlier presented for better understanding.

Figure 54

Keeping Documented Procedures on Farm Activities (Before GAP Implementation)

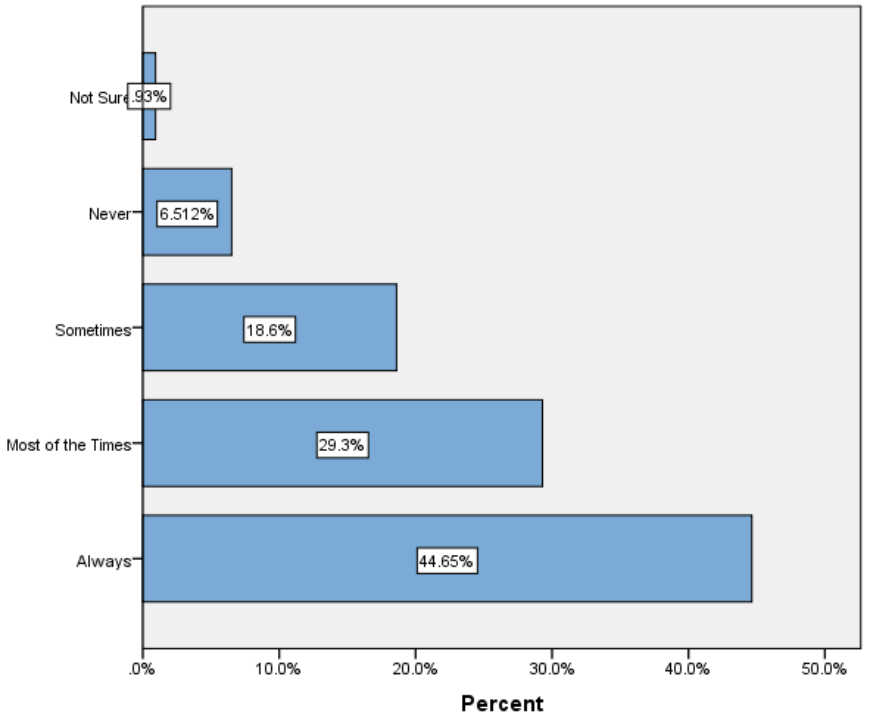


The same question was asked of the respondents, but in this case, it was whether they were keeping documented procedures of farm activities after the implementation of GAP. Again, the results changed significantly, where 96(44.65%) of the respondents always kept documented procedures of farm activities, 63(29.3%) kept them most of the time, and 40(18.6%) sometimes. On the other hand, there was a significant decrease to 14(6.51%) of the respondents who never kept

documented procedures of farm produce after the implementation of GAP and a further reduction to 2(0.93%) of the respondents who were not sure. Figure 55 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 20 earlier presented for better understanding.

Figure 55

Keeping Documented Procedures on Farm activities- (After GAP Implementation)



Descriptive Analysis of Challenges Being Faced After Implementation of Good Agricultural Practices

The last section of the questions asked to the 215 participants was about the challenges faced after the implementation of Good Agricultural Practices (GAP). The responses were analyzed and presented as shown in Table 21 below.

Table 21

Responses on Challenges After Implementation of Good Agricultural Practices

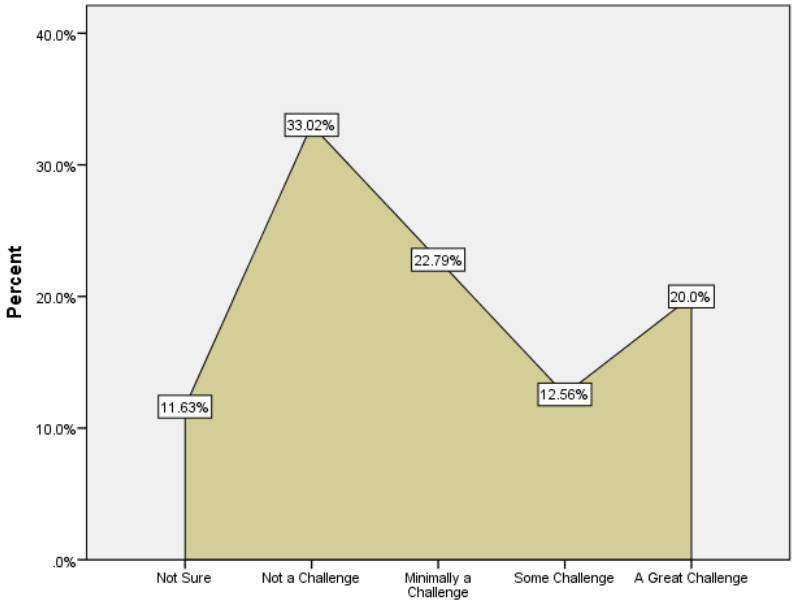
	Not Sure	Not a Challenge	Minimally a Challenge	Some Challenge	A Great Challenge
I understand of GAP is a challenge on the farm	25(11.6%)	71(33.0%)	49(22.8%)	27(12.6%)	43(20.0%)
Is the financial cost of implementing GAP a challenge	9(4.2%)	52(24.2%)	41(19.1%)	46(21.4%)	67(31.2%)
Is it a challenge to get a technical expert to implement GAP	11(5.1%)	70(32.6%)	25(11.6%)	42(19.5%)	67(31.2%)

The participants in this study were asked if understanding the standards of Good Agricultural Practices (GAP) after implementation was still a challenge on the farm. From the results, 26 respondents, representing 11.63% of the sample population, were not sure if understanding the standards of Good Agricultural Practices (GAP) after implementation was still a challenge on the farm, and 71(33.02%) responded as being not a challenge. However, 49(22.79%) of the respondents responded as having minimal challenges understanding the standards of Good

Agricultural Practices (GAP) after implementation, 27(12.56%) responded as having some challenges, and 43(20.0%) responded as having a great challenge, respectively. Figure 56 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 21 earlier presented for better understanding.

Figure 56

Is Understanding of GAP a Challenge on the Farm

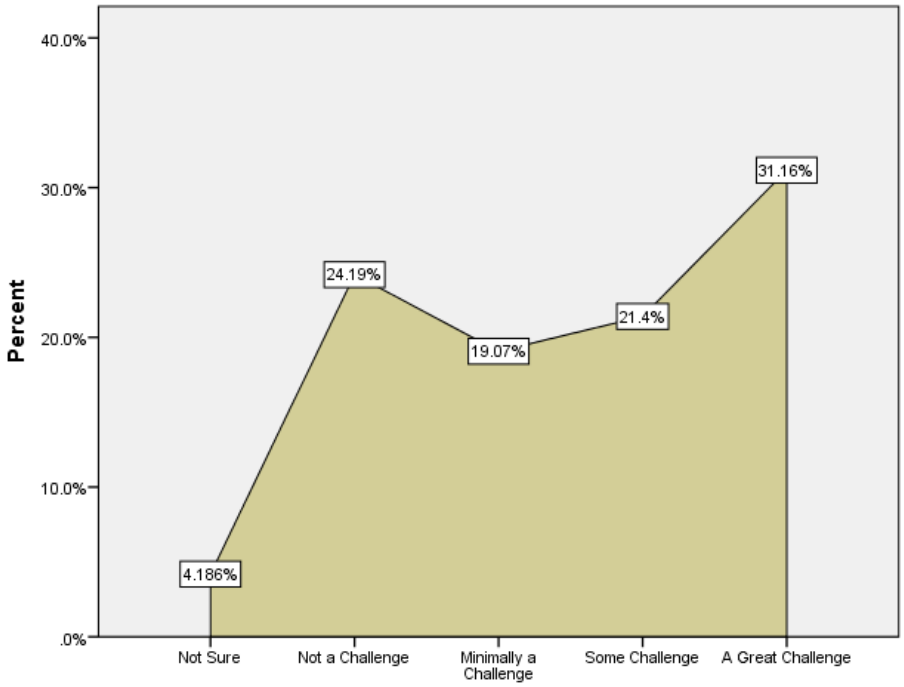


The participants were further asked if the financial cost of implementing the standards of GAP was a challenge on the farm. From the results, 9 respondents, representing 4.18% of the sample population, were not sure if the financial cost of implementing the standards of GAP was a challenge on the farm, and 52(24.19%) responded as being not a challenge. However, 41(19.07%) of the respondents responded as having minimal challenges with the financial cost of implementing the standards of GAP on the farm, 46(21.4%) responded as having some challenges, and

67(31.16%) responded as having a great challenge, respectively. Figure 57 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 21 earlier presented for better understanding.

Figure 57

Is the Financial Cost of Implementing GAP a Challenge

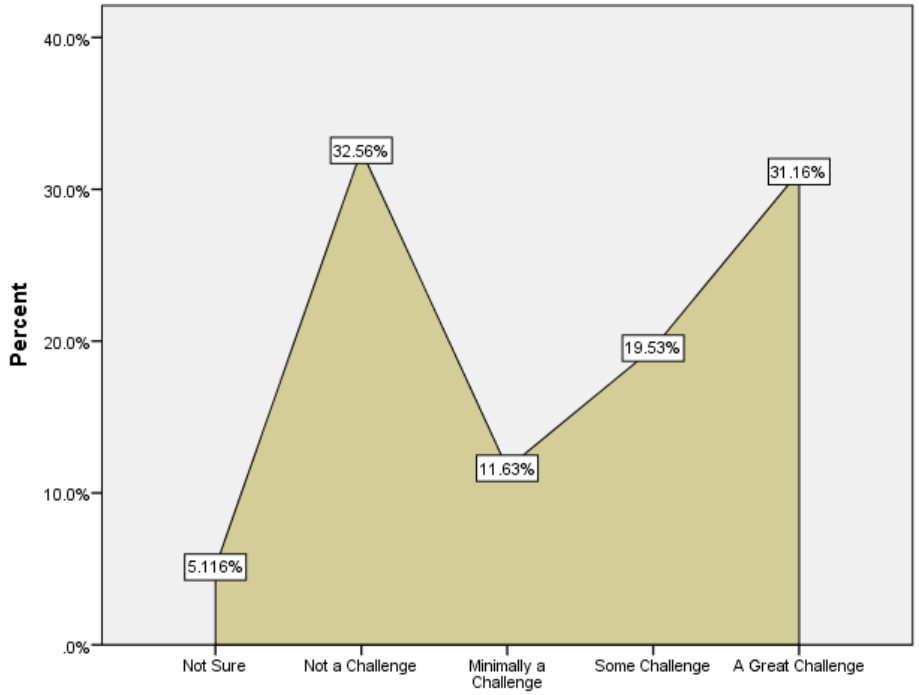


The last question asked was whether they had a challenge getting a technical expert to implement GAP on the farm. From their responses, 11, representing 5.11% of the sample population, were not sure if there was a challenge to get a technical expert to implement GAP, and 70 (32.56%) saw it as not a challenge. On the other hand, 25(11.63%) responded that getting technical expertise to implement the standards of GAP on the farm was a minimal challenge. About

42(19.53%) responded that they were having some challenges, and 67(31.16%) responded that they were having a great challenge in getting a technical expert to implement the standards on GAP on the farm. Figure 58 below further summarizes the findings on this area of questioning, which appeared in the descriptive analysis Table 21 earlier presented for better understanding.

Figure 58

Is it a Challenge to get a Technical Expert to Implement GAP



Inferential Statistical Analysis

The study adopted an inferential statistical analysis approach to further analyse the quantitative data collected from smallholder farmers in Kenya. Inferential statistics involves drawing conclusions or inferences based on a set of data observed (Chanoknath & Louangrath,

2015). Quantitative data in the study is collected to explore efficacy prior and post implementation of product food safety standards and quality management systems by smallholder farmers in Kenya. Therefore, using inferential statistics, the study compares descriptive statistics obtained from the sample population prior and post implementation of product food safety standards and quality management systems to make a conclusion or inference about the smallholder farmer population in Kenya. The results or findings derived from the sample population are used to draw conclusions about Kenya's larger smallholder farmers population.

Determination of multicollinearity in the study variables

When testing for multicollinearity, correlation is frequently employed to examine the relationship between a set of variables. Strong correlations between the independent variables are known as multicollinearity, and this is an undesirable scenario. Tolerance and the Variance Inflation Factor are two statistics used to measure multicollinearity. The Variance Inflation Factor is the tolerance's inverse (VIF). If a variable's VIF is 5 or higher, multicollinearity is linked with that variable. The multicollinearity results for variables in this study are shown below.

Multicollinearity of Importance of Good Agricultural Practice Variables

The test for multicollinearity was performed on the questionnaire section on the "Importance of Good Agricultural Practice (GAP) variables. As shown in Table 22 below, the results show that the tolerance values are not near 0, while the VIF values are less than 5, meaning that the variables have no multicollinearity in this category.

Table 22

Multicollinearity of Importance of Good Agricultural Practice Variables

Model	Collinearity Statistics	
	Tolerance	VIF
Importance to know market requirements- (Before GAP Implementation)	.671	1.491
Importance to know market requirements- (After GAP Implementation)	.469	2.132
Importance to know FSS requirements- (Before GAP Implementation)	.601	1.665
Importance to know FSS requirements- (After GAP Implementation)	.508	1.969
Importance to gain access to new markets- (Before GAP Implementation)	.530	1.887
Importance to gain access to new markets- (After GAP Implementation)	.361	2.767
Importance to know about product rejection- (Before GAP Implementation)	.509	1.966
Importance to know about product rejection- (After GAP Implementation)	.355	2.816
Importance to ensure you receive higher prices- (Before GAP Implementation)	.463	2.158
Importance to ensure you receive higher prices- (After GAP Implementation)	.427	2.343

Multicollinearity of Farm Activities Variables

Multicollinearity in the farm activities questionnaire section was tested, and the results are shown in Table 23. The Tolerance score for these variables was close to 1, while the VIF was less than 5, meaning there was no multicollinearity between these variables in this category.

Table 23

Multicollinearity of Farm Activities Variables

Model	Collinearity Statistics	
	Tolerance	VIF
Did you know about human infectious diseases and spread on farm- (Before GAP Implementation)	.759	1.318
Did you know about human infectious diseases and spread on farm- (After GAP Implementation)	.793	1.261
Did you know how to reduce product FS risks on farm- (Before GAP Implementation)	.667	1.500
Did you know how to reduce product FS risks on farm- (After GAP Implementation)	.684	1.462
Did you know the importance of cleaning and sanitizing on farm- (Before GAP Implementation)	.619	1.615
Did you know the importance of cleaning and sanitizing on farm- (After GAP Implementation)	.715	1.400
Were domestic animals kept in the farm- (Before GAP Implementation)	.559	1.788
Were domestic animals kept in the farm- (After GAP Implementation)	.584	1.712
Were you monitoring and testing of water quality- (Before GAP Implementation)	.519	1.926
Were you monitoring and testing of water quality- (After GAP Implementation)	.548	1.824

Multicollinearity of Farm Sales, Records and Documented Procedures

The variables in the questionnaire section on farm sales, records and documented procedures were also tested for multicollinearity, as shown in Table 24 below. The Tolerance score for these variables was close to 1, while the VIF was less than 5, meaning there was no multicollinearity between these variables in this category.

Table 24

Multicollinearity of Farm Sales, Records and Documented Procedures

Model	Collinearity Statistics	
	Tolerance	VIF
Which markets to sale farm produce- (Before GAP Implementation)	.769	1.301
Which markets to sale farm produce- (After GAP Implementation)	.733	1.364
Estimated farm produce sales per year- (Before GAP Implementation)	.624	1.602
Estimated farm produce sales per year- (After GAP Implementation)	.509	1.966
Keeping of farm produce sales records- (Before GAP Implementation)	.767	1.304
Keeping of farm produce sales records- (After GAP Implementation)	.443	2.255
Keeping of sales records for more than 3yrs- (Before GAP Implementation)	.644	1.554
Keeping of farm produce records for more than 3yrs- (After GAP Implementation)	.410	2.438
Keeping documented procedures on farm activities- (Before GAP Implementation)	.756	1.323
Keeping documented procedures on farm activities- (After GAP Implementation)	.773	1.294

Multicollinearity on Challenges When Implementing Standards of Good Agricultural Practices Variables

The variables in the last questionnaire section on challenges when implementing standards of GAP were also tested for multicollinearity, as shown in Table 25 below. From the results, the tolerance values for all the variables are greater than 0, while the VIF values were below 5, which means that there was no multicollinearity between variables in this category.

Table 25

Multicollinearity on Challenges When Implementing Standards of Good Agricultural Practices Variables

Model	Collinearity Statistics	
	Tolerance	VIF
Is understanding GAP a challenge on the farm	.517	1.933
Is the financial cost of implementing GAP a challenge	.563	1.777
Is it a challenge to get a technical expert to implement GAP	.505	1.981

It is, therefore, evident from the analysis that there is no multicollinearity between all the variables. Consequently, it was concluded that there was no evidence of multicollinearity in this study.

Chi-square Test

The study used the chi-square test to find if there was any relationship among non-numeric variables used when collecting data from the respondents or statistical analysis (Nihan, 2020).

Cramer's V statistics was used to determine the strength of association/relationship between the categorical variables. Cramer's V values in the range 0 to $\leq$ 0.1 indicate little if any association, >0.1 to $\leq$ 0.3 indicate low/weak association, >0.3 to $\leq$ 0.5 indicate moderate association and Cramer's V values $\geq$ 0.5 indicate high association.

The section below shows the chi-square test results in the respective sections, with questions answered by the participants.

Chi-square Test Results for the Importance of Good Agricultural Practices

The Chi-square test was performed to determine the dependence of the variables in Section B of the questionnaire and to help test the *Hypothesis 1a*:

H_0: There is no significant association between the farmers' knowledge about the importance of good agricultural practices before and after implementation of product food safety standards and quality management programmes; versus

H_1: There is a significant association between the farmers' knowledge about the importance of good agricultural practices before and after implementation of product food safety standards and quality management programmes.

The Chi-square results are shown in Table 26 below.

Table 26

Chi-square test results for the Importance of GAP

	Df	Asymp. Sig. (2-sided)	Cramer's V Value	Remarks
Importance to know market requirements- (After GAP Implementation) - Importance to know market requirements- (Before GAP Implementation)	16	.099	.166	Variable relationships are independent (no significant relationship) since the asymptotic significance is greater than 0.05 (p-value>0.05). However, there is a weak association since the Cramer's V value is >0.1 ≤0.3
Importance to know FSS requirements- (After GAP Implementation) - Importance to know FSS requirements- (Before GAP Implementation)	16	.033	.180	Variable relationships are independent (no significant relationship) since the asymptotic significance is greater than 0.05 (p-value>0.05). However, there is a weak association since the Cramer's V value is >0.1 ≤0.3
Importance to gain access to new markets- (After GAP Implementation) - Importance to gain access to new markets- (Before GAP Implementation)	16	.359	.142	Variable relationships are independent (no significant relationship) since the asymptotic significance is greater than 0.05 (p-value>0.05). However, there is a weak association since the Cramer's V value is >0.1 ≤0.3
Importance to know about product rejection- (After GAP Implementation) - Importance to know about product rejection- (Before GAP Implementation)	16	.001	.219	Variable relationships are dependent (relationship exists) since the asymptotic significance is less than 0.05 (p-value<0.05). However, there is a weak

				association since the Cramer's V value is >0.1 ≤0.3
Importance to ensure you receive higher prices- (After GAP Implementation) - Importance to ensure you receive higher prices- (Before GAP Implementation)	16	.053	.174	Variable relationships are independent (no significant relationship exists) since the asymptotic significance is greater than 0.05 (p-value>0.05). However, there is a weak association since the Cramer's V value is >0.1 ≤0.3

From the chi-test results of the study shown in Table 26, all the variables had low/weak relationships/associations before and after the implementation of GAP. That is a.) the importance to know about market requirements; b.) the importance to know the requirements of product food safety standards; c.) the importance to gain access to new markets; d.) the importance to know why buyers reject farm produce in the marketplace; and e.) the importance to ensure you received higher prices for farm produce.

Chi-square Test on Farm Activities

The Chi-square test was performed to determine the dependence of the variables in Section C of the questionnaire and to test *Hypothesis 2a*:

H_0: There is no significant association between the farmers' knowledge about important farm-related activities before and after implementation of product food safety standards and quality management programmes; versus

H_1: There is a significant association between the farmers' knowledge about important farm-related activities before and after implementation of product food safety standards and quality management programmes.

The Chi-square results are shown in Table 27 below.

Table 27

Chi-square Test on Farm Activities

	df	Asymp. Sig. (2-sided)	Cramer's V value	Remarks
Did you know about human infectious diseases and spread on the farm- (After GAP Implementation) - Did you know about human infectious diseases and spread on the farm- (Before GAP Implementation)	4	0.006	.184	Variable relationships are dependent (relationship exists) since the asymptotic significance is less than 0.05 (p-value<0.05). However, there is a weak association since the Cramer's V value is >0.1 ≤0.3
Did you know how to reduce product FS risks on the farm- (After GAP Implementation) - Did you know how to reduce product FS risks on the farm- (Before GAP Implementation)	4	0.218	.116	Variable relationships are independent (no significant relationship) since the asymptotic significance is greater than 0.05 (p-value>0.05). However, there is a weak association since the Cramer's V value is >0.1 ≤0.3
Did you know the importance of cleaning and sanitizing on the farm- (After GAP Implementation) - Did you know the importance of cleaning and	4	0.003	.194	Variable relationships are dependent (relationship exists) since the asymptotic significance is less than 0.05 (p-

sanitizing on the farm- (Before GAP Implementation)				value<0.05). However, there is a weak association since the Cramer's V value is >0.1 ≤0.3
Were domestic animals kept in the farm- (After GAP Implementation) - Were domestic animals kept in the farm- (Before GAP Implementation)	12	.000	.245	Variable relationships are dependent (relationship exists) since the asymptotic significance is less than 0.05 (p-value<0.05). However, there is a weak association since the Cramer's V value is >0.1 ≤0.3
Were you monitoring and testing water quality- (After GAP Implementation) - Were you monitoring and testing water quality- (Before GAP Implementation)	16	.000	.347	Variable relationships are dependent (relationship exists) since the asymptotic significance is less than 0.05 (p-value<0.05). However, there is a moderate association since the Cramer's V value is >0.3 ≤0.5

From the chi-test results of the study shown in Table 27, the variable that had low/weak relationship/associations before and after the implementation of GAP were; a.) to know about human infectious diseases and spread on the farm; b.) to know how to reduce product food safety on the farm; c.) to know the importance of cleaning and sanitizing on the farm; and d.) keeping of domestic animals kept in the farm. On the other hand, the variables that had moderate relationship/association before and after the implementation of GAP were on the monitoring and testing water quality.

Chi-square test on Farm Sales, Records, and Documented Procedures

The Chi-square test was performed to determine the dependencies of the variables in Section D of the questionnaire and to test *Hypothesis 3a*:

H_0: There is no significant association between the farmers' knowledge about where to sell farm produce, importance of keeping farm records and documented procedures before and after implementation of product food safety standards and quality management programmes; versus

H_1: There is a significant association between the farmers' knowledge about where to sell farm produce, importance of keeping farm records and documented procedures before and after implementation of product food safety standards and quality management programmes.

The Chi-square results are shown in Table 28 below.

Table 28

Chi-square Test on Farm Sales, Records, and Documented Procedures

	df	Asymp. Sig. (2-sided)	Cramer's V value	Remarks
Which markets to sell farm produce- (After GAP Implementation) - Which markets to sell farm produce- (Before GAP Implementation)	16	.000	.236	Variable relationships are dependent (relationship exists) since the asymptotic significance is less than 0.05 (p-value<0.05). However, there is a weak association since the Cramer's V value is >0.1 ≤0.3
Estimated farm produce sales per year- (After GAP Implementation) - Estimated	16	.000	.416	Variable relationships are dependent (relationship exists) since the asymptotic significance is less than 0.05 (p-

farm produce sales per year- (Before GAP Implementation)				value<0.05). However, there is a moderate association since the Cramer's V value is >0.3 ≤0.5
Keeping of farm produce sales records- (After GAP Implementation) - Keeping of farm produce sales records- (Before GAP Implementation)	16	.002	.208	Variable relationships are dependent (relationship exists) since the asymptotic significance is less than 0.05 (p-value<0.05). However, there is a weak association since the Cramer's V value is >0.1 ≤0.3
Keeping of farm produce records for more than 3yrs- (After GAP Implementation) - Keeping of sales records for more than 3yrs- (Before GAP Implementation)	16	.000	.286	Variable relationships are dependent (relationship exists) since the asymptotic significance is less than 0.05 (p-value<0.05). However, there is a weak association since the Cramer's V value is >0.1 ≤0.3
Keeping documented procedures on-farm activities- (After GAP Implementation) - Keeping documented procedures on-farm activities- (Before GAP Implementation)	16	.000	.403	Variable relationships are dependent (relationship exists) since the asymptotic significance is less than 0.05 (p-value<0.05). However, there is a moderate association since the Cramer's V value is >0.3 ≤0.5

From the chi-test results of the study shown in Table 28, the variables that had low/weak relationship/associations before and after the implementation of GAP were a.) which markets to sell farm produce; b.) keeping of farm produce sales records; and c.) keeping of farm produce sales records for more than 3 years. The variables that had moderate relationships/associations before and after the implementation of GAP were; a.) estimated farm produce sales per year; and b.) keeping documented procedures on-farm activities.

Wilcoxon Signed Rank Test

The nonparametric test that replaces the dependent t-test is the Wilcoxon signed-rank test. The dependent t-test should not be employed when the assumption of normality in the data has been broken. Therefore, the Wilcoxon signed-rank test is a preferred test, which does not make this assumption. The Wilcoxon signed-rank test compares two sets of scores from the same respondents when variables are subjected to more than one condition or when we want to analyze any score changes from one point to the next. In addition, the Wilcoxon signed-rank test assumes that the dependent variable is being measured at the ordinal or continuous level. Among other methods of ranking categories, Likert scales are examples of ordinal variables. Therefore, the assumption is valid for the study since most variables are measured on the Likert scale.

Wilcoxon Signed Rank Test on the Importance of GAP

Table 29 below provides comparative information on the respondent's opinions on the importance of GAP variables before and after the implementation of Good Agricultural Practice (GAP).

Table 29

Ranks of Importance of GAP

Ranks

		N	Mean Rank	Sum of Ranks
Importance to know market requirements- (After GAP Implementation) - Importance to know market requirements- (Before GAP Implementation)	Negative Ranks	21[a]	57.02	1197.50
	Positive Ranks	165[b]	98.14	16193.50
	Ties	29[c]		
	Total	215		
	Negative Ranks	34[d]	55.57	1889.50

Importance to know FSS requirements- (After GAP Implementation) - Importance to know FSS requirements- (Before GAP Implementation)	Positive Ranks	138[e]	94.12	12988.50
	Ties	43[f]		
	Total	215		
Importance to gain access to new markets- (After GAP Implementation) - Importance to gain access to new markets- (Before GAP Implementation)	Negative Ranks	35[g]	62.30	2180.50
	Positive Ranks	137[h]	92.68	12697.50
	Ties	43[i]		
	Total	215		
Importance to know about product rejection- (After GAP Implementation) - Importance to know about product rejection- (Before GAP Implementation)	Negative Ranks	45[j]	60.96	2743.00
	Positive Ranks	130[k]	97.36	12657.00
	Ties	40[l]		
	Total	215		
Importance to ensure you receive higher prices- (After GAP Implementation) - Importance to ensure you receive higher prices- (Before GAP Implementation)	Negative Ranks	26[m]	54.94	1428.50
	Positive Ranks	143[n]	90.47	12936.50
	Ties	46[o]		
	Total	215		

From the rank results on the importance of GAP, all responses had a higher post-opinion score than before the implementation of GAP. That is, a.) importance to know market requirements: a positive rank of 165(after GAP) compared to a negative rank of 21 (before GAP). There were 21 ties; b.) importance to know food safety standard requirements: a positive rank of 138(after GAP) compared to a negative rank of 34 (before GAP). There were 43 ties; c.) importance to gain access to new markets: a positive rank of 137(after GAP) compared to a negative rank of 35 (before GAP). There were 43 ties; d.) importance to know about product rejection: a positive rank of 130 (after GAP) compared to a negative rank of 45 (before GAP). There were 40 ties; e.) importance to ensure you receive higher prices: a positive rank of 143(after GAP) compared to a negative rank of 26 (before GAP). There were 46 ties.

In addition, Table 30 below is also derived to show the Wilcoxon signed-rank test for testing *Hypothesis 1b*:

H_0: There is no significant change in farmers' knowledge about the importance of good agricultural practices before and after implementation of product food safety standards and quality management programmes; versus

H_1: There is a significant change in farmers' knowledge about the importance of good agricultural practices before and after implementation of product food safety standards and quality management programmes.

The results show that the implementation of GAP (product food safety standards and quality management programmes) elicited a statistically significant change in the participant's opinion on the importance of GAP.

Table 30

Wilcoxon Signed Rank Results of Importance of GAP

	Z	Asymp. Sig. (2-tailed)	Remarks
Importance to know market requirements- (After GAP Implementation) - Importance to know market requirements- (Before GAP Implementation)	-10.364[b]	.000	p<0.0001. Therefore, significant change
Importance to know FSS requirements- (After GAP Implementation) - Importance to know FSS requirements- (Before GAP Implementation)	-8.607[b]	.000	p<0.0001. Therefore, significant change
Importance to gain access to new markets- (After GAP Implementation) - Importance to gain	-8.153[b]	.000	p<0.0001. Therefore, significant change

access to new markets- (Before GAP Implementation)			
Importance to know about product rejection- (After GAP Implementation) - Importance to know about product rejection- (Before GAP Implementation)	-7.489[b]	.000	p<0.0001. Therefore, significant change
Importance to ensure you receive higher prices- (After GAP Implementation) - Importance to ensure you receive higher prices- (Before GAP Implementation)	-9.160[b]	.000	p<0.0001. Therefore, significant change

b. Based on negative ranks.

From the results on Wilcoxon signed-rank results of the importance of GAP, there was a significant change in the participant's responses on a) the importance to know market requirements, b.) the importance to know FSS requirements, c.) the importance to gain access to new markets; d.) the importance to know about product rejection, and e.) the importance to ensure you receive higher prices.

Wilcoxon Signed Rank Test on Farm Activities

Table 31 below provides comparative information on the respondents' opinions on the farm activity variables before and after the implementation of Good Agricultural Practice (GAP).

Table 31

Ranks of Farm Activities

Ranks

		N	Mean Rank	Sum of Ranks
Did you know about human infectious diseases and spread on a farm- (After GAP Implementation) - Did you know about human infectious diseases and spread on the farm- (Before GAP Implementation)	Negative Ranks	164[a]	90.46	14835.50
	Positive Ranks	15[b]	84.97	1274.50
	Ties	36[c]		
	Total	215		
Did you know how to reduce product FS risks on the farm- (After GAP Implementation) - Did you know how to reduce product FS risks on the farm- (Before GAP Implementation)	Negative Ranks	152[d]	84.24	12804.50
	Positive Ranks	13[e]	68.50	890.50
	Ties	50[f]		
	Total	215		
Did you know the importance of cleaning and sanitizing on the farm- (After GAP Implementation) - Did you know the importance of cleaning and sanitizing on the farm- (Before GAP Implementation)	Negative Ranks	147[g]	79.66	11710.50
	Positive Ranks	13[h]	89.96	1169.50
	Ties	55[i]		
	Total	215		
Were domestic animals kept in the farm- (After GAP Implementation) - Were domestic animals kept in the farm- (Before GAP Implementation)	Negative Ranks	153[j]	88.11	13481.50
	Positive Ranks	18[k]	68.03	1224.50
	Ties	44[l]		
	Total	215		
Were you monitoring and testing water quality- (After GAP Implementation) -	Negative Ranks	146[m]	87.11	12718.50
	Positive Ranks	20[n]	57.13	1142.50

Were you monitoring and testing water quality- (Before GAP Implementation)	Ties	49[o]
	Total	215

From the rank result on farm activities, all responses had a higher pre-opinion score than after the implementation of GAP. That is, a.) did you know about human infectious diseases and spread on a farm: a negative rank of 164(before GAP) compared to a positive rank of 15 (after GAP). There were 36 ties; b.) did you know how to reduce product food safety risks on the farm: a negative rank of 152 (before GAP) compared to a positive rank of 13 (after GAP). There were 50 ties; c.) did you know the importance of cleaning and sanitizing on the farm: a negative rank of 147(before GAP) compared to a positive rank of 13 (after GAP). There were 55 ties; d.) were domestic animals kept in the farm: a negative rank of 153 (after GAP) compared to a positive rank of 18 (after GAP). There were 44 ties; e.) were you monitoring and testing water quality: a negative rank of 146 (before GAP) compared to a positive rank of 20 (after GAP). There were 49 ties.

In addition, Table 32 below is also derived to show the Wilcoxon signed-rank test for testing *Hypothesis 2b***:**

H_0: There is no significant change in farmers' knowledge about important farm-related activities before and after implementation of product food safety standards and quality management programmes; versus

H_1: There is a significant change in farmers' knowledge about important farm-related activities before and after implementation of product food safety standards and quality management programmes.

The results in Table 32 below show that the implementation of GAP elicited a statistically significant change in the participants' opinion on the farm activities.

Table 32:

Wilcoxon Signed Rank Results of Farm Activities

	Z	Asymp. Sig. (2-tailed)	Remarks
Did you know about human infectious diseases and spread on the farm- (After GAP Implementation) - Did you know about human infectious diseases and spread on the farm- (Before GAP Implementation)	-10.706[b]	.000	p<0.0001. Therefore, significant change
Did you know how to reduce product FS risks on the farm- (After GAP Implementation) - Did you know how to reduce product FS risks on the farm- (Before GAP Implementation)	-10.452[b]	.000	p<0.0001. Therefore, significant change
Did you know the importance of cleaning and sanitizing on the farm- (After GAP Implementation) - Did you know the importance of cleaning and sanitizing on the farm- (Before GAP Implementation)	-9.877[b]	.000	p<0.0001. Therefore, significant change
Were domestic animals kept in the farm- (After GAP Implementation) - Were domestic animals kept in the farm- (Before GAP Implementation)	-9.589[b]	.000	p<0.0001. Therefore, significant change
Were you monitoring and testing water quality- (After GAP Implementation) - Were you monitoring and testing water quality- (Before GAP Implementation)	-9.485[b]	.000	p<0.0001. Therefore, significant change

b. Based on negative ranks.

From the results on Wilcoxon signed-rank results of the farm activities, there was a significant change in the participant's responses on a) did you know about human infectious diseases and spread on a farm; b.) did you know how to reduce product FS risks on the farm; c.) did you know the importance of cleaning and sanitizing on the farm; d.) were domestic animals kept in the farm, and e.) were you monitoring and testing water quality.

Wilcoxon Signed Rank Results on Farm Sales, Records and Documented Procedures

Table 33 below provides comparative information on the respondents' opinions on farm sales, records, and procedure variables before and after the implementation of Good Agricultural Practice (GAP).

Table 33

Ranks on Farm Sales, Records and Documented Procedures

Ranks

		N	Mean Rank	Sum of Ranks
Which markets to sell farm produce- (After GAP Implementation) - Which markets to sell farm produce- (Before GAP Implementation)	Negative Ranks	20[a]	48.08	961.50
	Positive Ranks	97[b]	61.25	5941.50
	Ties	98[c]		
	Total	215		
Estimated farm produce sales per year- (After GAP Implementation) - Estimated farm produce sales per year- (Before GAP Implementation)	Negative Ranks	14[d]	61.25	857.50
	Positive Ranks	122[e]	69.33	8458.50
	Ties	79[f]		
	Total	215		
	Negative Ranks	21[g]	89.64	1882.50

Keeping of farm produce sales records- (After GAP Implementation) - Keeping of farm produce sales records- (Before GAP Implementation)	Positive Ranks	162[h]	92.31	14953.50
	Ties	32[i]		
	Total	215		
Keeping of farm produce records for more than 3yrs- (After GAP Implementation) - Keeping of sales records for more than 3yrs- (Before GAP Implementation)	Negative Ranks	42[j]	68.82	2890.50
	Positive Ranks	117[k]	84.01	9829.50
	Ties	56[l]		
	Total	215		
Keeping documented procedures on-farm activities- (After GAP Implementation) - Keeping documented procedures on-farm activities- (Before GAP Implementation)	Negative Ranks	151[m]	82.36	12436.00
	Positive Ranks	10[n]	60.50	605.00
	Ties	54[o]		
	Total	215		

From the rank results of farm sales, records and documented procedures, most responses had a higher post-opinion score on the variables than before the implementation of GAP other than one response. That is, a.) which markets to sell farm produce: a positive rank of 97 (after GAP) compared to a negative rank of 20 (before GAP). There were 98 ties; b.) estimated farm produce sales per year: a positive rank of 122 (after GAP) compared to a negative rank of 14 (before GAP). There were 79 ties; c.) keeping of farm produce sales records: a positive rank of 162 (after GAP) compared to a negative rank of 21 (before GAP). There were 32 ties; d.) keeping of farm produce records for more than 3yrs: a positive rank of 117 (after GAP) compared to a negative rank of 42 (before GAP). There were 56 ties. Only the response on keeping documented procedures on-farm activities had a varying opinion: a positive rank of 10 (after GAP) compared to a negative rank of 151 (before GAP). There were 54 ties.

In addition, Table 34 below is also derived to show the Wilcoxon signed-rank test for testing *Hypothesis 3b***:**

H_0: There is no significant change in farmers' knowledge about where to sell farm produce, importance of keeping farm records and documented procedures before and after implementation of product food safety standards and quality management programmes; versus

H_1: There is a significant change in farmers' knowledge about where to sell farm produce, importance of keeping farm records and documented procedures before and after implementation of product food safety standards and quality management programmes

The results in Table 34 below show that the implementation of GAP elicited a statistically significant change in the participants' opinion on the farm sales, records, and documented procedures.

Table 34

Wilcoxon Signed Rank Results on Farm Sales, Records, and Documented Procedures

	Z	Asymp. Sig. (2-tailed)	Remarks
Which markets to sell farm produce- (After GAP Implementation) - Which markets to sell farm produce- (Before GAP Implementation)	-7.085[b]	.000	p<0.0001. Therefore, significant change
Estimated farm produce sales per year- (After GAP Implementation) - Estimated farm produce sales per year- (Before GAP Implementation)	-8.353[b]	.000	p<0.0001. Therefore, significant change
Keeping of farm produce sales records- (After GAP Implementation) - Keeping of farm produce sales records- (Before GAP Implementation)	-9.257[b]	.000	p<0.0001. Therefore, significant change

Keeping of farm produce records for more than 3yrs- (After GAP Implementation) - Keeping of sales records for more than 3yrs- (Before GAP Implementation)	-6.064[b]	.000	p<0.0001. Therefore, significant change
Keeping documented procedures on-farm activities- (After GAP Implementation) - Keeping documented procedures on-farm activities- (Before GAP Implementation)	-10.151[c]	.000	p<0.0001. Therefore, significant change

b. Based on negative ranks.

From the results on Wilcoxon signed-rank results of the farm sales, records, and documented procedures activities, there was a significant change in the participant's responses on a) which markets to sell farm produce; b.) estimated farm produce sales per year; c.) keeping of farm produce sales records; d.) keeping of farm produce records for more than 3yrs and e.) keeping documented procedures on-farm activities.

Qualitative Results

The main purpose of the research study was to determine the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. Therefore, the study compared efficacy prior and post implementation of product food safety and quality management systems among smallholder farmers in Kenya. The explanatory sequential research design was adopted in the study to allow quantitative data to be collected first from smallholder farmers, then qualitative data collected from key stakeholders in the agricultural sector, as shown in Table 35 to further explain and elaborate on the quantitative results (Creswell & Clark, 2018).

Table 35

Qualitative data collected from key stakeholders in the agricultural sector in Kenya

Sector		Stakeholder
1.	Government Agencies:	
	Horticultural Crop Authority	4 participants
	Ministry of Agriculture	1 participant
2.	Horticulture Exporting Companies	2 participants
3.	Agricultural Extension Officers	1 participant

The study used open-ended interview questions as the research tool to collect qualitative data from informants in Kenya's agricultural sector. The issues considered in the interview questions in the collection of qualitative data are shown in Table 36.

Table 36

Issues considered in the study when collecting qualitative data

Qualitative
1. Demographic
2. Extent smallholder farmers have benefited from implementing good agricultural practices
3. Factors or enablers that make smallholder farmers implement good agricultural practices
4. Challenges faced by smallholder farmers when implementing good agricultural practices
5. Recommendations to smallholder farmers that want to do a change management process and implement good agricultural practices
6. The extent of government support to encourage smallholder farmers to implement good agricultural practices
7. Social-economic impacts on smallholder farmers that have implemented good agricultural practices
8. How smallholder farmers can acquire knowledge to mitigate embedded risks when implementing good agricultural practices

The key stakeholders or informants were asked to voice their experiences best while the researcher recorded the answers for further analysis (Creswell, 2012). The qualitative data primarily expressed the detailed insights, views, beliefs, experiences and motivations (Gill et al., 2008) of key stakeholders regarding the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. The collected interview data, which had been audio recorded, was then transcribed into words and then entered into a computer file for analysis purposes.

The study used a thematic approach to analyse the qualitative data collected from key stakeholders in the agricultural sector in Kenya. As a result, the researcher would better understand smallholder farmers' thoughts, experiences, and behaviour patterns (Kiger & Varpio, 2020) on efficacy prior and post implementation of product food safety standards and quality management systems.

Themes

The interviews with the key stakeholders in the agricultural sector in Kenya were analysed, and four themes were identified to address the research questions, as shown in Table 37. The selected codes and themes were centred around the change management process to determine the efficacy of smallholder farmers in Kenya prior and post implementation of product food safety standards and quality management systems.

Table 37

Major Themes Identified from the Interviews with Key Stakeholders in the Agricultural Sector

Themes	Definitions	Exemplifiers
1. Understanding Context	Smallholder farmer's understanding of the change management process	Stakeholders cite the key enablers/drivers in implementing product food standards and quality management systems by smallholder farmers in Kenya. For example: "…smallholder farmers are expected to understand the protocols and requirements of product food safety standards and quality management systems for undertaking at the farm level". "…the implementation of product food safety and quality management system presented as an elementary foundation for smallholder farmers that want to produce safe food for humans and increase profitability".
2. Outcomes	Result and consequence of the smallholder farmer's change management process	Stakeholders cite the benefits and challenges that smallholder farmers encounter in implementing product food safety standards and quality management systems. For example: Benefit: "…extensive training has been given to smallholder farmers on product food safety and quality management systems". Challenge: "lack of adequate resources has resulted in smallholder farmers not complying with post-harvest procedures and thus affecting the quality of farm produce…". Social impact: "Emphasis on diversification in that those smallholder farmers producing vegetables are also producing fruits and flowers for alternative markets".
3. Government Involvement	Government of Kenya's initiative to develop and sustain smallholder farmer's compliance with product food safety standards and quality management systems	Stakeholders cite what the government can do to encourage more farmers in Kenya to implement product food safety standards and quality management programmes. For example: "County Government and Horticultural Crop Development… join together to form a hearing committee that handles issues on product food safety and quality management systems, right from the farm to the marketplace…".
4. Mapping Pathway/ Evaluation	Smallholder farmer's chance to discuss and evaluate the change management process	Stakeholders cite recommendations that help smallholder farmers implement product food safety standards and quality management systems. For example: "…smallholder farmers need to be given more knowledge on product food safety and quality

	management systems, farm tools and assistance in marketing and personal protective equipment to improve farm production and sales". "smallholder farmers need to be organized in groups so that products are sourced from predefined sources for sale to common markets...".

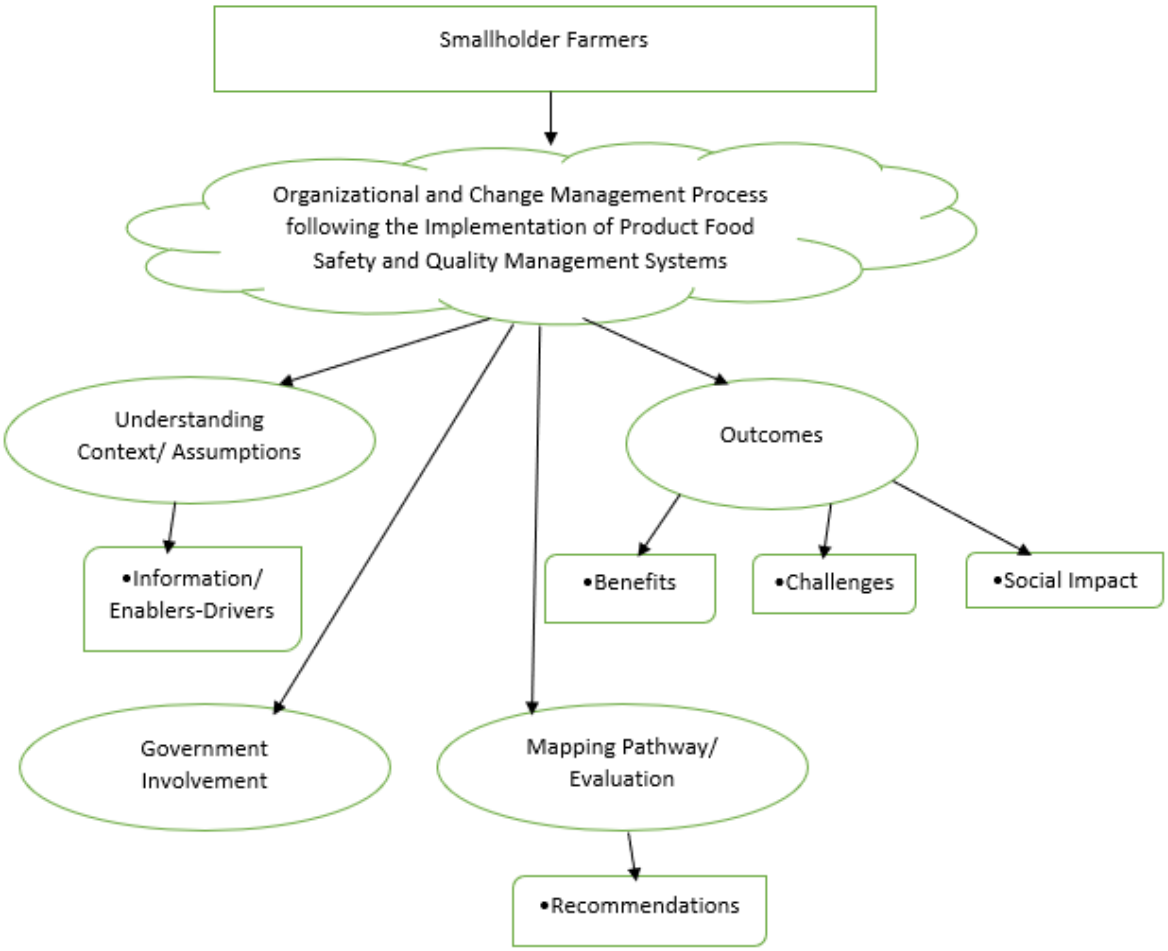
In summary, understanding context (Theme 1) is a major theme identified in the study from the interviews with key stakeholders in the agricultural sector that sought to determine the smallholder farmer's understanding of the change management process. The findings provided answers that addressed RQ2, that is, what the key enablers/drivers are in the implementation of product food standards and quality management systems for smallholder farmers in Kenya. Outcomes (Theme 2) is another major theme identified in the study from the interviews with key stakeholders in the agricultural sector that sought to determine the result and consequence of the smallholder farmer's change management process. The findings provided answers that addressed RQ1, that is, to what extent have smallholder farmers in Kenya benefited from the implementation of product food safety standards and quality management system, QR3, that is, what are the challenges faced by smallholder farmers in Kenya in establishing and implementing product food safety standards and quality management systems, and, RQ4, that is, what are the factors that have contributed to majority of the smallholder farmers in Kenya not implementing product food safety and quality management systems. Government involvement (Theme 3) is another major theme identified in the study from the interviews with key stakeholders in the agricultural sector that sought to determine the initiatives by the Government of Kenya to develop and sustain smallholder farmers' compliance with product food safety standards and quality management systems. The findings provided answers that addressed RQ5, that is, what can the government do to encourage

more farmers in Kenya to implement product food safety standards and quality management programmes. Finally, mapping pathway/ evaluation (Theme 4) is a major theme identified in the study from the interviews with key stakeholders in the agricultural sector that sought to provide a chance for smallholder farmers to discuss and evaluate the overall change management process.

Therefore, the qualitative analysis focused on discussions and dynamic interactions with the informants. The data collected were coded separately, and codes were identified, designed, and developed to respond directly to the research questions. A thematic framework was created from the collected data, as shown in Figure 59.

Figure 59

Thematic Framework for the Interview Responses



The researcher analyzed the selected themes in the study from the qualitative data collected to address the five research questions below:

(RQ 1): To what extent have smallholder farmers in Kenya benefited from the implementation of product food safety standards and quality management systems?

(RQ 2): What are the key enablers/drivers in the implementation of product food standards and quality management systems for smallholder farmers in Kenya?

(RQ 3): What are the challenges faced by smallholder farmers in Kenya in establishing and implementing product food safety standards and quality management systems?

(RQ 4): What are the factors that have contributed to majority of the smallholder farmers in Kenya not implementing product food safety and quality management systems?

(RQ 5): What can the government do to encourage more farmers in Kenya to implement product food safety standards and quality management programmes?

The findings from the qualitative data analysis are discussed in the next section.

Research Question 1

The first research question (**RQ 1)** explored how smallholder farmers in Kenya benefited from implementing product food safety standards and quality management systems. Several informants seemed to affirm that the implementation of a product food safety standard and quality management systems in their management process benefited smallholder farmers in many ways. For example, Stakeholder 1 reported that smallholder farmers benefited from 'extensive training…' following the change management process of implementing product food safety standards and quality management systems. In addition, some of the informants were of the view that smallholder farmers demonstrated improvement '… in the management of the land and ecosystem within their surrounding' (Stakeholder 3). Furthermore, there seemed to be a consensus that smallholder farmers appeared to produce '…quality and safe food for market consumption, thus improving their incomes' since they could be '… contracted for an organized market… increasing market opportunities' (Stakeholder 2). Some smallholder farmers seem to have had a social impact on their

communities. Smallholder farmers who have been able to access new markets seem to have further diversified their income sources through other means like '…producing…flowers for alternative markets' and '…educating their children….' (Stakeholder 1).

Smallholder farmers implementing product food safety standards and quality management systems seem to have benefited from good agricultural practices. Such benefits include the 'good use of farm water, soil analysis that assists in the soil texture and thus improving farm yield, and the adherence to good ethical business protocols' (Stakeholder 2).

Research Question 2

The second research question (**RQ 2)** asked what are the key enablers/drivers in the implementation of product food safety standards and quality management systems for smallholder farmers in Kenya. The objective of this question was to explore smallholder farmers' understanding of the change management process when implementing product food standards and quality management systems. Stakeholder 7 stated that 'smallholder farmers are expected to understand the protocols and requirements of product food safety standards and quality management systems for undertaking at the farm level'. Good agricultural practices encompassing the implementation of product food safety and quality management systems ought to be viewed as '…an elementary foundation for smallholder farmers that want to produce safe food for humans and increase profitability' (Stakeholder 2). The assured market, therefore, ought to be the enabling factor that 'motivates smallholder farmers to implement product food safety standards and quality management systems and partner with market buyers to optimize sales returns' (Stakeholder 2 & 8).

Research Question 3

The third research question (**RQ 3)** asked what challenges smallholder farmers faced in establishing and implementing product food safety standards and quality management systems in Kenya. Many smallholder farmers in Kenya seem to find it challenging when implementing product food safety standards and quality management systems as a change management process in their farming operations. '… it is a costly exercise since it requires some structures as per standard requirement' (Stakeholder 5). In addition, after implementing product food safety and quality management systems, '…farmers need to do regular monitoring to prevent challenges of post implementation' (Stakeholder 8). There was also an issue of the lack of adequate resources, which resulted in '…smallholder farmers not complying with post-harvest procedures and thus affecting the quality of farm produce' (Stakeholder 1).

Furthermore, stakeholder 2 seemed to suggest that 'many of the smallholder farmers are not highly educated, making it difficult to adequately understand and implement product food safety and quality management system requirements'. Also, it was observed that the cost of implementing product food safety standards and quality management systems seemed prohibitive to many smallholder farmers. Therefore, many smallholder farmers '…are restricted from accessing global markets, thus affecting changes to improve livelihoods' (Stakeholder 3).

Research Question 4

The fourth research question (**RQ 4)** asked, what are the factors that have contributed to majority of the smallholder farmers in Kenya not implementing product food safety standards and quality management systems?

This question seems to have been primarily explained by the challenges in RQ 3 faced by the smallholder farmers in Kenya when trying to instigate a change management process to implement product food safety standards and quality management systems. However, the overriding reason, according to Stakeholder 1, for most smallholder farmers not implementing product food safety standards and quality management systems is the 'lack of motivation to engage them in the active marketing of their produce' from diverse sources such as the Government and entities such as the Fresh Product Exporters Association of Kenya (FPEAK). As a result, smallholder farmers that have implemented product food safety standards and quality management systems do not seem to stand out in the communities "…as admirable ambassadors of global safety and security proponents' (Stakeholder 5).

Research Question 5

The fifth research question (**RQ 5)** asked what can the government do to encourage more farmers in Kenya to implement product food safety standards and quality management systems. The primary focus was to explore the initiatives the Government of Kenya undertook to develop and sustain smallholder farmer's compliance with product food safety standards and quality management systems. There seemed to be a consensus that the Government of Kenya has made efforts to ensure that smallholder farmers implement product food safety standards and quality management systems to access international and regional markets to increase sales returns and improve livelihoods. According to Stakeholder 1, '…County Government and Horticultural Crop Development have joined together to form a hearing committee that handles issues on product food safety standards and quality management systems from the farm to the marketplace. Further, the

'… county governments have availed extension agricultural workers that assist smallholder farmers in implementing and monitoring product food safety standards and quality management systems.

However, it still appears that the government needs to do much more to assist smallholder farmers in overcoming challenges related to implementing product food safety standards and quality management systems. According to Stakeholder 3, the national government should provide '… funding that can help smallholder farmers in Kenya purchase farm inputs at subsidized prices'. In addition, the national Government '…should do more research on agricultural-based technology that would boost the returns of smallholder farmers'.

In summary, in the thematic analysis of the qualitative data collected from the key stakeholders from the agricultural sector in Kenya, four major themes corresponding to the study questions were selected to aid in solving the research problem.

Evaluation of Findings

The study sought to determine and explore the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. The study also considered that smallholder farmers in Kenya have made great strides to adopt change management models that recognize global product food safety standards and quality management systems (Doherty & Kittipanya-Ngam, 2021). However, compliances with product food safety standards and quality management systems are generally burdensome and costly (Maguire-Rajpaul et al., 2020). Nevertheless, once product food safety standards and quality management systems are implemented correctly, the change management process can improve efficiencies and, thus, more accessibility to markets, leading to improved livelihoods (Lee et al., 2012).

The study presented a mixed method analysis of large quantitative and qualitative datasets that compared the efficacy prior and post the implementation of product food safety standards and quality management systems among smallholder farmers in Kenya. The study collected quantitative data from 215 smallholder farmers in Meru county, a dominant production of every type of fruit and vegetable in Kenya, sold in international and domestic markets. Further, the study collected qualitative data from 8 key stakeholders in the agricultural sector in Kenya. A brief report on the evaluation of the findings is presented below.

RQ (1): To what extent have smallholder farmers in Kenya benefited from the implementation of product food safety standards and quality management systems?

The findings from the quantitative analysis indicate that more males 112(52.1%) than females 102(47.4%) have engaged the principles and roles of change in their management systems by implementing product food safety standards and quality management systems to gain access to international markets to improve livelihoods. Further, the findings indicate that smallholder farmers' critical production of farming services primarily benefits the family structure, with 76.7% of married people compared to 14% of single people, contributing significantly to agricultural production, food security and biodiversity in Kenya (Kamara et al., 2019). In addition, 1-5 people in every household, being 61.4% of smallholder farmers in Kenya, seem to benefit from the societal transition of livelihoods that enable the sustainability and equitable distribution of food systems that tackle poverty and environmental issues (Andrade, 2016; FAO, 2014).

The increase in smallholder farmers' accessibility to the local and international markets from 4.2% to 41.4% after implementing product food safety standards and quality management systems

further explains the benefits of the change management process for smallholder farmers in Kenya. Produce sales per year have also recorded increased income, that is, Kes. 50,000 – Kes. 99,999 from 13.0% to 25.1%, and Kes. 100,000 and above, from 3.3% to 28.4%.

Findings from the qualitative analysis further show that smallholder farmers have benefited from the proliferated response of change by implementing product food safety standards and quality management systems to respond to the global agri-food system (Lee et al., 2012). Some of the benefits highlighted by key stakeholders in the agricultural sector include a.) extensive smallholder farmer training, b.) improved farm management operations and the surrounding ecosystem, c.) increased market opportunities resulting in increased returns, d.) diversification of income from other sources such as livestock farming; and finally, e.) the social community impact from the exchange of agriculture information leading to reduced risks in the food supply chain, improved farm yields, and compliance to good ethical business protocols.

RQ (2): What are the key enablers/drivers in the implementation of product food safety standards and quality management systems for smallholder farmers in Kenya?

In the findings of the quantitative analysis, 74% of the respondents confirmed that knowledge of the market requirement following the implementation of product food safety standards and quality management systems was a key enabler and driver of the smallholder change management process. Further, 72.6% of the respondents indicated that access to new markets after the change management process also contributed significantly to the implementation of product food safety standards and quality management systems since farm operations could be applied widely in the context of program development and evaluation (Silva et al., 2015; Vogel, 2012). For

example, the awareness of keeping farm produce records increased from 5.1% of the respondents to 31.2%, indicating improvement in logical planning management models after adopting a change process (Clark & Apgar, 2019). In addition, smallholder farmers that kept sales records for more than 3 years increased from 6% to 32.1% after adopting systematic management changes by implementing product food safety standards and quality management systems.

Findings from the qualitative analysis further indicated that increased profitability and desire to optimize sales returns through producing safe food for human consumption and market partnerships were also key drivers in the smallholder farmer's change management process.

RQ (3): What are the challenges faced by smallholder farmers in Kenya in the establishment and implementation of product food safety standards and quality management systems?

In the findings from the quantitative analysis, 31.2% of the respondents indicated that the financial cost of implementing product food safety standards and quality management systems is a great challenge, whereas 21.4% experienced some challenges. The findings on the challenge of the financial cost represent more than 50% of the respondents. The lack of adequate public expenditure by the national Government to support smallholder farmers is a barrier to agricultural productivity in Kenya (Birch, 2018). Further, the findings indicate that 31.2% of respondents confirmed that getting adequate technical expertise to implement the change management process is a great challenge, whereas 19.5% stated they were getting some challenges. The findings on the challenge of technical expertise represent almost 50% of the respondents. Birch (2018) further states that the national Government's budgetary expenditures have reduced over time, and hence, the smallholder farmer cannot be adequately supported with agricultural extension services.

Findings from the qualitative analysis also seemed to affirm the costly exercise in implementing the change management process since some infrastructure needs must be met in compliance with the standard requirements. Also, many smallholder farmers do not have adequate financial resources to comply with post-harvest procedures, affecting the quality of farm produce. Furthermore, many smallholder farmers are not highly educated, making it challenging to adequately comprehend the requirements of product food safety standards and quality management systems. According to the statistical analysis on the level of education, 40% of the respondents have secondary/high school qualifications, whereas 28.8% have primary school qualifications. Only 27.9% have college/university qualifications.

RQ (4): What are the factors that have contributed to majority of the smallholder farmers in Kenya not implementing product food safety and quality management systems?

Smallholder farmers encounter several challenges that hinder them from implementing product food safety standards and quality management systems, which makes it difficult to effectively compete in marketplaces and contribute to the strategic food security goals (Kamara et al., 2019; RSA, 2012). According to the findings of the quantitative analysis, some of the challenges range from understanding the requirements of the product food safety standards and quality management systems; that is, 20% of the respondents have a great challenge, 12.6% have some challenges, and 22.8% have minimal challenges. Further, other hindrances result from financial challenges; 31.2% of the respondents have a great challenge, 21.4% have some challenges, and 19.1% have minimal challenges. Also, the challenges in getting technical expertise to guide the implementation of product food safety standards and quality management systems is another reason

why the majority of smallholder farmers in Kenya have not implemented product food safety standards and quality management systems. The findings revealed that 31.2% of the respondents have a great challenge, 19.5% have some challenges, and 11.6% have minimal challenges.

Other factors besides understanding the requirements of the standards, financial costs and sourcing for technical expertise include climate change with hazardous variables such as high temperatures, floods, droughts, bushfires, soil salinity and shifts in the rainfall patterns affecting crop production, and the livelihood of smallholder farmers (Kipkoech et al., 2015; Paloma et al., 2020).

The qualitative analysis revealed that smallholder farmers also lack the motivation to engage in active marketing from support entities such as the National government and the Fresh Product Exporters Association of Kenya (FPEAK). Also, the few smallholder farmers that have implemented product food safety standards and quality management systems do not seem to be admirable ambassadors of global safety and security proponents. Therefore, other smallholder farmers are denied the opportunities to implement globally recognized international standards that would increase returns and improve household livelihoods.

RQ (5): What can the government do to encourage more farmers in Kenya to implement product food safety standards and quality management programmes?

The national Government has fronted Kenya as an investment region in agriculture, agri-business spanning from crop production, animal production and marketing hub for local and export consumption markets (AMADPOC, 2011). Further, the national Government has developed agri-

based strategic policies through the Kenya Vision 2030 to advance the smallholder farmers' operating environment, increase sales returns, and thus improve livelihoods (Wangu et al., 2021).

The findings from the qualitative analysis indicated that there is a consensus that the national Government has made efforts to help smallholder farmers implement and comply with product food safety standards and quality management systems in the change management process. For example, through institutions such as the county governments and Horticultural Crop Development (HCD), the national Government has formed hearing committees with smallholder farmer representation that discuss issues, such as farm-to-marketplace supply chain operations and global standards implementations and compliances.

Nevertheless, the study findings still indicate that much more is expected from the National government to help smallholder farmers implement product food safety standards and quality management systems to access global markets to increase returns and improve household livelihoods. For example, a.) the need to subsidize costs of farm inputs; b.) increase efforts towards agri-based technology research to boost smallholder farmer's returns; and c.) intensify the marketing of smallholder farmer's products in the international markets.

Table 38 below summarises the study findings, integrating quantitative and qualitative results.

Table 38:

Integration of Quantitative and Qualitative Findings

RQ	Quantitative Findings	Qualitative Findings
RQ1: To what extent have smallholder farmers in Kenya benefited from the implementation of product food safety standards and quality management systems	- The smallholder farmers' critical production of farming services primarily benefits the family structure, contributing significantly to agricultural production, food security and biodiversity in Kenya.	- Some of the benefits highlighted by key stakeholders in the agricultural sector include a.) extensive smallholder farmer training, b.) improved farm management operations and the surrounding ecosystem, c.) increased market

	- Smallholder farmers in Kenya seem to benefit from the societal transition of livelihoods that enable the sustainability and equitable distribution of food systems that tackle poverty and environmental issues. - The increase in smallholder farmers' accessibility to the local and international markets after implementing product food safety standards and quality management systems further explained the benefits of the change management process for smallholder farmers in Kenya. Produce sales per year recorded increased income.	opportunities resulting in increased returns, d.) diversification of income from other sources such as livestock farming; and finally, e.) the social community impact from the exchange of agriculture information leading to reduced risks in the food supply chain, improved farm yields, and compliance to good ethical business protocols.
RQ2: What are the key enablers/drivers in the implementation of product food safety standards and quality management systems for smallholder farmers in Kenya	- In the findings, the smallholder farmers confirmed that knowledge of the market requirement following the implementation of product food safety standards and quality management systems was a key enabler and driver of the smallholder change management process. - Further, access to new markets after the change management process also contributed significantly to the implementation of product food safety standards and quality management systems since farm operations could be applied widely in the context of program development and evaluation.	- Findings by the key stakeholders in the agricultural sector indicated that increased profitability and desire to optimize sales returns through producing safe food for human consumption and market partnerships were also key drivers in the smallholder farmer's change management process.
RQ3: What are the challenges faced by smallholder farmers in Kenya in the establishment and implementation of product food safety standards and quality management systems	- In the findings from the quantitative analysis, the smallholder farmers indicated that the financial cost of implementing product food safety standards and quality management systems is a great challenge. - Also, the findings indicated challenges in identifying technical expertise to help implement product food safety standards and quality management systems. - According to Birch (2018), the national government's budgetary expenditures have reduced over time, and hence, smallholder farmers cannot be adequately supported by agricultural extension services.	- Findings from the key stakeholders in the agricultural sector also seemed to affirm the costly exercise in implementing the change management process since some infrastructure needs must be met in compliance with the standard requirements. - Also, many smallholder farmers do not have adequate financial resources to comply with post-harvest procedures, affecting the quality of farm produce. - Many smallholder farmers are not highly educated, making it challenging to adequately comprehend the requirements of product food safety standards and quality management systems.

RQ4: What are the factors that have contributed to majority of the smallholder farmers in Kenya not implementing product food safety and quality management systems	- According to the findings of the quantitative analysis, some of the challenges faced by smallholder farmers contributing to not implementing product food safety standards and quality management systems range from challenges in understanding the requirements of the product food safety standards and quality management systems, financial challenges, challenges in getting technical expertise to guide the implementation of product food safety standards and quality management systems. - Other factors beyond the control of the smallholder farmers preventing the implementation of product food safety standards and quality management systems include climate change with hazardous variables such as high temperatures, floods, droughts, bushfires, soil salinity and shifts in the rainfall patterns affecting crop production and the livelihood of smallholder farmers (Kipkoech et al., 2015; Paloma et al., 2020).	- The qualitative analysis revealed that smallholder farmers also lack the motivation to engage in active marketing from support entities such as the National government and the Fresh Product Exporters Association of Kenya (FPEAK). - Also, the few smallholder farmers that have implemented product food safety standards and quality management systems do not seem to be admirable ambassadors of global safety and security proponents. Therefore, other smallholder farmers are denied the opportunities to implement globally recognized international standards that would increase returns and improve household livelihoods.
RQ5: What can the government do to encourage more farmers in Kenya to implement product food safety standards and quality management systems	- In the quantitative findings from smallholder farmers, there is an acknowledgement that the National government has tried to front Kenya as an investment region in agriculture, agri-business spanning from crop production, animal production and marketing hub for local and export consumption markets, as also mentioned by AMADPOC (2011). - Furthermore, the national Government has developed agri-based strategic policies through the Kenya Vision 2030 to advance the smallholder farmers' operating environment, increase sales returns, and thus improve livelihoods (Wangu et al., 2021).	- The findings from the key stakeholders in the agricultural sector also indicated a consensus that the national Government has made efforts to help smallholder farmers implement and comply with product food safety standards and quality management systems in the change management process. For example, through institutions such as the county governments and Horticultural Crop Development (HCD), the national Government has formed hearing committees with smallholder farmer representation that discuss issues, such as farm-to-marketplace supply chain operations and global standards implementations and compliances. - Nevertheless, the study findings still indicate that much more is expected from the national Government to help smallholder farmers implement product food safety standards and quality

		management systems to access global markets to increase returns and improve household livelihoods. For example, a.) the need to subsidize costs of farm inputs; b.) increase efforts towards agri-based technology research to boost smallholder farmer's returns; and c.) intensify the marketing of smallholder farmer's products in the international markets.

Chapter Summary

In summary, the chapter began by restating the purpose of the study. Agriculture in Kenya continues to play an important role in the rural economy. Smallholder farmers in Kenya are the main drivers of the country's agricultural production, accounting for 70 per cent of the marketed agricultural production (Raithatha, 2019). In addition, smallholder farmers in Kenya have gone to great lengths to identify and establish global product food safety standards and quality management systems to improve their operating and production structures, enabling them to gain access to more profitable markets and improve their livelihoods.

In the chapter, the product food safety standards and quality management systems were described as tools used to improve and regulate the quality and safety of agricultural products for marketing services across borders (Shaw et al., 2014). Therefore, the purpose of the study was to determine the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. As explained in the chapter, the researcher sought to identify problem gaps in the study relating to the change management process by presenting an impact comparative on the efficacy of smallholder farmers in Kenya prior and post implementation of product food safety standards and quality management systems. Once the problem gaps are identified and solved, smallholder farmers in Kenya are expected to benefit from the change

management process through higher productivity, lower production costs, higher enterprise and farm incomes, higher disposable incomes, and consequently greater farm investments that improve the welfare of household members.

Based on the problem, research purpose, aims, and objectives outlined above, Chapter 4 findings sought to answer the following research questions in the study: (a) to what extent have smallholder farmers in Kenya benefited from the implementation of product food safety standards and quality management systems, (b) what are the key enablers/drivers in the implementation of product food safety standards and quality management systems for smallholder farmers in Kenya, (c) what are the challenges faced by smallholder farmers in Kenya in the establishment and implementation of product food safety standards and quality management systems, (d) what are the factors that have contributed to majority of the smallholder farmers in Kenya not implementing product food safety and quality management systems, and finally, (e) what can the government do to encourage more farmers in Kenya to implement product food safety standards and quality management programmes?

Data for analysis and the findings presented in Chapter 4 were collected using quantitative and qualitative tools. Quantitative data collected using questionnaire tools and qualitative data collected from interview tools were analysed using a process of cleaning, transforming, and modelling data to find useful information that solves the research problem identified in the study (Islam, 2020).

The first section of Chapter 4 explained the trustworthiness, reliability and validity of the data used in the study for analysis. The trustworthiness of the data collected was vital since data for the research study should be collected precisely, consistently and exhaustively (Nowell et al., 2017)

for transferability, credibility, confirmability and dependability (Stahl & King, 2020). The research procedures used when analysing data should create trustworthiness based on four general criteria: transferability, credibility, confirmability, and dependability (Stahl & King, 2020). Therefore, a total of 215 smallholder farmers answered favourably during quantitative data collection, yielding a response rate of 100 per cent. This study's response rate of 100% was deemed satisfactory because the statistical analysis requires a response rate of at least 50% to commence analysis. In the case of qualitative data collection, 10 key stakeholders in the agricultural sector in Kenya were invited to respond to the interview questions. The number of interviewees that answered favourably was 8, yielding a response rate of 80 per cent. The study's response rate of 80% is also deemed satisfactory because the statistical analysis to commence analysis requires a response rate of at least 50%.

Also, Chapter 4 mentions that the primary study was done, and research tools were pre-tested on 20 pre-selected participants with the same characteristics as the target population and excluded from the final analysis. The primary goals of the pilot study were to evaluate the instruments' ambiguity, sensitivity, and appropriateness. In addition, a pre-test on collecting qualitative data was also done on 2 pre-selected participants. The preliminary study assisted in estimating the length of an interview session and improving the tools' accuracy.

In the case of the validity of the study, variables explained in the chapter emphasised the degree of accuracy and significance of inference based on the research findings. In contrast, the reliability of the study variables emphasises the amount to which there is no bias, ensuring uniform measurement in the research instruments used. All items for quantitative data collection were subjected to a reliability analysis in the study, and the component factor analysis was also validated. In addition, Cronbach’s alpha was used in the study as a measure of dependability that illustrates

how well the instrument's items are connected (Bonett & Wright, 2015). Reliability scores were determined on the variables in the questionnaire before the implementation of Good Agricultural Practice (GAP) and after the implementation of Good Agricultural Practice (GAP). In both cases, Cronbach's alpha values of above 0.7 were reported. Therefore, Cronbach's alpha values of 0.7 and above are considered adequate. Thus, this implies that the items under each variable were consistent.

The second section of Chapter 4 explained statistical description and inferential analysis based on the quantitative data collected from the responses of 215 smallholder farmers in Meru county. Descriptive statistics (James & Simister, 2020), as cited by Ameer (2021), is an analytical technique used to describe or present quantitative data in a readily accessible manner that enables the study to illustrate and sum up observations. The quantitative survey results were organized into sections that outline the results of the quantitative data analysis. The Statistical Package for Social Sciences (SPSS) was used to clean, code, and analyze the data based on each independent variable.

Also, Chapter 4 explained how the nature of the questionnaire tool used to collect quantitative data was designed in a manner that allowed for the collecting and gathering of both nominal and ordinal data. The questionnaire comprised six sections with a total of 43 in-depth questions that were developed to ensure the rigour and objectivity of data. The questionnaire mainly required the participants to select from a list of options, thus making it simple to complete. In addition, provisions for additional responses were included in the questionnaire to avoid unreasonably limiting the participant's responses. Before filling out the questionnaire, the participants were directed to the sub-clause that informs that Good Agricultural Practice (GAP) in

the questionnaire means the implementation of product food safety standards and quality management systems.

The outline of the sections from the questionnaires, in summary, consisted of the following: (a) demographic variables, that is, gender, age, level of education, marital status, number of people per household, number of years in farming, size of farming land, position on the farm, and the farm location, (b) variables on the importance of GAP, that is, market requirements, requirements of food safety standards, access to new markets, why buyers reject farm produce in the marketplace, and receiving higher prices from the farm produce, (c) variables on farm activities, that is, human infectious diseases and how they spread on the farm, product food safety risks on the farms, cleaning and sanitizing the farm and farm produce, keeping domestic animals away from the farm and harvest area, monitoring and testing water quality, (d) variables on farm sales, records, and documented procedures, that is, markets where farm produce was sold, estimated sales of farm produce per year, keeping farm produce sales records, duration of keeping farm produce sales records, keeping documented procedures of farm activities, (e) variables on challenges faced after implementing GAP, finally, (f) additional responses that would help enhance GAP relating to product food safety and quality management systems in the farm and marketplace.

Descriptive statistics in Chapter 4 presented the analysis of continuous and categorical data in diagrams of frequencies and percentages, graphs, and charts relating to data smallholder farmer's data collected prior and post implementation of product food safety standards and quality management systems.

On the other hand, inferential statistics used in Chapter 4 referred to an inductive approach and technique that allowed the findings from quantitative data collected from a sample to be

generalized for a specific faction to the entire population (Ameer, 2021). In Chapter 4, inferential statistics were also used to analyse further the quantitative data collected from smallholder farmers in Kenya to determine efficacy prior and post implementation of product food safety standards and quality management systems. Inferential statistics involves drawing conclusions or inferences based on a set of data observed (Chanoknath & Louangrath, 2015). Therefore, using inferential statistics, that is, Multicollinearity correlation, the Chi-square test, the Wilcoxon signed-rank test, and the t-Test, the study compared descriptive statistics obtained from the sample population prior and post implementation of product food safety standards and quality management systems to make a conclusion or inference about the smallholder farmer population in Kenya. The results or findings derived from the sample population are used to draw conclusions about Kenya's larger smallholder farmers population.

In brief, as explained in Chapter 4, multicollinearity correlation is frequently employed to examine the relationship between a set of variables. Strong correlations between the independent variables are known as multicollinearity, and this is an undesirable scenario. Tolerance and the Variance Inflation Factor are two statistics used to measure multicollinearity. The Variance Inflation Factor is the tolerance's inverse (VIF). If a variable's VIF is 5 or higher, multicollinearity is linked with that variable.

As explained in the chapter, the study used the chi-square test to find any relationship among non-numeric variables when collecting respondents' data or statistical analysis (Nihan, 2020). The chi-square test results on the respective variables of the questionnaire as per the respondents were presented in detail in Chapter 4.

As explained in the chapter, the non-parametric Wilcoxon signed-ranked test was used in Chapter 4 to replace the dependent t-test. The dependent t-test should not be employed when the assumption of normality in the data has been broken. According to the literature, the Wilcoxon signed-rank test compares two sets of scores from the same respondents when variables are subjected to more than one condition or when we want to analyze any score changes from one point to the next. In addition, the Wilcoxon signed-rank test assumes that the dependent variable is being measured at the ordinal or continuous level. Among other methods of ranking categories, Likert scales are examples of ordinal variables. Therefore, the assumption is valid for the study since most variables are measured on the Likert scale.

The third section in Chapter 4 constituted the detailed study of quantitative results and conclusions based on the detailed statistical descriptives and inferential analysis conducted on the research questions with tables and figures to illustrate the findings as earlier mentioned.

The fourth section is on the thematic approach used in the study to analyse qualitative data collection from the 8 key stakeholders from the agricultural sector in Kenya. The study sought to give a solution to the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. Qualitative data used in Chapter 4 was collected from key stakeholders in the agricultural sector, namely (a) Government Agencies, that is, Horticultural Crop Authority and Ministry of Agriculture, (b) Horticulture Exporting Companies and (c) Agricultural Extension Officers.

As explained in the chapter, the study used open-ended interview questions as the research tool to collect qualitative data from informants in Kenya's agricultural sector. The issues considered in the interview questions in the collection of qualitative data included (a) the demographic, (b) the

extent smallholder farmers have benefited from implementing good agricultural practices, (c) the factors or enablers that make smallholder farmers implement good agricultural practices, (d) the challenges faced by smallholder farmers when implementing good agricultural practices, (e) the recommendations to smallholder farmers that want to do a change management process and implement good agricultural practices, (f) the extent of government support to encourage smallholder farmers to implement good agricultural practices, (g) the social-economic impacts on smallholder farmers that have implemented good agricultural practices, and finally, (h) how smallholder farmers can acquire knowledge to mitigate embedded risks when implementing good agricultural practices.

In brief, as explained in Chapter 4, the key stakeholders or informants were asked to voice their experiences best while the researcher recorded the answers for further analysis (Creswell, 2012). The qualitative data primarily expressed the detailed insights, views, beliefs, experiences and motivations (Gill et al., 2008) of key stakeholders regarding the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. The collected interview data, which had been audio recorded, was then transcribed into words and then entered into a computer file for analysis purposes. The study used a thematic approach to analyse the qualitative data collected from key stakeholders in the agricultural sector in Kenya. As a result, the researcher would better understand smallholder farmers' thoughts, experiences, and behaviour patterns (Kiger & Varpio, 2020) on efficacy prior and post implementation of product food safety and quality management systems.

In Chapter 4, the interviews with the key stakeholders in the agricultural sector in Kenya were analysed, and four themes were identified to address the research questions, namely, (a) understanding context, (b) outcomes, (c) government involvement, and (d) mapping pathway/ evaluation. The selected codes and themes were centred around the change management process to

determine the efficacy of smallholder farmers in Kenya prior and post implementation of product food safety standards and quality management systems. The selected themes in the study from the qualitative data collected were used to address the five research questions presented in the study. The findings from the qualitative data analysis are discussed in detail in Chapter 4.

The fifth section in Chapter 4 presented a report on evaluating the study findings and deducing the meanings thereof to determine and explore the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya.

Finally, Chapter 4 ends with a summary discussion of the key points presented in the entire Chapter 4.

CHAPTER 5: IMPLICATIONS, RECOMMENDATIONS, AND CONCLUSIONS

Introduction

The chapter presents the implications, recommendations, and conclusions of the findings from the data analysis exhibited in Chapter 4. The study aimed to explore and determine the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. The recognition of global product food safety standards and quality management systems has resulted in smallholder farmers taking great lengths to incorporate change management processes to become competitive and access international markets to improve their net returns and change livelihoods (Doherty & Kittipanya-Ngam, 2021). Therefore, in establishing the study purpose, an impact comparative was conducted to determine the efficacy prior and post implementation of product food safety standards and quality management systems among smallholder farmers in Kenya.

The study consciously recognized the impacts of the theory of change (Mayne, 2017) by seeking to understand how organizational changes are implemented and how the importance and roles of change management affected the smallholder farmers prior and post implementation of product food safety standards and quality management systems. In addition, the social science theory was also considered in the study to contextualize and bring understanding to how smallholder farmers in Kenya apply the theory of change (ToC) when implementing product food safety products and quality management systems (Callaghan, 2017; Stein & Craig, 2012). Therefore, by integrating ToC with social science theories, the study brought a better understanding and an in-depth view of the smallholder farmer's change management behaviours that were critical when analysing data from the respondents to find a solution to the research problem (Callaghan,

2017). The study explored literature reviews supporting collaborative efforts that promoted the smallholder farmer's long-term sustainable change management structures after implementing product food safety standards and quality management systems (Chambers, 2019).

A mixed approach social research method was adopted in the study, combining both quantitative and qualitative methodologies to collect data that would be analysed and interpreted to obtain solutions to aid in understanding the research problem and answering the research questions. Many researchers have advocated using the mixed method research approach as it is a powerful mix that brings a complex and dynamic solution to the research problem (Creswell, 2012). In addition, the explanatory sequential design was selected and used in the study, which allowed quantitative data to be collected first and then qualitative data to elaborate and explain further the quantitative results (Creswell & Clark, 2018).

Therefore, quantitative data was first collected by randomly selecting 215 smallholder farmers from four purposively chosen sub-counties of Meru county, namely, Buuri, Imenti South, Igembe Central, and Tigana West. Then, qualitative data was collected from 8 key stakeholders in the agricultural sector of Kenya to elaborate and explain further the findings from the quantitative results.

Approval letters were obtained from the research participants, the Unicaf Research Ethical Committee (UREC) and the National Commission for Science, Technology and Innovation (NACOSTI), a national Government authority in Kenya, before the data collection stage. During the data collection phase, honesty and integrity were further considered when interacting with the target participants to enhance the application of ethical principles throughout the study (Shery,

2016). As a result, the study ensured that issues of privacy, deception and potential harm were addressed adequately throughout the research.

This chapter summarizes the data gathered and the statistical and thematic treatment of the analysis. In addition, the chapter then discusses the specific aims and research topics in question and determines the significance of the findings by analyzing and interpreting them. Specific goals and research issues are addressed explicitly in the conclusions. Finally, the proposals cover ideas for additional research and reformulations.

Limitations of the Study

It is essential to acknowledge the limitations encountered in this study. Agriculture in Kenya is considered a broad-based national economic activity critical for driving the National government's economic strategy growth hunger program (Atela et al., 2018). However, when collecting quantitative data, the study confined the target population of 215 participants to one geographical county region in Kenya, that is, Meru county; although justified in the study as a dominant production region in Kenya for fruits and vegetables sold in the regional and international markets (Associates, 2017). Furthermore, the thematic analysis used to analyse the qualitative data collected from 8 key stakeholders in the agricultural sector of Kenya assumes that the data collected was sufficient based on literature reviews and approved statistical tests that deemed the response rates satisfactory for the study (Fincham, 2008). However, expanding the target population and including other stakeholders in the interview phase would have greatly interested the study, covering the entire supply chain from the smallholder farmer to the final consumer markets.

Another limitation was that the study assumed that the smallholder farmers have a broad understanding of Good Agricultural Practices (GAP) when implementing product food safety standards and quality management systems as a change management process to increase returns (Ramful, 2017). The principles and requirements of product food safety standards and quality management systems are broader than the variables presented in the study. They could include other mandatory and private voluntary standards not highly emphasized in the study, such as the Hazard Analysis Critical Control Point (HACCP) food management system (COLEACP, 2011).

Another limitation was the need to fully understand the impact of the theory of change (ToC) on the smallholder farmer's economic, social and environmental well-being at both ends of the supply chain, that is, from the farms and consumer markets. However, the study highlighted the improved well-being of the smallholder farmers after implementing product food safety standards and quality management systems. Nevertheless, players like retailers in the agri-food supply chain also play a critical role in improving the livelihood of the smallholder (Lee et al., 2012). According to the author, intermediaries in the agri-food supply chain, such as exporters and retailers, could change and, in return, significantly impact the smallholder farmer's output. Therefore, it would be interesting to research the buyer-driven supply chain components further and establish the direct impact of the terms of trade and the implications for smallholder farmers' change management processes.

The limitations presented in the study do not fully represent a novel analysis of the larger foundation for future research. However, the study could be applied more generally to a broader research scope in other sectors to enlarge the understanding of the efficacy of product food safety

standards and quality management systems among smallholder farmers nationally, regionally and globally.

Implications

The study used the mixed method approach and the explanatory sequential design research strategy to explore the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. A comparative analysis prior and post implementation of product food safety standards and quality management systems by smallholder farmers was conducted to determine efficacy based on quantitative and qualitative data collected in the study. Quantitative data was collected using questionnaires from 215 respondents from four sub-counties in Meru county, a dominant agricultural production region in Kenya where one can find all the varieties of fruits and vegetables sold in the national, regional and international markets. In addition, qualitative data was collected using interviews from the actual words of 8 key stakeholders in the agricultural sector in Kenya.

Combining the quantitative and qualitative research methods presented the study with meaningful findings on efficacy prior and post implementation of product food safety standards and quality management systems among smallholder farmers in Kenya. Furthermore, mixing both research approaches gives more credence to the results or findings of the study used in solving the research problem (Creswell & Clark, 2018).

The study sought to provide solutions to the following research questions to solve the research problem.

(RQ 1): To what extent have smallholder farmers in Kenya benefited from the implementation of product food safety standards and quality management systems?

(RQ 2): What are the key enablers/drivers in the implementation of product food safety standards and quality management systems for smallholder farmers in Kenya?

(RQ 3): What are the challenges faced by smallholder farmers in Kenya in establishing and implementing product food safety standards and quality management systems?

(RQ 4): What are the factors that have contributed to majority of the smallholder farmers in Kenya not implementing product food safety standards and quality management systems?

(RQ 5): What can the government do to encourage more farmers in Kenya to implement product food safety standards and quality management programmes?

In the case of RQ 1, the findings in Chapter 4 indicate that smallholder farmers seem to have benefited largely from establishing and implementing product food safety standards and quality management systems as good agricultural practices. Knowledge of the target markets' nature enlarged, thus increasing smallholder farmers' accessibility to more consumers nationally and internationally. Smallholder farmers were able to vouch for higher prices for their produce. The quality of the farm products improved because smallholder farmers could control and eliminate product contamination from infectious diseases in the farm operations and maintain cleanness and good hygiene practices when handling farm produce. Water quality was frequently monitored, and domestic animals were kept away from the production and harvesting centres for hygiene purposes.

According to Chamberlain (2019), notwithstanding the challenges faced by smallholder farmers in developing countries to access international markets and consistently supply the right

volumes and quality of farm products, a holistic, robust and practical application of the Theory of Change (ToC) designed to guide smallholder farmers and stakeholders sustainably in the agri-food supply chain structure, is lacking. Therefore, the findings relating to RQ 1 seem to validate why the world has given much attention to the smallholder farmer's change management process, which has led to their development in the context of transforming and stimulating farming activities to increase sales returns that ultimately improve household livelihoods.

Further, Dyck et al. (2012), with smallholder farmers now being able to comply with global product food safety standards and quality management systems, more participation in the international markets has resulted in poverty reduction and increased global security.

In perspective, the study results from the quantitative analysis indicated that smallholder farmers could increase their sales output in local markets while others could access international markets. As a result, farm produce sales per year, Kes. 100,000 and above, increased from 3.3% to 28.4% after implementing product food safety standards and quality management systems and from 13% to 25.1% for produce farm sales of Kes. 50,000- Kes. 99,999.

In addition, the study findings from the thematic analysis of qualitative data also affirmed that smallholder farmers benefited from extensive training from various stakeholders in the agricultural supply chain after implementing product food safety standards and quality management systems as good agricultural practices. As a result, smallholder incomes improved, enabling many to diversify into other income-generating activities such as livestock farming and floriculture farming, thus impacting the community positively.

However, from the study findings, smallholder farmers still encountered challenges in implementing product food safety standards and quality management systems. For example, the

cost of maintaining the change management process and identifying technical expertise is also challenging. Therefore, if the challenges are not addressed adequately, this could work against the benefits realized by smallholder farmers in the sustainability of the product food safety standards and quality management systems implemented in the farm operations.

In the case of RQ 2, the findings in Chapter 4 identified a number of enablers/drivers that drive the smallholder farmer's decision on change management to implement product food safety standards and quality management systems. According to Serrat (2017), adopting a theory of change (ToC) seems to have motivated smallholder farmers to achieve strategic organizational goals through a chain of early and intermediate programs that contribute to the achievement of the intended plan. In other words, the smallholder farmers seemed to have viewed the ToC as a motivational strategy to attain their business goals and achieve the planned outcome as explained and adopted in the Hivos approach (Clark & Apgar, 2019).

Other enablers, as derived from the research findings in chapter 4, smallholder farmers were motivated to implement product food safety standards and quality management systems to maximize farm sales returns and profitability. Improving the farm sales return and profitability is a key driver/enabler for smallholder farmers' decisions on the change management process. Therefore, as evidenced in the study, the smallholder farmer’s interest in knowing why the farm produce was rejected at the marketplace, according to the quantitative findings, showed an increase from 17.7% prior to implementing product food safety standards and quality management system to 70.2% post implementation. Further, the smallholder farmers wanted to know how to access new markets as a driver/enabler for the change management process. The study indicates that 72.6% of the respondents opted to implement the product food safety standard and quality management

system to gain access to new markets and optimize farm sales. The study findings contrast with 19.1% of the respondents who seemed uninterested in the market dynamics before adopting good agricultural practices for market accessibility.

Global developments in the agri-food industry require smallholder farmers to be socially and economically responsible as key stakeholders in the food supply chain system (Lee et al., 2012). For example, the recent transformation in the European marketplace and the increased demand for fresh horticultural products require smallholder farmers to supply safe food for consumption (Krause et al., 2016). Therefore, smallholder farmers in Kenya must know how to prevent infectious diseases from spreading on the farm and reduce food safety risks as a key driver/enabler to implementing product food safety standards and quality management systems. The study findings indicate that 87.0% of the respondents confirmed being aware of how human infectious diseases spread on the farm after implementing product food safety standards and quality management systems, compared to 15.3% before implementation. The same is also evidenced in the study where 86.5% of the respondents confirmed being aware of the importance of minimizing product food safety risks on the farm after implementing product food safety standards and quality management systems, in contrast to 21.9% before implementation.

According to the thematic analysis from the qualitative data collected, smallholder farmers also needed to understand, besides the drive to increase sales and profit objects, the protocols and requirements of product food safety standards and quality management systems for undertaking at the farm level as a good agricultural practice. Further, the thematic analysis findings also highlighted the surety of the market as a primary foundation for smallholder farmers to produce safe food for humans and increase profitability.

However, it is worth mentioning that the drivers/enablers of implementing product food safety standards and quality management systems may not necessarily be realized by the smallholder farmer even after undergoing the change management process. There are still challenges beyond the direct control of the smallholder farmers that could hinder the anticipated accelerated growth towards the effective contribution to strategic food security goals and compete effectively in marketplaces (Kamara et al., 2019; RSA, 2012). For example, challenges in global climate (Kipkoech et al., 2015; Paloma et al., 2020); limited access to and ownership of capital assets for food and farm production (Sinyolo et al., 2014); challenges from the poor road and institutional infrastructures (Paloma et al., 2020); limited access to the admittance of secure loans from a financial institution (Demirguc-Kunt & Klapper, 2012); and consistent adherence to the global product food safety standards and quality management systems, and global completion (Kamara et al., 2019).

In the case of RQ 3, several challenges are highlighted in the study encountered by the smallholder farmers in Kenya when implementing product food safety standards and quality management systems. For example, many smallholder farmers in sub-Saharan regions operate in stressful environments with climate adaptation challenges, limited credit facilities, poor access to technological advancements, and limited market information, to mention a few (Ngeve et al., 2014; Rhodes et al., 2014). Such challenges affect smallholder farmers' ability to effectively implement global standards and quality systems, consequently accelerating poverty. Also, the literature review indicates that agricultural activities in recent times have stagnated, with smallholder farmers and related agriculture supply chain entities encountering challenges that affect business growth and improvement of the quality of farm products (USAID, 2021).

In perspective, challenges from the quantitative study findings encountered by smallholder farmers indicate that 12.8% of the respondents experienced some challenges in understanding the product food safety standards and quality management systems during implementation. Another 20% experienced great challenges in understanding the standard of good agricultural practice, while 22.8% experienced minimal challenges. Therefore, over 50% of the respondents had challenges in understanding the protocols of the product food safety standards and quality management systems. Further, 21.4% of the respondents had some challenges with the financial cost of implementing the product food safety standards and quality management systems, and 31.2% had significant challenges. Also, 19.5% of the respondents had some challenges getting a technical expert to assist in implementing the product food safety standards and quality management systems, and a further 31.2% experienced a great challenge.

Generally, change management processes resulting in implementing and complying with product food safety standards and quality management systems can be costly and excessively burdensome for smallholder farmers (Maguire-Rajpaul et al., 2020). Nevertheless, smallholder farmers' implementation of product food safety standards and quality management systems must not be viewed as restrictive, as it underpins the global agrifood compliance objectives of food security and consumer protection of food safety (Hammoudi et al., 2015).

The thematic findings based on qualitative data seem to complement the results from quantitative data in that many smallholder farmers are not highly educated, making it difficult to understand the protocols in the food safety product standard and quality management system. In addition, the cost of implementing product food safety standards and quality management systems

was prohibitive, restricting many smallholder farmers from accessing global markets and thus exacerbating poverty levels.

Regarding RQ 4, the study sought to establish the factors that have contributed to majority of the smallholder farmers in Kenya not implementing product food safety standards and quality management systems. The literature review shows that many smallholder farmers in Kenya face challenges when complying with strict product safety standards and quality management systems (Ajwang, 2020). Consequently, many smallholder farmers have inexorably exited the change management process, opting to supply local and national markets with less stringent agrifood standards.

According to Lee et al. (2012) and Krause et al. (2016), recent consumer trends in the global agri-food industry show a year-round supply in the European market in favour of farm products from production units that have implemented product food safety standards and quality management systems. However, though debatable, implementing product food safety standards and quality management systems to ensure adequate food production and distribution in an economically and ecologically sustainable long term still appears to be far-reaching for smallholder farmers (Jacobi et al., 2020).

In the study, the findings from the quantitative data on the inherent challenges explained in RQ 3 largely explain why smallholder farmers in Kenya have not implemented product food safety standards and quality management systems.

Also, the findings from the thematic analysis of qualitative data indicated that most of the smallholder farmers in Kenya lack the motivation to actively market their farm produce. In addition, the smallholder farmers that have already implemented product food safety standards and quality

management systems do not stand out in the community as admirable ambassadors of global food safety and security proponents.

Nevertheless, Ajwang (2020) still explains that smallholder farmers who have implemented compliant global food safety standards, quality management systems, and other regulatory processes often quickly access international markets, thus increasing income levels and reducing poverty. Therefore, compliance market agencies and government sectors have arisen to help smallholder farmers overcome the historical challenges experienced in support of the change management process in farm operations.

In the case of RQ 5, the study sought to understand the government's role in encouraging smallholder farmers in Kenya to implement product food safety standards and quality management systems. Kenya is considered a global region with investment opportunities in agriculture and agri-business for local and international consumer markets (AMADPOC, 2011). Through the Kenya Vision 2030 (Wangu et al., 2021), the national Government has developed progressive strategic policies that address critical issues hindering smallholder farmers from optimizing returns.

However, the study sought to emphasise the unprecedented stress following Covid-19 on the agricultural sector that impacted the government's efforts to address critical issues to optimize smallholder farmer’s sales return. According to Sumekar et al. (2021), the government’s approach and how they interact with smallholder farmers changed drastically during the Covid-19 era since markets were inaccessible and the restriction of movement made delivery of farm inputs challenging. Covid-19 made it difficult for the government to implement the country’s agricultural sector development planning with smallholder farmers.

Nevertheless, according to the findings from the thematic analysis in the study, there was consensus among stakeholders in the agriculture sector that the national Government has made tremendous efforts to assist smallholder farmers in implementing product food safety standards and quality management systems. Consequently, such efforts through the County government and the Horticultural Crop Development agency have enabled smallholder farmers in Kenya to access regional and international markets and increase returns to improve livelihood. In addition, the national Government has further availed agricultural extension officers who work with smallholder farmers to confront challenges relating to the implementation of product food safety standards and quality management systems.

However, findings of qualitative thematic analysis indicate that there is still much more that the national Government needs to do to assist smallholder farmers in overcoming challenges relating to the implementation of product food safety standards and quality management systems. In addition, smallholder farmers want to be funded by the national Government to purchase farm inputs at subsidized prices. Also, more research activities on agri-based technology should be done to boost farm yields.

Other challenges facing smallholder farmers, according to the literature review, that the national Government has to deal with include land and population pressures, climate change, agricultural research and development and extension, soil fertility and land degradation markets, and public expenditure, soil fertility and land degradation (Birch, 2018).

The study, in summary, explored the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. Over the past two decades following economic globalization, consumers have been made more aware of food safety issues from

production to consumer markets (Hammoudi et al., 2015). Therefore, smallholder farmers must, in principle, embrace food safety issues that are well-managed throughout every phase of the supply chain. As a result, national Governments and the global food industry have continued compelling smallholder farmers to embrace change management processes and implement product food safety standards and quality management systems. On this basis, the study sought to compare efficacy prior and post implementation of product food safety standards and quality management systems among smallholder farmers in Kenya.

The change management process is a broad programme of logical planning models for development in any practice and operation (Stein & Craig, 2012). For example, implementing product food safety standards and quality management systems is an effective management practice in the agri-food industry, and it is used as a logical planning model for process development from farm production to the consumer market (Clark & Apgar, 2019). Therefore, the study aims to find more knowledge on change management processes through the smallholder farmer's operations in Kenya and add to the existing body of knowledge. Furthermore, by comparing efficacy prior ad post implementation of product food safety standards and quality management systems among smallholder farmers in Kenya, the study is able to determine the whys and how initiatives to change management processes apply widely and measure the actual value of benefits (Silva et al., 2015; Vogel, 2012) that arise when smallholder farmers in Kenya develop and implement stringent and costly models for business growth.

The researcher believes the study further complements the horticulture research work commissioned by the Kingdom of the Netherlands, mapping the fruits and vegetables in Kenya (Associates, 2017). The research study commissioned by the Kingdom of the Netherlands

considered Kenya's agricultural and horticultural sector as a powerhouse export segment that has made enormous strides in recent years, notwithstanding the challenges faced by smallholder farmers and the regulatory landscape. According to Lee et al. (2012), changes in the global agrifood system require smallholder farmers to implement product food safety standards and quality management systems as food regulations to reduce food-related risks. However, according to Maguire-Rajpaul et al. (2020), compliance with food agri-systems is costly and often deemed disproportionately burdensome for smallholder farmers. Therefore, this study contributes more knowledge by exploring the comparative impact on efficacy of smallholder farmers in Kenya prior and post implementation of product food safety standards and quality management systems and if accessing international markets has improved their livelihoods.

Finally, the study, though focusing on theoretical knowledge, has been done in view of how it can be applied to the practice of business and business management. For example, Andrade (2016) states that smallholder farmers generally live in poverty and encounter challenges when accessing sustainable international markets. However, according to Kamara et al. (2019), smallholder farmers are still considered significant contributors to Africa's agricultural production, biodiversity and food security despite the challenges. Therefore, the applied Doctorate Business and Administration (DBA) degree provides a better understanding of real-world business, focusing on business-oriented things and problem-solving skills on the latest business research, theories and trends.

In summary, the theoretical and practical implications of the study are presented in Table 39 for ease of understanding.

Table 39:

Summary of Key Theoretical and Practical Implications

#	Findings	Impact
RQ1	Smallholder farmers seem to have benefited largely from establishing and implementing product food safety standards and quality management systems as good agricultural practices.	Practical implication - Knowledge of the target markets' nature enlarged, thus increasing smallholder farmers' accessibility to more consumers nationally and internationally. - Smallholder farmers were able to vouch for higher prices for their produce. - The quality of the farm products improved because smallholder farmers could control and eliminate product contamination from infectious diseases in the farm operations and maintain cleanness and good hygiene practices when handling farm produce. - Water quality was frequently monitored, and domestic animals were kept away from the production and harvesting centres for hygiene purposes. - Smallholder farmers benefited from extensive training from various stakeholders in the agricultural supply chain after implementing product food safety standards and quality management systems as good agricultural practices. - Smallholder incomes improved, enabling many to diversify into other income-generating activities such as livestock farming and floriculture farming, thus impacting the community positively. Theoretical implication: - A holistic, robust and practical application of the Theory of Change (ToC) designed to guide smallholder farmers and stakeholders sustainably in the agri-food supply chain structure seems to be lacking (Chamberlain, 2019). - Smallholder farmers can now comply with global product food safety standards and quality management systems, and more participation in the international markets has resulted in poverty reduction and increased global security (Dyck et al., 2012).
RQ2	There were a number of enablers/drivers that led to the smallholder farmer's decision on change management to implement product food safety standards and quality management systems.	Practical implication - Improving the farm sales return and profitability is a key driver/enabler for smallholder farmers' decisions on the change management process. - Smallholder farmers also needed to understand, besides the drive to increase sales and profit objects, the protocols and requirements of product food safety standards and quality management systems for undertaking at the farm level as a good agricultural practice. - The findings also highlighted the surety of the market as a primary foundation for smallholder farmers to produce safe food for humans and increase profitability.

		Theoretical implication: - Adopting a theory of change (ToC) seems to have motivated smallholder farmers to achieve strategic organizational goals through a chain of early and intermediate programs that contribute to the achievement of the intended plan (Serrat, 2017). In other words, the smallholder farmers seemed to have viewed the ToC as a motivational strategy to attain their business goals and achieve the planned outcome as explained and adopted in the Hivos approach (Clark & Apgar, 2019). - Global developments in the agri-food industry require smallholder farmers to be socially and economically responsible as key stakeholders in the food supply chain system (Lee et al., 2012). For example, the recent transformation in the European marketplace and the increased demand for fresh horticultural products require smallholder farmers to supply safe food for consumption (Krause et al., 2016). - However, it is worth mentioning that the drivers/enablers of implementing product food safety standards and quality management systems may not necessarily be realized by the smallholder farmer even after undergoing the change management process. There are still challenges beyond the direct control of the smallholder farmers that could hinder the anticipated accelerated growth towards the effective contribution to strategic food security goals and compete effectively in marketplaces (Kamara et al., 2019; RSA, 2012).
RQ3	Several challenges are highlighted in the study encountered by the smallholder farmers in Kenya when implementing product food safety standards and quality management systems.	Practical implication - Smallholder farmers experienced challenges understanding food safety standards and quality management systems protocols during implementation. - Smallholder farmers experienced financial challenges in implementing the product food safety standards and quality management systems. - Further, smallholder farmers had challenges getting a technical expert to assist in implementing the product food safety standards and quality management systems. Theoretical implication: - Many smallholder farmers in sub-Saharan regions operate in stressful environments with climate adaptation challenges, limited credit facilities, poor access to technological advancements, and limited market information, to mention a few (Ngeve et al., 2014; Rhodes et al., 2014). - Agricultural activities in recent times have stagnated, with smallholder farmers and related agriculture supply chain entities encountering challenges that affect business growth and improvement of the quality of farm products. (USAID, 2021).

RQ4	Several factors have contributed to most of the smallholder farmers in Kenya not implementing product food safety standards and quality management systems.	Practical implication - The challenges mentioned in RQ3 have led to many smallholder farmers having inexorably exited the change management process, opting to supply local and national markets with less stringent agrifood standards. - Also, most of the smallholder farmers in Kenya lack the motivation to actively market their farm produce. - In addition, the smallholder farmers that have already implemented product food safety standards and quality management systems do not stand out in the community as admirable ambassadors of global food safety and security proponents. Theoretical implication: - According to Lee et al. (2012) and Krause et al. (2016), recent consumer trends in the global agri-food industry show a year-round supply in the European market in favour of farm products from production units that have implemented product food safety standards and quality management systems. However, though debatable, implementing product food safety standards and quality management systems to ensure adequate food production and distribution in an economically and ecologically sustainable long term still appears to be far-reaching for smallholder farmers (Jacobi et al., 2020).
RQ5	There seemed to be a consensus that the government has encouraged smallholder farmers in Kenya to implement product food safety standards and quality management systems.	Practical implication - The government was able to change its approach when dealing with the unprecedented stress following Covid-19 on the agricultural sector to address critical issues to optimize smallholder farmer's sales return. - Consequently, such efforts through the County government and the Horticultural Crop Development agency have enabled smallholder farmers in Kenya to access regional and international markets and increase returns to improve livelihood. - In addition, the national Government has further availed agricultural extension officers who work with smallholder farmers to confront challenges relating to the implementation of product food safety standards and quality management systems. Theoretical implication: - Kenya is considered a global region with investment opportunities in agriculture and agri-business for local and international consumer markets (AMADPOC, 2011). - Through the Kenya Vision 2030 (Wangu et al., 2021), the national Government has developed progressive strategic policies that address critical issues hindering smallholder farmers from optimizing returns.

Recommendations for application

Based on the study's findings, there is a need to understand how the study results can be adopted for real-life application. The study explored the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. As earlier mentioned in the literature review by authors like Lee et al. (2012), smallholder farmers have gone to great lengths to recognize global product food safety standards and quality management systems by incorporating change management processes in their farm operations to increase farm sales returns and improve livelihoods. Nui (2018) further argued that the implementation of product food safety standards and quality management systems is not considered cheap but rather costly and time-consuming because of the rigorous implementation processes in the sustainability of the standards' requirements. Therefore, in view of some of the comments in the literature review and the dynamics when adopting the theory of change in organizational set-up, the study sought to carry out a comparative analysis on efficacy prior and post implementation of product food safety standards and quality management systems among smallholder farmers in Kenya. The below section supports the recommendations for application based on the results analyzed from the quantitative and qualitative data collected.

The literature review presented the theory of change (ToC) as a framework to convey a lens or signpost on how to process knowledge that all stakeholders can apply in agribusiness (Brockie et al., 2019; Callaghan, 2017; Grant & Osanloo, 2014; Roth et al., 2018). ToC, according to Serrat (2017), provided a purposeful model of a complex decision-making process encompassing policy, strategy, and a program that contributes through a chain of outcomes towards the intended results.

Therefore, in view of the complexity and robustness of the ToC approach in guiding decision-making, the recommendation for application derived from the study is expected to focus on the smallholder initiative to develop, implement and evaluate product food safety standards and quality management systems processes to optimize on the gain that arises from accessing international markets to increase returns and improve livelihoods (Silva et al., 2015; Vogel, 2012).

According to Vogel (2023), the ToC approach impacts how humans or organisations work by packaging positive beliefs and assumptions about change management processes. Understanding how the change management process is recommended for application since, from the study results, the smallholder farmers appeared empowered. Furthermore, the ToC supposedly empowers all smallholder farmers to make well-informed decisions on managing their farm operations using standards such as product food safety standards and quality management systems to access international markets for increased income and improved household livelihoods. Therefore, the process of establishing and developing the ToC is viewed as corporate and participatory, requiring all stakeholders and target partners to be involved in the entire ToC approach cycle.

The study results validated the benefits of applying a corporate and participatory approach when carrying out a change management process. As reported by Stakeholder 1 in the qualitative survey, the smallholder farmers mentioned having advanced from extensive training after implementing product food safety standards and quality management systems. In addition, as reported by Stakeholder 3, smallholder farmers resulted in improved land management and ecosystem management within their surroundings. Also, Stakeholder 2 mentioned the positive impact on the social environment that enabled smallholder farmers to diversify their income sources

through other means, like producing flowers for alternative markets, thus allowing the children to go to school consistently for education.

The study also recommends the use of logical planning models (Clark & Apgar, 2019) to explore the incorporation of complex and systematic management changes in business operations. The study elaborated on how smallholder farmers in Kenya established, determined and implemented product food safety standards and quality management systems as a strategic and comprehensive guide to increase farm sales after penetrating global markets and improving their business operations. As a result, the smallholder farmers, after the implementation of product food safety standards and quality management systems, reported an increase in the farm produce sales per year, Kes. 100,000 and above, from 3.3% to 28.4% and from 13% to 25.1% for produce farm sales of Kes. 50,000- Kes. 99,999.

The study also recommends that businesses understand technical processes when planning to undertake critical management changes in their operations, for example, using such models as the Hivos approach (Clark & Apgar, 2019) as a comprehensive guide to the change management process. For example, the study explored the perceived vision of the smallholder farmer on how management changes bring success. The study also expounded on how smallholder farmers established technical understanding, progressive thinking and development of literacy levels before embarking on the change management process to implement product food safety standards and quality management systems in their farm operations. For example, the study results evidenced how smallholder farmers' knowledge of the markets increased sales in the local and export markets from 4.2% to 41.4% after the implementation of product food safety standards and quality management

systems. Therefore, the ToC becomes a basis for evaluating the business planning tools to optimize the goals on the pathway to change.

Another recommendation for application from the study is on the importance of businesses using different information gathered before embarking on a change management process to promote the intended business outcomes. For example, compliance by smallholder farmers to product food safety standards and quality management systems is a costly process and often considered disproportionately burdensome (Maguire-Rajpaul et al., 2020). However, recent transformations in the global agri-food industry indicate that European markets have desired a year-round supply of fresh horticultural products from farmers who have implemented product food safety standards and quality management systems (Krause et al., 2016; Lee et al., 2012). Therefore, this implies that smallholder farmers must engage in a deliberate transformation and change management process to access international markets for sustainable and equitable business growth (Jacobi et al., 2020). For example, the engagement in the transformation of smallholder farmer's understanding of the change management process is validated in the study by the increase in the importance of knowing about market requirements from 11.2% to 74% after the implementation of product food safety and quality management systems. Also, the importance of knowing why buyers reject farm produce in the marketplace increased from 17.7% to 70.2% after product food safety standards and quality management systems were implemented.

The study also adopted the social science theory to contextualize and understand the evidence base used when applying the ToC approach from a behavioural change perspective (Callaghan, 2017; Stein & Craig, 2012). The social science theory model provided a helpful

framework in the study for understanding smallholder farmers' managerial processes and employee supervision styles.

Therefore, it is recommended from the study that smallholder farmers adopt the applications of social science theory to get insights on how to make organizational decisions during moments like that of resource-constraint. For example, about 49.3% of the respondents answered that before the implementation of Good Agricultural Practices (GAP), it was not very important to know market requirements and were followed closely by 26.51% of them who felt that it was slightly important. Up to 9.30% had a neutral view, while 11.16% thought it was very important to know market requirements. The remaining 3.72% of the total respondents, 215, were not sure.

However, when the same respondents were asked about the importance of market requirements after implementing GAP, 73.95% felt it was very important, followed by 10.23% who believed it was slightly important. A total of 8.83% of the respondents had a neutral view, whereas 6.51% felt it was not very important to know market requirements after implementing GAP. Only 0.46 % were not sure if it was important to know market requirements after GAP implementation.

Therefore, the study, in a generalized manner, recommends the need to embrace propositions from social science theories or behavioural changes that help smallholder farmers identify and understand the relevancy when addressing issues central to the theory of change (Clark & Apgar, 2019).

Further, as a recommendation of application to study based on the findings of the results above, social science theory helps sharpen one’s thinking by providing new ways of looking at smallholder farmers' philosophy that ultimately improves how the ToC is applied in organizational or managerial operations.

Stakeholder 7, when responding to the question on the key enablers/drivers in implementing product food standards and quality management systems for smallholder farmers in Kenya, confirmed that after operationalizing the change management process, they could produce safe food for humans and increase their profitability.

Therefore, as a recommendation for application, the ability to integrate ToC with social science theories can be said to bring a better understanding and an in-depth view of smallholder farmers' managerial behavioural aspects that are also critical for assessing analytic models (Callaghan, 2017) that support collaborative efforts by rationalizing business arguments that promote long-term sustainable management structures and are thus worth the hard work of change management (Chambers, 2019).

The following section recommends for application the use of simplistic models for social science disciplines, which, when integrated with the ToC approach, present appropriate construct of the smallholder farmer's change management decisions in terms of the smallholder farmer's construct of ideas, propositions, underlying logic, assumptions and boundary conditions when establishing and implementing product food safety standards and quality management systems to access international markets (Bhattacherjee, 2023).

For example, the recommendation for application is to use the agency theory to optimize contracts and agreements between smallholder farmers and market agencies to help minimize the effects of organizational goal incongruence. The principle is well illustrated from the results on the importance of GAP for smallholder farmers to know why buyers reject farm produce in the marketplace. The responses revealed that 33.02% were of the view it was not important, while 25.58% thought it was slightly important to know about product rejection before GAP

implementation. In addition, 12.09% of the respondents had a neutral view of this statement, while those who felt it was important to know about product rejection before GAP were 17.67% of the sample. The respondents who were not sure about the statement were 11.63% of the sample population.

In contrast, when the respondents were asked the same question, but in this case, after GAP implementation, 70.23% felt that knowing about product rejection after GAP implementation was very important, while 10.23% were of the view it was not important. Those with a neutral view were 9.30%, while those who thought it was slightly important were 6.04%, and 4.18% were not sure how important it is to know why buyers reject farm produce in the marketplace.

Therefore, it is in the interest of the smallholder farmer to seek to understand the nature of the problems and challenges encountered when implementing a change management process to achieve the targeted objectives when implementing the product food safety standards and quality management systems to access international markets for better returns and improvement of livelihoods.

The theory of planned behaviour (TPB) is another example for the recommendation of application as it is widely used in understanding individual behaviours regarding conscious, reasoned choices shaped by cognitive thinking and social pressure, Azjen (1991), as mentioned by Bhattacherjee (2023). In the study context, the smallholder farmers perform a behaviour resulting in a change management process to implement product food safety standards and quality management systems to access international markets for better returns and improve house livelihood. For example, when the respondents in the study were then asked if they knew how to reduce product food safety risks on the farm before the implementation of GAP, the results

indicated that 47(21.86%) agreed to know how to reduce product food safety risks on the farm before the implementation of GAP, 135(62.79%) disagreed, and 33(15.35%) were not sure.

In contrast, when the change management behavioural process is aligned towards the adoption of the ToC approach and the smallholder farmer becomes conscious and applies reason-based choices shaped by cognitive thinking, the consequential effects of the change management decision to implement the product food safety standards and quality management systems will achieve a desirable consequence to access international markets and get better returns that improve their livelihoods. The TBP is evidenced when the same question was asked, but in this case, to respond if they now knew how to reduce the produce food safety risks after the implementation of GAP. The results show that 186(86.51%) of the respondents agreed that they know how to reduce the produce food safety risks after the implementation of GAP, 25(11.63%) disagreed, and 4(1.86%) were not sure.

Therefore, the subjective behavioural norm of the smallholder farmer is whether the employees and other stakeholders in the food supply chain system, in their subconscious mind, expect the smallholder farmer to proceed and actualize the decision to implement the costly and involving behaviour change to establish the food safety standards and quality management systems in the farm operations.

Another recommendation for application in the study is derived from the innovation diffusion theory (IDT), as Bhattacherjee (2023) mentioned. Smallholder farmers are encouraged to embrace knowledge when driving change management processes like the implementation of product food safety standards and quality management systems. After understanding the depth of the change management process, the smallholder farmer ensures that all stakeholders within the

supply chain adopt a structure that ensures compliance with global food agri-systems protocols to optimize all expectations to achieve increased sales returns that improve household livelihoods.

To demonstrate in perspective from the findings of the study, when the respondents were asked to evaluate the importance to know about the requirements of the food safety standards, the rating of very important increased from 16.6% before the implementation of product food safety standards and quality management systems, to 73.% after implementation of the same. The study's findings imply that embracing knowledge of change management is highly recommended as a key application process for smallholder farmers that want to carry out change management processes in their farm operations.

Therefore, though the IDT process alignment during adaptation to the change management process may start slowly when implementing product food safety standards and quality management systems, the adoption and creative aspect of the process within the entire supply chain is expected to increase sales and change household livelihoods. Smallholder farmers are transformed into functional and motivated leaders as people's behaviours are changed positively, thus impacting the organizational structures.

To summarise the IDT recommendation of application principles, according to the literature review, the smallholder farmer's innovation characteristics are expected to enhance efficiency and effectiveness, eventually translating to increased income as farm produce rejects a decrease in the global markets.

Kenya is considered a leading destination for investors in the region with varied investment opportunities in agriculture and agri-business, spanning from crop and animal production, agro-processing, and marketing for local and export consumption (AMADPOC, 2011). Through the

Kenya Vision 2030 (Wangu et al., 2021), the national Government has developed strategic policies that address critical issues affecting the agricultural sector in Kenya following the failure of liberalized policies in agriculture under the World Bank-led Structural Adjustment Program (SAP) of the 1980s. However, even though the research findings in certain aspects of the study indicated that there is a consensus that the national Government has made efforts to help smallholder farmers implement and comply with product food safety standards and quality management systems in the change management process, the study results also indicated that much more is expected from the national Government to help smallholder farmers implement product food safety standards and quality management systems to access global markets to increase returns and improve household livelihoods. Therefore, other policy recommendations for application in the study to the national Government entail a.) the need to increase subsidizes on the costs of farm inputs; b.) increase efforts towards agri-based technology research to boost smallholder farmer's returns; and c.) intensify the marketing of smallholder farmer's products in the international markets. Such efforts by the national Government could promote the agriculture sector in Kenya by allowing several smallholder farmers to embrace inclusivity business initiatives such as the implementation of product food safety standards and quality management systems that increase farm productivity and access to international markets and thus increasing sales returns that ultimately reduces poverty and improve household livelihoods (Ajwang et al., 2019).

In summary, the international markets for the agri-based industry have adopted food procurement structures and models that have significantly changed how smallholder farmers carry out farm activities (Toiba et al., 2020). Therefore, the recommendations for the application of the study are necessary as they enable expected outputs in a change management process in business

operations to be evaluated against the outcomes or resultant effects. Table 40 below attempts to categorize the recommendations for application into policy recommendations and managerial recommendations for enhanced understanding.

Table 40:

Categorization of Recommendations for Application

Policy Recommendation	**Managerial Recommendation**
To achieve national Government objectives of Kenya being considered a leading destination for investors in the region with varied investment opportunities in agriculture and agri-business, spanning from crop and animal production, agro-processing, and marketing for local and export consumption (AMADPOC, 2011); 1. There is a need to increase subsidies on the costs of farm inputs. 2. There is a need to increase efforts towards agri-based technology research to boost smallholder farmer's net returns. 3. There is a need to intensify the marketing of smallholder farmer's products in the regional and international markets. 4. There has to be the continual development of strategic policies by the national Government to address critical issues affecting the agricultural sector in Kenya to help smallholder farmers implement and comply with product food safety standards and quality management systems in the change management process to access profitable markets that increase the net sales returns and ultimately the household livelihoods (Wangu et al., 2021).	1. The use of logical planning models (Clark & Apgar, 2019) to explore the incorporation of complex and systematic management changes in business operations. 2. Businesses should seek to understand technical processes when planning to undertake critical management changes in their operations, for example, using such models as the Hivos approach (Clark & Apgar, 2019) as a comprehensive guide to the change management process. 3. The importance of businesses to use different information gathered before embarking on a change management process to promote the intended business outcomes. Therefore, smallholder farmers must engage in a deliberate transformation and change management process to access international markets for sustainable and equitable business growth (Jacobi et al., 2020). 4. Adaptation of the applications of social science theory to get insights on how to make organizational decisions during moments like that of resource-constraint. 5. There is a need to embrace propositions from social science theories or behavioural changes that help smallholder farmers identify and understand the relevancy when addressing issues central to the theory of change (Clark & Apgar, 2019). 6. The use of social science theory to help sharpen one's thinking by providing new ways of looking at smallholder farmers' philosophy that ultimately improves how the ToC is applied in organizational or managerial operations. 7. Integration of ToC with social science theories to bring a better understanding and an in-depth view of smallholder farmers' managerial behavioural aspects that

	are also critical for assessing analytic models (Callaghan, 2017) that support collaborative efforts by rationalizing business arguments that promote long-term sustainable management structures and are thus worth the hard work of change management (Chambers, 2019).

Recommendations for future research

The purpose of the study is to explore the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. The study from the literature reviews recognized that smallholder farmers in Kenya have gone to great strides to embrace and change their business models and management structures to incorporate globally recognized agri-food protocols such as product food safety standards and quality management systems to become competitive and access international markets to improve their livelihoods (Doherty & Kittipanya-Ngam, 2021). Furthermore, the study considered that agriculture plays an important and complex role in Kenya's rural economy (Atela et al., 2018). According to FAO (2023), as discussed in the literature review, agriculture contributes 20 per cent of the Gross Domestic Product (GDP) and another 27 per cent indirectly through linkages with other sectors in the public, parastatals, non-government and private organizations. In addition, according to IFAD (2023), the agriculture sector in Kenya also accounts for 65 per cent of Kenya’s export earnings. Further, it provides more than 80 per cent of livelihood directly and indirectly to the Kenyan population through employment, income and food security needs (FAO, 2023).

According to Birch (2018) and USAID (2021), the study mentioned in the literature review that smallholder farmers in Kenya are the main drivers, accounting for 70% of the country’s agricultural production. According to Maguire-Rajpaul et al. (2020), as earlier mentioned in the

literature review, implementing global agri-food standards is costly and further encompasses burdensome procedures. Nevertheless, some smallholder farmers have successfully implemented product food safety standards and quality management systems. Consequently, according to the study findings, smallholder farmers have improved their operating and production structures to gain access to international markets, which are more profitable for improving livelihoods.

In view of this, the study used a mixed method approach to perform a comparative impact analysis on efficacy prior and post implementation of product food safety standards and quality management systems among smallholder farmers in Kenya. The study sought to investigate the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya prior and post implementation to determine the benefits realized from such programs. In addition, the smallholder farmer's organization and change management process was also investigated to establish if there have been improvements in their operating and production activities to gain access to more profitable markets and improve their livelihoods. Finally, the study sought to ascertain if the time, effort, and money spent on such programs are justifiable to Kenya's smallholder farmers and improve their livelihoods.

The study's findings suggest that smallholder farmers have benefited extensively from implementing product food safety standards and quality management systems by accessing new markets. For example, smallholder farmers estimated annual farm produce sales above Kes 100,000 have increased from 3.3% to 28.4% after adopting good agricultural practices. The study results revealed that the government had done much to assist smallholder farmers. However, there was a shred of evidence of challenges noted in the study. For example, 31.2% of the respondents felt the cost of such programs was a challenge, a further 20% a challenge in understanding fully the

requirements of product food safety standards and quality management systems and another 31.2% a challenge getting technical expertise in implementing the change management process.

This section highlights the recommendations for future research based on the study's findings. According to FAO (2015a), the literature review discussed the rapid demand on the food value chain to produce food that meets internationally approved product food safety standards and quality management systems. Further, the author explains that smallholder farmers have multiplied in response to the changes in the global agri-food systems to reduce risks in the food supply chains against potential contamination. Also, smallholder farmers assessed as compliant with product food safety standards and quality management systems are generally considered to show safer systems than those not assessed, thus able to penetrate more markets and improve livelihoods.

However, from the study findings, notwithstanding the opportunity to access the international market with farm products that comply with global agri-food systems, many smallholder farmers in Kenya still seem to find it challenging to embrace the framework structures in the theory of change and implement product food safety standards and quality management systems as a change management process in their farming operations. According to Stakeholder 5 in the thematic analysis findings, implementing the product food safety standards and quality management systems is costly since it requires some structures as per standard requirements. In addition, even after implementing product food safety and quality management systems, smallholder farmers, according to Stakeholder 8, must have additional financial resources to regularly monitor the change management process to prevent the risk of farm produce losses after post implementation to avoid affecting the quality of farm produce.

Based on the above challenges, the study recommends that future research on change management processes be carried out on smallholder farmers from semi-developed and developed countries to explore how the smallholder farmers that have implemented product food safety standards and quality management systems or similar globally acceptable agri-food standards have been able to sustain the change management process longterm.

Also, the study findings revealed that many smallholder farmers are not highly educated, making it difficult to adequately understand and implement product food safety and quality management system requirements. According to the descriptive findings on the respondents' education level, 40.5% of the respondents had a secondary level of education, 28.8% had a primary level of education, a further 27.9% had a college/university education, and 2.8% had no formal education. Further, 20.0% of the respondents revealed great challenges in understanding the requirements of the product food safety standards and quality management systems.

Based on the findings on the level of education of the smallholder farmers in Kenya and the challenges in fully understanding the requirements of the product food safety standards and quality management systems, further questions arise on the effectiveness and functionality of the change management process to fully optimize on the gains attributed by complying with the global agri-food requirements. Therefore, the study recommends further research on the change management process to determine if the smallholder farmers in Kenya who have implemented the product food safety standard and quality management systems benefit in full from the anticipated gains associated with the compliance of such programmes.

Apparently, according to the literature review, an article by the Food Safety Authority of Ireland (2018) seems to affirm that the smallholder farmers that have implemented the procedures

relating to product food safety standards and quality management systems provide cost-effective systems that allow for control of food from ingredients right through to production, storage and distribution to sale and service of the final consumer. Therefore, by undertaking further research studies, smallholder farmers can be assisted in ensuring they benefit further by saving business money in the long run, avoiding poisoning consumers, increasing food safety standards, ensuring compliance with the law, and promoting teamwork and efficiency during production.

The determination of the study area was based on a horticultural study done by the Kingdom of the Netherlands mapping the production of fruits and vegetables in Kenya (Associates, 2017). Therefore, following the detailed review of the inventory of fruits and vegetables in Kenya, Meru county was selected as the statistical sample region to determine the efficacy of product food safety standards and quality management systems of smallholder farmers in Kenya. The study used a probabilistic sampling design to select 215 smallholder farmers from four purposively selected Meru county sub-counties, namely, Buuri, Imenti South, Igembe Central, and Tigana West, to administer questionnaires for quantitative data collection.

According to the literature review by Associates (2019), Meru county has temperate and tropical weather conditions that make it generally favourable for developing and producing fruits and vegetables for both export to international markets and domestic markets. Furthermore, the coastal climate largely influenced Meru county’s physical and topographic features, especially the mountain's eastern slopes, with altitudes ranging from 300m to 5,199m above sea level. Meru county has many rivers and streams originating from Mount Kenya and Nyambene streams that people depend on for agriculture and domestic use. The average temperature in Meru county ranges from 8c at the minimum to 32c, the highest, with annual rainfall ranging between 300mm per annum

in the lower midlands to 2500mm in the South East. The rainfall patterns comprise long rains from mid-March to May and short rains from October to December.

Therefore, the study findings are primarily influenced by the production of smallholder farmers who have implemented the product food safety standards and quality management systems from a farming region that dominates as the main production area in Kenya, where every type of fruit and vegetable can be found that is sold in both international and domestic markets. The study recommends future research studies in other production regions in Kenya to have a balanced view of the efficacy of product food safety standards and quality management systems among the larger smallholder farmers in Kenya. The studies will be expected to reveal whether the problem gaps in the research and the anticipated benefits from change management processes are unique or uniform among the varying smallholder farmers in different regions of Kenya.

Also, the study selected the explanatory sequential mixed method design as the research strategy to collect data to solve the research problem and obtain answers to the research questions. According to the literature review on the explanatory sequential research design (Creswell & Clark, 2018), the study first collected quantitative data and then qualitative data to explain and elaborate further on the findings from the quantitative results. However, Creswell and Clark (2018) still mention that many other types of research designs advanced in literature can be adopted in the mixed method research approach.

Further, as discussed in the literature review, Creswell and Clark (2018) argue that the rationale for using the explanatory sequential mixed research design is justified because (a) the quantitative data and the results thereof are determined to provide a basis for comparability in understanding the general picture of the research problem when investigating the efficacy prior and

post implementation of product food safety standards and quality management systems among smallholder farmers in Kenya, and (b) the study allowed for the collection of additional information in the form of qualitative data. Therefore, qualitative data collected and analysed offered a different base for the quantitative findings to be refined, extended, and used to further explain the research problem's general picture.

Further, as discussed in the literature review, many other types of mixed designs are also advanced in literature (Creswell & Clark, 2018). Therefore, the study recommends further research using a different research design to establish which best presents a practical and effective approach to investigate the efficacy of product food safety standards and quality management systems among smallholder farmers. For instance, the researcher could decide to reverse the research process to ensure the study begins with analysing the qualitative data collected before embarking on the quantitative phase. For example, the qualitative data collected from interviewing 8 key stakeholders in the agricultural sector serves as the primary data for the study to compare results on the efficacy prior and post implementation of product food safety standards and quality management systems among smallholder farmers in Kenya. The quantitative phase then elaborates further and explains the qualitative data findings. The study conclusion will additionally act as a guide to understand better the study findings involving the human behaviour of smallholder farmers in relation to the change management process.

The concept of the theory of change (ToC), as explained by Chamberlain (2019) in the literature review, sought to address the challenges smallholder farmers face in developing countries to access international markets and consistently supply the right volumes and quality to market consumers. Therefore, ToC was designed to guide smallholder farmers and stakeholders

sustainably in the agri-food supply chain structure from farm to final consumer to increase farm returns and improve household livelihoods. Some examples of challenges faced by smallholder farmers even after implementing the change management process, as mentioned in the literature review, range from limited access to land and water resources, limited mechanization, limited financial resources, poor infrastructure and limited technical and commercial knowledge, to mention a few.

According to Serrat (2017), as discussed in the literature review, smallholder farmer's anticipation to increase sales and improve household livelihoods could be high after adopting the change management process encompassing the implementation of product food safety standards and quality management systems in the farm operations. The change of management process ranges from the institutional set-up of derivates ranging from purposeful models with policy and strategy programmes put in place, targetting intended outcomes, to the set-up of improved organizational skills in managing complex decision-making processes that help business owners and entrepreneurs navigate complex management changes to achieve strategic organizational goals, among other initiatives.

According to Mayne and Johnson (2015), as discussed in the literature review, ToC has been used by different organizations for planning, impact assessment and intervention, programme design, monitoring, measuring and evaluation processes. According to Vogel (2023), the rationale when using the ToC approach is that every programme in the change management process is packed with beliefs and assumptions about how humans work in organizations to achieve target goals and objectives. Therefore, ToC, according to the study findings, seems to have empowered all smallholder farmers to make well-informed decisions on managing their farm operations using

standards such as product food safety standards and quality management systems to access international markets for increased income and improved household livelihoods.

However, although the study focused on the theory of change in view of the global agri-food industry trends and transformation, according to Lee et al. (2012), to establish, determine and implement product food safety standards and quality management systems, some challenges arose beyond the anticipation of the smallholder farmers that may have affected farm operation efficiencies and thus making it difficult to fully optimize on the commercial gains from tapping into the European markets with a demand year-round supply. Some of the challenges faced by smallholder farmers, according to Kamara et al.(2019) and RSA (2012), as discussed in the literature review, include climate change, access to and ownership of capital assets for food production, poor road infrastructure, storage and marketing facilities, challenges in admittance to financial services for working capital loans, competition to international markets from other countries, among others.

The study recommends future research to determine how to mitigate factors beyond the smallholder farmer's reach so that investments into change management processes, such as implementing product food safety standards and quality management systems, will result in a higher net return and ultimately improve household livelihoods.

However, based on the study findings, smallholder farmers still opt out of continual international export market participation. Therefore, further research studies need to be conducted to suggest other effective problem-gap solutions that can help the government of Kenya improve smallholder farmers' livelihoods and household income.

Conclusions

The study commenced by recognizing that agriculture continues to play an important role in the rural economy of Kenya. As explained earlier, agriculture has been fully devolved under the county government as an essential service provision to ensure food security. As mentioned in the study, agriculture in Kenya is considered large and complex, employing more than 40 per cent of the total population, out of which 70 per cent or more are rural people (FAO, 2023). In addition, the agriculture sector was explained as a key sector of consideration to Kenya's economy, contributing directly 20 per cent of the Gross Domestic Product (GDP) and another 27 per cent contribution indirectly through linkages with other sectors in the public, parastatals, non-government and private organizations. The agriculture sector in Kenya also accounts for 65 per cent of Kenya’s export earnings (IFAD, 2023). It thus provides more than 80 per cent of livelihood directly and indirectly to the Kenyan population through employment, income and food security needs (FAO, 2023).

The study explained that smallholder farmers in Kenya are the country’s main agricultural production drivers, accounting for 70 per cent of the marketed agricultural production (Raithatha, 2019). The smallholder farmers, however, live and cultivate on farms with average land sizes smaller than 2 hectares (FAO, 2023). Nevertheless, despite these constraints, smallholder farmers in Kenya produce food for a substantial proportion of the world’s population.

The study further recognized that smallholder farmers in Kenya have gone to great lengths to change their business model architecture to incorporate globally recognized product food safety standards and quality management systems to become competitive and access international markets to improve their livelihoods (Doherty & Kittipanya-Ngam, 2021). However, as explained by the

author in the study, compliance with product food safety standards and quality management systems is costly and often deemed disproportionately burdensome for smallholder farmers (Maguire-Rajpaul et al., 2020).

On this basis, the study's purpose was to explore the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. Therefore, to solve the problem envisioned in the problem statement, the study sought to identify and present an impact comparative on the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya prior and post implementation and determine the benefits realized from such programs. Further, the study also sought to identify and discuss the inherent and potential challenges arising from the change management process by smallholder farmers to implement product food safety standards and quality management systems. Finally, the study sought to determine solutions to the problem gaps identified and explore the possibility of upgrading smallholder farmers in Kenya to improve their livelihoods further.

Based on the problem, research purpose, aims, and objectives outlined above, this study sought to answer the following research questions: (a) to what extent have smallholder farmers in Kenya benefited from the implementation of product food safety standards and quality management systems, (b) what are the key enablers/drivers in the implementation of product food standards and quality management systems for smallholder farmers in Kenya, (c) what are the challenges faced by smallholder farmers in Kenya in the establishment and implementation of product food safety standards and quality management systems, (d) what are the factors that have contributed to majority of the smallholder farmers in Kenya not implementing product food safety and quality

management systems, and (e) what can the government do to encourage more farmers in Kenya to implement product food safety standards and quality management programmes.

A literature methodology search of peer reviews was used to compile data to explore the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. Approximately 230 peer-reviewed articles were studied and primarily related directly to smallholder farmers' change management process, smallholder participation in the international market, and smallholder farmers' compliance with product food safety standards and quality management systems. The literature review provided comprehensive information on the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. In addition, the literature review explored smallholder farmers' change management processes to determine if such decisions improved their operating and production activities to gain access to more profitable markets and improve their livelihoods. Also, the literature review provided information that investigated if the time, effort, and money spent on such programs change management programs are justifiable to Kenya's smallholder farmers and improve their livelihoods.

The Theory of Change (ToC) was presented in the study as a rational theoretical framework for the research, problem statement, purpose, meaning and research questions (Lederman & Lederman, 2017) when performing an impact comparative on the efficacy of smallholder farmers in Kenya prior and post implementation of product food safety standards and quality management systems. The ToC approach correlated to the study's objective, making it easier to solve the thesis problem (Okemba, 2018) and explore the principles for change, how to effectively implement organizational changes, and the importance and role of changes, among other facets.

The Hivos approach (Clark & Apgar, 2019), which is a seven-step structured process approach framework of the ToC, was used to build consensus around the study objectives and direction. The seven-step structured process approach explained in detail in the study included (a) Purpose of ToC, (b) Impact Vision, (c) Understanding Context Dynamics, (d) Outcomes as Changes in Stakeholders, (e) Mapping Causal Pathways, (f) Assumptions, and (g) Evaluation Plan. In addition, the complexities and systematic changes experienced by smallholder farmers in Kenya were also examined to explain the efficacy of product food safety standards and quality management systems.

Also, the study incorporated a literature review on the social theory model to supplement and provide additional in-depth analysis of the ToC as a change management tool to explain the proliferated response to the changes and demands of smallholder farmers. The use of social science theory was described in the chapter as ideal to contextualize and understand the evidence base used when applying the ToC approach (Callaghan, 2017; Stein & Craig, 2012). In other words, social changes depend on behavioural change. It also gave an insight into how smallholder farmers make organizational decisions during resource-constraint times. The literature review explained how the social science theories provided a bedrock of solid pillars that can help understand how smallholder farmers deal with challenges faced when undertaking a change management process when implementing product food safety standards and quality management systems in their operations.

Therefore, a simplistic presentation of different social science disciplines applicable in explaining the relevance of social science theories to the study was described and included (a) the agency theory, (b) the theory of planned behaviour, (c) the innovation diffusion theory, and, (d) the general deterrence theory.

The use of social science theory was described in the chapter as ideal to contextualize and understand the evidence base used when applying the ToC approach (Callaghan, 2017; Stein & Craig, 2012). In other words, social changes depend on behavioural change. It also gives an insight into how smallholder farmers make organizational decisions during resource-constraint times.

The study also adopted a conceptual framework to guide further and bring out the aspects of the research on how they interlink when exploring the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. The conceptual framework viewed the interrelated components and variables to address the research objectives and aims to solve the problem in the study (Guntur, 2019).

The study confirmed that letters of approval from the research participants, the Unicaf Research Ethical Committee (UREC) and the National Commission for Science, Technology and Innovation (NACOSTI), a national Government authority in Kenya, were obtained to protect the use of humans in the study. Human factors and their complexities were explained when mapping the smallholder farmer's change management process to compare efficacy prior and post implementation of product food safety standards and quality management systems.

The study used a methodological repertoire commonly referred to as mixed method research with design frameworks that include quantitative and qualitative methods, widely known as a mixed approach research method, which has gained impetus among educational researchers (Creswell, 2012; Timans et al., 2019). The mixed approach methodology is used in conjunction with statistical analysis to analyse and interpret the surveyed data collected from the study participants to determine the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. The study further explained that the rising popularity of the mixed approach

method in social and behavioural science made it the preferred research method to use when engaging smallholder farmers to determine the efficacy prior and post implementation of product food safety standards and quality management systems.

The explanatory sequential design was selected for the study to solve the research problem and answer the research questions. The explanatory sequential research design allows quantitative and qualitative data to be collected sequentially in two phases (Creswell & Clark, 2018). Quantitative data is collected first in the study, followed by qualitative data to explain and elaborate further on the quantitative results. Therefore, the rationale for using the explanatory sequential design was justified in the study. According to Creswell and Clark (2018), the advantages of the use of the explanatory sequential design were summarized as follows: (a) the design offers a robust quantitative research orientation, (b) it is a straightforward design to implement conducted in two separate phases, that is, quantitative and then qualitative, for the same type of data, (c) final report written is clearer to the readers as the quantitative section is presented first then the qualitative report, and finally, (d) the design aligns itself to emergent approaches since the second phase can be modified and adapted based on the outcome of the initial quantitative phase.

On the other hand, the study also presented the challenges associated with using explanatory sequential design research. It was summarized as follows: (a) the design can be time-consuming in the implementation of the two-phase, and (b) it is not easy to state in advance the participants to be selected in the second qualitative phase until the initial quantitative phase is completed, (c) the design requires the researcher to specify who can best be selected to explain the qualitative phase.

The study further presented the horticultural study by the Kingdom of the Netherlands mapping the production of fruits and vegetables in Kenya (Associates, 2017) that concluded that

Kenya's temperate and tropical weather conditions make it generally favourable for the development and production of fruits and vegetables for both export to international markets and domestic markets. According to the article by the Kingdom of the Netherlands, Meru county dominated as the main production area in Kenya, where every type of fruit and vegetable can be found that is sold in both international and domestic markets. Therefore, on this basis, the study selected Meru county as the statistical sample region to determine the efficacy of product food safety standards and quality management systems of smallholder farmers in Kenya.

The mixed approach was adopted to determine and evaluate the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. The study's targeted population comprised smallholder farmers aged between 20 and 75 years. The sampling design encompassed both probability sampling techniques for quantitative data collection and non-probability sampling techniques for qualitative data collection. The study's sample size targeted 225 participants, with 215 smallholder farmers participating in the quantitative survey and 10 key stakeholders in the agricultural sector being interviewed for the qualitative survey. However, only 8 key stakeholders responded during the qualitative data collection phase.

The instruments used to collect quantitative and qualitative data were also explained. The quantitative or qualitative research tools were critically checked or examined to ensure that the instruments were likely to give the expected results for the study. The researcher had to ensure that the instruments used to collect data for the study were valid, reliable and appropriate. In the study to explore the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya, the questionnaire was used as the research tool to collect quantitative data. The questionnaire asked the smallholder farmers to answer closed-ended questions to collect

quantitative data. The closed-ended questions are widely used because they provide greater uniformity of responses than open-ended ones and are easier to process during data analysis. Smallholder farmers were asked to answer a list of provided questions pertinent to the study. In addition, the Likert scale (Babbie, 2013) formated the smallholder farmers' responses into categories such as strongly agree, agree, disagree or strongly disagree or perhaps approve, strongly approve, and so forth; hence, it is easy to transfer directly into the computer format.

The questionnaires were worded in a simplified English language and administered to 215 smallholder farmers for quantitative data collection. The smallholder farmers identified to participate and respond to the quantitative research tool were randomly selected from the four purposively selected sub-counties of Meru county, namely, Buuri, Imenti South, Igembe Central, and Tigana West. In addition, the researcher was present to clarify any question where necessary, as worded in the questionnaire.

Further, the researcher used qualitative data collected to interview key stakeholders and informants within the agricultural sector to explain and elaborate further on the quantitative results. Thus, with this in mind, interviewing was used as the research tool to collect qualitative data from other key stakeholders and informants within the agricultural sector. The study had targeted 10 participants for face-to-face and telephone interviews for in-depth case analysis selected from key stakeholders and informants as follows: (a) 4 participants from the Horticultural Crop Development Authority, (b) 1 participant from the Ministry of Agriculture, (c) 1 participant from the Kenya Plant Health Inspectorate Authority, (d) 2 participants from Horticultural export companies, and finally, (e) 2 participants from Agricultural extension officers. The appointments were booked with the respective government offices and horticultural companies to conduct one-to-one physical and

telephone interviews with the target participants. However, only 8 participants responded positively to the qualitative research study.

The interviews incorporated designed open-ended questions that did not restrict the respondent's views when collecting qualitative data. The interview process involved asking key stakeholders or informants in the agricultural sector in Kenya one or more open-ended questions to best voice their experience. At the same time, the researcher recorded their answers for further analysis (Creswell, 2012). The collected data was then transcribed and entered into a computer file. Finally, the smallholder farmer participant's conversation was audiotaped so that the information could be transcribed into words for analysis purposes.

The use of operational variables became critical since they communicated the quantitative phase used by the researcher in the study when comparing the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. Therefore, the study entailed the consideration of measurable factors called variables that are subject to change due to smallholder farmers' change management processes or circumstances when implementing product food safety standards and quality management systems. Variables in a research study explain variances that occur in a change created due to manipulation (Olayemi, 2017). In other words, variables are names given to variances critical to the research and explain the research process that determines the nature and direction of the study. Also, variables become central in the research process because the research title is actually made up of variables and thus focal to the study. Cohen, Manion and Morrison (2007), as mentioned by Olayemi (2017), describe a variable as an operationalized construct in which the researcher is interested because it dictates the subsequent development of a measurement instrument to access the variable.

The variables in the study's quantitative phase, as explained in the chapter, primarily focused on the attributes of the smallholder farmer prior and post implementation of product food safety standards and quality management systems. The variables for measurability purposes were presented in an easy and straightforward manner that the smallholder farmers could quickly respond to when filling out the questionnaire for quantitative data collection and later for statistical analysis.

Ethical assurance was explained as an interdisciplinary component of responsible research (Burr & Leslie, 2021). As described in the study, ethical assurance presented a unifying structure of numerous practical mechanisms built upon governance that supported inclusive and participatory ethical deliberations of smallholder farmers and key stakeholders in the agricultural sector while grounded on the technical and social realities of the research work. The study further considered integrity and honesty when interacting with smallholder farmers and key stakeholders in the agricultural sector in Kenya. The participant's rights were protected by including directions for completing and submitting both quantitative and qualitative data. To assure anonymity, the data collected and analysed results are presented in an aggregated format, not identifiable by name. Smallholder farmers and key stakeholders in Kenya's agricultural sector were informed of their rights to participate voluntarily in the study. Quantitative data and qualitative data collected were held in an electronically formatted location for analysis with no indication of their source. The collected data will be secured in the researcher's computer, and the survey site will be closed. The final data will then be removed from the computer and stored in a flash disk and external storage drive for safe custody for a duration of one full year after completion of the study. Then, it will be destroyed.

The proposed techniques to analyse the quantitative and qualitative data collected for the study were exhaustively explained. Data analysis in the study was considered the process of cleaning, transforming, and modelling data to find useful information that solves the research problem identified (Islam, 2020). Further, data analysis was described as a complex and enigmatic phase in a qualitative (Kiger & Varpio, 2020). The thematic approach was used to analyse the qualitative data collected from the key stakeholders in the agricultural sector in Kenya. Though widely used and often misunderstood (Kiger & Varpio, 2020), thematic analysis is a useful and accessible tool for a qualitative research study.

Also, quantitative data analysis was explained as a statistical process that systematically collects and evaluates measurable and verifiable data (Ameer, 2021). The process, technique, findings and conclusion from the quantitative data analysis can be quantified as inferential statistics (Ameer, 2021). Descriptive statistics (James & Simister, 2020), as mentioned by Ameer (2021), was presented in the study as an analytical technique used to describe or present quantitative data in an easily accessible manner that enables the study to illustrate and sum up observations. Therefore, descriptive statistics enable the establishment of a rationale to measure quantitative data collected for the study. Descriptive statistics, the preliminary phase of quantitative data analysis converting observations into numerical figures, are arranged into frequency distribution and graph displays.

Inferential statistics were explained in the study as an inductive approach and technique that allowed the findings from quantitative data collected from a sample to be generalized for a specific faction to the entire population (Ameer, 2021). Inferential statistics enabled different instruments to measure the similarity or dissimilarity of data collected and analysed for the study. Examples

presented in the chapter on inferential statistics used in the study include multicollinearity, the chi-square test, the Wilcoxon signed-ranked test, and the t-Test.

The study further explained how the concepts of trustworthiness, reliability, and validity of the data were used to validate the analysis. The trustworthiness of the data collected was described as vital since data for the research study should be precise, consistent and exhaustive (Nowell et al., 2017) for transferability, credibility, confirmability and dependability (Stahl & King, 2020). A total of 215 smallholder farmers answered favourably during quantitative data collection, yielding a response rate of 100 per cent. This study's response rate of 100% was deemed satisfactory because the statistical analysis requires a response rate of at least 50% to commence analysis. In the case of qualitative data collection, 10 key stakeholders in the agricultural sector in Kenya were invited to respond to the interview questions. The number of interviewees that answered favourably was 8, yielding a response rate of 80 per cent. The study's response rate of 80% is also deemed satisfactory because the statistical analysis to commence analysis requires a response rate of at least 50%.

A primary study was done, and research tools were pre-tested on 20 pre-selected participants with the same characteristics as the target population and excluded from the final analysis. The primary goals of the pilot study were to evaluate the instruments' ambiguity, sensitivity, and appropriateness. In addition, a pre-test on collecting qualitative data was also done on 2 pre-selected participants. The preliminary study assisted in estimating the length of an interview session and improving the tools' accuracy.

In the case of the validity of the study, variables explained in the chapter emphasised the degree of accuracy and significance of inference based on the research findings. In contrast, the reliability of the study variables emphasises the amount to which there is no bias, ensuring uniform

measurement in the research instruments used. All items for quantitative data collection were subjected to a reliability analysis in the study, and the component factor analysis was also validated. In addition, Cronbach's alpha was used in the study as a measure of dependability that illustrates how well the instrument's items are connected (Bonett & Wright, 2015). Reliability scores were determined on the variables in the questionnaire before the implementation of Good Agricultural Practice (GAP) and after the implementation of Good Agricultural Practice (GAP). In both cases, Cronbach's alpha values of above 0.7 were reported. Therefore, Cronbach's alpha values of 0.7 and above are considered adequate. Thus, this implies that the items under each variable were consistent.

The quantitative survey results were organized into sections that outline the results of the quantitative data analysis. The Statistical Package for Social Sciences (SPSS) was used to clean, code, and analyze the data based on each independent variable.

Also, the questionnaire tool used to collect quantitative data was designed in a manner that allowed for the collecting and gathering of both nominal and ordinal data. The questionnaire comprised six sections with a total of 43 in-depth questions that were developed to ensure the rigour and objectivity of data. The questionnaire mainly required the participants to select from a list of options, thus making it simple to complete. In addition, provisions for additional responses were included in the questionnaire to avoid unreasonably limiting the participant's responses. Before filling out the questionnaire, the participants were directed to the sub-clause that informs that Good Agricultural Practice (GAP) in the questionnaire means the implementation of product food safety standards and quality management systems.

The outline of the sections from the questionnaires, in summary, consisted of the following: (a) demographic variables, that is, gender, age, level of education, marital status, number of people per household, number of years in farming, size of farming land, position on the farm, and the farm location, (b) variables on the importance of GAP, that is, market requirements, requirements of food safety standards, access to new markets, why buyers reject farm produce in the marketplace, and receiving higher prices from the farm produce, (c) variables on farm activities, that is, human infectious diseases and how they spread on the farm, product food safety risks on the farms, cleaning and sanitizing the farm and farm produce, keeping domestic animals away from the farm and harvest area, monitoring and testing water quality, (d) variables on farm sales, records, and documented procedures, that is, markets where farm produce was sold, estimated sales of farm produce per year, keeping farm produce sales records, duration of keeping farm produce sales records, keeping documented procedures of farm activities, (e) variables on challenges faced after implementing GAP, finally, (f) additional responses that would help enhance GAP relating to product food safety standards and quality management systems in the farm and marketplace.

Descriptive statistics in the study presented the analysis of continuous and categorical data in diagrams of frequencies and percentages, graphs, and charts relating to smallholder farmer's data collected prior and post implementation of product food safety standards and quality management systems. On the other hand, inferential statistics refers to an inductive approach and technique that allows the findings from quantitative data collected from a sample to be generalized for a specific faction to the entire population (Ameer, 2021). Inferential statistics were also used to analyse further the quantitative data collected from smallholder farmers in Kenya to determine efficacy prior and post implementation of product food safety standards and quality management systems. Inferential

statistics involves drawing conclusions or inferences based on a set of data observed (Chanoknath & Louangrath, 2015). Therefore, using inferential statistics, that is, Multicollinearity correlation, the Chi-square test, the Wilcoxon signed-rank test, and the t-Test, the study compared descriptive statistics obtained from the sample population prior and post implementation of product food safety standards and quality management systems to make a conclusion or inference about the smallholder farmer population in Kenya. The results or findings derived from the sample population were used to draw conclusions about Kenya's larger smallholder farmers population.

In brief, multicollinearity correlation was employed to examine the relationship between a set of variables. Strong correlations between the independent variables are known as multicollinearity, and this is an undesirable scenario. Tolerance and the Variance Inflation Factor are two statistics used to measure multicollinearity. The Variance Inflation Factor is the tolerance's inverse (VIF). If a variable's VIF is 5 or higher, multicollinearity is linked with that variable.

As explained in the study, the chi-square test was used to find any relationship among non-numeric variables when collecting respondents' data or statistical analysis (Nihan, 2020).

As explained in the study, the non-parametric Wilcoxon signed-ranked test was used to replace the dependent t-test. The dependent t-test should not be employed when the assumption of normality in the data has been broken. According to the literature, the Wilcoxon signed-rank test compares two sets of scores from the same respondents when variables are subjected to more than one condition or when we want to analyze any score changes from one point to the next. In addition, the Wilcoxon signed-rank test assumes that the dependent variable is being measured at the ordinal or continuous level. Among other methods of ranking categories, Likert scales are examples of

ordinal variables. Therefore, the assumption is valid for the study since most variables are measured on the Likert scale.

The study used the thematic approach to analyse qualitative data collection from the 8 key stakeholders from the agricultural sector in Kenya. The study sought to give a solution to the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya. Qualitative data used in Chapter 4 was collected from key stakeholders in the agricultural sector, namely (a) Government Agencies, that is, Horticultural Crop Authority and Ministry of Agriculture, (b) Horticulture Exporting Companies and (c) Agricultural Extension Officers.

As explained in the study, the study used open-ended interview questions as the research tool to collect qualitative data from informants in Kenya's agricultural sector. The issues considered in the interview questions in the collection of qualitative data included (a) the demographic, (b) the extent smallholder farmers have benefited from implementing good agricultural practices, (c) the factors or enablers that make smallholder farmers implement good agricultural practices, (d) the challenges faced by smallholder farmers when implementing good agricultural practices, (e) the recommendations to smallholder farmers that want to do a change management process and implement good agricultural practices, (f) the extent of government support to encourage smallholder farmers to implement good agricultural practices, (g) the social-economic impacts on smallholder farmers that have implemented good agricultural practices, and finally, (h) how smallholder farmers can acquire knowledge to mitigate embedded risks when implementing good agricultural practices.

The key stakeholders or informants were asked to voice their experiences best while the researcher recorded the answers for further analysis (Creswell, 2012). The qualitative data primarily expressed the detailed insights, views, beliefs, experiences and motivations (Gill et al., 2008) of key stakeholders regarding the efficacy of product food safety standards and quality management

systems among smallholder farmers in Kenya. The collected interview data, which had been audio recorded, was then transcribed into words and then entered into a computer file for analysis purposes. The study used a thematic approach to analyse the qualitative data collected from key stakeholders in the agricultural sector in Kenya. As a result, the researcher would better understand smallholder farmers' thoughts, experiences, and behaviour patterns (Kiger & Varpio, 2020) on efficacy prior and post implementation of product food safety standards and quality management systems.

The interviews with the key stakeholders in the agricultural sector in Kenya were analysed, and four themes were identified to address the research questions, namely, (a) understanding context, (b) outcomes, (c) government involvement, and (d) mapping pathway/ evaluation. The selected codes and themes were centred around the change management process to determine the efficacy of smallholder farmers in Kenya prior and post implementation of product food safety standards and quality management systems. The selected themes in the study from the qualitative data collected were used to address the five research questions presented in the study.

The following section summarizes the implications and recommendations of the study to address the research problem and the results of the study obtained from the quantitative data collected from 215 smallholder farmers and qualitative data from 8 key stakeholders from the agricultural section in Kenya.

To briefly comment on the findings and implications of RQ 1, smallholder farmers had benefited mainly from establishing and implementing product food safety standards and quality management systems as a good agricultural practice. Knowledge of the target markets' nature was enhanced, the quality of the farm products improved, water quality was frequently monitored, and

domestic animals were kept away from the production and harvesting centres for hygiene purposes. Smallholder farmers could increase their sales output in local markets because of increased access to international markets. In addition, smallholder farmers benefited from extensive training from various stakeholders in the agricultural supply chain after implementing product food safety standards and quality management systems as good agricultural practices. As a result, smallholder farmer's incomes improved, enabling many to diversify into other income-generating activities such as livestock farming and floriculture farming, thus impacting the community positively.

However, smallholder farmers still encountered challenges in implementing product food safety standards and quality management systems. The challenges need to be addressed so that they do not work against the benefits realized by smallholder farmers following the implementation of product food safety standards and quality management systems. For example, the cost of maintaining the change management process and identifying technical expertise was also challenging.

In the case of RQ 2, smallholder farmers were motivated to implement product food safety standards and quality management systems to maximize farm sales returns and profitability. Smallholder farmers were interested in why the farm produce was rejected at the marketplace. Further, the smallholder farmers wanted to know how to access new markets as a driver/enabler for the change management process. The findings and the study's implication aligned with the global developments in the agri-food industry that require smallholder farmers to be socially and economically responsible as key stakeholders in the food supply chain system (Lee et al., 2012). For example, the recent transformation in the European marketplace and the increased demand for fresh horticultural products require smallholder farmers to supply safe food for consumption

(Krause et al., 2016). Besides the drive to increase sales and profit objects, smallholder farmers wanted to know the protocols and requirements of product food safety standards and quality management systems for undertaking at the farm level as a good agricultural practice. Further, the surety of the market was a primary foundation for smallholder farmers to produce safe food for humans and increase profitability.

However, challenges beyond the direct control of the smallholder farmers could hinder the anticipated accelerated growth towards the effective contribution to strategic food security goals and compete effectively in marketplaces (Kamara et al., 2019; RSA, 2012). For example, challenges in global climate (Kipkoech et al., 2015; Paloma et al., 2020); limited access to and ownership of capital assets for food and farm production (Sinyolo et al., 2014); challenges from the poor road and institutional infrastructures (Paloma et al., 2020); limited access to the admittance of secure loans from a financial institution (Demirguc-Kunt & Klapper, 2012); and consistent adherence to the global product food safety standards and quality management systems, and global completion (Kamara et al., 2019).

In the case of RQ 3, the study's results still revealed several challenges encountered by the smallholder farmers in Kenya when implementing product food safety standards and quality management systems. For example, many smallholder farmers in sub-Saharan regions operate in stressful environments with climate adaptation challenges, limited credit facilities, poor access to technological advancements, and limited market information, to mention a few (Ngeve et al., 2014; Rhodes et al., 2014). Such challenges affect smallholder farmers' ability to effectively implement global standards and quality systems, consequently accelerating poverty. Also, the literature review indicates that agricultural activities in recent times have stagnated, with smallholder farmers and

related agriculture supply chain entities encountering challenges that affect business growth and improvement of the quality of farm products. (USAID, 2021).

Generally, change management processes resulting in implementing and complying with product food safety standards and quality management systems can be costly and excessively burdensome for smallholder farmers (Maguire-Rajpaul et al., 2020). Nevertheless, smallholder farmers' implementation of product food safety standards and quality management systems must not be viewed as restrictive, as it underpins the global agrifood compliance objectives of food security and consumer protection of food safety (Hammoudi et al., 2015). Also, the smallholder farmers are not highly educated, making understanding the food safety product standards and quality management system protocols difficult. Finally, the cost of implementing product food safety standards and a quality management system was prohibitive, restricting many smallholder farmers from accessing global markets and thus exacerbating poverty levels.

In the case of RQ 4, the study findings and resultant implications establish why most smallholder farmers in Kenya have not implemented product food safety standards and quality management systems. The literature review shows that many smallholder farmers in Kenya face challenges when complying with strict product safety standards and quality management systems (Ajwang, 2020). Consequently, many smallholder farmers have inexorably exited the change management process, opting to supply local and national markets with less stringent agrifood standards. Further, as explained by Lee et al. (2012) and Krause et al. (2016), recent consumer trends in the global agri-food industry show a year-round supply in the European market in favour of farm products from production units that have implemented product food safety standards and quality management systems. However, though debatable, implementing product food safety

standards and quality management systems to ensure adequate food production and distribution in an economically and ecologically sustainable long term still appears to be far-reaching for smallholder farmers (Jacobi et al., 2020).

The literature review largely explains why smallholder farmers in Kenya have not implemented product food safety standards and quality management systems. The study's results confirmed why most of the smallholder farmers in Kenya lack the motivation to actively market their farm produce. In addition, the smallholder farmers that have already implemented product food safety standards and quality management systems do not stand out in the community as admirable ambassadors of global food safety and security proponents. Nevertheless, Ajwang (2020) still explains that smallholder farmers who have implemented compliant global food safety standards, quality management systems, and other regulatory processes often quickly access international markets, thus increasing income levels and reducing poverty.

In the case of RQ 5, there is still consensus among stakeholders in the agriculture sector that the national Government has made tremendous efforts to assist smallholder farmers in implementing product food safety standards and quality management systems. Consequently, such efforts through the County government and the Horticultural Crop Development agency have enabled smallholder farmers in Kenya to access regional and international markets and increase returns to improve livelihood. In addition, the national Government has further availed agricultural extension officers who work with smallholder farmers to confront challenges relating to the implementation of product food safety standards and quality management systems.

Nevertheless, there is still much more that the national Government needs to do to assist smallholder farmers in overcoming challenges relating to the implementation of product food safety

standards and quality management systems. In addition, smallholder farmers want to be funded by the national Government to purchase farm inputs at subsidized prices. Also, more research activities on agri-based technology should be done to boost farm yields.

The study findings and results validated the theory of change (ToC) framework to convey a lens or signpost on how to process knowledge that all stakeholders can apply in agribusiness (Brockie et al., 2019; Callaghan, 2017; Grant & Osanloo, 2014; Roth et al., 2018). The study recommended the use of logical planning models (Clark & Apgar, 2019) to explore the incorporation of complex and systematic management changes in business operations. The study also recommends that businesses understand technical processes when planning to undertake critical management changes in their operations, for example, using such models as the Hivos approach (Clark & Apgar, 2019) as a comprehensive guide to the change management process. Another recommendation for application from the study is on the importance of businesses using different information gathered before embarking on a change management process to promote the intended business outcomes. In summary, the international markets for the agri-based industry have adopted food procurement structures and models that have significantly changed how smallholder farmers carry out farm activities (Toiba et al., 2020). Therefore, the recommendations for applying the study are necessary as they enable expected outputs in a change management process in business operations to be evaluated against the outcomes or resultant effects.

Although the study framework highlights that smallholder farmers drive Kenya’s export market in horticultural fruit and vegetable production, the study only considered 215 smallholder farmers participants in Meru county, one of Kenya's predominant agricultural production areas. Therefore, there is a need for future research studies to adopt other production regions in Kenya to

have a balanced view of the efficacy of product food safety standards and quality management systems among the larger smallholder farmers in Kenya.

The study selected the explanatory sequential design as the research strategy to collect data to solve the research problem and obtain answers to the research questions. More detailed research studies can be considered, and a more effective approach is adopted that probably begins with qualitative data collection before embarking on the quantitative phase.

Based on the findings on the level of education of the smallholder farmers in Kenya and the challenges in fully understanding the requirements of the product food safety standards and quality management systems, further questions arise on the effectiveness and functionality of the change management process to fully optimize on the gains attributed by complying with the global agri-food requirements. Therefore, the study recommended further research on the change management process to determine if the smallholder farmers in Kenya who have implemented the product food safety standard and quality management systems benefit in full from the anticipated gains associated with the compliance of such programmes.

Also, the study recommended future research to determine other organizational, creative programmes beyond compliance to agri-food standards that can assist smallholder farmers with benefits such as saving business money in the long run, compliance with the law, and promoting teamwork and efficiency during production.

Finally, based on the study findings, smallholder farmers still opt out of continual international export market participation. Therefore, further research studies need to be conducted to suggest other effective problem-gap solutions that can help the government of Kenya improve smallholder farmers' livelihoods and household income.

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APPENDICES

Appendix A: Unicaf University Research Ethics Application Form Doctoral Studies Provisional Approval

REAF_DSPA - Version 1.0

UNICAF UNIVERSITY
RESEARCH ETHICS APPLICATION FORM
DOCTORAL STUDIES PROVISIONAL APPROVAL

The Provisional Approval - Research Ethics Application Form (REAF) should be completed by Doctoral level candidates enrolled on Dissertation stage 1.

This form is a **provisional approval** which means that the UREC committee has accepted the initial description of the project but this is conditional as changes may have to be implemented following Dissertation Stage 2 and piloting in Dissertation Stage 3.

This is a conditional offer and acceptance of the project needs to be verified and confirmed upon completion of the Research Ethics Application Form in Dissertation Stage 3.

Important Notes:

- An electronic version of the completed form should be uploaded by the student to the relevant submission link in the VLE. Student's supervisor will then review the form and provide feedback commentary. Once supervisor's initial approval is given then the supervisor will forward this to doctoral.studies-aa@unicaf.org, for provisional approval by the Unicaf University Research Ethics Committee (UREC).

- Please type your answers and **do not** submit paper copy scans. Only *PDF* format documents should be submitted to the committee. It is recommended to use free version of Adobe Acrobat Reader available online: https://get.adobe.com/reader/

- If you need to supply any supplementary material, not specifically requested by the application form, please do so in a separate file. Any additional document(s) should be clearly labelled and uploaded in the relevant VLE link.

- If you have any queries about the form, please address them to your dissertation or project supervisor.

REAF_DSPA - Version 1.0

UNICAF UNIVERSITY
RESEARCH ETHICS APPLICATION FORM
DOCTORAL STUDIES PROVISIONAL APPROVAL

UREC USE ONLY:
Application No:
Date Received:

Student's Name: Kenneth Maundu

Student's E-mail Address: maunduken@gmail.com

Student's ID #: R1909D9254201

Supervisor's Name: Dr Vusumuzi Sibanda

University Campus: Unicaf University Zambia (UUZ)

Program of Study: UUZ: DBA Doctoral of Business Administration

Research Project Title: The Efficacy of Product Food Safety Standards and Quality Management Systems among Smallholder Farmers in Kenya

1. **Please state the timelines involved in the proposed research project:**

Estimated Start Date: 08-Mar-2021 Estimated End Date: 31-Dec-2022

2. **The research project**

2a.Project Summary:

In this section please fully describe the purpose and underlying rationale for the proposed research project. Ensure that you pose the research questions to be examined, state the hypotheses, and discuss the expected results of your research and their potential.

It is important in your description to use plain language so it can be understood by all members of the UREC, especially those who are not necessarily experts in the particular discipline. To that effect please ensure that you fully explain / define any technical terms or discipline-specific terminology (maximum 300 words +/- 10%).

This study seeks to identify and present an impact comparative on the efficacy of smallholder farmers in Kenya prior and post implementation of product food safety standards and quality management systems. This study seeks to answer the following research questions;
(i) To what extent have smallholder farmers in Kenya benefited from the implementation of product food safety standards and quality management systems?
(ii) What are the key enablers/drivers in the implementation of product food standards and quality management systems for smallholder farmers in Kenya?
(iii) What are the challenges faced by smallholder farmers in Kenya in the establishment and implementation of product food safety standards and quality management systems?
(iv) Why have majority of the smallholder farmers in Kenya not implemented product food safety standards and quality management systems?
(v) What can the government do to encourage more farmers in Kenya to implement product food safety standards and quality management programmes?
Therefore, once the problem gaps are identified and solved, this study is expected to benefit smallholder farmers in Kenya through attainment of higher productivity, lower production costs, higher enterprise and farm incomes, higher disposable incomes, and consequently greater investments on-farm and in other areas and activities that improve the welfare of household members.

2b. Significance of the Proposed Research Study and Potential Benefits:

Outline the potential significance and/or benefits of the research (maximum 200 words).

The study intends to identify and present an impact comparative on the efficacy of smallholder farmers in Kenya prior and post implementation of product food safety standards and quality management systems. Therefore, the study seeks to explore the value chain structure of the smallholder farmers in Kenya and its relationship to product food safety standards and quality management systems prior and post implementation in order to determine the benefits that are realized from such programs. The study will further explore the potential challenges and consider the possibilities of upgrading smallholder farmers in Kenya to further improve their livelihoods. Finally, the approach and application of the study is intended to further provide more hard evidence to the existing studies on the impact of implementing product food safety standards and quality management systems among smallholder farmers in Kenya in order to justify the amount of time, efforts and money spent on such programs.

3. **Project execution:**

3a. Type of project. The following study is an:

- [x] experimental study (primary research)
- [ ] desktop study (secondary research)
- [ ] desktop study using existing databases involving information of human/animal subjects
- [ ] Other

If you have chosen 'Other' please Explain:

3b. Methods. The following study will involve the use of:

Method	Materials / Tools
☑ Qualitative	☑ Face to Face Interviews
	☑ Phone Interviews
	☑ Face to Face Focus Groups
	☐ Online Focus Groups
	☐ Other*
☑ Quantitative	☑ Self-administered Questionnaires
	☑ Online Questionnaires
	☑ Experiments
	☐ Tests
	☐ Other *

*If you have chosen 'Other' please Explain:

4. Participants

4a. Does the Project involve the recruitment of participants?

☑ YES **If YES, please complete all following sections.**

☐ NO **If NO, please directly proceed to Question 5.**

Note: The definition of "participation" includes active participation, such as when participants knowingly take part in an interview or complete a questionnaire.

4b. Relevant Participant Details of the Proposed Research

Please state the number of participants you plan to recruit, and describe important characteristics such as: demographics (e.g. age, gender, location, affiliation, level of fitness, intellectual ability etc). It is also important that you specify any inclusion and exclusion criteria that will be applied (e.g. eligibility criteria for participants).

Number of participants: 225

Age range: From 30 To 70

Gender: ☑ Female ☑ Male

Eligibility Criteria:

- Inclusion criteria: (i) A farmer and grower of fresh vegetables and/or fruits (ii) The farmer must have implemented good agricultural practices encompassing product food safety standards and quality management systems
- Exclusion criteria: (i) A farmer with less than 5 years in farm production (ii) Farmers outside the geographical boundaries of Kenya (iii) A farmer that has engaged minor workers (less than 18 years)

Disabilities: N/a

Other relevant information (maximum 100 words):

None

4c. Recruitment Process for Human Research Participants:

Please clearly describe how the potential participants will be identified, approached and recruited (maximum 200 words).

The study will adopt a mixed method approach that involves recruitment of smallholder farmers where about 75 participants will be interviewed under the qualitative aspect of the study and 150 administered via questionnaires under the quantitative aspect of the study. The country of Kenya is divided by the 2010 constitution into 47 units of devolved governments commonly referred to county governments. The study will identify and select the top 15 counties leading in agricultural production in Kenya and thereafter recruit 15 participants on average from each county selected to obtain a number of 225 participants for the study. The researcher will use the contacts, relationships and networks developed over 10 years of active professional engagement in the horticultural industry to identify, select and recruit participants for the study. Interviews will be face to face whereas questionnaires will be administered either on hard copies and/or via emails.

4d. Relationship between the principal investigator and participants:

Is there any relationship between the principal investigator (student), co-investigators(s), (supervisor) and participant(s)? For example, if you are conducting research in a school environment on students in your classroom (e.g. instructor-student).

☐ YES ☑ NO

If YES, please specify (maximum 100 words).

5. Further Approvals

Are there any other approvals required (in addition to ethics clearance from UREC) in order to carry out the proposed research study?

☐ YES ☑ NO

If YES, please specify (maximum 100 words).

6. **Potential Risks of the Proposed Research Study**

Are there any potential risks, psychological harm and/or ethical issues associated with the proposed research study, other than risks pertaining to everyday life events (such as the risk of an accident when travelling to a remote location for data collection)?

☐ YES ☑ NO

If YES, please specify (maximum 150 words):

7. **Application Checklist**

Please mark √ if the study involves any of the following:

☐ Children and young people under 18 years of age, vulnerable population such as children with special educational needs (SEN), racial or ethnic minorities, socioeconomically disadvantaged, pregnant women, elderly, malnourished people, and ill people.

☐ Research that foresees risks and disadvantages that would affect any participant of the study such as anxiety, stress, pain or physical discomfort, harm risk (which is more than is expected from everyday life) or any other act that participants might believe is detrimental to their wellbeing and / or has the potential to / will infringe on their human rights / fundamental rights.

☐ Risk to the well-being and personal safety of the researcher.

☐ Administration of any substance (food / drink / chemicals / pharmaceuticals / supplements / chemical agent or vaccines or other substances (including vitamins or food substances) to human participants.

☐ Results that may have an adverse impact on the natural or built environment.

8. Final Declaration by Applicants:

(a) I declare that this application is submitted on the basis that the information it contains is confidential and will only be used by Unicaf University and Unicaf University Research Ethics Committee (UREC) for the explicit purpose of ethical review and monitoring of the conduct of the research proposed project as described in the preceding pages.

(b) I understand that this information will not be used for any other purpose without my prior consent, excluding use intended to satisfy reporting requirements to relevant regulatory bodies.

(c) The information in this form, together with any accompanying information, is complete and correct to the best of my knowledge and belief and I take full responsibility for it.

(d) I undertake to abide by the highest possible international ethical standards governing the Code of Practice for Research Involving Human Participants, as published by the UN WHO Research Ethics Review Committee (ERC) on http://www.who.int/ethics/research/en/ and to which Unicaf University aspires to.

(e) In addition to respect any and all relevant professional bodies' codes of conduct and/or ethical guidelines, where applicable, while in pursuit of this research project.

(f) I understand it is my responsibility to submit a full REAF application during Dissertation Stage 3 to UREC. If a REAF application is not submitted my project is not approved by UREC.

(g) I fully acknowledge that this form does not constitute approval of the proposed project but it is only a provisional approval.

☑ **I agree with all points listed under Question 8**

Student's Name: Kenneth Maundu

Supervisor's Name: Dr Vusumuzi Sibanda

Date of Application: 02-May-2021

Important Note:
Please now save your completed form (we suggest you also print a copy for your records) and then submit it to your UU Dissertation/project supervisor (tutor). **In the case of student projects, the responsibility lies with the Faculty Dissertation/Project Supervisor.** If this is a student application, then it should be submitted via the relevant link in the VLE. Please submit only electronically filled in copies; **do not** hand fill and submit scanned paper copies of this application.

☑ **Before submitting your application, please tick this box to confirm that all relevant sections have been filled in and the information contained is accurate to the best of your knowledge.**

Appendix B: Unicaf University Research Ethics Application Form Doctoral Studies

REAF_DS - Version 3.1

UNICAF UNIVERSITY
RESEARCH ETHICS APPLICATION FORM
DOCTORAL STUDIES

UREC USE ONLY:
Application No:

Date Received:

Student's Name: Kenneth Maundu

Student's E-mail Address: maunduken@gmail.com

Student's ID #: R1909D9254201

Supervisor's Name: Dr Vusumuzi Sibanda

University Campus: Unicaf University Zambia (UUZ)

Program of Study: UUZ: DBA Doctoral of Business Administration

Research Project Title: The Efficacy of Product Food Safety Standards and Quality Management Systems among Smallholder Farmers in Kenya

1. **Please state the timelines involved in the proposed research project:**

Estimated Start Date: 08-Mar-2021 Estimated End Date: 30-Jun-2023

2. **External Research Funding (if applicable):**

2.a. Do you have any external funding for your research?

☐ YES ☑ NO

If YES, please answer questions **2b** and **2c**.

2.b. List any external (third party) sources of funding you plan to utilise for your project. You need to include full details on the source of funds (e.g. state, private or individual sponsor), any prior / existing or future relationships between the funding body / sponsor and any of the principal investigator(s) or co-investigator(s) or student researcher(s), status and timeline of the application and any conditions attached.

N/A

2.c. If there are any perceived ethical issues or potential conflicts of interest arising from applying or and receiving external funding for the proposed research then these need to be fully disclosed below and also further elaborated on, in the relevant sections on ethical considerations later on in this form.

N/A

3. The research project

3.a. Project Summary:

In this section fully describe the purpose and underlying rationale for the proposed research project. Ensure that you pose the research questions to be examined, state the hypotheses, and discuss the expected results of your research and their potential.

It is important in your description to use plain language so it can be understood by all members of the UREC, especially those who are not necessarily experts in the particular discipline. To that effect ensure that you fully explain / define any technical terms or discipline-specific terminology (use the space provided in the box).

This study seeks to identify and present an impact comparative on the efficacy of smallholder farmers in Kenya prior and post implementation of product food safety standards and quality management systems.

This study seeks to answer the following research questions;
(i) To what extent have smallholder farmers in Kenya benefited from the implementation of product food safety standards and quality management systems?
(ii) What are the key enablers/drivers in the implementation of product food standards and quality management systems for smallholder farmers in Kenya?
(iii) What are the challenges faced by smallholder farmers in Kenya in the establishment and implementation of product food safety standards and quality management systems?
(iv) Why have majority of the smallholder farmers in Kenya not implemented product food safety standards and quality management systems?
(v) What can the government do to encourage more farmers in Kenya to implement product food safety standards and quality management programmes?

The establishment and implementation of product food safety standards and quality management systems among smallholder farmers constitute a change management process that is crucial in enhancing good agricultural practices and accessing the global markets.

Therefore, once the problem gaps are identified and solved, the study will benefit smallholder farmers in Kenya through increased productivity, lower production costs, higher disposable incomes, and greater investments on-farm and in other areas and activities that improve the welfare of household members.

3.b. Significance of the Proposed Research Study and Potential Benefits:

Outline the potential significance and/or benefits of the research (use the space provided in the box).

The study intends to identify and present an impact comparative on the efficacy of smallholder farmers in Kenya prior and post implementation of product food safety standards and quality management systems. Smallholder farmers who are a vital part of the global agricultural community live in rural areas, and agriculture is their primary source of livelihood. Smallholder farmers in Kenya have gone to great lengths to change their business model architecture to incorporate globally recognized product food safety standards and quality management systems to become competitive and access international markets to improve their livelihoods. Therefore, the study explores the efficacy of product food safety standards and quality management systems among smallholder farmers in Kenya prior and post implementation and determines the benefits realized from such programs. In addition, the study will examine if smallholder farmers in Kenya's organizational or change management processes have improved their operating and production activities to gain access to more profitable markets and improve their livelihoods. Finally, the study will also investigate the potential challenges and consider the possibilities of upgrading smallholder farmers in Kenya to improve their livelihoods further. The study's approach and application provide more hard evidence to the existing studies on the impact of implementing global standards and systems among smallholder farmers in Kenya to justify the amount of time, effort, and money spent on such programs.

4. Project execution:

4.a. The following study is an:

- [x] experimental study (primary research)
- [ ] desktop study (secondary research)
- [ ] desktop study using existing databases involving information of human/animal subjects
- [ ] Other

If you have chosen 'Other' please Explain:

N/A

4.b. Methods. The following study will involve the use of:

Method	Materials / Tools
Qualitative:	☑ Face to Face Interviews
	☑ Phone Interviews
	☐ Face to Face Focus Groups
	☐ Online Focus Groups
	☐ Other *
Quantitative:	☑ Face to Face Questionnaires
	☐ Online Questionnaires
	☐ Experiments
	☐ Tests
	☐ Other *

*If you have chosen 'Other' please Explain:

N/A

5. Participants:

5 a. Does the Project involve the recruitment and participation of additional persons other than the researcher(s) themselves?

☑ YES **If YES, please complete all following sections.**

☐ NO **If NO, please directly proceed to Question 7.**

5 b. Relevant Details of the Participants of the Proposed Research

State the number of participants you plan to recruit, and explain in the box below how the total number was calculated.

Number of participants: 225

Quantitative data to be collected from 215 smallholder farmers in the county of Meru with less than 10acres. Also, qualitative data to collect from 10 face-to-face and telephone interviews for further in-depth case analysis selected from key stakeholders and informants from Government agencies, Horticultural export companies and Agricultural extension officers.

Describe important characteristics such as: demographics (e.g. age, gender, location, affiliation, level of fitness, intellectual ability etc). It is also important that you specify any inclusion and exclusion criteria that will be applied (e.g. eligibility criteria for participants).

Age range From 20 To 75

Gender
- ☑ Female
- ☑ Male

Eligibility Criteria:

- Inclusion criteria: (i) A farmer and grower of fresh vegetables and/or fruits
  (ii) The farmer must have implemented good agricultural practices (GAP) encompassing product food safety standards and quality management systems (*GAP defination below)
- Exclusion criteria: (i) Farmers outside the geographical boundaries of Kenya
  (ii) A farmer that has engaged minor workers (less than 18 years)

Disabilities: The study only includes the participants who can provide informed consent for themselves. Individuals who have a mental disability and are not in a position to provide their own consent are to be excluded from the study.

Other relevant information (use the space provided in the box):

GAP are agricultural practices that address environmental, economic and social sustainability for on-farm processes concerning food safety standards and quality management systems. (FAO, 2010, Mascal et al., 2022)

5 c. Participation & Research setting:

Clearly describe which group of participants is completing/participating in the material(s)/ tool(s) described in 5b above (use the space provided in the box).

Questionnaires for quantitative data collection- According to a scientific horticultural research study commissioned by the Embassy of the Kingdom of Netherlands by Match Maker Associates (2017), mapping the production of fruits and vegetables in Kenya, the county of Meru represents the market window of opportunities for smallholder farmers in Kenya. Therefore, 215 smallholder farmers with less than 10 acres selected and administered questionnaires for the study.
Qualitative data collection- Ten face-to-face or telephone interviews with key stakeholders in the agricultural sector in Kenya as follows: Government agencies: (Horticultural Crop Development Authority- 4 participants, Ministry of Agriculture- 1 participant, Kenya Plant Health Inspectorate Authority- 1 participant); Horticultural Exporting Companies- 2 participants and Agricultural Extension Officers – 2 participants.

5 d. Recruitment Process for Human Research Participants:

Clearly describe how the potential participants will be identified, approached and recruited (use the space provided in the box).

The study is a mixed method approach involving collecting quantitative data from 215 smallholder farmer participants from the county of Meru and collecting qualitative data from ten face-to-face and telephone interviews with key stakeholders and informants in the agricultural sector in Kenya. The researcher will use the contacts, relationships, and networks developed over ten years of active professional engagement in the horticultural industry to enhance participants' identification, selection, and recruitment process for the study. Interviews will be face to face and by telephone, whereas questionnaires will be administered either on hard copies and/or via emails. Approval to conduct the study will be obtained from the Meru County Administrators Office through the Gatekeepers letter. All participants will be required to sign the Informed Consent form prior to their participation in the study.

5 e. Research Participants Informed Consent.

Select below which categories of participants will participate in the study. Complete the relevant Informed Consent form and submit it along with the REAF form.

Yes	No	Categories of participants	Form to be completed
☑	☐	Typically Developing population(s) above the maturity age *	Informed Consent Form
☐	☑	Typically Developing population(s) under the maturity age *	Guardian Informed Consent Form

* Maturity age is defined by national regulations in laws of the country in which the research is being conducted.

5 f. Relationship between the principal investigator and participants.

Is there any relationship between the principal investigator (student), co-investigators(s), (supervisor) and participant(s)? For example, if you are conducting research in a school environment on students in your classroom (e.g. instructor-student).

☐ YES ☑ NO

If YES, specify (use the space provided in the box).

6. Potential Risks of the Proposed Research Study.

6 a. i. Are there any potential risks, psychological harm and/or ethical issues associated with the proposed research study, other than risks pertaining to everyday life events (such as the risk of an accident when travelling to a remote location for data collection)?

☐ YES ☑ NO

If YES, specify below and answer the question 6 a.ii.

6 a.ii Provide information on what measures will be taken in order to exclude or minimise risks described in 6.a.i.

N/A

6 b. Choose the appropriate option

		Yes	No
i.	Will you obtain written informed consent form from all participants?	☐	☑
ii.	Does the research involve as participants, people whose ability to give free and informed consent is in question?	☐	☑
iii.	Does this research involve participants who are children under maturity age? **If you answered YES to question iii, complete all following questions.** **If you answered NO to question iii, do not answer Questions iv, v, vi and proceed to Questions vii, viii, ix and x.**	☐	☑
iv.	Will the research tools be implemented in a professional educational setting in the presence of other adults (i.e. classroom in the presence of a teacher)?	☐	☑
v.	Will informed consent be obtained from the legal guardians (i.e. parents) of children?	☐	☑
vi.	Will verbal assent be obtained from children?	☐	☑
vii.	Will all data be treated as confidential? If NO, explain why confidentiality of the collected data is not appropriate for this proposed research project, providing details of how all participants will be informed of the fact that any data which they will provide will not be confidential.	☑	☐
viii.	Will all participants /data collected be anonymous? If NO, explain why and describe the procedures to be used to ensure the anonymity of participants and/or confidentiality of the collected data both during the conduct of the research and in the subsequent release of its findings.	☑	☐

		Yes	No
ix.	Have you ensured that personal data and research data collected from participants will be securely stored for five years?	☑	☐
x.	Does this research involve the deception of participants? If YES, describe the nature and extent of the deception involved. Explain how and when the deception will be revealed, and who will administer this debrief to the participants:	☐	☑

6 c. i. Are there any other ethical issues associated with the proposed research study that are not already adequately covered in the preceding sections?

☐ Yes ☑ No

If YES, specify (maximum 150 words).

6.c.ii Provide information on what measures will be taken in order to exclude or minimise ethical issues described in 6.c.i.

N/A

6 d. Indicate the Risk Rating.

☐ High ☑ Low

7. **Further Approvals**

Are there any other approvals required (in addition to ethics clearance from UREC) in order to carry out the proposed research study?

☑ YES ☐ NO

If YES, specify (maximum 100 words).

The researcher will obtain permission from the National Commission for Science, Technology and Innovation (NACOSTI). NACOSTI is mandated to regulate and assure quality in the research, science, and technology and innovation sector in Kenya.

8. **Application Checklist**

Mark √ if the study involves any of the following:

☐ Children and young people under 18 years of age, vulnerable population such as children with special educational needs (SEN), racial or ethnic minorities, socioeconomically disadvantaged, pregnant women, elderly, malnourished people, and ill people.

☐ Research that foresees risks and disadvantages that would affect any participant of the study such as anxiety, stress, pain or physical discomfort, harm risk (which is more than is expected from everyday life) or any other act that participants might believe is detrimental to their wellbeing and / or has the potential to / will infringe on their human rights / fundamental rights.

☐ Risk to the well-being and personal safety of the researcher.

☐ Administration of any substance (food / drink / chemicals / pharmaceuticals / supplements / chemical agent or vaccines or other substances (including vitamins or food substances) to human participants.

☐ Results that may have an adverse impact on the natural or built environment.

9. **Further documents**

Check that the following documents are attached to your application:

		ATTACHED	NOT APPLICABLE
1	Recruitment advertisement (if any)	☐	☑
2	Informed Consent Form / Guardian Informed Consent Form	☑	☐
3	Research Tool(s)	☑	☐
4	Gatekeeper Letter	☑	☐
5	Any other approvals required in order to carry out the proposed research study, e.g., institutional permission (e.g. school principal or company director) or approval from a local ethics or professional regulatory body.	☑	☐

10. Final Declaration by Applicants:

(a) I declare that this application is submitted on the basis that the information it contains is confidential and will only be used by Unicaf University for the explicit purpose of ethical review and monitoring of the conduct of the research proposed project as described in the preceding pages.

(b) I understand that this information will not be used for any other purpose without my prior consent, excluding use intended to satisfy reporting requirements to relevant regulatory bodies.

(c) The information in this form, together with any accompanying information, is complete and correct to the best of my knowledge and belief and I take full responsibility for it.

(d) I undertake to abide by the highest possible international ethical standards governing the Code of Practice for Research Involving Human Participants, as published by the UN WHO Research Ethics Review Committee (ERC) on http://www.who.int/ethics/research/en/ and to which Unicaf University aspires to.

(e) In addition to respect any and all relevant professional bodies' codes of conduct and/or ethical guidelines, where applicable, while in pursuit of this research project.

☑ **I agree with all points listed under Question 10**

Student's Name: Kenneth Maundu

Supervisor's Name: Dr Vusumuzi Sibanda

Date of Application: 28-Apr-2022

Important Note:
Save your completed form (we suggest you also print a copy for your records) and then submit it to your UU Dissertation/project supervisor (tutor). **In the case of student projects, the responsibility lies with the Faculty Dissertation/Project Supervisor.** If this is a student application, then it should be submitted via the relevant link in the VLE. Please submit only electronically filled in copies; **do not** hand fill and submit scanned paper copies of this application.

Appendix C: Unicaf University Research Ethics Committee Decision

UREC Desision, Version 2.0

Unicaf University Research Ethics Committee Decision

Student's Name: Kenneth Maundu

Student's ID #: R1909D9254201

Supervisor's Name: Dr Vusumuzi Sibanda

Program of Study: UU-DBA-900-3-ZM

Offer ID /Group ID: O36605G38229

Dissertation Stage: DS3

Research Project Title: The Efficacy of Product Food Safety Standards and Quality Management Systems among Smallholder Farmers in Kenya

Comments: No comments

Decision*: A. Approved without revision or comments

Date: 11-Jul-2022

*Provisional approval provided at the Dissertation Stage 1, whereas the final approval is provided at the Dissertation stage 3. The student is allowed to proceed to data collection following the final approval.

Appendix D: National Commission for Science, Technology and Innovation (Local Authority Approval)

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **117164**

Date of Issue: **06/March/2024**

RESEARCH LICENSE

This is to Certify that Mr.. Kenneth Maundu of UNICAF University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Meru on the topic: THE EFFICACY OF PRODUCT FOOD SAFETY STANDARDS AND QUALITY MANAGEMENT SYSTEMS AMONG SMALLHOLDER FARMERS IN KENYA for the period ending : 06/March/2025.

License No: **NACOSTI/P/24/33775**

117164

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013 (Rev. 2014)
Legal Notice No. 108: The Science, Technology and Innovation (Research Licensing) Regulations, 2014

The National Commission for Science, Technology and Innovation, hereafter referred to as the Commission, was the established under the Science, Technology and Innovation Act 2013 (Revised 2014) herein after referred to as the Act. The objective of the Commission shall be to regulate and assure quality in the science, technology and innovation sector and advise the Government in matters related thereto.

CONDITIONS OF THE RESEARCH LICENSE

1. The License is granted subject to provisions of the Constitution of Kenya, the Science, Technology and Innovation Act, and other relevant laws, policies and regulations. Accordingly, the licensee shall adhere to such procedures, standards, code of ethics and guidelines as may be prescribed by regulations made under the Act, or prescribed by provisions of International treaties of which Kenya is a signatory to
2. The research and its related activities as well as outcomes shall be beneficial to the country and shall not in any way;
    i. Endanger national security
    ii. Adversely affect the lives of Kenyans
    iii. Be in contravention of Kenya's international obligations including Biological Weapons Convention (BWC), Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), Chemical, Biological, Radiological and Nuclear (CBRN).
    iv. Result in exploitation of intellectual property rights of communities in Kenya
    v. Adversely affect the environment
    vi. Adversely affect the rights of communities
    vii. Endanger public safety and national cohesion
    viii. Plagiarize someone else's work
3. The License is valid for the proposed research, location and specified period.
4. The license any rights thereunder are non-transferable
5. The Commission reserves the right to cancel the research at any time during the research period if in the opinion of the Commission the research is not implemented in conformity with the provisions of the Act or any other written law.
6. The Licensee shall inform the relevant County Director of Education, County Commissioner and County Governor before commencement of the research.
7. Excavation, filming, movement, and collection of specimens are subject to further necessary clearance from relevant Government Agencies.
8. The License does not give authority to transfer research materials.
9. The Commission may monitor and evaluate the licensed research project for the purpose of assessing and evaluating compliance with the conditions of the License.
10. The Licensee shall submit one hard copy, and upload a soft copy of their final report (thesis) onto a platform designated by the Commission within one year of completion of the research.
11. The Commission reserves the right to modify the conditions of the License including cancellation without prior notice.
12. Research, findings and information regarding research systems shall be stored or disseminated, utilized or applied in such a manner as may be prescribed by the Commission from time to time.
13. The Licensee shall disclose to the Commission, the relevant Institutional Scientific and Ethical Review Committee, and the relevant national agencies any inventions and discoveries that are of National strategic importance.
14. The Commission shall have powers to acquire from any person the right in, or to, any scientific innovation, invention or patent of strategic importance to the country.
15. Relevant Institutional Scientific and Ethical Review Committee shall monitor and evaluate the research periodically, and make a report of its findings to the Commission for necessary action.

National Commission for Science, Technology and
Innovation(NACOSTI),
Off Waiyaki Way, Upper Kabete,
P. O. Box 30623 - 00100 Nairobi, KENYA
Telephone: 020 4007000, 0713788787, 0735404245
E-mail: dg@nacosti.go.ke
Website: www.nacosti.go.ke

Appendix E: Informed Consent Form

UU_IC - Version 2.1

Informed Consent Form

Part 1: Debriefing of Participants

Student's Name: Kenneth Maundu

Student's E-mail Address: maunduken@gmail.com

Student ID #: R1909D9254201

Supervisor's Name: Dr Vusumuzi Sibanda

University Campus: Unicaf University Zambia (UUZ)

Program of Study: UUM: DBA - Doctorate of Business Administration

Research Project Title: The Efficacy of Product Food Safety Standards and Quality Management Systems among Smallholder Farmers in Kenya

Date: 25-May-2022

Provide a short description (purpose, aim and significance) of the research project, and explain why and how you have chosen this person to participate in this research (maximum 150 words).

The study intends to identify and present an impact comparative on the efficacy of smallholder farmers in Kenya prior and post implementation of product food safety standards and quality management systems. Smallholder farmers who are a vital part of the global agricultural community live in rural areas, and agriculture is their primary source of livelihood. Smallholder farmers in Kenya have gone to great lengths to change their business model architecture to incorporate globally recognized product food safety standards and quality management systems to become competitive and access international markets to improve their livelihoods. Therefore, the study explores the benefits realized from such programs.

With this in mind, we have selected you to participate in the study because you are a smallholder farmer implementing Good Agricultural Practices in Meru, the leading County in Kenya, producing fresh vegetables and fruits for the international market and domestic (local) market.

The above named Student is committed in ensuring participant's voluntarily participation in the research project and guaranteeing there are no potential risks and/or harms to the participants.

Participants have the right to withdraw at any stage (prior or post the completion) of the research without any consequences and without providing any explanation. In these cases, data collected will be deleted.

All data and information collected will be coded and will not be accessible to anyone outside this research. Data described and included in dissemination activities will only refer to coded information ensuring beyond the bounds of possibility participant identification.

I, Kenneth Maundu **, ensure that all information stated above is true and that all conditions have been met.**

Student's Signature: K.Maundu

Appendix F: Research Data Collection Tools (Questionnaire & Interview)

Survey Questionnaire

Farmers Questionnaire on the Efficacy of Product Food Safety Standards and Quality Management Systems among Smallholder Farmers in Kenya

This research questionnaire is only for academic purposes to determine **efficacy (effectiveness & efficiency) before (prior) and after (post) the implementation of product food safety standards and quality management systems among smallholder farmers in Kenya.** You are assured of confidentiality concerning any views expressed in this research. I, therefore, plead with you to provide information as accurate as possible for correct results. Thank you for your kind co-operation.

Note: participation in the survey is voluntary and may take about 10-15 minutes to complete.

SECTION-A

Demographic

Note: Tick the correct box that represents your answer ☐

No.	Question	Response
1a.	What is your gender?	*Male* ☐ *Female* ☐ *Prefer not to say* ☐
2a.	What is your age?	*Years:* _____
3a.	What is your level of Education?	*Primary* ☐ *Secondary/ High School* ☐ *Collage/University* ☐ *None* ☐

4a.	What is your marital status?	*Married* ☐ *Single* ☐ *Widow/Widower* ☐ *Divorced/Separated* ☐
5a.	How many people are in your household?	*1-5 people* ☐ *6-10 people* ☐ *11 people and above* ☐
6a.	What is your number of years in farming?	*Below 5 years* ☐ *5-10 years* ☐ *11 years and above* ☐
7a.	What is the size of the land you are farming?	*1 acre & below* ☐ *2-5 acres* ☐ *6 acres and above* ☐
8a.	What is your position on the farm?	*Owner* ☐ *Fulltime employee* ☐ *Seasonal worker* ☐ *Other (specify):* _____
9a.	Where is your farm located?	County: _____ Sub-county: _____

SECTION-B

Note:

§ Tick the correct box that represents your answer ☐

§**Good Agricultural Practice (GAP)** means the implementation of Product Food Safety Standards and Quality Management Systems

§**Comparing variables and Reporting criteria: (1)** Smallholder Farmer Household (*relating to Section A*); **(2)** Production; **(3)** Labour, land & Other Capital; **(4)** Income Earned & Consumption; **(5)** Market & Innovation; **(6)** The future of smallholder farmers

Importance of Good Agricultural Practice

No.		**Status**	**Question**	**Response/ Answer**				
				Not Important	Slightly Important	Neutral (Important/ Not important)	Very Important	Not Sure
1b.	**(5)**	Before you learnt about Good Agricultural Practice	How important was it to know about market requirements?	☐	☐	☐	☐	☐

		After you learnt about Good Agricultural Practice	How important is it to know about market requirements	☐	☐	☐	☐	☐
2b.	**(2)**	Before you learnt about Good Agricultural Practice	How important was it to know the requirements of product food safety standards?	☐	☐	☐	☐	☐
		After you learnt about Good Agricultural Practice	How important is it to know about product food safety standards requirements?	☐	☐	☐	☐	☐
3b.	**(5)**	Before you learnt about Good Agricultural Practice	How important was it to gain access to new markets?	☐	☐	☐	☐	☐
		After you learnt about Good Agricultural Practice	How important is it to gain access to new markets?	☐	☐	☐	☐	☐
4b.	**(4)**	Before you learnt about Good Agricultural Practice	How important was it to know why buyers rejected farm produce in the marketplace?	☐	☐	☐	☐	☐
		After you learnt about Good Agricultural Practice	How important is it to know why buyers reject farm produce in the marketplace?	☐	☐	☐	☐	☐
5b.	**(4)**	Before you learnt about Good Agricultural Practice	How important was it to ensure you received higher prices for farm produce?	☐	☐	☐	☐	☐
		After you learnt about Good Agricultural Practice	How important is it to ensure you receive higher prices for farm produce?	☐	☐	☐	☐	☐

SECTION-C

Farm Activities

No.		**Status**	**Question**	**Response/ Answer**		
				Yes	No	Not Sure
1c.	**(2)**	Before you learnt about Good Agricultural Practice	Did you know about human infectious diseases and how they spread on the farm?	☐	☐	☐

		After you learnt about Good Agricultural Practice	Do you know about human infectious diseases and how they spread on the farm?	☐	☐	☐
2c.	**(2)**	Before you learnt about Good Agricultural Practice	Did you know how to reduce product food safety risks on the farm?	☐	☐	☐
		After you learnt about Good Agricultural Practice	Do you know how to reduce product food safety risks on the farm?	☐	☐	☐
3c.	**(2)**	Before you learnt about Good Agricultural Practice	Did you know the importance of cleaning and sanitizing the farm and farm produce?	☐	☐	☐
		After you learnt about Good Agricultural Practice	Do you know the importance of cleaning and sanitizing the farm and farm produce?	☐	☐	☐

No.		**Status**	**Question**	**Response/ Answer**				
				Always	Most of the Time	Sometimes	Never	Not Sure
4c.	**(2)**	Before you learnt about Good Agricultural Practice	Were you keeping domestic animals away from the farm and harvest areas?	☐	☐	☐	☐	☐
		After you learnt about Good Agricultural Practice	Are you keeping domestic animals away from the farm and harvest areas?	☐	☐	☐	☐	☐
5c.	**(2)**	Before you learnt about Good Agricultural Practice	Were you monitoring and testing water quality?	☐	☐	☐	☐	☐
		After you learnt about Good Agricultural Practice	Are you monitoring and testing water quality?	☐	☐	☐	☐	☐

SECTION-D

Farm Sales, Records and Documented Procedures

No.		**Status**	**Question**	**Response/ Answer**				
				Local Market	Export Market	Local and Export Markets	Not Sure	Did not Sale
1d.	**(5)**	Before you learnt about Good Agricultural Practice	Which markets did you sell your farm produce?	☐	☐	☐	☐	☐

		After you learnt about Good Agricultural Practice	Which markets do you sell farm produce?	☐ ☐ ☐ ☐ ☐

No.		Status	Question	Response/ Answer				
				Kes. 0 – Kes. 19,999	Kes. 20,000 – Kes. 49,999	Kes. 50,000 – Kes. 99,999	Kes. 100,000 and above	I Prefer not to Answer
2d.	**(4)**	Before you learnt about Good Agricultural Practice	What were your estimated farm produce sales per year?	☐	☐	☐	☐	☐
		After you learnt about Good Agricultural Practice	What are the farm produce sales per year?	☐	☐	☐	☐	☐

No.		Status	Question	Response/ Answer				
				No Records	Some Records	Most Records	All Records	Not Sure
3d.	**(5)**	Before you learnt about Good Agricultural Practice	Were you keeping farm produce sales records?	☐	☐	☐	☐	☐
		After you learnt about Good Agricultural Practice	Are you keeping farm produce sales records?	☐	☐	☐	☐	☐
4d.	**(5)**	Before you learnt about Good Agricultural Practice	Were farm produce sales records kept for more than 3years?	☐	☐	☐	☐	☐
		After you learnt about Good Agricultural Practice	Is farm produce sales records being kept for more than 3years?	☐	☐	☐	☐	☐

No.		Status	Question	Response/ Answer				
				Always	Most of the Time	Sometimes	Never	Not Sure
5d.	**(2)**	Before you learnt about Good Agricultural Practice	Were you keeping documented procedures on-farm activities procedures?	☐	☐	☐	☐	☐
		After you learnt about Good Agricultural Practice	Are you keeping documented procedures of farm activities?	☐	☐	☐	☐	☐

SECTION-E

What are some of the challenges being faced <u>after</u> implementing standards of Good Agricultural Practices?

No.		Question	Response/ Answer				
			Not Sure	Not a Challenge	Minimally Challenge	Some Challenge	A Great Challenge
1e.	**(3)**	Is the understanding of the standards of Good Agricultural Practices a challenge on the farm?	☐	☐	☐	☐	☐
2e.	**(3)**	Is the financial cost of implementing the standards on Good Agricultural Practices a challenge on the farm?	☐	☐	☐	☐	☐
3e.	**(3)**	Is it a challenge to get a technical expert to implement the standards on Good Agricultural Practices on the farm?	☐	☐	☐	☐	☐

SECTION-F

1f. Is there any additional information that would help enhance Good Agricultural Practice relating to product food safety and quality management systems in the farm and marketplace?

END OF QUESTIONNAIRE. THANK YOU FOR YOUR TIME!

Interview Guide

General Interview Guide on other Key Stakeholders (Informants) in the Agricultural Sector on the Efficacy of Product Food Safety Standards and Quality Management Systems among Smallholder Farmers in Kenya

Target Group:

1. Government agencies:
    a. Horticultural Crop Development Authority (HCD) – 4 Participants
    b. Ministry of Agriculture (MOA)- 1 Participant
    c. Kenya Plant Health Inspectorate Services (KEPHIS)- 1 Participant
2. Horticultural Exporting Companies- 2 Participants
3. Agricultural Extension Officers in the sub-county level- 2 Participants

Qualitative Research Interview Questions for Discussion

1. Demographic

No.	Question	Response
1.1	What is your gender?	*Male* ☐ *Female* ☐ *Prefer not to say* ☐
1.2	What is your age?	*Years:* _____
1.3	What is your level of Education?	*Primary* ☐ *Secondary/ High School* ☐ *Collage/University* ☐ *None* ☐
1.4	What is your current sector of work?	*Government Agency* ☐ *Agricultural Extension* ☐ *Horticultural Exporter* ☐

2. To what extent have smallholder farmers in Kenya benefited from the implementation of product food safety standards and quality management systems?
3. What factors or enablers would make smallholder farmers implement good agricultural practices relating to product food safety standards and quality management systems?
4. In your view, what are the challenges faced by smallholder farmers when establishing and implementing the product food safety standards and quality management system? What challenges have farmers reported/complained about post implementation of GAP?
5. Would you recommend smallholder farmers to do a change management process and implement product food safety and quality management systems? If yes, why would you recommend it? If no, why would you not recommend it, and what alternatives would you propose?
6. Do you think the government is giving sufficient support to encourage and sustain the change management process by smallholder farmers in Kenya that have implemented product food safety and quality management systems? What else do you think the government should do?
7. What are the social-economic impacts on smallholder farmers in Kenya when implementing a product food safety and quality management system in their business operations?
8. How can smallholder farmers in Kenya acquire knowledge to mitigate embedded agribusiness risk factors that would inversely affect their ability to generate more income and improve their livelihoods when implementing global food safety standards and quality management systems?

9. What other change management processes would you recommend for smallholder farmers in Kenya to adapt and improve their livelihoods besides adopting product food safety standards and quality management systems?