

**FARMER GROUPS' READINESS AND ADOPTION OF TRACEABILITY SYSTEMS
IN AGRICULTURAL SUPPLY CHAINS, A CASE OF KAABONG DISTRICT**

BY

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DECLARATION

This dissertation is my original work and has not been presented for a degree in any other University

Signature:..... Date:.....

APPROVAL

We confirm that the work in this dissertation was done by the candidate under our supervision

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DEDICATION

This dissertation is dedicated to my sponsor Mr. Kennedy James Owuor for the financial support and encouragement that enabled me to complete the course seamlessly.

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LIST OF ABBREVIATIONS

AI- Artificial Intelligence

IoT- Internet of Things

BD- Big Data

RFID- Radiofrequency Identification

ABSTRACT

The study examined the relationship between farmer group readiness and traceability system adoption in Uganda with focus on; examining the relationship between member readiness and adoption of traceability systems in agricultural supply chains, analysing the relationship between organizational readiness and the adoption of traceability systems in agricultural supply chains and examining the relationship between management readiness and the adoption of traceability systems in agricultural supply chains. A cross-sectional survey design with a quantitative approach was used. The data was collected from a knowledgeable individual representing the farmer group's operations using structured questionnaires. The study population consisted of 300 registered farmer groups under the WFP's Agricultural and Market Support project. Using Krejcie and Morgan's (1970) table, a sample size of 169 farmer groups was determined, and simple random sampling was used for selection. The results showed a very high positive relationship ($r = 0.872$) between management readiness and the adoption of traceability systems and was significant ($p=0.000$). There was also a moderate positive significant relationship ($r = 0.553$) between organizational readiness and the adoption of traceability systems and was significant ($p=0.000$). Lastly, there was a high positive significant relationship ($r = 0.731$) between member readiness and the adoption of traceability systems and was significant ($p=0.000$). The regression model ($R^2 = 0.744$) indicated that 74.4% of the variation in adoption could be explained by these predictors member, organisational, and management readiness. Management readiness emerged as the strongest predictor ($\beta = 0.494$, $p < 0.05$), then member readiness ($\beta = 0.086$, $p = 0.082$) and organisational readiness ($\beta = -0.075$, $p = 0.024$). It is thus concluded that internal organizational factors are very critical enablers to traceability systems adoption. The study recommends prioritising management readiness enhancement through a clear vision and commitment to traceability systems, enhancing member awareness and skilling, and enhancing organizational readiness through improved communication and regulations.

CHAPTER ONE

INTRODUCTION

1.0 Introduction

Consumers increasingly want to know what they are buying. While previously, it was enough for a product to be safe and of high-quality, today's consumers are concerned about more than that. Consumers have come to understand that their purchasing power may be the most important influence they have on the planet. As a result, the fundamental values of each customer become important for their purchase habits and, consequently, for producers. Today's successful products must therefore be sustainable, high-quality, and safe (Bergström & Haas, 2020).

The food traceability system (TS) records all food supply, processing, marketing, and distribution processes along the supply chain, giving customers visual services.

To improve Uganda's agricultural supply chains, robust traceability systems are essential for example the introduction of the Uganda Livestock Identification And Traceability System (ULITS) to improve Uganda's livestock supply chain. But given the problems with digital technology adoption in Ugandan agriculture (Kansiime et al., 2022), it is necessary to ascertain whether farmer organizations are prepared to embrace the traceability system.

This study aimed to investigate the relationship between farmer groups' readiness and adoption of traceability systems in agricultural supply chains. The independent variable, farmer groups readiness, was analyzed through three dimensions; member readiness, organizational readiness and management readiness. This chapter presents the background of the study, the statement

of the problem, the purpose of the study, the study objectives, research questions, justification for the study, significance of the study, and the scope of the study.

1.1 Background to the Study

1.1.1 Historical background

The industry of food has had a number of scandals, mishaps, and incidents in the past which have been linked to changes in co-product management, new technology, or environmental pollution (Montet & Dey, 2017). For instance, The 2009 salmonella outbreak in peanut butter paste, which resulted in the largest food recall in US history, ultimately led to the company's owner serving 28 years in prison and the company becoming defunct (Marucheck et al., 2011). Then, the use of genetically modified (GM) crops in food and other food crises, including Foot-and-Mouth Disease (FMD), has severely damaged the food industry's reputation in recent decades (Aung & Chang, 2014).

Due to food-related scandals and occurrences, consumers demand integrity, safety assurances, and openness (Okpala & Korzeniowska, 2023). In the past, food-related information has been documented mostly on product labels, but with restrictions on the quantity of information that may be shared. In the present, the amount of information being gathered and disseminated has expanded due to technological advancements and growing consumer interest in food safety and product origins (Durrant et al., 2021). Hence, food business operators (FBOs) now implement traceability not only as a voluntary practice but also in reaction to mandated policy requirements (Islam & Cullen, 2021). From the outset, the goal of traceability is to establish the item's history, characteristics and or qualities along the supply chain (Garcia-Torres et al., 2019).

Numerous methods and measurement approaches have been used to confirm the authenticity of food products, guarantee their high quality and safety, and identify potential fraudulent activity. These include isotope analysis and chromatographic methods (Hassoun et al., 2023). Recently, more advanced analytical approaches, such as Radio frequency identification (RFID) tags, profiling and fingerprinting techniques (Ballin & Laursen, 2019; Grundy et al., 2023; Chanchaichujit et al., 2020). The innovations and technological advancements prompted by the onset of the fourth industrial revolution (Industry 4.0) that combines physical, digital, and biological trends have led to the rise of concepts like “Food Traceability 4.0” (Hassoun et al., 2022) referring to the implementation of smart traceability systems from farm to fork using Industry 4.0 technologies, especially blockchain, artificial intelligence (AI), big data (BD), and the Internet of Things (IoT) (Hassoun et al., 2023).

Traceability systems have been suggested and adopted in Europe, North America and other highly developed regions (Charlebois et al., 2024). For Europe, traceability is not a choice but it is a requirement, since the European Parliament and Council 2002 178/2002 legislation on traceability is geared to maintain traceability and food safety in food supply chains (Charlebois et al., 2024; International Trade Centre, 2015).

Despite the benefits of traceability adoption and implementation such as improved visibility, access to global markets, risk management, transparency, enhancing sustainable consumption, reducing food recalls (Lin et al., 2021), some studies have indicated that corporations are not willing to adopt traceability systems due to high costs of operation, knowledge deficiency, lack of shared information among implementing organisations (Hastig & Sodhi, 2020; Schiefer 2011). Other studies for example in the African context, cite gaps in technical support, digital awareness and literacy among others (Mhalanga & Ndhlovu, 2023; Kansiime et al, 2022). Such

challenges have resulted to varying perceptions of different agricultural supply chain actors towards traceability with no uniform voice to adoption and implementation of traceability systems (FAO, 2022). This study focused on the Karamoja region in Uganda where traceability systems have been advocated.

1.1.2 Theoretical Background

The Technology Acceptance Model (TAM) (Davis, 1989) version was used because it's the original model thus ensured theoretical purity, simplicity, validity, foundational and it directly align with my study. TAM assumes that an individual's behavioral intention to use a technology is primarily mediated by two core beliefs: Perceived Usefulness and Perceived Ease of Use. It assesses the users' perceptions of a new technology's usability as one of the elements influencing how and when they will utilize it. The model reflects how strongly potential users feel about utilizing a certain technology would improve their ability to accomplish their jobs. A person's perception of how easy it will be to use a given system is the second component, and it measures how much they believe it will be uncomplicated to implement this new technology (traceability systems). The individual farmer's readiness that is people, commitment, attitudes will be understood using this model since the model has been considered to be simple, however a number of limitations have been cited with the model like limited scope variables, inadequate of context specificity, and lack of dynamic nature (assuming beliefs and attitudes remain constant).

Its strength lies in its parsimony and high explanatory power in predicting technology acceptance across diverse contexts. To address its limitation of being individually focused, the study integrates it with the Perceived Organizational E-Readiness (POER) model by Molla and Licker (2005).

To eliminate any shortcomings that may come up due to choice of the TAM model, the Perceived Organization E-Readiness model shall explain the other variables studied in organizational readiness (management and organizational readiness).

Perceived Organization E-Readiness (POER) model which includes six factors (as commitment, governance, awareness, human resource, business resource, and technology resource) relaying within the organization and that will affect the initial adoption of traceability system, is one of the two main constructs in the Molla and Licker (2005) model that will lead to the adoption of traceability.

1.1.3 Conceptual background

Adoption of Traceability systems

The International Organization for Standardization (ISO 22005:2007) defines traceability as: “ability to follow the movement of a feed or food through specified stage(s) of production, processing and distribution.”

Traceability Systems adoption refers to the decision of farmers and firms to implement these systems as a condition for doing business, particularly in response to regulatory requirements and market demands (Monteiro & Caswell, 2009). Traceability systems adoption is influenced by factors such as farm size, prior compliance with quality assurance schemes, and the desire to access more profitable markets, management support among others (Zheng et al., 2023).

The use of Traceability Systems improves information visibility across the supply chain and helps to minimize unsafe or inferior products (Zhou et al., 2022). In addition, such systems provide possibilities for actions to achieve a sustainable supply chain (SSC) that creates economic, environmental, and social benefits (Mol and Oosterveer, 2015).

Farmer Group Readiness

Farmer groups, which include self-help and women's groups, are common in developing countries of Sub-Saharan Africa and provide services that are widely viewed as contributing to income and productivity for small-scale producers (Ma et al., 2023).

Farmer groups' readiness refers to the collective preparedness of agricultural cooperatives or associations to adopt new practices, technologies, or systems that enhance their operational efficiency and market competitiveness (Azizah & Aprylasari, 2025; Omar et al., 2023). This readiness encompasses various dimensions, including individual member readiness, organizational readiness, and management readiness, which together determine the group's ability to implement and sustain innovations effectively (Putri et al., 2025). Adapted from the TAM and POER models, Farmer groups' readiness indicators like individual farmer readiness (attitudes, commitment and awareness), management readiness (Top management support and feasibility) and organizational readiness (communication systems, technological environment, governance) shall be relevant to understanding extent adoption of traceability systems.

1.1.4 Contextual background

Traceability systems, which allow for the tracking of agricultural products throughout the supply chain, have been widely adopted in developed countries (Nabuuma et al., 2021).

For Uganda, following a warning issued by European union in 2019 of produce exports having high presence of pests, poor packaging, high levels of unwanted chemical pesticide residues and a ban of Red pepper export earlier in 2015 which was Uganda's then top export vegetable to the European fresh produce market (Nanyunja et al., 2015), various private initiatives towards

traceability implementation to curb these issues were made for instance Hamwe east Africa developed a traceability system for farmer groups in northern Uganda growing (Waiswa, 2021).

The Ministry of Agriculture, Animal Industry and Fisheries, on 14th January 2020, conducted training for Agricultural Inspectors to equip them with knowledge about the new and reinforced traceability system that will improve compliance with sanitary and phyto-sanitary standards, especially in animal production (The Ministry of Agriculture, Animal Industry and Fisheries, 2020).

Of recent, Uganda whose 60% coffee exports go to the EU market is working harder to register its coffee growers in accordance with the European Union's Deforestation Regulation (EUDR) in order to protect its coffee exports to the EU market. Hence 812,000 of the expected 3 million coffee producers have been registered as of April 2025, which is almost 30% of the goal (Farmers Review Africa, 2025). All coffee exported to the EU is required by the EUDR to be traceable along its whole value chain in order to avoid being associated with deforestation (European Commission, n.d.). About 60% of Uganda's coffee exports go to the EU market, making it a vital market (Farmers Review Africa, 2025). Challenges still exist despite the advancements for example some farmers have voiced worries that taxes could increase as a result of registration which could be an impediment towards adoption (Oyugi, 2025).

FAO report of 2017, indicate Agricultural supply chains as Uganda's biggest employer accounting for about 72% of the total labor force. Karamoja significant agricultural producer by region faces setbacks like climate Shocks, Conflict & Insecurity Armed cattle rustling and thefts lead to the loss of productive assets and disruption of food production and food markets, inadequate market information, High Food Prices, Seasonal crop pests and diseases facing

agriculture productivity in the region (Abrahams, 2020) hence further affecting agricultural marketing in Karamoja.

With the intention to develop robust food and market systems in Karamoja, government, development partners, agencies and non-government organizations have introduced resilience programs, encouraged climate smart agricultural practices, provided agro inputs to the communities who have been organized in small holder farmers (Obubu et al., 2022). However, information sharing, visibility of the agricultural supply chains amidst use of technologies like mobile phones to transact and communicate still remains a challenge (Ayub et al., 2023).

Since Parasuraman (2000) contends that lower technology utilization rates may be due to a lack of consumer (user) preparedness, there is need to assess readiness for use of traceability systems in the Ugandan context.

1.2 Problem Statement

In the Karamoja region of Uganda, a significant portion of the population relies on agricultural activities for their livelihoods. Food(maize and beans) purchased locally from Agricultural Market Support (AMS) farmer groups has increased from 98 mt in 2018 to 2,345.6 mt in 2023 where World Food Programme (WFP) procured 600mt of beans and 1745.6 mt of white maize from the Karamoja sub region earning income of over USD 1,947,933 to the small holder farmers (AMS, 2023). Nevertheless, the full market potential of the regions maize and beans is not fully tapped into.

Thus, traceability systems in Uganda have been emphasized for example the Budget framework paper for 2022/23 outlines the intentions for the development of an input traceability system in the bid to agro-industrialization. More so, efforts towards the national seed tracking and tracing

system aimed at providing real time information on the movement of seed along the value chain (ISSD Uganda, 2024). With regard to Coffee, since it is estimated that over 60% of Uganda's coffee exports are destined for the EU, the need to adopt sustainable practices that ensure traceability and protect the environment has been stressed (UCDA, 2024). The Ministry of Agriculture, Animal Industry and Fisheries has also made efforts towards the introduction of a traceability system Uganda livestock identification and traceability system (ULITS) currently at 80% completion.

The 2022 USAID Digital Agriculture Ecosystem Assessment for Uganda notes that facilitating an enabling environment is essential for the development of a sustainable digital agriculture ecosystem. However, statistical evidence underscores the gravity of the challenge. For instance, a study by Kansiime et al. (2022) found that only 78% of smallholder farmers in Uganda and Kenya had access to digital extension services, and this figure is significantly lower in remote regions like Karamoja due to connectivity and literacy barriers. Furthermore, the rejection of over 100 metric tons of produce from Karamoja in 2023 by the WFP due to poor quality (AMS, 2023) provides a tangible, quantitative indicator of the existing quality control and traceability gaps. This practice gap, particularly with cereals like maize and beans, has direct implications: it results in significant income loss for farmers and undermines food security efforts. The inability to guarantee quality and traceability blocks access to premium markets, including cross-border trade with Kenya, where Ugandan maize has frequently been rejected for high levels of mycotoxins (Njeru, 2021). Therefore, this study seeks to provide empirical evidence on the readiness factors that must be addressed to bridge this adoption gap.

1.3. Objectives of the study

1.3.1 General Objective.

To establish the relationship between farmer groups' readiness and adoption of traceability systems in agricultural supply chains in Karamoja.

1.3.2 Specific Objectives.

- i. To examine the relationship between member readiness and adoption of traceability systems in agricultural supply chains.
- ii. To analyse the relationship between organizational readiness and the adoption of traceability systems in agricultural supply chains.
- iii. To examine the relationship between management readiness and the adoption of traceability systems in agricultural supply chains.

1.4 Research questions

- i. What is the relationship between member readiness and adoption of traceability systems in agricultural supply chains?
- ii. What is the relationship between organizational readiness and the adoption of traceability systems in agricultural supply chains?
- iii. What is the relationship between management readiness and the adoption of traceability systems in agricultural supply chains?

1.5.0 Scope of the study

1.5.1 Subject scope

The study concentrated on farmer groups' readiness as the independent variable, adoption of traceability systems as the dependent variable. The study expounds independent variable into individual farmers' readiness, organisational readiness and management readiness.

1.5.2 Time scope

The study was done for 120 days (four months) for its relevance as traceability systems were sought to be implemented in the project thus information obtained formed a basis on what is relative to effectively ensure full embrace of the new technology.

1.5.3 Geographical scope

The study was carried out in the Kaabong District of the Karamoja sub-region in Uganda. This research specifically focused on registered and active farmer groups under the World Food Programme's (WFP) Agricultural and Market Support (AMS) project. These groups are primarily composed of smallholder farmers engaged in the collective production and bulking of staple cereals, namely maize, sorghum and millet. The selection of these groups was deliberate, as they are the direct beneficiaries of ongoing initiatives aimed at improving agricultural markets and are the primary targets for the introduction of new traceability systems."

To develop Karamoja as an economy, the research is relevant since it provides practical answers on how to better link the various agricultural value chain actors that is anticipated to have a huge impact on development of market and food systems in the area and especially farmer groups to access both national and international markets with minimal barriers.

1.6 Significance of the Study

This study puts perspective on what needs to be done by various stakeholders to enable adoption of traceability systems.

The study helps to inform decisions of government, non-government organizations, farmers, local Karamojong community on quality of food consumed. Better Understanding of agricultural value chains and risk management tactics shall be attained as a solution to food

insecurity and trade setbacks and consumers shall be able to benchmark products before making purchasing decisions thus reliable products.

In addition, study provides relevant insights on the how factors like individual farmer readiness, organizational and management readiness influence adoption of traceability. It also provides information on challenges that could hinder adoptability and usability of traceability systems and suggest solutions to the issues.

The study also influences government policies on enforcing food safety and quality assurance before consumption or export per say, and policies for development of traceability systems and technologies to resolve agricultural value chain bottlenecks. And on the other hand a tool to prevent local market breakdown.

Knowledge from the study may be borrowed for decision making at different organizations like government, FAO in enacting traceability systems with information on requirements, risks associated with introduction and implementation of traceability which can be used as monitoring tools and performance measurement tools for all agricultural project decisions.

1.7 Conceptual Framework

The model below shows the relationship between farmer groups' readiness (independent variable) and adoption of traceability system (dependent variable). The model also acted as the basis for the study objectives.

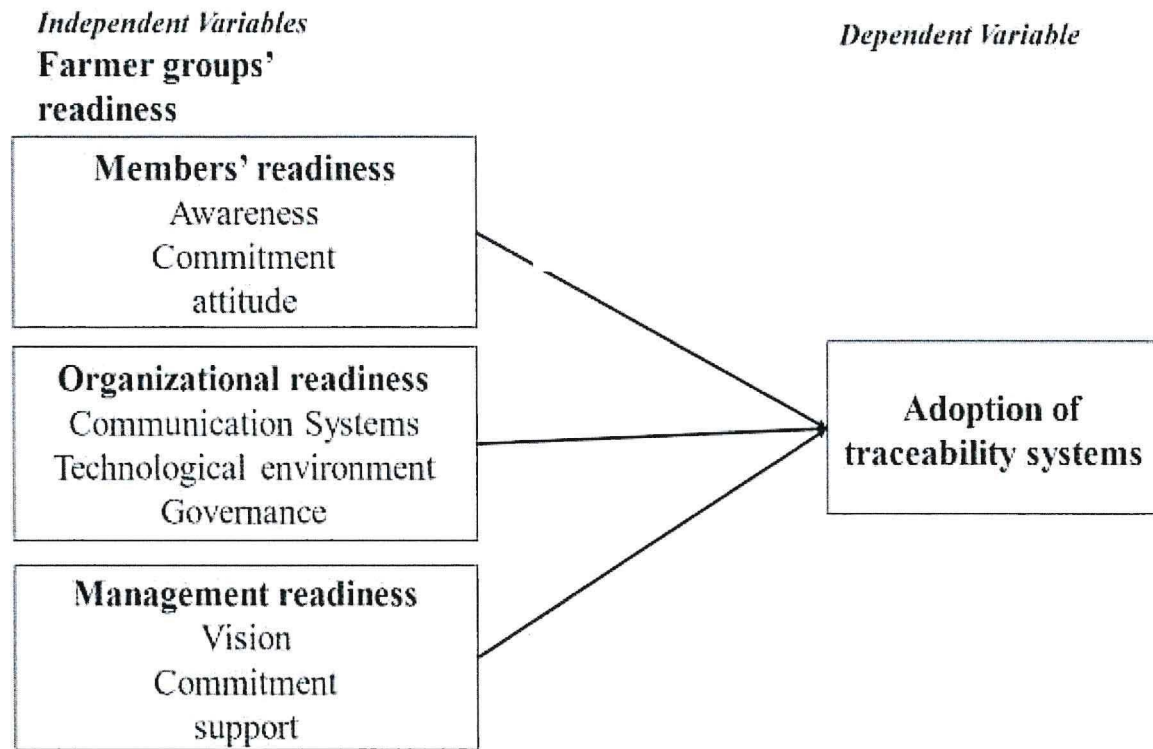


Figure 1. 1: Conceptual Framework of the study

Adapted from Perceived e-Readiness Model for assessing the E-commerce adoption by Molla and Licker (2005), the Technology Acceptance Model by Davis (1989) and the Diffusion of Innovation Theory (Rogers ,1995)

The table below shows the supporting literature for variables used.

Variable	Related Literature
Member readiness	Duan et al. (2017) Stentoft et al. (2019) Haug et al. 2011, Chan and Ngai (2007) Geissbauer et al., (2016); Satyro et al. (2024) Khan et al. (2018) Haji et al. (2021) Clohessy & Acton (2019)
Organisational readiness	Duan et al. (2017) Stentoft et al. (2019) Haug et al. 2011, Chan and Ngai (2007) Geissbauer et al., (2016); Satyro et al. (2024) Khan et al. (2018) Haji et al. (2021) Gangwar, 2018; Li et al. 2022 Clohessy & Acton (2019)
Management readiness	Duan et al. (2017) Stentoft et al. (2019) Haug et al. 2011, Chan and Ngai (2007) Geissbauer et al., (2016); Satyro et al. (2024) Khan et al. (2018) Haji et al. (2021) Li et al. (2022) Clohessy & Acton (2019)
Adoption of Traceability systems	Duan et al. (2017) Khan et al. (2018) Haji et al. (2021) Papa et al. (2024) Karâa & Morana (2016) (Zhang et al., 2021) (Wang et al., 2020) Prakash & Dhingra (2021)

In this study, the following definitions will apply;

Members readiness refers to the preparedness and willingness of individual members within a farmer group to engage with and adopt new practices, technologies, or systems, such as traceability systems (Najmi et al., 2023; (Zhang et al., 2021).). This includes awareness of the benefits and functionalities of the system, their skills and knowledge related to its use, and their overall attitude towards change (Pradana et al., 2024).

Organisational readiness pertains to the collective capacity of the farmer group as an organization to implement and sustain new initiatives, such as traceability systems (Gangwar, 2018; Li et al. 2022). This encompasses the group's structure, resources, culture, and processes that support or hinder the adoption of new technologies. Key elements include the availability

of financial resources, infrastructure, support governance systems, and the presence of effective communication channels within the group (Clohessy & Acton (2019).

Management readiness refers to the preparedness of the leadership and management team within the farmer group to facilitate the adoption of new systems and practices(Li et al. (2022)). This includes their ability to provide strategic direction or vision, allocate resources, and foster an environment supportive to change (Duan et al., 2017). Management readiness involves top management understanding the importance of traceability systems, being equipped with the necessary skills to guide the group through the adoption process, and having a clear vision for how the system will enhance the group's operations and market access (Clohessy & Acton, 2019).

Adoption of traceability refers to the process by which farmer groups integrate and utilize traceability systems. This involves the acceptance and implementation of practices that allow for the tracking and documentation of agricultural products from production to consumption (Duan et al., 2017). Adoption can be measured by the extent to which the traceability system is used, the level of compliance with its requirements, and the integration of traceability into everyday operations. Successful adoption often leads to improved product quality, enhanced market access, and increased consumer trust.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter presents a review of literature based on numerous peer-reviewed scholarly articles on the research variables that were compiled from books, journals, and reports.

2.1 Theoretical Review

The Davis (1989) Technology Acceptance Model (TAM) served as the study's compass. This model deals with perceptions rather than actual usage and relies on attitude explanations of intentions to use a specific technology or service.

According to the TAM, users' perceptions of a new technology's utility are one of the elements influencing how and when they will utilize it. This reflects how strongly potential users feel utilizing a certain technology would improve their ability to accomplish their jobs. A person's perception of how easy it will be to use a given system is the second component, and it measures how much they believe it will be uncomplicated (Davis, 1989).

This model has been extensively used in many similar studies and in molding adoption of information systems across many disciplines with positive outcomes registered (Barugahare, 2017; Zhu et al., 2006; Oliveira & Maria Rosario, 2011) and in this study, it guided in understating the people attitudes and acceptance of traceability systems in their farmer groups.

The Perceived Organization E-Readiness (POER) model, which includes six factors (as commitment, governance, awareness, human resource, business resource, and technology resource), relates within the organization and will affect the adoption of the traceability system (Molla and Licker, 2005).

2.2 Conceptual Review

2.2.1 Farmer Groups and composition of farmer groups

Farmers' organizations (FOs), which are composed of farmer groups, self-help, and women's groups (Ma et al., 2023), are common in developing countries of Sub-Saharan Africa and provide services that are widely viewed as contributing to income and productivity for small-scale producers. FOs mainly deal with the agriculture enterprise-related needs of their membership.

In Karamoja, farmer groups consist of smallholder farmers in Karamoja having two hectares or less of farmed land and are mainly reliant on family labor, and have limited access to agricultural resources (Nakalembe et al., 2017).

The farmer groups in Karamoja have an average membership of 30 people including women, men and the youth (Daily Monitor, 2024) and an average of 30 farmer groups come together to form apex farmer organizations. Some of Key activities carried out by farmer organizations under the agriculture and market support project is bulking of produce, bee keeping, fish farming etc.

In order to take advantage of economies of scale and lower transaction costs in collective marketing, the purchasing of equipment, and access to training and information (extension) services, the development of farmer groups has been strongly encouraged. Farmer groups are still encouraged as a way to address various issues related to rural development today (Ochieng et al., 2018).

In the context of Karamoja, several studies have been conducted on the challenges facing agricultural food supply chains. For instance, (Mwesigye et al. 2020) conducted a study on the

challenges facing agricultural marketing in Karamoja, where they identified poor quality control, inadequate infrastructure, and inadequate market information as the main challenges facing the sector.

Because they lack the organizational ability and leadership necessary to sustain appropriate performance, smallholders rarely self-organize in a formal manner, and many never develop into formal commercial entities. According to (Ochieng et al., 2018), the organization and activities of many farmer groups are frequently externally driven by the roll-out of development projects. As a result, the group activities cease once the projects are completed.

Farmers' organizations have been essential in addressing difficulties faced by small-scale farmers' access to both input and output markets resultant from market imperfections across several low-income countries (Markelova et al., 2009).

2.2.2 Readiness

The Oxford learners' dictionary defines readiness as a condition of being fully prepared for something that is possessing the necessary knowledge, abilities, and other attributes to deal with a set of circumstances.

The term "technological readiness" refers to the individual's predisposition to embrace and utilize technology to accomplish goals in their professional and private lives (Parasuraman, 2000). He contends that despite the widespread availability of the necessary infrastructure and other services, lower technology utilization rates may be due to a lack of consumer (user) preparedness in his study thus tools and techniques for assessing the readiness and adoption of new technologies like The Technology Readiness Index (TRI) were created (Parasuraman, 2000).

On the other hand, when referring to readiness for change as an organizational-level construct, it is important to note that this concept refers to the members of an organization's common commitment to making a change as well as their shared confidence in their capacity to do so.

2.2.3 Traceability/ traceability systems

Although the relevance of food product traceability has increased lately, there is no agreement on what the term "traceability" means, and there are a number of different definitions available (Olsen & Borit, 2013).

Gonzalez-Amarillo et al. (2018) describes that traceability can be internal or external and differentiates Internal crop traceability as that monitors the crop from the seedling stage through harvest to ensure its quality and safety, whereas external crop traceability monitors the crop from harvest through the creation of agriproducts and distribution in the market.

Karâa & Morana (2016), on the other hand, define traceability as a system that goes beyond just the tracking and tracing of products, but rather can generate, update, and disseminate data on the following subjects of the product. (1) product characteristics (such as weight and temperature); (2) energy and resource consumption; (3) batch quantity/size; and (4) production, transformation, and distribution schedule and capacity. This definition was adopted by (Razak et al., 2021) while critically trying to understand the link between traceability and Supply Chain Resilience.

New technologies continue to emerge regarding food traceability, including wireless sensor networks (WSN), radio frequency identification (RFID), and many others (Ballin & Laursen, 2019). Radio frequency identification (RFID) is one of the most used tracking technologies in

the food supply chain, as radio waves are used by technology to identify items automatically (Kumperščak et al., 2019).

Geographic information systems (GIS), Wireless sensor networks (WSN), DNA barcoding, blockchain technology, and internet of things (IoT) are some of the other traceability technologies available on the globe for managing supply chain operations (Kumperščak et al., 2019).

For this research, traceability will be defined as the capacity to use recorded identifications to acquire access to any or all details concerning the item/material under assessment during its entire life cycle.

2.2.4 Agricultural supply chains

Supply Chains (SCs) have grown more vulnerable to risks, turbulence, and disturbances as a result of a recent rise in their level of complexity (Brusset & Teller, 2017).

Due to its capacity to gather, update, and transfer information in real time with no delay or error, traceability systems have come to be seen as a crucial instrument for enhancing Supply Chain performance in connection to Supply Chain risk management (Stranieri et al., 2017). The simplest supply chains link a number of parties, originating from the source supplier at the earliest stage of production and continuing on to the manufacturer, distributor, retailer, and ultimately to the client (Ivanov, 2011)

Various authors use different terms to refer to “agricultural supply chains.” Some authors use the term “agri-food” or “agri business” in place of “agricultural” and use the word “value” in place of “supply.” Therefore, various terms can be used to describe these supply chains, such

as agri-food supply chains, agribusiness supply chains, agricultural value chains, agri-food value chain (Jamie & Rahimifard, 2018).

Agricultural supply chains constitute networks for the movement of agricultural products, as well as the flow of funds and information concerning the products. It is important to understand that agricultural products go through various production and/or manufacturing procedures prior being delivered to customers. As a result, agricultural supply chains can include a variety of different operations, from supplying inputs to farms through processing these inputs (by growing crops) until the end products are fit for consumption (Aramyan et al., 2007).

2.3 The Empirical Review

2.3.1 Member readiness and adoption of traceability systems

Individual readiness, characterized by employees' attitudes towards new technologies, significantly influences the adoption of traceability systems. Research indicates that positive perceptions and readiness of staff to embrace technological changes can lead to increased willingness to adopt and effectively use traceability systems (Bai et al., 2020).

One of the key components of member readiness is training. A well-structured training program enhances employee self-efficacy and equips them with necessary skills for using traceability systems. Studies show that organizations that prioritize training for their staff experience higher levels of engagement and better optimization of traceability processes (Prakash & Dhingra, 2021).

Motivation also plays a crucial role in readiness for adopting new systems. Incentive mechanisms, such as recognition for successful implementation and use of traceability systems, have been found to significantly enhance individual readiness among staff. Evidence suggests

that motivated employees are more likely to embrace and utilize traceability systems effectively (Zhang et al., 2021).

Individual resistance to change is a critical factor affecting readiness in adopting traceability systems. Psychological readiness, influenced by overall job satisfaction and perceived organizational support, is essential for overcoming resistance. Studies indicate that addressing employee concerns and facilitating a supportive environment can enhance psychological readiness, facilitating the adoption process (Morrison et al., 2019).

The literature suggests that member readiness which refers to the availability and capability of members within a farmer group to effectively engage with traceability systems significantly influences the adoption of traceability systems.

2.3.2 Organisational readiness and the adoption of traceability systems

Organizational readiness is a crucial factor that affects the adoption of traceability systems, encompassing various elements such as resources, governance, and overall structural preparedness.

The readiness of management is influenced by the organizational culture surrounding technological innovation and change management. Organizations with a culture that values transparency and accountability are more likely to adopt traceability systems. Research indicates that a proactive management approach facilitates the adoption process by fostering open communication and addressing employee concerns (Melnik et al., 2021).

A farmer group's assessment of existing technological infrastructure also impacts readiness for adopting traceability systems. Organizations that recognize the need for technological upgrades

and investments are better positioned to implement effective traceability solutions. Empirical evidence suggests that management-focused evaluations of technological needs can mitigate barriers to adoption (Regattieri et al., 2019).

The readiness of the farmer group is also related to the ability to engage with stakeholders across the supply chain. Management support is pivotal for fostering collaborations that are essential for information sharing and optimizing traceability systems. Research demonstrates that effective collaboration among stakeholders enhances the overall readiness for traceability adoption, as supported by proactive management (Mena & Adenso-Diaz, 2020).

Thus, Organizational readiness includes the availability of human, technological, and business resources. Firms that possess adequate resources are better equipped to implement e-commerce systems. This includes having skilled personnel, appropriate technology, and sufficient financial backing to support the adoption process. Organizational culture plays a significant role in readiness. A culture that encourages innovation, flexibility, and adaptability is more conducive to adopting e-commerce systems. Organizations that are resistant to change may struggle with the adoption process.

2.3.3 Management readiness and the adoption of traceability systems

Management readiness, characterized by support and commitment from top executives, plays a crucial role in the adoption of traceability systems. Studies have shown that when management actively champions traceability initiatives, resources are more likely to be allocated effectively, leading to successful implementation (Kumar & Singh, 2020).

The commitment from key members of the farmer group, especially the top executives, is essential for successful traceability system adoption. When management actively supports and

champions traceability initiatives, it sets a positive tone for the entire organization, encouraging employees to engage with and adopt new technologies.

Management readiness also encompasses the ability to manage change effectively. Organizations that are prepared for the changes associated with e-commerce, including shifts in processes and culture, are more likely to navigate the transition smoothly and achieve higher levels of adoption

Effective communication from management about the benefits and impact of traceability systems on the overall supply chain fosters better staff readiness. Research shows that involving employees in the planning and implementation stages of traceability initiatives can increase their commitment and readiness to adopt new technologies (Wang et al., 2020).

Management's perception of the importance of training can significantly affect employees' readiness to adopt new systems. Studies highlight that comprehensive training programs proposed by management lead to better understanding and efficiency in using traceability systems (Bechini et al., 2022).

Management readiness involves establishing clear objectives and priorities regarding traceability adoption. A well-defined strategic direction helps align resources and efforts towards implementing traceability systems effectively. Management also plays a crucial role in allocating the necessary resources—financial, human, and technological to support traceability initiatives

2.4 Summary of the Literature Review

The literature on adoption of traceability systems and the readiness of farmer groups is covered in this chapter. The literature review highlights the significance of farmer groups readiness as a means of attaining adoption of traceability systems.

Nonetheless, there are still large gaps that require methodological and contextual attention. This study was essential to address these gaps, particularly for farmer groups in the Kaabong context.

The literature gaps in the study of farmer group readiness and the adoption of traceability systems in agricultural supply chains in Kaabong district needs to be addressed hence the specific geographical setting has been considered.

2.5 Literature Gaps

Contextual Gaps. Regarding marginalized regions, there is scarcity of empirical studies in conflict-prone, pastoral or semi-arid regions. Much of the literature on traceability systems and farmer group readiness centers on commercialized, high-output areas. The unique social, economic, and infrastructural constraints faced by regions like Kaabong marked by pastoralism, insecurity, and weak market linkages are underexplored.

Underrepresentation of informal farmer groups. Studies often focus on formal cooperatives or commercial farmer associations, overlooking informal or semi-formal groups which dominate subsistence economies.

Member-level psychological readiness is under-researched. Studies tend to assume that if an organization is ready, members will comply. The attitudes, awareness, trust in digital systems, and literacy levels of individual farmers are rarely dissected in depth.

Organizational readiness research is often technocentric. Literature emphasizes technological infrastructure and financial resources, but neglects social capital, local leadership structures, or cultural norms that can enable or hinder organizational adoption.

Management readiness in smallholder contexts is thinly theorized. Management capacity is mostly examined in large agribusinesses. Little is known about how grassroots leadership in farmer groups (often unpaid or voluntary) navigates digital innovations like traceability.

Longitudinal evidence is lacking. Many studies are cross-sectional, capturing readiness at one point in time. How readiness evolves before, during, and after system adoption in a fragile rural context is not well documented.

Interaction effects between levels of readiness. The interdependence of member, organizational, and management readiness is under-theorized. For example, does strong management readiness compensate for weak member readiness or vice versa?

There is limited empirical research examining how the socio-economic context of marginalized pastoral districts, such as Kaabong, influences farmer groups' readiness to adopt traceability systems.

Existing studies largely neglect the psychological and attitudinal factors at the individual member level that may hinder or facilitate the adoption of traceability technologies.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter defined the methodology, study pollution, sample size, sample design and procedures, data collection methods. Data analysis, measurement design, ethical considerations and limitations of the study.

3.1 Research design

The study used cross sectional survey study design with a quantitative research approach. By using a cross-sectional approach, a population is captured at a specific period (Bell et al., 2019). It was preferred in order to facilitate a single-point inquiry on the relationship between farmer groups' readiness and adoption of traceability systems.

The quantitative approach was emmpolyed to quantify and ascertain the relationships between farmer groups' readiness and adoption traceability systems Creswell (2014), Saunders et al. (2019), and Kothari (2004)

3.2 Study Population

All registered and active agricultural Farmer groups in Kaabong district in Karamoja Region made up the study's population. In the Kaabong District Local Government, there are at least 300 functional agricultural farmer groups under the Agricultural and market support program according to the World Food Programme (2023) report.

The unit of inquiry was the individual respondent, specifically a knowledgeable representative (e.g., group chairperson, secretary, or treasurer) from each selected farmer group, who could provide insights into the group's collective readiness and operations.

The unit of analysis, which is the entity about which generalisations are made, was the farmer group itself. Data collected from individual representatives were aggregated and analysed to draw conclusions about the farmer groups as organisational entities.

3.3 Sample size and sampling technique

Based on the sampling guidelines provided in Table 3.1 below by Krejcie and Morgan (1970), the study considered a sample size of 169 respondents (farmer groups). Simple random sampling gave all groups equal chance to be selected to participate in the study.

Table 3.1: Displays the population, sample size, methods, and instruments.

Category	Population	Sample	Sampling technique
Farmer Groups in Kaabong	300	169	Simple random
Total	300	169	

Source: Taken from Morgan and Krejcie (1970)

3.4 Data Collection Methods and Tools

The survey research approach was used for the study considering quantitative data thus a questionnaire was the main data collection method used for this study.

The questionnaire survey method was utilized to gather quantitative primary data from the sampled farmer groups by using research assistants. Besides having an educational background in agriculture and supply chain, the research Assistants were also selected based on three key criteria to ensure data quality in a challenging geographical context: Firstly, Language Proficiency with mandatory fluency in the local languages prevalent in Kaabong (e.g., Karamojong) to effectively translate the questionnaire and interpret responses accurately, overcoming potential communication barriers. Secondly, previous Survey Experience demonstrated in administering questionnaires and conducting field surveys in rural, low-literacy

settings. Thirdly, Local Contextual Knowledge characterized by familiarity with the agricultural practices and social dynamics of farmer groups in the region, which aided in navigating the sampling process and building rapport with respondents.

Questionnaires were issued to 169 respondents from each representing a farmer group as the research assistants captured responses. Use of questionnaire was selected because its useful in collecting insights on perceptions, its advantage of gathering vast information in the least time possible (Arbale & Mutisya 2024).

3.5 Data collection tools

The study used closed ended questionnaire partitioned into sections of background data, individual farmer readiness, organizational readiness, management readiness and adoption of traceability systems.

A five-point Likert scale was used to grade the questionnaire: strongly agree (5 out of 5), agree (4 out of 5), not sure Neutral (3 out of 5), disagree (2 out of 5), and strongly disagree (1 out of 5) Individual respondents were contacted by research assistants to obtain quantitative primary data.

3.6 Measurements of Variables

A five-point Likert scale was used to grade the questionnaire: strongly agree (5 out of 5), agree (4 out of 5), not sure Neutral (3 out of 5), disagree (2 out of 5), and strongly disagree (1 out of 5) in measuring the variables member readiness, organizational readiness, management readiness and the adoption of traceability systems.

The variables individual member readiness, organizational readiness, management readiness and the adoption of traceability systems were measured based on items developed by Molla & Licker (2005) and Boateng (2024).

3.7 Validity and Reliability

3.7.1 Validity of the instruments

The validity of the instruments was tested using the Content Validity Index. This involved assigning a relevance score to each question on the instruments based on how it related to the study variables, and then making a consensus decision on each variable using only questions with relevance scores of 0.70 or higher. The table 3.2 shows the content validity results

3.7.2 Reliability of the instruments

Reliability measures the consistence of the instrument in measuring what it is supposed to measure (Nunnally & Bernstein, 1994). The study used the Cronbach's alpha coefficient test to show how reliable the data is by using the Software Package for Social Sciences (SPSS) taking only variables scoring above 0.70 as suggested by Nunnally and Bernstein (1994). The reliability of measures was pre-tested by computing Cronbach's alpha coefficients. All the values of the coefficients were checked against the acceptable scale of 0.60-0.80 to ensure an acceptable level of reliability (Nunnally & Bernstein, 1994).

Table 3.2: Validity and reliability of results

Variable	CVI	Cronbach's Alpha	No. of Items
Member readiness	0.85	0.882	7
Organisational readiness	0.80	0.909	9
Management readiness	0.85	0.891	8
Adoption of Traceability systems	0.80	0.88	4

Source: SPSS dataset

3.8 Data Analysis

Quantitative data collected was analyzed using descriptive statistics (frequencies, percentages, mean and standard deviation) for all the variables in the study.

Using the SPSS software Version 22, descriptive statistics (frequency ranges, percent, and tables technique) was used to analyse the various group proportions in terms of designation and years the farmer group has existed.

A correlation analysis was performed to determine the relationship between member readiness and adoption of traceability systems in agricultural supply chains, the relationship between organizational readiness and the adoption of traceability systems in agricultural supply chains, and the relationship between management readiness and the adoption of traceability systems in agricultural supply chains.

Later on, a multi regression analysis was performed to determine the level of prediction each farmer groups readiness factor has on the adoption of traceability systems and the coefficient of determination and significance statistics were used to depict the best predictor.

3.9 Ethical consideration

To obtain permission from the farmer groups, a letter of introduction was obtained from the Kyambogo University Directorate of Research and Graduate Training.

Additionally, the investigator ensured that the Kyambogo University Research and Ethics Committee rules were closely adhered to in order to fulfill all specified ethical requirements.

The ' confidentiality of the participants was ensured, and informed harmony was sought. Any underlying documents that were used were cited.

3.10 Limitations of the study

Due to the rural context of the respondents, language barriers and cultural norms somehow impeded successful communication. In order to improve communication, this was resolved by hiring researchers or local translators who are conversant in the language and culture of the community.

The study's other shortcoming is that it used data from a single respondent to represent the farmer group for its analysis. One argument is that single respondent bias may result from gathering data from lone informants. Similarly, self-administered questionnaire surveys have also been observed to induce self-reporting bias in respondents. The research's validity is thus threatened by reporting biases, thus required precautions to be undertaken to reduce or eliminate self-reporting and single respondent bias. As a result, the respondents were told that their identities and answers would remain anonymous.

CHAPTER FOUR

PRESENTATION, ANALYSIS AND INTERPRETATION OF RESULTS

4.1. Introduction

This chapter presents, analyses and interprets the study findings of “farmer groups’ readiness and adoption of traceability systems in agricultural supply chains in Karamoja case of Kaabong district centered on the information acquired from the study questionnaire. It presents the response rate, background information, descriptive statistics for the variables and the respective analysis for each research question.

4.2. Response Rate

169 questionnaires were issued out and 125 questionnaires were reverted for the study consideration hence a response ratio of 74%.

4.3. Years the Farm Group has existed

Table 4.1: Years the Farm Group has existed

Years the Farm Group has existed					
	Years	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	7	5.6	5.6	5.6
	3	19	15.2	15.2	20.8
	4	32	25.6	25.6	46.4
	5	39	31.2	31.2	77.6
	6	2	1.6	1.6	79.2
	7	14	11.2	11.2	90.4
	8	3	2.4	2.4	92.8
	9	2	1.6	1.6	94.4
	10	2	1.6	1.6	96.0
	11	3	2.4	2.4	98.4
	13	2	1.6	1.6	100.0
	Total	125	100.0	100.0	

From the table above, it can be established that the farmer groups involved in the study spread across various years of farmer group existence hence various experiences have been captured.

4.4 Descriptive Analysis of Variables

The study described the data regarding individual farmers', management and organizational readiness and adoption of traceability systems. The method with which the respondents' views were clustered was based on the dispersion (standard deviation) and central tendency (mean). The standard deviation calculated the degree of variation in the respondent's opinions.

4.4.1 Adoption of Traceability systems

The adoption of traceability systems was measured using 4 items scored on a 5-point Likert scale.

Each of the variables was measured using items scored on a five-point Likert scale ranging from 5=Strongly Agree (SA) 4=Agree (A), 3=Neither Agree or Disagree (N), 2= Disagree (D), and 1= Strongly Disagree (SD). In this study, a mean result below 3.5 suggested a low adoption level while a mean result above 3.5 suggested a high adoption level of traceability systems on a particular item of the variable.

Table 4.2: Descriptive results for the Adoption of Traceability systems

		SD	D	N	A	SA	Mean	Std Dev
ADOP1	Adopting traceability systems enhances achievement of the main goals of the farmer group	3.2	8.8	32.8	42.4	12.8	3.53	0.938
ADOP2	Embracing the use of traceability systems enhances farmer group performance e.g. access to market markets, agro-inputs, finance, agriculture insurance etc.	2.4	13.6	24.8	44.8	14.4	3.55	0.979
ADOR1	Use of traceability systems strengthens business relationships with different agriculture supply chain actors	1.6	15.2	28.0	45.6	9.6	3.46	0.921
ADOC1	Adoption of traceability systems makes communication of farmer groups easier	2.4	13.6	30.4	42.4	11.2	3.46	0.947

Source: Primary Data

The able above shows that;

The respondents agreed (mean=3.53) that adopting traceability systems enhances achievement of the main goals of the farmer group

The respondents agreed (mean=3.55) that Embracing the use of traceability systems enhances farmer group performance e.g. access to market markets, agro-inputs, finance, agriculture insurance etc.

The respondents slightly agreed (mean=3.46) that the Use of traceability systems strengthens business relationships with different agriculture supply chain actors

The respondents slightly agreed that the Adoption of traceability systems makes communication of farmer groups easier

4.4.2 Individual Member Readiness

Individual Farmer Readiness was one of the dimensions of Farmer Groups Readiness responsible for adoption of traceability systems and was measured using 5 items scored on a 5-point Likert scale. A mean result above 3.5 suggested that respondents agreed that the item in the study was vital component of individual farmer readiness.

Table 4.3: Descriptive results for Individual Member readiness

		SD	D	N	A	SA	Mean	Std. Dev
INDA1	Members are aware/have heard of what traceability systems are	9.6	14.4	27.2	42.4	6.4	3.22	1.082
INDA2	Members know the benefits/importance of using traceability systems	9.6	16.8	27.2	40.0	6.4	3.17	1.091
INDA3	Members are familiar with some types of traceability systems and how they work	8.0	23.2	27.2	37.6	4.0	3.06	1.045
INDC1	Members are willing to use or accept traceability innovations	3.2	8.8	22.4	54.4	11.2	3.62	.914
INDC2	Members are committed to using traceability systems to improve performance of agricultural value chains at the farmer group or individual farmers levels	3.2	16.0	21.6	43.2	16.0	3.53	1.044
INDAT1	Members believe use of Traceability systems will enable them perform better and ease designated roles in the farmer group	.8	14.4	26.4	49.6	8.8	3.51	.876
INDAT2	Members perceive the adoption of traceability systems is a good move	3.2	6.4	29.6	45.6	15.2	3.63	.929

The respondents did not to some extent agree (Mean=3.22) that members are aware/have heard of what traceability systems are

The respondents did not to some extent agree (mean=3.17) that members know the benefits/importance of using traceability systems

The respondents did not to some extent agree (mean=3.07) that members are familiar with some types of traceability systems and how they work

The respondents agreed (Mean=3.62) that members are willing to use or accept traceability innovations

The respondents agreed (Mean=3.53) that members are committed to using traceability systems to improve performance of agricultural value chains at the farmer group or individual farmers levels

The respondents agreed (Mean=3.51) that members believe use of Traceability systems will enable them perform better and ease designated roles in the farmer group

The respondents agreed (Mean=3.63) that members perceive the adoption of traceability systems is a good move

4.4.3 Organisational readiness

Organisational Readiness was measured using 5 items scored on a five-point Likert scale ranging from 5=Strongly Agree 4=Agree, 3=Neither Agree or Disagree, 2= Disagree, and 1= Strongly Disagree. A mean result below 3.5 suggests low level of organisational readiness while

a mean result of 3.5 suggests a high level of organisational readiness on a particular item of the variable.

Table 4.4: Descriptive results for Organisational readiness

		SD	D	N	A	SA	Mean	Std Dev
ORGT1	The farmer group has a well-established internal communication system that facilitates smooth information flow.	3.2	13.6	32.8	42.4	8.0	3.38	.931
ORGT2	The farmer group has a reliable and secure communication channels for sharing traceability information.	5.6	16.0	27.2	40.8	10.4	3.34	1.048
ORGR1	The farmer group has computers or tablets, or a smartphone	11.2	16.8	27.2	25.6	19.2	3.25	1.261
ORGR2	The farmer group has access to internet	8.0	21.6	26.4	29.6	14.4	3.21	1.173
ORGR3	The farmer group has access to power (grid or solar) to charge computer or tablet or smartphone or feature phone	8.0	17.6	30.4	28.0	16.0	3.26	1.165
ORGL1	The Farmer group regulations allow for adoption of traceability systems innovations	3.2	20.0	32.0	36.8	8.0	3.26	.977
ORGL2	The farmer group policies align with industry standards and regulatory requirements for traceability.	1.6	13.6	35.2	44.0	5.6	3.38	.850
ORGL3	Internal regulations clearly specify roles and responsibilities regarding traceability system use	3.2	9.6	31.2	48.8	7.2	3.47	.885
ORGL4	There are clear consequences for non-compliance with traceability policies	6.4	12.0	20.8	56.0	4.8	3.41	.985

The respondents had a low level of agreement (Mean=3.38) that the farmer group has a well-established internal communication system that facilitates smooth information flow.

The respondents had a low level of agreement (Mean=3.34) that the farmer group has a reliable and secure communication channels for sharing traceability information.

The respondents had a low level of agreement (Mean=3.25) that the farmer group has computers or tablets, or a smartphone

The respondents had a low level of agreement (Mean=3.21) that the farmer group has access to internet

The respondents had a low level of agreement (Mean=3.26) that the farmer group has access to power (grid or solar) to charge computer or tablet or smartphone or feature phone

The respondents had a low level of agreement (Mean=3.26) that the Farmer group regulations allow for adoption of traceability systems innovations

The respondents had a low level of agreement (Mean=3.38) that the farmer group policies align with industry standards and regulatory requirements for traceability.

The respondents had a low level of agreement (Mean=3.47) that Internal regulations clearly specify roles and responsibilities regarding traceability system use

The respondents had a low level of agreement (Mean=3.41) that there are clear consequences for non-compliance with traceability policies.

4.4.4 Management Readiness

Management Readiness was measured using 5 items scored on a five-point Likert scale ranging from 5=Strongly Agree 4=Agree, 3=Neither Agree or Disagree, 2= Disagree, and 1= Strongly Disagree. A mean result below 3.5 suggests low level of management readiness while a mean result of 3.5 suggests a high level of management readiness on a particular item of the variable.

Table 4.5: Descriptive results for Management Readiness

		SD	D	N	A	SA	Mean	Std Dev
MANV1	Farmer group management has a vision on the adoption of traceability systems	4.0	11.2	23.2	44.8	16.8	3.59	1.025
MANV2	The vision on the adoption of traceability systems is clear	4.0	14.4	29.6	42.4	9.6	3.39	.983
MANV3	The management is aware of the challenges to the vision for adoption of traceability systems	7.2	10.4	32.0	37.6	12.8	3.38	1.068
MANC1	Farmer group management is committed to adoption of traceability systems	1.6	9.6	38.4	42.4	8.0	3.46	.838
MANC2	Farmer group management is committed to address challenges related to adoption and implementation of traceability systems	3.2	12.0	28.8	47.2	8.8	3.46	.929
MANS1	Farmer group management supports implementation of innovation, learning, and change	2.4	12.0	35.2	37.6	12.8	3.46	.947
MANS2	The management will support the establishment of a special team to spearhead implementation of traceability systems in the farmer group	4.8	14.4	27.2	42.4	11.2	3.41	1.025
MANS3	The management will support training(computer skilling) for farmers to use traceability systems	1.6	9.6	42.4	42.4	4.0	3.38	.779

The respondents agreed (Mean= 3.59) that farmer group management has a vision on the adoption of traceability systems

The respondents had a low level of agreement agree (Mean=3.39) that the vision on the adoption of traceability systems is clear

The respondents had a low level of agreement (Mean=3.38) that the management is aware of the challenges to the vision for adoption of traceability systems

The respondents had a low level of agreement (Mean=3.46) that farmer group management is committed to adoption of traceability systems

The respondents had a low level of agreement (mean=3.46) that farmer group management is committed to address challenges related to adoption and implementation of traceability systems

The respondents had a low level of agreement (mean=3.46) that farmer group management supports implementation of innovation, learning, and change

The respondents had a low level of agreement (mean= 3.41) that the management will support the establishment of a special team to spearhead implementation of traceability systems in the farmer group

The respondents had a low level of agreement (mean= 3.38) that the management will support training (computer skilling) for farmers to use traceability systems

4.5. The influence of farmer group readiness on the adoption of traceability systems

The analysis first involved testing to determine if there was a significant relationship between farmer group readiness (individual member readiness, organizational readiness and

management readiness) and adoption of traceability systems. A correlation analysis was conducted using spearman's correlation coefficient and significance statistics. Spearman's correlation was chosen over Pearson's correlation after preliminary tests indicated that the data for the variables significantly deviated from a normal distribution.

The findings are presented in the table below.

Table 4.6: Correlation Matrix between farmer group readiness and the adoption of traceability systems

Independent Variables	Spearman's rho	Dependent variable: Adoption of Traceability systems
Individual Readiness	Correlation Coefficient	.731**
	Sig. (2-tailed)	.000
	N	125
Organisational Readiness	Correlation Coefficient	.553**
	Sig. (2-tailed)	.000
	N	125
Management Readiness	Correlation Coefficient	.872**
	Sig. (2-tailed)	.000
	N	125
**. Correlation is significant at 0.05 (2-tailed).		

Table 4.6 above shows the Spearman's correlation coefficient $r = 0.731$, $p=0.000$ between individual member readiness and adoption of traceability systems in agricultural supply chains suggesting that the two variables had a high positive significant relationship. The individual member readiness implication was that adoption of traceability systems heavily depends on the extent to which the individual members are ready to adopt to traceability systems in form of awareness about traceability systems, knowledge about the benefits/importance of using

traceability systems, familiarity with some types of traceability systems and how they work, willingness to use or accept traceability innovations, commitment to using traceability systems to improve performance of agricultural value chains at the farmer group or individual farmers levels. The findings also mean that the gaps in individual member readiness constrain adoption of traceability systems.

Table 4.6 above shows the Spearman's correlation coefficient $r = 0.553$, $p=0.000$ between organisational readiness and adoption of traceability systems in agricultural supply chains suggesting that the two variables had a moderate positive significant relationship. The organisational readiness implication was that adoption of traceability systems heavily depends on the extent to which the farmer group as an organisation is ready to adopt to traceability systems in form of having a well-established internal communication system that facilitates smooth information flow having computers or tablets, or a smartphone and access to internet, having access to power (grid or solar) to charge computer or tablet or smartphone or feature phone, having farmer group regulations allow for adoption of traceability systems innovations, having farmer group policies align with industry standards and regulatory requirements for traceability. The findings also mean that the gaps in organisational readiness constrain adoption of traceability systems.

Table 4.6 above shows the Spearman's correlation coefficient $r = 0.872$, $p=0.000$ between management readiness and adoption of traceability systems in agricultural supply chains suggesting that the two variables had a very high positive significant relationship. The management readiness implication was that adoption of traceability systems heavily depends on the extent to which the farmer group management is ready to adopt to traceability systems in form of having a clear vision on the adoption of traceability systems, management awareness

of the challenges to the vision for adoption of traceability systems, Farmer group management commitment to adoption of traceability systems, Farmer group management commitment to address challenges related to adoption and implementation of traceability systems and support to implementation of innovation, learning, and change. The findings also mean that the gaps in management readiness greatly constrain adoption of traceability systems.

During the study, the researcher employed the multiple regression analysis to determine the strength of the relationship between farmer groups readiness and adoption of traceability systems. The multiple regression was also used to form an opinion on the research questions

From table 4.7 below, it was revealed that the R^2 = of the model was 0.744 which implies that 74.4% of the variance in adoption of traceability systems can be explained by member readiness, organisational readiness and management readiness.

Table 4.7: showing a summary of the multiple regression model.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.866 ^a	.751	.744	1.65511

a. Predictors: (Constant), MANAGEMENT, ORGANISATIONAL, INDIVIDUAL

Further analysis in table 4.7 below, the model was statistically significant at 0.05 level of significance since the p-value (0.000) < 0.05 thus we can assume that the model explains a statistically significant amount of the variance in the factors determining the adoption of traceability systems. It can be concluded that member readiness, organisational readiness and management readiness can be used to reliably predict adoption of traceability systems.

Table 4.8: Showing the statistical significance statistics of the multiple regression model

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	997.525	3	332.508	121.380	.000 ^b
	Residual	331.467	121	2.739		
	Total	1328.992	124			

a. Dependent Variable: ADOPTION

b. Predictors: (Constant), MANAGEMENT, ORGANISATIONAL, INDIVIDUAL

Table 4.9: Showing the coefficients of the multiple regression model

Coefficients^a

		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
Model		B	Std. Error	Beta		
1	(Constant)	.605	.747		.809	.420
	INDIVIDUAL	.086	.049	.141	1.756	.082
	ORGANISATIONAL	-.075	.033	-.164	-2.291	.024
	MANAGEMENT	.494	.050	.867	9.858	.000

a. Dependent Variable: ADOPTION

The general regression equation is as below;

Adoption of traceability systems (Y) = X₀ + X₁b₁ + X₂b₂ + X₃b₃..... Equation 1

Adoption of traceability systems = 0.605 + 0.086 Individual Member readiness+ -0.075 Organisational readiness + 0.494 Management Readiness Equation 2

Further analysis from the standardized coefficient results revealed that the score management readiness was the strongest predictor of adoption of traceability systems with ($\beta = 0.4945$) which is significant at 5% level of significance since the p-value $0.000 < 0.05$ leaving other factors constant. Individual Member readiness was the second strongest predictor ($\beta = 0.086$) and lastly

organisational readiness ($\beta=-0.075$) Therefore, the study concluded that management readiness factors for example having a clear vision on the adoption of traceability systems, management awareness of the challenges to the vision for adoption of traceability systems, Farmer group management commitment to adoption of traceability systems, Farmer group management commitment to address challenges related to adoption and implementation of traceability systems and support to implementation of innovation, learning, and change are crucial for adoption of traceability systems.

An intriguing finding from the regression analysis was the negative beta coefficient for organisational readiness ($\beta = -0.075$, $p=0.024$). While the zero-order correlation was positive, this negative coefficient in the multiple regression suggests a suppressor effect. This can occur when organisational readiness shares a significant portion of its variance with management readiness. In practice, this may indicate that in contexts where management readiness is very high and is the primary driver of adoption, a simultaneous focus on complex organisational structures and regulations (organisational readiness) without commensurate management drive and resource allocation could inadvertently slow down the adoption process. It implies that management leadership is the primary engine for adoption, and an over-emphasis on building perfect organisational systems in isolation may not yield positive results unless it is championed by committed leadership.

CHAPTER FIVE

SUMMARY, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1. Introduction

This chapter presents the summary of each research question based on the study findings. Discussions, conclusions, recommendations, limitations, contributions, and areas for further study are equally presented.

5.2 Study findings summary

5.2.1 The relationship between member readiness and adoption of traceability systems in agricultural supply chains.

The correlation outcomes revealed a high positive and significant relationship between member readiness and adoption of traceability systems in agricultural supply chains in Uganda ($r = 0.731$, $p = 0.000$) hence the need for a heightened member readiness as the respondents appreciated the usefulness of member readiness factors towards adoption of traceability systems.

5.2.2 The relationship between organisational readiness and adoption of traceability systems in agricultural supply chains

The correlation results revealed a moderately positive and significant relationship between organisational readiness and adoption of traceability systems in agricultural supply chains ($r = 0.553$, $p = 0.000$) hence the need for a substantial level of organisational support as the respondents appreciated the usefulness of organisational readiness towards adoption of traceability systems.

5.2.3 The relationship between management readiness and adoption of traceability systems in agricultural supply chains

The correlation results revealed a very high positive and significant relationship between management readiness and adoption of traceability systems in agricultural supply chains ($r = 0.872$, $p = 0.000$) hence the need for a substantial level of management readiness as the respondents appreciated the usefulness of management readiness towards the adoption of traceability systems.

5.3 Discussion of findings

5.3.1 The relationship between member readiness and adoption of traceability systems in agricultural supply chains.

From the findings, there is a positive relationship between member readiness and adoption of traceability systems in agricultural supply chains. The study therefore brought the conclusion that adoption of traceability systems depends on the extent of member readiness in the farmer groups through awareness about the benefits of traceability systems, possession of relevant IT skills, members' willingness and commitment to use traceability systems.

This finding is strongly supported by the descriptive analysis, which revealed that members exhibited a high level of attitudinal readiness. For instance, items such as "Members are willing to use or accept traceability innovations" (Mean=3.62) and "Members perceive the adoption of traceability systems is a good move" (Mean=3.63) scored highly. This indicates a foundational positive disposition towards the technology, which is a critical precursor to adoption as theorized in the Technology Acceptance Model.

These study findings and observations are supported by previous studies such as Bai et al. (2020) which notes that positive perceptions and readiness of individuals to embrace technological changes can lead to increased willingness to adopt and effectively use traceability systems

Prakash & Dhingra (2021) also found out that training for individuals fosters higher levels of engagement and better optimization of traceability processes. Zhang et al. (2021) also found out that motivated employees are more likely to embrace and utilize traceability systems effectively. Wang et al. (2020) shows that involving individuals in the planning and implementation stages of traceability initiatives can increase their commitment and readiness to adopt new technologies.

Hence, the study observes that member readiness significantly and positively influences adoption of traceability systems in agricultural supply chains in Uganda.

5.3.2 The relationship between organisational readiness and adoption of traceability systems in agricultural supply chains

From the findings, there is a positive relationship between organisational readiness and adoption of traceability systems in agricultural supply chains. The study therefore brought the conclusion that adoption of traceability systems depends on the extent of organisational readiness in the farmer groups through farm group trainings, knowledge of digital platforms, possession of computers or tablets, or a smartphone, farmer group regulations and establishment of a special team towards the adoption of traceability systems.

These study findings and observations are supported by previous studies such as Melnyk et al. (2021) which attributed adoption of traceability systems to organisational readiness.

Regattieri et al. (2019) also found that evaluations of technological needs of the farmer group can mitigate barriers to adoption as it creates a supporting culture. Research by Mena & Adenso-Diaz (2020) demonstrates that effective collaboration among stakeholders enhances the overall readiness for traceability adoption, as supported by proactive management.

Hence, the study observes that organisational readiness significantly and positively in adoption of traceability systems in agricultural supply chains in Uganda.

5.3.3 The relationship between management readiness and adoption of traceability systems in agricultural supply chains

From the findings, there is a positive relationship between management readiness and adoption of traceability systems in agricultural supply chains. The study therefore brought the conclusion that adoption of traceability systems depends on the extent of management readiness in the farmer groups through farm group management vision, commitment and support for implementation of innovation, learning, and change, commitment to address challenges related to adoption and implementation of traceability systems, allocation of resources for adoption and implementation of traceability systems. The descriptive data shows that the highest agreement was for "Farmer group management has a vision on the adoption of traceability systems" (Mean=3.59). This underscores the paramount importance of leadership and strategic direction.

These study findings and observations are supported by previous studies such as Kumar & Singh (2020) who found that when management actively champions traceability initiatives, resources are more likely to be allocated effectively, leading to successful adoption of traceability systems. Bechini et al. (2022) found out that comprehensive training programs proposed by management lead to better understanding and efficiency in using traceability systems. Morrison et al. (2019)

in their research found out that facilitating a supportive environment can enhance psychological readiness, facilitating the adoption process of traceability systems.

Hence, the study observes that management readiness significantly and positively influences adoption of traceability systems in agricultural supply chains in Uganda.

5.4 Conclusion

Particularly in nations that are developing like Uganda, the assessment of farmer group readiness is important towards the adoption of traceability systems in agricultural supply chains in Uganda. When thinking about the actual implementation of traceability systems, the readiness of farmer groups should be carefully examined.

To establish the relationship between farmer group readiness and adoption of traceability systems in agricultural supply chains in Uganda, this research aimed at establishing its relationship with key readiness blocks.

The results show that individual member readiness is positively related to adoption of traceability systems in agricultural supply chains. It also establishes that organisational readiness is positively related to adoption of traceability systems in agricultural supply chains. Finally, the study shows that management readiness is positively related to adoption of traceability systems in agricultural supply chains. In the broad sense, it can be deduced that the readiness of farmer groups positively influences the adoption of traceability systems in agricultural supply chains in Uganda.

Since the predictive model also shows that 25.6% of adoption of traceability systems is predicted by many other readiness factors, there is need to look at the other factors affecting the adoption of traceability systems especially the external factors that have not been studied.

5.5 Recommendations

5.5.1 Managerial Recommendations

Enhance Management Readiness: Farmer group leaders should develop and communicate a clear, compelling vision for traceability. This should be backed by tangible commitment, such as establishing a dedicated implementation team and allocating resources for training and initial setup.

Boost Member Readiness through Targeted Training: Management should prioritize continuous awareness campaigns and hands-on skill development programs. These should demystify traceability systems, clearly articulate their benefits (e.g., better prices, market access), and build digital literacy among members.

Improve Organizational Infrastructure: Farmer groups should proactively invest in or seek support for basic technological infrastructure. This includes securing reliable power sources (e.g., solar chargers) and improving access to mobile internet and shared devices like tablets or smartphones to facilitate data entry.

5.5.2 Policy Recommendations

Develop Supportive Regulatory Frameworks: The government, through the Ministry of Agriculture, should develop and enforce policies that incentivize traceability adoption. This could include integrating traceability requirements into national quality standards and providing tax breaks or subsidies for farmer groups adopting these systems.

Invest in Enabling Infrastructure: Policymakers and development partners should prioritize public investment in rural digital infrastructure, specifically expanding mobile network coverage and electricity grids in agricultural regions like Karamoja to lower the barrier to technological adoption.

Fund Capacity Building Programs: Government and NGO-led initiatives should design and fund large-scale capacity-building programs focused on both digital skills for farmers and leadership training for the management of farmer groups to ensure sustainable adoption.

5.6 Directions for future research

A future research recommendation is that other factors responsible for adoption of traceability systems for example the external factors of market forces, the government regulations need to be examined.

Agricultural supply chains in Uganda includes diverse sectors like coffee, tea, dairy, and horticulture. Future research can explore how farmer group readiness and adoption of traceability systems differs across these sub-sectors. It is therefore imperative to identify sector-specific readiness factors that could inform tailored adoption of traceability systems.

With the global emphasis of the sustainable development Goals, research on how traceability systems can be aligned with sustainability goals, such as organic farming, carbon footprint reduction can be done. It is necessary to examine how traceability systems can foster sustainability practices in agricultural supply chains.

Investigating the role of emerging technologies, such as blockchain, IoT (Internet of Things), and mobile applications, in enhancing traceability systems in agricultural supply chains. This

research could assess the effectiveness, scalability, and user-friendliness of these technologies in the context of developing countries.

Research could focus on consumer attitudes towards traceable agricultural products, including their willingness to pay for products with traceability features. Understanding consumer demand can help tailor traceability systems to meet market needs and encourage farmers to adopt these systems.

Future research could also explore how the adoption of traceability systems affects farmers' access to local, national, and international markets. This could include quantitative analyses of sales data before and after the implementation of traceability systems, as well as qualitative interviews with farmers to understand their experiences and challenges.

REFERENCES

- Abigaël, O. (2018). Field Assessment of Agronomic Performance, Resistance to Aflatoxin, and Fumonisin Accumulation in Selected Maize Inbred Lines in Kenya. *Agriculture, Forestry and Fisheries*, 7(4), 94. <https://doi.org/10.11648/j.aff.20180704.11>
- Abrahams, D. (2020). Land is now the biggest gun: climate change and conflict in Karamoja, Uganda. *Climate and Development*, 13(8), 748–760. <https://doi.org/10.1080/17565529.2020.1862740>
- Ahikiriza, E., Wesana, J., Van Huylenbroeck, G., Kabbiri, R., De Steur, H., Lauwers, L., & Gellynck, X. (2022). Farmer knowledge and the intention to use smartphone-based information management technologies in Uganda. *Computers and Electronics in Agriculture*, 202, 107413.
- AMS. (2023). Agriculture and Market Support Programme August 2023
- Annelie, C. (2015). *Traceability systems in the SA food industry*.
- Aramyan, L. H., Oude Lansink, A. G. J. M., van der Vorst, J. G. A. J., & van Kooten, O. (2007). Performance measurement in agri-food supply chains: A case study. *Supply Chain Management: An International Journal*, 12(4), 304–315. <https://doi.org/10.1108/13598540710759826>
- Arbale, H., & Mutisya, D. N. (2024). Book Review: "Research Methods for Business Students" by Mark NK Saunders, Philip Lewis, and Adrian Thornhill (Pearson Education, 2019). *African Quarterly Social Science Review*, 1(2), 8-21.

- Aung, M. M., & Chang, Y. S. (2014). Traceability in a food supply chain: Safety and quality perspectives. *Food control*, 39, 172-184.
- Ayub, M., Muhanguzi, F. K., & Boonabaana, B. (2023). Gender and the use of technologies in the face of drought among smallholder farmers in Karamoja sub region, North Eastern Uganda. *KKU International Journal of Humanities and Social Sciences*, 13(2), 51-76.
- Azizah, S., & Aprylasari, D. (2025). FARMER: THE DECISION MAKER. *Yayasan Drestanta Pelita Indonesia*.
- Bai, J., Wang, Y., & Zhang, Z. (2020). "The Role of Individual Attitudes in the Adoption of Traceability Systems in the Food Industry." *British Food Journal*, 122(5), 1517-1532.
- Ballin, N. Z., & Laursen, K. H. (2019). To target or not to target? Definitions and nomenclature for targeted versus non-targeted analytical food authentication. *Trends in Food Science & Technology*, 86, 537–543. <https://doi.org/10.1016/J.TIFS.2018.09.025>
- Balraj, P. L., & Pavalam, S. M. (2012). Integrating ICT in agriculture for knowledge-based economy. *Rwanda Journal*, 27, 44-56.
- Barugahare, I. (2017). *Organizational E-Readiness and Adoption Of E-Procurement in Ugandan Armed Forces: A Case of Uganda Police Force*.
- Bechini, A., Ferrucci, L., & Taisch, M. (2022). "Traceability in Supply Chains: A Comprehensive Study." *Computers in Industry*, 135, 103234.
- Bell, E., Bryman, A., & Harley, B. (2019). *Business research methods*. Oxford University Press.

- Bergström, W., & Haas, F. (2020). Supply Chain Traceability: A framework for a future traceability system in the electrification industry.
- Bernard, A., & Fierens, S. (2002). The Belgian PCB/Dioxin Incident: A Critical Review of Health Risks Evaluations. *International Journal of Toxicology*, 21(5), 333–340.
<https://doi.org/10.1080/10915810290096540>
- Bitner, M. J., Brown, S. W., & Meuter, M. L. (2000). Technology Infusion in Service Encounters. *Journal of the Academy of Marketing Science*, 28(1), 138–149.
<https://doi.org/10.1177/0092070300281013>
- Boateng, K.A., (2024). Digital Technology Adoption, Supply Chain Integration and Supply Chain Transparency in Ghana's Health Sector. University of Cape Coast
- Borit, M., & Olsen, P. (2012). Evaluation framework for regulatory requirements related to data recording and traceability designed to prevent illegal, unreported and unregulated fishing. *Marine Policy*, 36(1), 96–102. <https://doi.org/10.1016/j.marpol.2011.03.012>
- Brusset, X., & Teller, C. (2017). Supply chain capabilities, risks, and resilience. *International Journal of Production Economics*, 184, 59–68.
<https://doi.org/10.1016/j.ijpe.2016.09.008>
- Chan, S.C.H. and Ngai, E.W. (2007), “A qualitative study of information technology adoption: how ten organizations adopted web-based training”, *Information System Journal*, Vol. 17 No. 3, pp. 289-315.

- Chanchaichujit, J., Balasubramanian, S., & Charmaine, N. S. M. (2020). A systematic literature review on the benefit-drivers of RFID implementation in supply chains and its impact on organizational competitive advantage. *Cogent business & management*, 7(1), 1818408.
- Charlebois, S., Latif, N., Ilahi, I., Sarker, B., Music, J., & Vezeau, J. (2024). Digital traceability in Agri-Food Supply Chains: A Comparative analysis of OECD member countries. *Foods*, 13(7), 1075.
- Charlebois, S., Sterling, B., Haratifar, S., & Kyaw Naing, S. (2014). *Comparison of Global Food Traceability Regulations and Requirements*.
- Chemeltorit, P., Saavedra, Y., & Gema, J. (2018). *Food traceability in the domestic horticulture sector in Kenya*.
- Chong, A. Y. L., Lin, B., Ooi, K. B., & Raman, M. (2009). Factors affecting the adoption level of c-commerce: An empirical study. *Journal of Computer Information Systems*, 50(2), 13-22.
- Clohessy, T., & Acton, T. (2019). Investigating the influence of organizational factors on blockchain adoption: An innovation theory perspective. *Industrial management & Data systems*, 119(7), 1457-1491.
- Daily Monitor. (2024). Making Karamoja agriculturally viable. [Making Karamoja agriculturally viable | Monitor](#)

Dandage, K. P. (2018). *Development traceability Systems for Agricultural Products in India*.

Univeridad Politecnica De madrid.

Davis, F. D. (1989). Technology acceptance model: TAM. *Al-Sugri, MN, Al-Aufi, AS: Information Seeking Behavior and Technology Adoption*, 205, 219.

Dong, L., Jiang, P. (Puping), & Xu, F. (2020). Blockchain Adoption for Traceability in Food Supply Chain Networks. *SSRN Electronic Journal*.
<https://doi.org/10.2139/ssrn.3484664>

Duan, Y., Miao, M., Wang, R., Fu, Z., & Xu, M. (2017). A framework for the successful implementation of food traceability systems in China. *The Information Society*, 33(4), 226-242.

Durrant, A., Markovic, M., Matthews, D., May, D., Leontidis, G., & Enright, J. (2021). How might technology rise to the challenge of data sharing in agri-food? *Global Food Security*, 28, 100493.

Duvon, E. A.-. (2014). *UNDERSTANDING THE PERCEPTIONS OF TRACEABILITY SYSTEMS IN THE COCOA SUPPLY CHAIN: A CASE OF GHANA* [PDH thesis]. Newcastle University Business School and Grenoble.

European Commission. (n.d.) Regulation on Deforestation-free Products.
https://environment.ec.europa.eu/topics/forests/deforestation/regulation-deforestation-free-products_en

FAO (Food and Agriculture Organization of the United Nations). (2022). Status of Digital Agriculture in 47 Sub-Saharan African Countries

Food and Agricultural Organisation of the United Nations. (2017). Food Traceability Guidance. Santiago.

Food Marketing Research and Information Center (FMRIC). (2008). Handbook for Introduction of Food Traceability Systems (Guidelines for Food Traceability)

Fritz, M., & Schiefer, G. (2010). The challenge of reaching transparency: 'T-readiness' of enterprises and sector networks. *International Journal on Food System Dynamics*, 1(3), 182-183.

Gangwar, H. (2018). Understanding the determinants of the manufacturing and services sectors. *Information Resources Management Journal (IRMJ)*, 31(4), 1-22.

Garcia-Torres, S.; Albareda, L.; Rey-Garcia, M. & Seuring, S. (2019) 'Traceability for sustainability – literature review and conceptual framework', *Supply Chain Management: An International Journal*, 24(1), pp. 85-106. doi: <https://doi.org/10.1108/SCM-04-2018-0152>

Geissbauer, R., Vedso, J., & Schrauf, S. (2016, April). Industry 4.0: Building the digital enterprise.

Giagnocavo, C., Bienvenido, F., Ming, L., Yurong, Z., Sanchez-Molina, J. A., & Xinting, Y. (2017). Agricultural cooperatives and the role of organisational models in new

intelligent traceability systems and big data analysis. *International Journal of Agricultural and Biological Engineering*, 10(5), 115-125.

Gonzalez-Amarillo, C. A., Corrales-Munoz, J. C., Mendoza-Moreno, M. A., Gonzalez Amarillo, A. maria, Hussein, A. F., Arunkumar, N., & Ramirez-Gonzalez, G. (2018). An IoT-Based Traceability System for Greenhouse Seedling Crops. *IEEE Access*, 6, 67528–67535. <https://doi.org/10.1109/ACCESS.2018.2877293>

Grundy, H. H., Brown, L. C., Romero, M. R., & Donarski, J. A. (2023). Review: Methods to determine offal adulteration in meat products to support enforcement and food security. *Food Chemistry*, 399, Article 133818. <https://doi.org/10.1016/j.foodchem.2022.133818>

Habtemariam, L. T., Kassa, G. A., & Gandorfer, M. (2017). Impact of climate change on farms in smallholder farming systems: Yield impacts, economic implications and distributional effects. *Agricultural systems*, 152, 58-66.

Haji, M., Kerbache, L., Sheriff, K. M., & Al-Ansari, T. (2021). Critical success factors and traceability technologies for establishing a safe pharmaceutical supply chain. *Methods and Protocols*, 4(4), 85.

Happy, K., Gang, R., Ban, Y., Yang, S., Rahmat, E., Okello, D., & Kang, Y. (2024). Agricultural sustainability through smart farming systems: A comparative analysis between the Republic of Korea and Republic of Uganda. *Journal of Plant Biotechnology*, 51(1), 167-201.

Hassoun, A., Abdullah, N. A., Aït-kaddour, A., Bes,ir, A., Zannou, O., Onal, " B., Aadil, R. M., Lorenzo, J. M., Khaneghah, A. M., Regenstein, J. M., Bes,ir, A., Zannou, O., Onal, " B., Aadil, R. M., & Lorenzo, J. M. (2022). Food traceability 4.0 as part of the fourth industrial revolution: Key enabling technologies. *Critical Reviews in Food Science and Nutrition*, 1–17. <https://doi.org/10.1080/10408398.2022.2110033>

Hassoun, A., Kamiloglu, S., Garcia-Garcia, G., Parra-López, C., Trollman, H., Jagtap, S., ... & Esatbeyoglu, T. (2023). Implementation of relevant fourth industrial revolution innovations across the supply chain of fruits and vegetables: A short update on Traceability 4.0. *Food Chemistry*, 409, 135303.

Hastig, G. M., & Sodhi, M. S. (2020). Blockchain for supply chain traceability: Business requirements and critical success factors. *Production and Operations Management*, 29(4), 935-954.

Haug, A., Graungaard Pedersen, S., & Stentoft Arlbjörn, J. (2011). IT readiness in small and medium-sized enterprises. *Industrial Management & Data Systems*, 111(4), 490-508.

Helms, M. (2004). Food sustainability, food security and the environment. *British Food Journal*, 106(5), 380–387. <https://doi.org/10.1108/00070700410531606>

<https://www.agriculture.go.ug/messp/>

International trade Centre. (2015). Traceability in Food and Agricultural Products

Islam, S., & Cullen, J. M. (2021). Food traceability: A generic theoretical framework. *Food Control*, 123, 107848.

ISSD Uganda. (2024) Integrated Seed and Sector Development Uganda. ANNUAL REPORT

Ivanov, D. (2011). Principles of supply chain management by R.E. Crandall, W.R. Crandall and C.C. Chen. *International Journal of Production Research*, 49(4), 1229–1230.
<https://doi.org/10.1080/00207543.2010.494360>

Jamie, S., & Rahimifard, S. (2018). *Resilience in agri-food supply chains: A critical analysis of the literature and synthesis of a novel framework*. Loughborough University.
<https://hdl.handle.net/2134/27452>

Kanjere, J. (2021). A blockchain-enabled system to enhance food traceability in local food supply chains (FSCs) suitable for small co-operatives in South Africa.

Kansiime, M. K., Mugambi, I., Rware, H., Alokite, C., Aliamo, C., Zhang, F., & Romney, D. (2022). Challenges and Capacity Gaps in Smallholder Access to Digital Extension and Advisory Services in Kenya and Uganda. *Frontiers of Agricultural Science and Engineering*, 9(4), 642-654.

Karâa, M., & Morana, J. (2016). The determinants leading to the adoption of traceability: Adaptation to the Tunisian date sector. *Supply Chain Forum: An International Journal*, 17(1), 3–14. <https://doi.org/10.1080/16258312.2016.1143205>

Karunaratna, I., Gunasena, P., Hapuarachchi, T., & Gunathilake, S. (2024). The crucial role of data collection in research: Techniques, challenges, and best practices. *Uva Clinical Research*, 1-24.

- Kayikci, Y., Subramanian, N., Dora, M., & Bhatia, M. S. (2022). Food supply chain in the era of Industry 4.0: Blockchain technology implementation opportunities and impediments from the perspective of people, process, performance, and technology. *Production planning & control*, 33(2-3), 301-321.
- Khan, S., Haleem, A., Khan, M. I., Abidi, M. H., & Al-Ahmari, A. (2018). Implementing traceability systems in specific supply chain management (SCM) through critical success factors (CSFs). *Sustainability*, 10(1), 204.
- KRAISINTU, K., & TING, Z. (2011). *The role of traceability in supply chain management*.
- Kumar, A., & Singh, R. (2020). "The Role of Management Support in the Adoption of Traceability Systems." *International Journal of Production Economics*, 219, 175-188.
- Kumperščak, S., Medved, M., Teršlav, M., Wrzalik, A., & Obrecht, M. (2019). Traceability Systems and Technologies for Better Food Supply Chain Management. *Quality Production Improvement - QPI*, 1(1), 567–574. <https://doi.org/10.2478/cqpi-2019-0076>
- Li, C., Zhang, Y., & Xu, Y. (2022). Factors influencing the adoption of blockchain in the construction industry: a hybrid approach using PLS-SEM and fsQCA. *Buildings*, 12(9), 1349.
- Lin, X., Chang, S. C., Chou, T. H., Chen, S. C., & Ruangkanjanases, A. (2021). Consumers' intention to adopt blockchain food traceability technology towards organic food products. *International Journal of Environmental Research and Public Health*, 18(3), 912.
- Ma, W., Marini, M. A., & Rahut, D. B. (2023). Farmers' organizations and sustainable development: An introduction. *Annals of Public and Cooperative Economics*, 94(3), 683-700.

- Manos, B., & Manikas, I. (2010). Traceability in the Greek fresh produce sector: drivers and constraints. *British food journal*, 112(6), 640-652.
- Markelova, H., Meinzen-Dick, R., Hellin, J., & Dohrn, S. (2009). Collective action for smallholder market access. *Food policy*, 34(1), 1-7.
- Marucheck, A. et al. (2011) 'Product safety and security in the global supply chain: Issues, challenges and research opportunities', *Journal of Operations Management*. Elsevier B.V., 29(7-8), pp. 707-720. doi: 10.1016/j.jom.2011.06.007
- Masudin, I., Rahmatullah, B. B., Agung, M. A., Dewanti, I. A., & Restuputri, D. P. (2022). Traceability System in Halal Procurement: A Bibliometric Review. *Logistics*, 6(4), 67. <https://doi.org/10.3390/logistics6040067>
- Mattevi, M., & Jones, J. A. (2016a). Traceability in the food supply chain: Awareness and attitudes of UK Small and Medium-sized Enterprises. *Food Control*, 64, 120-127. <https://doi.org/10.1016/j.foodcont.2015.12.014>
- Mattevi, M., & Jones, J. A. (2016b). Traceability in the food supply chain: Awareness and attitudes of UK Small and Medium-sized Enterprises. *Food Control*, 64, 120-127. <https://doi.org/10.1016/j.foodcont.2015.12.014>
- Meinzen-Dick, R., DiGregorio, M., & McCarthy, N. (2004). Methods for studying collective action in rural development. *Agricultural Systems*, 82(3), 197-214. <https://doi.org/10.1016/j.agry.2004.07.006>
- Melnyk, S. A., Van Dierendonck, A., & Arellano, M. (2021). "Organizational Culture and Change Management: Key Considerations for Implementing Traceability Systems." *Journal of Operations Management*, 67(3), 213-227.
- Mena, C., & Adenso-Diaz, B. (2020). "Implementation of Traceability Systems in Food Supply Chains: A Stakeholder Perspective." *Supply Chain Management: An International Journal*, 25(5), 629-643.

- Meuter, M. L., Ostrom, A. L., Roundtree, R. I., & Bitner, M. J. (2000). Self-Service Technologies: Understanding Customer Satisfaction with Technology-Based Service Encounters. *Journal of Marketing*, 64(3), 50–64. <https://doi.org/10.1509/jmkg.64.3.50.18024>
- Miao, M., Liu, X., Duan, Y., Wang, R., & Fu, Z. (2011). Critical Success Factors for Implementing Traceability Systems in Chinese Food Enterprises. *2011 International Conference on Management and Service Science*, 1–4. <https://doi.org/10.1109/ICMSS.2011.5998273>
- Ministry of Agriculture, Animal Industry and Fisheries. (2021). *MAAIF develops electronic system to monitor agrochemicals*.
- Mol, A. P., & Oosterveer, P. (2015). Certification of markets, markets of certificates: Tracing sustainability in global agro-food value chains. *Sustainability*, 7(9), 12258-12278.
- Molla, A., & Licker, P. S. (2005). Perceived e-readiness factors in e-commerce adoption: An empirical investigation in a developing country. *International journal of electronic commerce*, 10(1), 83-110.
- Monteiro, D. M. S., & Caswell, J. A. (2009). Traceability adoption at the farm level: An empirical analysis of the Portuguese pear industry. *Food policy*, 34(1), 94-101.
- Montet, D., & Dey, G. (2017). History of food traceability. In *Food traceability and authenticity* (pp. 1-30). CRC press.
- Morrison, E. W., Milliken, F. J., & Scholes, L. (2019). "Psychological Safety and Employee Involvement: Key Considerations for Traceability System Adoption." *Journal of Organizational Behavior*, 40(5), 579-595.
- Muhanguzi, D., Mugenyi, A., Bigirwa, G., Kamusiime, M., Kitibwa, A., Akurut, G. G., ... & Tweyongyere, R. (2017). African animal trypanosomiasis as a constraint to livestock health and production in Karamoja region: a detailed qualitative and quantitative assessment. *BMC veterinary research*, 13, 1-13.

- Nabuumu, D., Ekesa, B., Faber, M., & Mbhenyane, X. (2021). Community perspectives on food security and dietary diversity among rural smallholder farmers: A qualitative study in central Uganda. *Journal of Agriculture and Food Research*, 5, 100183.
- Najmi, A., Ahmed, W., & Jahangir, S. (2023). Firm's readiness for halal food standard adoption: assessing the importance of traceability system. *Journal of Islamic Accounting and Business Research*, 14(8), 1451-1473.
- Nakalembe, C., Dempewolf, J., & Justice, C. (2017). Agricultural land use change in Karamoja Region, Uganda. *Land Use Policy*, 62, 2-12.
- Nanyunja, J., Jacxsens, L., Kirezieva, K., Kaaya, A. N., Uyttendaele, M., & Luning, P. A. (2015). Assessing the Status of Food Safety Management Systems for Fresh Produce Production in East Africa: Evidence from Certified Green Bean Farms in Kenya and Noncertified Hot Pepper Farms in Uganda. *Journal of Food Protection*, 78(6), 1081–1089. <https://doi.org/10.4315/0362-028X.JFP-14-364>
- Njeru, T. N. (2021). *Why maize is causing trade tensions between Kenya and its neighbours* [Personal communication].
- Nunnally, J. C., & Bernstein, I. H. (1994). Psychological theory.
- Obubu, J. P., Odong, R., Alamerew, T., Fetahi, T., & Mengistou, S. (2022). Application of DPSIR model to identify the drivers and impacts of land use and land cover changes and climate change on land, water, and livelihoods in the L. Kyoga basin: implications for sustainable management. *Environmental Systems Research*, 11(1), 11.
- Ochieng, J., Knerr, B., Owuor, G., & Ouma, E. (2018). Strengthening collective action to improve marketing performance: Evidence from farmer groups in Central Africa. *The Journal of Agricultural Education and Extension*, 24(2), 169–189. <https://doi.org/10.1080/1389224X.2018.1432493>
- Okpala, C. O. R., & Korzeniowska, M. (2023). Understanding the relevance of quality management in agro-food product industry: From ethical considerations to assuring

food hygiene quality safety standards and its associated processes. *Food Reviews International*, 39(4), 1879-1952.

Oliveira, T., & Maria Rosario, O. M. (2011). *Literature Review of Information Technology Adoption Models at Firm Level*.

Olsen, P., & Borit, M. (2013). How to define traceability. *Trends in Food Science & Technology*, 29(2), 142–150. <https://doi.org/10.1016/j.tifs.2012.10.003>

Omar, Q., Yap, C. S., Ho, P. L., & Keling, W. (2023). Can technology readiness predict farmers' adoption intention of the e-AgriFinance app?. *Journal of Agribusiness in Developing and Emerging Economies*, 13(1), 156-172.

Opara, U. (2003). *Traceability in agriculture and food supply chain A review of basic concepts technological implications and future prospects*.

Orr, G. (2003). Diffusion of innovations, by Everett Rogers (1995). Retrieved January, 21, 2005.

Oyugi, Z. (2025). Uganda Intensifies Coffee Farmer Registration to Meet EU Compliance Deadline

Palma, M. Â. A. D. (2020). A Tracking and Tracing System for a Supply Chain.

Papa, M., de Medeiros Oliveira, S. R., & Bergier, I. (2024). Technologies in cattle traceability: A bibliometric analysis. *Computers and Electronics in Agriculture*, 227, 109459.

Parasuraman, A. (2000). Technology Readiness Index (Tri): A Multiple-Item Scale to Measure Readiness to Embrace New Technologies. *Journal of Service Research*, 2(4), 307–320. <https://doi.org/10.1177/109467050024001>

Ponte, S. (2007). *Bans, tests, and alchemy: Food safety regulation and the Uganda fish export industry*.

- Pradana, I. G. M. T., Djatna, T., Hermadi, I., & Yuliasih, I. (2024). Readiness Assessment Framework and Integrated Participatory Development Approach for Blockchain-Based Traceability Systems: Case Study in Kintamani Coffee Agroindustry Supply Chain. *Journal of Social Computing*, 5(4), 344-362.
- Prakash, A., & Dhingra, J. (2021). "Enhancing Employee Readiness for Traceability System Adoption through Training." *International Journal of Production Research*, 59(12), 3765-3780.
- Private Sector Development Unit Ministry of Finance, Planning and Economic Development. (2021). How Gaps in traceability systems affect Uganda's livestock sector transformation
- Putri, E., Bandi, B., Widarjo, W., & Arifin, T. (2025). The value of cloud accounting for MSMEs: a Technology-Organization-Environment (TOE) framework perspective. *Cogent Business & Management*, 12(1), 2494712.
- Razak, G. M., Hendry, L. C., & Stevenson, M. (2021). Supply chain traceability: A review of the benefits and its relationship with supply chain resilience. *Production Planning & Control*, 1–21. <https://doi.org/10.1080/09537287.2021.1983661>
- Razak, G. M., Hendry, L. C., & Stevenson, M. (2023). Supply chain traceability: A review of the benefits and its relationship with supply chain resilience. *Production Planning & Control*, 34(11), 1114-1134.
- Regan, G., Biro, M., Flood, D., & McCaffery, F. (2015). Assessing traceability-practical experiences and lessons learned: ASSESSING TRACEABILITY -PRACTICAL EXPERIENCES AND LESSONS LEARNED. *Journal of Software: Evolution and Process*, 27(8), 591–601. <https://doi.org/10.1002/smr.1728>
- Regattieri, A., Gamberi, M., & Manzini, R. (2007). Traceability of food products: General framework and experimental evidence. *Journal of Food Engineering*, 81(2), 347-356. <https://doi.org/10.1016/j.jfoodeng.2006.10.032>

- Regattieri, A., Gamberini, R., & Dallari, F. (2019). "The Impact of Technology on Traceability in the Food Supply Chain." *Journal of Food Engineering*, 217, 134-145.
- Regulation(EC) No.178/2002 of The European Parliament and of the Council, (2002).
- Satyro, W. C., Contador, J. C., Gomes, J. A., Monken, S. F. D. P., Barbosa, A. P., Bizarrias, F. S., ... & Prado, R. G. (2024). Technology-organization-external-sustainability (TOES) framework for technology adoption: critical analysis of models for industry 4.0 implementation projects. *Sustainability*, 16(24), 11064.
- Schiefer, G. (2011) 'Transparency in Food: A Challenge for Research and Sector Initiatives', *International Journal on Food Systems Dynamics*, 2(2), pp. 112–113.
- Sigles, R. J. (2024). Traceability in food supply chains: Current landscape, mechanisms for implementation and potential success factors. UK Research and Innovation Global Challenges Research Fund (UKRI GCRF) Trade, Development and the Environment Hub.
- Sjah, T., & Zainuri, Z. (2020). Agricultural Supply Chain and Food Security. In W. Leal Filho, A. M. Azul, L. Brandli, P. G. Özuyar, & T. Wall (Eds.), *Zero Hunger* (pp. 79–88). Springer International Publishing. https://doi.org/10.1007/978-3-319-95675-6_82
- Skilton, P. F., & Robinson, J. L. (2009). Traceability and Normal Accident Theory: How Does Supply Network Complexity Influence the Traceability of Adverse Events? *Journal of Supply Chain Management*, 45(3), 40–53. <https://doi.org/10.1111/j.1745-493X.2009.03170.x>
- Ssennoga, F., Mugurusi, G., & Oluka, P. N. (2019). Food insecurity as a supply chain problem. Evidence and lessons from the production and supply of bananas in Uganda. *Scientific African*, 3, e00076. <https://doi.org/10.1016/j.sciaf.2019.e00076>
- Stentoft, J., Jensen, K. W., Philipsen, K., & Haug, A. (2019). Drivers and barriers for Industry 4.0 readiness and practice: a SME perspective with empirical evidence.

- Storøy, J., Thakur, M., & Olsen, P. (2013). The Trace Food Framework – Principles and guidelines for implementing traceability in food value chains. *Journal of Food Engineering*, 115(1), 41–48. <https://doi.org/10.1016/j.jfoodeng.2012.09.018>
- Stranieri, S., Orsi, L., & Banterle, A. (2017). Traceability and risks: An extended transaction cost perspective. *Supply Chain Management: An International Journal*, 22(2), 145–159. <https://doi.org/10.1108/SCM-07-2016-0268>
- The Ministry of Agriculture, Animal Industry and Fisheries. (2020). *Roll out of National Traceability System under way*.
- Trienekens, J., & Zuurbier, P. (2008). Quality and safety standards in the food industry, developments and challenges. *International Journal of Production Economics*, 113(1), 107e122.
- Tzoulis, I., & Andreopoulou, Z. (2013). Emerging Traceability Technologies as a Tool for Quality Wood Trade. *Procedia Technology*, 8, 606–611. <https://doi.org/10.1016/j.protcy.2013.11.087>
- Uganda Intensifies Coffee Farmer Registration to Meet EU Compliance Deadline.
- United Nations. (n.d.). Sustainable development knowledge platform.
- Van der Merwe, M., & Kirsten, J. F. (2015). Traceability systems and origin based meat products in the South African sheep meat industry. *Agrekon*, 54(1), 53-69.
- Waiswa, S. (2021). Digital Traceability in Agriculture. Case Study.
- Wales, C., Harvey, M., & Warde, A. (2006). Recuperating from BSE: The shifting UK institutional basis for trust in food. *Appetite*, 47(2), 187–195. <https://doi.org/10.1016/j.appet.2006.05.007>
- Wang, X., Xu, Q., & Ding, L. (2020). "Communication and Involvement in Implementing Traceability Systems." *Supply Chain Management: An International Journal*, 25(6), 617-629.

- WFP. World Food Programme. (2021). Uganda Country Brief
- WFP. World Food Programme. (2023). Uganda Country Brief, July 2023
- Zhang, J., Wang, N., & Li, H. (2021). "Motivating Employees for Technological Change: The Case of Traceability Systems." *Journal of Business Research*, 124, 845-853.
- Zheng, Y., Xu, Y., & Qiu, Z. (2023). Blockchain traceability adoption in agricultural supply chain coordination: An evolutionary game analysis. *Agriculture*, 13(1), 184.
- Zhou, X., Pullman, M., & Xu, Z. (2022). The impact of food supply chain traceability on sustainability performance. *Operations Management Research*, 15(1), 93-115.
- Zhu, K., Kraemer, K. L., & Xu, S. (2006). The Process of Innovation Assimilation by Firms in Different Countries: A Technology Diffusion Perspective on E-Business. *Management Science*, 52(10), 1557–1576. <https://doi.org/10.1287/mnsc.1050.0487>

APPENDICES

Appendix 1: Questionnaire

I am (name of research assistant) carrying out a study/research on farmer groups' readiness and adoption of traceability systems in agricultural supply chains in Karamoja case of Kaabong district as a partial requirement for the award of Master's degree of Science in Procurement and Supply Chain Management.

You have been selected as a participant to share your views and insights on traceability systems considering your roles and responsibilities, knowledge and information possessed.

Your views will be treated with confidentiality and shall be used purposely for this study, the questionnaire shall take approximately 25 minutes.

Note for research assistant: *Ensure that all the questions are asked and appropriate boxes are ticked or blanks are filled as appropriate. Research assistant should follow the bolded instructions in italics by ticking the responses as indicated in each of the questions.*

SECTION 1: BACKGROUND DATA (SELECT RESPONSE)

CODE	No.	Variables	Response
A	1	I consent to participate in this research	Yes or no
B	2	Farmer group belonged to/location	
C	3	Designation	
D	4	Years the Farm Group has existed 0-5 years 6-10 years 11-15 years 16-20 years Above 21 years	

SECTION 2: ORGANIZATION'S READINESS AND ADOPTION OF TRACEABILITY SYSTEMS

Tick of response on how strongly the respondent agrees with the following statements

5	4	3	2	1
<i>Strongly Agree</i>	<i>Agree</i>	<i>Not sure</i>	<i>Disagree</i>	<i>Strongly disagree</i>

IND	2:1 Individual farmer readiness and adoption of traceability systems	1	2	3	4	5
INDA1	Members are aware/have heard of what traceability systems are	1	2	3	4	5
INDA2	Members know the benefits/importance of using traceability systems	1	2	3	4	5
INDA3	Members are familiar with some types of traceability systems and how they work	1	2	3	4	5
INDC1	Members are willing to use or accept traceability innovations	1	2	3	4	5
INDC2	Members are committed to using traceability systems to improve performance of agricultural value chains at the farmer group or individual farmers levels	1	2	3	4	5
INDAT1	Members believe use of Traceability systems will enable them perform better and ease designated roles in the farmer group	1	2	3	4	5
INDAT2	Members perceive the adoption of traceability systems is a good move	1	2	3	4	5
ORG	2:2 Organizational readiness and adoption of traceability systems	1	2	3	4	5

ORGT1	The farmer group has a well-established internal communication system that facilitates smooth information flow.	1	2	3	4	5
ORGT2	The farmer group has a reliable and secure communication channels for sharing traceability information.	1	2	3	4	5
ORGR1	The farmer group has computers or tablets, or a smartphone	1	2	3	4	5
ORGR2	The farmer group has access to internet	1	2	3	4	5
ORGR3	The farmer group has access to power (grid or solar) to charge computer or tablet or smartphone or feature phone	1	2	3	4	5
ORGL1	The Farmer group regulations allow for adoption of traceability systems innovations	1	2	3	4	5
ORGL2	The farmer group policies align with industry standards and regulatory requirements for traceability.	1	2	3	4	5
ORGL3	Internal regulations clearly specify roles and responsibilities regarding traceability system use	1	2	3	4	5
ORGL4	There are clear consequences for non-compliance with traceability policies	1	2	3	4	5
MAN	2:3 Management readiness and adoption of traceability systems	1	2	3	4	5
MANV1	Farmer group management has a vision on the adoption of traceability systems	1	2	3	4	5
MANV2	The vision on the adoption of traceability systems is clear	1	2	3	4	5
MANV3	The management is aware of the challenges to the vision for adoption of traceability systems	1	2	3	4	5
MANC1	Farmer group management is committed to adoption of traceability systems	1	2	3	4	5

MANC2	Farmer group management is committed to address challenges related to adoption and implementation of traceability systems	1	2	3	4	5
MANS1	Farmer group management supports implementation of innovation, learning, and change	1	2	3	4	5
MANS2	The management will support the establishment of a special team to spearhead implementation of traceability systems in the farmer group	1	2	3	4	5
MANS3	The management will support training(computer skilling) for farmers to use traceability systems					
ADOP	2.4 Adoption of traceability system	1	2	3	4	5
ADOP1	Adopting traceability systems enhances achievement of the main goals of the farmer group	1	2	3	4	5
ADOP2	Embracing the use of traceability systems enhances farmer group performance e.g. access to market markets, agro-inputs, finance, agriculture insurance etc.	1	2	3	4	5
ADOR1	Use of traceability systems strengthens business relationships with different agriculture supply chain actors	1	2	3	4	5
ADOC1	Adoption of traceability systems makes communication of farmer groups easier	1	2	3	4	5

Appendix 2: Introductory Letter
KYAMBOGO UNIVERSITY

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Directorate of Research and Graduate Training

Office of the Director

APPENDIX 8: INTRODUCTORY LETTER

Date: 15th/July/2025

The Chief Administrative Officer,
Kaabong District Local Government
Kotido.

Dear Sir/Madam,

RE: TINO PASKA

This is to introduce to you the above-named student **Reg: No 21/U/GMSC/14647/PE** pursuing Master of Science in Procurement and Supply Chain Management, Department of Procurement and Supply Chain Management, Kyambogo University.

She intends to carry out research on **"Farmer groups' readiness and adoption of traceability systems in agricultural supply chains: a case of Kaabong District"** in partial fulfillment of the requirements of the award of master of science in procurement and supply chain management of Kyambogo University.

The purpose of this letter therefore is to request you to introduce to student to relevant offices as well as support with any necessary assistance and guidance.

Any assistance rendered to her will be highly appreciated.

Yours sincerely

Prof. Bosco Bua

AG. DIRECTOR

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KAABONG DISTRICT LOCAL GOVERNMENT
OFFICE OF THE CHIEF ADMINISTRATIVE OFFICER

P.O. BOX 16,
KOTIDO-UGANDA

THE REPUBLIC OF UGANDA

IN ANY CORRESPONDENCE ON
THIS SUBJECT PLEASE QUOTE: CR/156/1

17th July 2025

**The Director,
Directorate of Research and Graduate Training
Kyambogo University
P.o Box 1, Kyambogo**

RE: ACCEPTANCE OF TINO PASKA TO CARRY OUT RESEARCH IN KAABONG DISTRICT

Reference is made to your letter dated 15th July 2025 requesting this Office to introduce the above student to relevant Offices as well as support with any necessary assistance and guidance to carry out research on 'Farmer groups' readiness and adoption of traceability system in agricultural supply chains. A case study of Kaabong District.

I wish to inform you that, your request has been accepted and the student will be supported by the Production department to carry out the research.

The student is asked to report to the District production Officer for further guidance and instructions.

Chelangat A.M Kamalingin
CHIEF ADMINISTRATIVE OFFICER

C.C Resident District Commissioner
C.C District Chairperson
C.C District Production Officer
C.C Principal Human Resource Officer