FARMERS' USE OF MOBILE PHONES TO ACCESS INFORMATION ON AGRICULTURE AND SERVICES IN UGANDA

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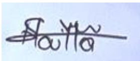
Declaration

I, **Naisanga Priscilla**, declare that this dissertation is my own unaided work and has never been forwarded or presented to any institution of higher learning for any award.

Signature: ………… ……………   Date: 11/03/2026

Approval

This dissertation is submitted for examination with the approval of the supervisor.

Signed …………………………………… **Date** ………12/03/26……………………………

Professor James Kiwanuka-Tondo

(Supervisor)

Dedication

This dissertation is dedicated to my Mother and my children for their enormous and tireless contribution to my education and their generous support and continuous guidance.

Acknowledgement

I am very grateful to colleagues and family members for the support that enabled me to produce this dissertation. I thank my supervisor at Uganda Christian University for the guidance, feedback, and direction, which enabled me to complete this study. I am grateful to my Mother and my children for their encouragement, which motivated me to complete this assignment. Lastly, I appreciate all respondents who responded to questionnaires. I am greatly indebted to you.

Lord Bless you all.

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Abstract

The purpose of this study was to analyze the influence of digital literacy on farmers' use of mobile phones in agricultural communication to access information and services in Luwero District, Uganda. Grounded in technology acceptance model and theory of technology affordance, the study adopts a quantitative approach and cross-sectional design and survey as data collection method. The data was collected from a sample size of (n=351) from three sub-counties in Luwero district. Data were collected using a structured questionnaire from 351 smallholder farmers. The results indicated that digital literacy did not significantly influence farmers' use of mobile phones in agricultural communication. Basic phone use had a significant positive influence on access to information and services. Smartphone use showed a significant but negative association with the use of ICT to access agricultural information and services. It was concluded that basic phones remain the most effective current channel for delivering essential agricultural information (market prices and weather forecasts) to smallholder farmers, while smartphone potential is constrained by cost, coverage, and transitional barriers. The researcher recommends that extension services maintain voice/SMS/USSD platforms for basic phone users while scaling smartphone-based interventions with affordable data subsidies, and targeted digital literacy training to ensure effective access to agricultural information and services.

Keywords: *Digital Literacy, Mobile Phones, Basic Phones, Smartphones, Agricultural Information Access, Agricultural Services, Smallholder Farmers, Luwero District, Uganda.*

Chapter One: Introduction

1.0 Introduction

The ubiquitous use of Information and Communication Technologies (ICTs) in agricultural communication offers new opportunities for farmers to access low-cost information and services (Van Campenhout *et al*., 2021; Davis *et al*., 2020; Nkonya *et al*., 2020; Norton & Alwang, 2020; Zhang, Wang & Duan, 2016). Uganda is effectively using ICTs to deliver agricultural advisory and extension services (Ajambo *et al*., 2023; UCC, 2023). However, farmers' digital literacy significantly influences farmers' use of ICTs (i.e., mobile phones) in agricultural communication to access information and services (Liu, Wen, Zhang and Xia, 2025**)**. This study will investigate the impact of farmers' digital literacy on use of Mobile phones in agricultural communication to access information and services.

This study is premised on three assumptions. One is that digital literacy influences farmers use of ICTs (i.e., mobile phones) in agricultural communication to access information and services. The influence is operationalized in terms of increased access to agricultural advisor and extension services in Luwero district, central Uganda. Another hypothesis is that farmers' digital literacy levels (i.e., 1 to 5) influence the use of mobile phones (i.e., basic or smart phones) in agricultural communication to access information and services. This influence is operationalized in terms of increased access to agricultural advisory and extension services. These include: weather forecast, market price, agro-inputs, agro-insurance, or good agronomic practices.

Chapter One presents the problem statement, purpose of the study, objectives of the study, research questions, research hypothesis, justification of the study, scope of the study, significance of the study, conceptual framework and operational definition of terms.

1.1 Background of the Study

1.1.1 Historical Background

Agricultural communication combines agriculture and communication disciplines (Corder & Irlbeck, 2018; Kurtzo, Hansen, Rucker, & Edgar, 2016; Tucker, Whaley & Cano, 2003). The historical background of agricultural communication can be traced back to 1800s, when the profession was born out of the practical need to share important farm and home information with isolated rural audiences (Rucker, & Edgar, 2016). Some 200 years later, agricultural communication has evolved into a diverse industry responsible for developing and disseminating news and marketing information related to food, agricultural, and environmental systems (Tucker, Whaley & Cano, 2003).

The introduction of ICTs is a major development shaping agricultural communication (Mapiye *et al*., 2023; Kurtzo *et al*., 2016). ICT is an umbrellas term that "includes anything ranging from radio to satellite imagery to mobile phones or electronic money transfer" (Salampasis & Theodoridis, 2013). The effective use of ICTs in agricultural communication to improve accessibility of information and services presents an opportunity to transform the productivity and livelihoods of farmers (Mapiye *et al*., 2023).

Moreover, the advent of ICTs has given rise to digital literacy (Kurtzo *et al*., 2016). Magesa *et al*. (2023) contend that the definition of digital literacy encompasses the ability to utilise and be aware of digital information, technology, and media for accessing, managing, integrating, evaluating and creating as needed. Therefore, digital literacy consists of a dynamic combination of mind-set, behaviour, and skills that are employed to enhance the literacies of smallholder farmers.

1.1.2 Theoretical Background

This study is informed by the theory of communication technology affordance and technology acceptance model to explain the influence of digital literacy on farmers' use of mobile phones in agricultural communication to access information and services. An affordance represents a relational approach to understand how people interact with technology (Evans, Pearce, Vitak, & Treem, 2017). In this study the theory of communication technology affordance is applied to understand how farmers interact with mobile phones to access agricultural information and services.

Davis (1986; 1989) proposed the Technology Acceptance Model for understanding user acceptance of a technology or system. In this study, the theory is applied to understand farmers' acceptance and use of ICTs, especially mobile phones in agricultural advisory and extension service for accessing information. The above-mentioned author suggests that farmers' motivation (to use ICTs, especially the basic, feature or smart phone) can be explained by three factors: perceived ease of use, perceived usefulness and attitudes towards using a mobile technology. The attitudes of a user towards a system was a major determinant of whether the user will actually use or reject the system. In turn, the attitude of a user was considered to be influenced by two major beliefs – perceived usefulness and perceived ease of use, with perceived ease of use having a direct influence on perceived usefulness. Both these beliefs were directly influenced by the mobile phone's design characteristic (basic phone, feature phone, and smart phone).

1.1.3 Conceptual Background

The independent variable of the study is digital literacy, which is defined as individual farmer skills in using ICTs. The dependent variable is use of ICTs, particularly phones to access agricultural information and services. This study focuses on the mobile phone as the ICTs used in agricultural communication to access information and services. Mobile phones and radio are the most widely used ICTs in agricultural communication to access information and services (Alant & Bakare, 2021; Salampasis & Theodoridis, 2013).

A growing number of studies have shown that digital literacy among other factors, such as phone ownership, internet access, network coverage and electricity, influence the use of mobile phones to access agricultural information and services (Misaki *et al*., 2018; Oladele, 2015; Nyamba, & Mlozi, 2012). For that reason, digital literacy is hypothesised to impact farmers' use of mobile phones in agricultural information to access information and services. Mobile phone use is analysed at two level – basic phone and smartphone. There are two reasons for conducting this analysis. Smartphones are distinguished from feature phones by their stronger hardware capability and extensive mobile operating systems, which facilitate wider software, internet access including web browsing over mobile band, and multimedia functionality including music, video, cameras, and gaming, alongside core phone functions. One is the widespread use of basic phones and smartphones as opposed to feature phones. Basic phones can make/receive calls and send/receive text messages. Feature phones provide advanced features found on smartphones such as access to social media and web browsing in addition to making/receiving calls and sending/receiving text messages (Asenahabi, 2019).

Another reason for analysing basic and smartphone use is related to farmers' digital literacy levels needed in agricultural communication to access information and services. The study assumed that basic phones and smart phones require different levels of digital literacy to access agricultural information and services. Studies on farmers 'digital literacy have identified five levels of digital literacy (Liu, Wen, Zhang & Xia, 2025; Alant & Bakare, 2021). For instance, Liu *et al*., (2025) employed the entropy method to measure farmers' digital literacy levels by establishing a digital literacy evaluation index system based on five dimensions, namely: (a) information and data literacy; (b) communication and collaboration literacy; (c) digital content creation literacy; (d) digital security literacy; and (e) problem-solving literacy.

This study adopted Alant and Bakare's (2021) typology to classify farmers' digital literacy levels.

- **Level 1**: access component (farmer is able to recognise and identify mobile phone symbols, such as on, off, call and end call)
- **Level 2**: interpret component (farmer is able to perform basic mobile phone operations)
- **Level 3**: management component (farmer is able to document caller contacts, type, and read messages).
- **Level 4**: evaluate component (farmer is able to use smartphone tasks, such as send, receive and access audio and video messages).
- **Level 5:** create component (farmer can use smartphone to access internet facilities)

For that reason, this study hypothesised that Level 1 & 2 digital literacy is required for farmers to use basic phones to access agricultural information and services. Level 4 & 5 digital literacy is required for farmers to use smart phones to access agricultural information and services. Therefore, the study operationalised digital literacy according to five levels, including access, interpret, management, evaluate and create. These levels of digital literacy influence use of basic and/or smart phones to access agricultural information and services.

1.1.4 Contextual Background

The government of Uganda has embraced agricultural technology as one of the key ways to fighting poverty. Nevertheless, many farmers are not adopting agricultural technologies to fight a poverty reality. Wabbi (2022) found that only 25% of the farmers were able to adopt the integrated pest management technologies which were being tried on cowpeas. This is very low compared to the (UBOS, 2014) statistics which suggest that over 85% of Ugandan population relies entirely on agriculture. In Luwero district, farmers face challenges in adopting digital technologies due to limited access to the internet, insufficient infrastructure, and lower levels of digital literacy. The government of Uganda has attempted to bridge the digital divide to ensure that all farmers, regardless of location or socio-economic status, benefit from the transformative potential of digital tools in enhancing agricultural practices, improving yields, and contributing to sustainable farming.

Despite these efforts, there is a problem in agricultural communication that limits access to information and services by farmers in Luwero (UBOS, 2023). According to the ITU (2019), the cost of basic mobile broadband services (5GB of mobile data) was at 41.5% of GNI per capita in 2019, in contrast to the UN Broadband Commission's target of 2 percent, making data consumption prohibitively expensive for most Ugandans. Internet use among individuals earning more than US$ 1,000 per month is very high (almost 100 percent), but it drops significantly in lower income brackets: among people earning less than US$ 100 per month, only 11 percent use the Internet. Basing on this background, the study will investigate the impact of digital migration divide on farmers' ability to access agriculture-related information in Luwero district.

1.2. Problem Statement

Across the globe, ICTs have been advanced as a promising way to overcome the problems associated with the conventional agricultural advisory and extension services (Van Campenhout, Spielman & Lecoutere, 2021). Traditionally, these services rely on face-to-face delivery through extension agents visiting farmers. The high penetration of ICTs presents opportunity for extension agents to deliver low-cost agricultural advisory and extension services to rural farmers (Davis *et al*., 2020; Nkonya *et al*., 2020) in Luwero district, eastern Uganda. However, farmers' digital literacy impacts of the use of ICTs (i.e., mobile phones) in agricultural communication to access information and services (Misaki *et al*., 2018; Oladele, 2015; Nyamba, & Mlozi, 2012). There remains limited research about the impact of farmers' digital literacy on the use of mobile phones in agricultural communication to access information and services. Several initiatives have been implemented by the Government of Uganda and development agencies to promote digital inclusion in agriculture through mobile-based extension services, digital financial services, e-extension platforms, and farmer training programs. However, despite these interventions, the utilization of ICTs for accessing agricultural information and services remains below expectations among many farmers, indicating that existing interventions may not be fully effective or adequately utilized (World Bank, 2023). If this problem is not addressed, farmers may continue to experience limited access to vital agricultural information and services. Although a number of studies such as those by Mutiso et al. (2024) have examined ICT adoption and digital agriculture in countries such as Kenya, most of these studies have been conducted outside Uganda and have paid limited attention to the influence of farmers' digital literacy on their use of mobile phones to access agricultural information and services which creates a research gap hence the need for the study.

1.3. Purpose of the Study

The purpose of the study was to analyze the influence of digital literacy on farmers' use of mobile phones in agricultural communication to access information and services in Luwero district.

1.3.1 Specific Objectives of the Study

1. To assess the extent to which digital literacy influences farmers' use of mobile phones in agricultural communication to access information and services in Luwero district.
2. To analyze the extent to which the use of basic phone in agricultural communication influences farmers' access to information and services in Luwero district.
3. To analyze the extent to which the use of smartphones in agricultural communication affects farmers' access agricultural information in Luwero district.

1.5. Research Questions

1. To what extent does digital literacy influence farmers' use of mobile phones to access agricultural information and services in Luwero district?
2. How does the use of basic phones in agricultural communication influence farmers 'ability to access agricultural information in Luwero District?
3. To what extent does the use of Smartphones in agricultural communication influence farmers' ability to access agricultural information in Luwero District?

1.6 Research Hypotheses

Hypothesis 1

H_{01}: There is no significant influence of digital literacy on farmers' use of mobile phones in agricultural communication to access information and services in Luwero District.

H_{11}: There is a significant influence of digital literacy on farmers' use of mobile phones in agricultural communication to access information and services in Luwero District.

Hypothesis 2

H_{02}: The use of basic phones in agricultural communication does not significantly influence farmers' access to information and services in Luwero District.

H_{12}: The use of basic phones in agricultural communication significantly influences farmers' access to information and services in Luwero District.

Hypothesis 3

H_{03}: The use of smartphones in agricultural communication does not significantly enhance farmers' access to information and services in Luwero District.

H_{13}: The use of smartphones in agricultural communication significantly enhances farmers' access to information and services in Luwero District.

1.7. Justification of the Study

Access to information by rural farming communities is one of the major constraints to agricultural development in Uganda. ICTs can potentially address this blockage and play a crucial role in improving farmers access to information (Apio, 2016). The mobile phone is the most widely used ICTs in agricultural advisory and extension services to disseminate information to farmers. According to Uganda Communications (UCC), the number of devices accessing the telecom network in Uganda has increased to 39.1 million as of March 2023. This surge is largely attributed to the increasing adoption of smartphones (12.6 million, feature phones (24.5 million) and decreasing basic phones (1.85 million) (UCC, 2023). The reason for undertaking this study was to investigate the impact of digital literacy on the use of ICTs, especially mobile phones in agricultural communication to accessing information and services in Luwero district. This is because digital literacy influences farmers use of mobile phones in agricultural communication to access agricultural information.

This study was also important for theory development regarding (i.e., technology acceptance model and the theory of communication technology affordance) in terms of farmers' use of ICTs in agricultural communication to access information and services. For instance, the theory of communication technology affordance captures the relational perspective of how the meaning of mobile phones use in agricultural communication is influenced by the affordances of a basic and/or smartphones in a particular setting. As Evans *et al*. (2017) argued, this concern differs from other areas in which affordances are popular, such as ecological psychology's focus on how animals evolve to perceive their environment in particular ways, or information system's focus on how designers manipulate features of technologies to encourage particular perceptions of artifacts.

1.8. Scope of the Study

This included the geographical, content and time scope.

1.8.1 Geographical Scope

This study was carried out in Luwero District in Central Uganda. Specifically, three sub-counties (SC) were selected. These include: Zirobwe SC, Kalagala SC and Kamira SC. These sub-counties were selected due to their diverse geographical setting, location dynamics, and varying distances, which offered a good representation of the district's agricultural environment. Luwero represents a rural agricultural setting, offering a context relevant for examining the impact of digital literacy on farmers' use of mobile phones in agricultural communication to access to agriculture-related information.

1.8.2 Content Scope

The study investigates the impact of the digital literacy on farmers' use of mobile phones in agricultural communication to access information and services in Luwero district. Specifically, it focuses on the extent to which digital literacy influences farmers' use of mobile phones in agricultural communication to access information and services; the influence of basic phone use in agricultural development on farmers' access to information and services; and the influence of smartphone use in agricultural communication on farmers' access to information and services in Luwero district.

1.8.3 Time Scope

The study considered 2015-2022 as the period of body of knowledge to review literature. This period was chosen because it provides recent data.

1.9. Significance of the Study

This study makes a significant contribution to the area of digital literacy and the use of multicultural information in a number of ways.

Policymakers. First it makes a significant contirbution to our understanding the impact of digital literacy on ICTs use in agricultural communication to access information and service for policy making and implementation and development of targeted policy interventions. Policymakers can use findings to tailor initiatives that enhance the digital literacy levels among farmers, in order to ensure access to agricultural information among the wider segment of the farming community.

Farmers. The study is significant for farmers as it explains how the effective use of mobile phones, supported by appropriate digital literacy, can improve their access to critical agricultural information and services. This improved access enables better decision-making on market prices, weather forecasts, input availability, agronomic practices, and insurance options, ultimately contributing to increased productivity, stronger market linkages, and improved livelihoods.

Academicians. This research provides a valuable foundation for academicians and future scholars interested in digital literacy, ICT adoption, and agricultural extension in developing-country contexts. The empirical evidence on the limited influence of digital literacy, the dominant role of basic phones, and the transitional challenges of smartphone use offers a basis for further theoretical refinement and comparative studies. It also contributes to the discourse on applying frameworks such as the Technology Acceptance Model and Communication Technology Affordances in rural areas.

Extension services. The findings hold direct significance for agricultural extension services and advisory providers. They offer practical information for refining communication strategies, delivery channels, and training programs to better align with farmers' existing phone types and literacy levels. The emphasis on the effectiveness of basic phone platforms (voice calls and SMS/USSD) alongside gradual integration of smartphone-based tools, extension services can improve outreach effectiveness, promote wider adoption of appropriate technologies, and improve the delivery of agricultural advisory and extension support.

Community leaders and development practitioners. The results are significant for community leaders and development practitioners working at the grassroots level. The findings inform the design and implementation of community-based initiatives aimed at building digital literacy and facilitating technology adoption among farmers. Targeted interventions such as local training workshops, awareness campaigns on cost-effective mobile use, and partnerships to address airtime and network barriers empower farmers with the knowledge and skills needed to use mobile tools for improved agricultural practices and livelihoods.

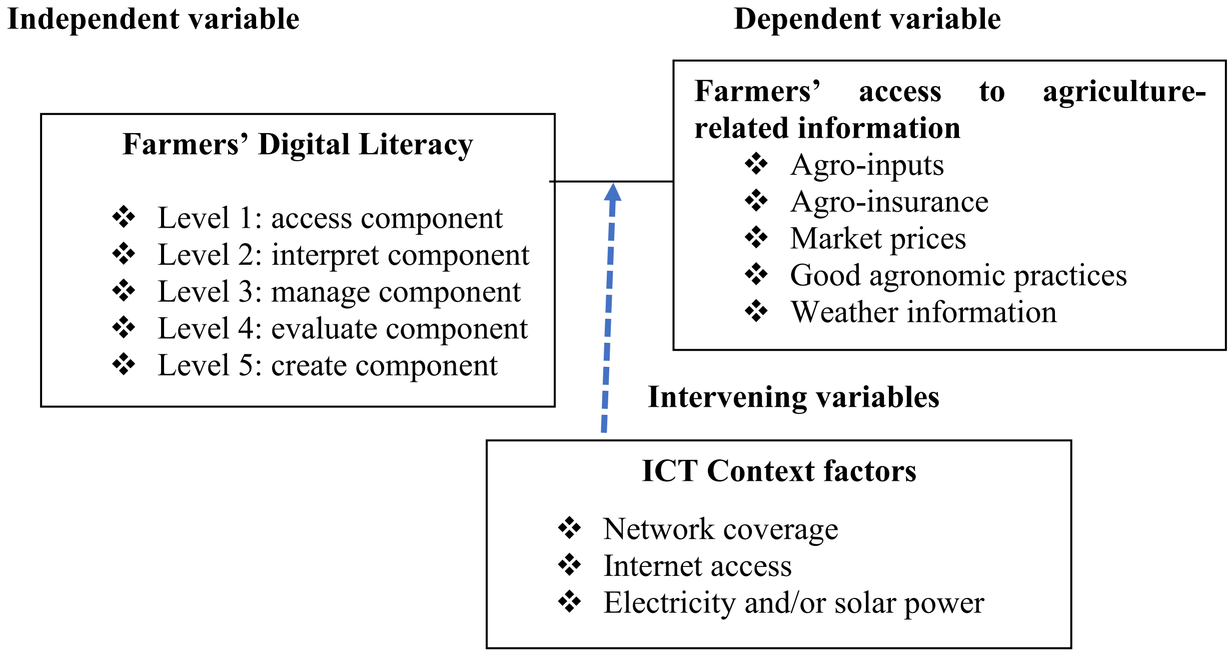
1.10. Conceptual framework

The conceptual framework describes the relationship between the independent variable (IV), dependent variable (DV) and intervening variable. As earlier indicated, the IV is farmers' digital literacy and the DV is use of ICTs and/or mobile phones in agricultural communication to access information and services, while the intervening variable is the ICTs contextual factors. Farmers' digital literacy is conceptualized according to five levels: access, interpret, manage, evaluate and create components of ICT, especially mobile phone use by farmers in agricultural communication to access agricultural-related information.

The dependent variable, use of ICTs and/or mobile phones in agricultural communication is conceptualized in terms of access to information and services. The information and services are seen as agricultural advisory and extension services. They include: agro-inputs, agro-insurance, good agronomic practices, weather information, and market prices. Contextual factors are conceptualized to influence the use of ICTs (i.e., mobile phones) in agricultural communication to access information and services. These context-specific factors include: network coverage, internet access, electricity and/or solar power.

Figure 1

Showing the conceptual framework for this study



Chapter Two

Literature Review

2.0 Introduction

The literature review has two sections – the theoretical and empirical review. This chapter presents a review of studies on theory of communication technology affordance and technology acceptance model as the theoretical framework. It also reviews literature on the topic under study. The review is organized according to the three objectives of the study.

2.1 Theoretical Review

This study is anchored within the theory of communication technology affordance and technology acceptance model. The theory of communication technology affordance presents a relational approach to understand how farmers interact and use mobile phones in agricultural communication to access information and services. The technology acceptance model provides understanding of farmers' acceptance and use of basic/smart phone in agricultural communication to access information and services. For this reason, these theories provide a framework to explain the impact of farmers' digital literacy on the use of ICTs in agricultural communication to access information and services.

2.1.1 Theory of Communication Technology Affordance

The affordance concept was originally coined by Gibson (1979) and the affordance perspective was popularized in design and human-computer interaction research by Norman (1988). Gibson (1979) defined an affordance as an action possibility available in the environment, existing relative to the action capabilities of an actor and does not change if the actor's need and/or goals change. Norman (1988) defined affordance perspective as a design aspect of an object or technology. Therefore, the nature of a technology informs how it should be used.

Subsequent scholars argued that affordances can emerge through direct interaction with technologies, which often leads to processes of experimentation and adaptation that shape the actions people take with the technology (Gaver, 1991; Leonardi, 2011; Evans *et al*., 2017). For that reason, Evans *et al*. (2017) define affordances as a multifaceted relationship structure between a technology and the user that enables or constrains potential behavioral outcomes in particular context. The concept of affordance is applied in this study to understand the multifaceted relationship between mobile phones and farmers using them in agricultural communication that enables or constraints their potential to access agricultural information and services in rural parts of the country.

Evans *et al*. (2017) argued that the relational perspective helps to explain why there is not singular theory of affordance, because relationships emerge between those using technologies, the material feature of those technologies, and the situational nature of use. Because the attributes and abilities of users, the materiality of technologies, and the contexts of technology use are potentially dynamic, the concept of affordances provides a framework to understand the impact of farmers' digital literacy on the use of mobile phones in agricultural communication to access information and services.

For that reason, this study argued that the multifaceted relationship structure emerges between the farmers using mobile phones in agricultural communication, the material features of basic or smart phones, and the situational nature of use to access agricultural information and services. Because the digital literacy of farmers, the materiality of basic or smart phones, and the context of use to access agricultural information and service, the concept of affordance provides a framework for analysis and interpretation. It is helpful to understand the impact of farmers' digital literacy on the use of mobile phones in agricultural communication to access information and services related to services related to weather, agro-inputs, good agronomic practices and market prices.

2.1.2 Technology Acceptance Model

Technology Acceptance Model, originally proposed by Davis (1986; 1989) and adapted from the Theory of Reasoned Action (Ajzen & Fishbein, 1980) has been applied to understand user acceptance of a technology (Chuttur, 2009; Lee, Kozar & Larsen, 2003). User acceptance of a technology has been an important field of study for over three decades. Although many models have been proposed to explain and predict the use of a system, the technology acceptance model has been the only one which has captured the most attention of the information system (Chuttur, 2009).

Davis (1986) considered that the actual use of a system is behaviour. For that reason, the model employed the construct of attitudes from the Theory of Reasoned Action to explain and predict that behaviour. Instead of considering individual beliefs to determine the attitude towards a given behaviour, the author identified two distinct beliefs – perceived usefulness and perceived ease of use, that were sufficient to predict the attitude of a user toward the use of a system. Perceived usefulness is the degree to which an individual believes that using a particular system would enhance his or her job performance. Perceived ease of use is the degree to which an individual believes that using a particular system would be free of physical and metal efforts.

A number of external variables were introduced to the model that affect perceived use and perceived ease of use, behavior intention and behavior. These variables include: (a) voluntarism, the degree to which use of the innovation is perceived as being voluntary or free will; (b) self-efficacy, the belief the one has the capability perform a particular behavior; (c) computer attitude, the degree to which a person like or dislikes the object; (d) visibility, the degree to which the innovation is visible in the organization; (e) relative advantage, the degree to which an innovation is perceived as being better than its precursor; (f) compatibility, the degree to which an innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adopters; (g) complexity, the degree to which an innovation is perceived as being difficult to use; (h) observability, the degree to which the results of an innovation are observable to others; (i) trialability, the degree to which an innovation may be experimented with before adoption (Lee *et al*., 2003).

The model is applied in this study to understand users' acceptance of ICTs in agricultural advisory and extension service for accessing information. David (1986) suggests that farmers' motivation to use ICTs in agricultural advisory and extension services to access information can be explained by three factors: perceived ease of use, perceived usefulness and attitudes towards using a mobile technology. The attitudes of a user towards a system was a major determinant of whether the user will actually use or reject the system. In turn, the attitude of a user was considered to be influenced by two major beliefs – perceived usefulness and perceived ease of use, with perceived ease of use having a direct influence of perceived usefulness. Both these beliefs were directly influenced by the mobile phone's design characteristic (basic phone, feature phone, and smart phone).

2.2. Empirical Review

2.2.1 Agricultural Communication

A growing number of studies in agricultural communication have analyzed various themes (Kurtzo *et al*., 2016; Morgan, 2010; Tucker *et al*., 2003). For instance, Kurtzo *et al*. (2016) evaluated the perspective of agricultural communication in the United States. Finding indicate that participants, including policy makers, industry leaders, educators, and researchers, were unable to identify a consistent definition of agricultural communication. The skills needed by agricultural communicator included agriculture and policy understanding, technical communications and science knowledge. All-important skills needed were audience identification, agricultural and policy knowledge, and targeted message development and delivery. Morgan (2010) sought to address a portion of agricultural communication on the skills, competencies, and resources necessary to prepare professional agricultural communicators for success in various aspects of agricultural knowledge management. Tucker *et al*. (2003) addressed some of the benefits and challenges posed by agricultural communication close relationship with private industry and other academic departments.

2.2.2 Context-specific factors for ICTs use in agricultural communication

As earlier discussed, this study viewed context-specific factors (i.e., network coverage, internet access and electricity and/or solar power) to influence both digital literacy levels and use of ICTS, especially mobile phones, in agricultural communication by both extension providers and farmers to deliver and receive information and services. For that reason, studies on context-specific factors are reviewed to understand how they influence digital literacy levels and use of ICTs and/or mobile phones in the selected study area.

These context-specific factors include: government ICT policies, community engagement and capacity building or training programs. The government policies facilitate the development of the ICT infrastructure. Prior to 1996, the communication infrastructure in Uganda was among the least developed in Africa. About 70% of the communication services were concentrated in urban areas, neglecting the rural areas with the least access to the vital communication services. However, the ICT infrastructure situation has changed as a result of the liberalization policies adopted by the government of Uganda during the early 1990s (Ministry of Works, Housing and Communication, 2003, p. 14).

The Communication Act of 1997 provided for two "National Telephone Operators" a duopoly that was designed to give incentives to private investors in the telecommunication sector. These NTO included Uganda Telecom Limited (UTL) and MTN Uganda. Until 1995, Posts and Telecommunications Corporation (UP&TC) was the only major telecom operator in Uganda. Uganda Telecom Limited took over the telecommunications services from the former government-owned UP&TC. MTN Uganda launched mobile phone operations in October 1998 as the Second National Operator (SNO). MTN is required by its license to cover all Uganda's districts. Apart from the two NTO, there was a third mobile phone operated. Celtel Uganda Limited was the first mobile operator in Uganda. It commenced its operations in 1995 and had a national-wide coverage. In 2007, Celtel Uganda Limited changed its brand name to ZAIN Uganda. Airtel Uganda was launched in 2010 (Airtel Uganda, 2025; Ministry of Works, Housing and Communication, 2003, p. 14).

Another context-specific factor critical in the use of ICTs in agricultural communication to access information and services is capacity building and building programs. According to National Information Technology Authority Uganda (NITA-U), it is important to improve skills to support ICT programs government of Uganda is setting up. To this end, NITA-U signed a memorandum of understanding with the National Council of Higher Education (NCHE) and Ministry of Education and Sport (MoES) to ensure ICT is embedded in the national curriculum. However, the digital literacy levels remain low among farmers. This is why the study incorporated the variable on the education level to understand the connection between capacity building programs and digital literacy levels among farmers.

2.2.3 The link between ICTs and digital literacy

A growing number of studies have analyzed the link between ICTs and digital literacy (Machin-Mastromatteo, 2021; Magesa, Jonathan & Urassa, 2023; Gow *et al*., 2023; Oladele, 2015). The linkage between Information and Communications Technology and digital literacy is generally found to be bidirectional and mutually reinforcing. On one hand, access to ICT tools such as mobile phones, computers, and internet services tends to improve individuals' digital literacy by providing opportunities for hands-on learning, exposure, and practice. For instance, Machin-Mastromatteo (2021) observed that the term information literacy was coined in the 1970s and refers to an individual's skills for using information, including seeking, accessing, retrieving, evaluating, managing, reusing, and communicating information, often regardless of the genre of medium. Digital literacy in a newer term, coined during the 1980s and refers to individual skills for using ICTs and interacting with digital information ecosystems. Over the past three decades, these terms have been used together and information literacy is a broader term that includes digital literacy. Nowadays, both terms are viewed as a dyad, mainly because most information people receive and consume is presented in digital forms and environments. There are also multiple associated concepts depending on the nature of information handled and the skills developed – media literacy, numeric literacy, and scientific literacy.

The agriculture sector in the Global South is undergoing profound change due to digital transformation. Agricultural extension and advisory services (AES) can play a crucial role in supporting efforts to promote digital self-determination for farmers and extension agents. However, extension providers need to develop digital literacy strategies that will empower smallholder farmers to make informed choices about ICT information dissemination models and how they can be integrates in extension and advisory services (Gow *et al*., 2023).

2.2.4 The use of ICTs in the delivery of agricultural advisory and extension services

A growing number of studies have analyzed the use of ICTs in the delivery of agricultural advisory and extension services (Van Campenhout *et al*., 2021; Norton & Alwang, 2020; Islam *et al*., 2017; Zhang, Wang & Duan, 2016). For instance, Norton and Alwang (2020) found that agricultural extension programs have changed significantly over the past four decades. Notably, extension programs have changed the approach from face-to-face to ICT-based provision of agricultural advisory and extension services. Several factors are driving structural changes in the provision of agricultural advisory and extension services. These include: new technologies, tight public budgets, decentralization, and emerging ICTs among others.

Islam *et al*. (2017) explored the extent of utilization of ICT by the field level extension personnel under agricultural extension service delivery system. A sample of 110 agricultural officers were selected using proportionate random sampling techniques. Data were collected using face to face interviews and focus group discussion (FGD) techniques. Results show that utilization of ICT was very low. Positive and significant relationship was found between training exposure, source of information use by the respondent, job satisfaction, and perception on ICT, and their utilization of ICT in agricultural advisory and extension services. As the respondents are solely depending on mobile phones, so other modern mobile devices could be easily acceptable for them and it could be a vital solution for proper utilization of ICT in agricultural extension service. This finding suggests that extension providers use mobile phones to deliver agricultural information and extension services.

Zhang *et al*. (2016) reviewed and identified the ICT-based information dissemination models in China, in order to share knowledge and experience in applying emerging ICTs in disseminating agricultural-related information to farmers to improve productivity. With the rapid development of ICTs, agricultural-related information dissemination models are constantly evolving and improving. These models can be classified into the following categories: (a) web portal, a collection of relevant websites to form one stop center for users (MOA web portal); (b) voice-based services, information dissemination through telephone (call centers); (c) SMS-based services, information disseminated through text messages of mobile) phones (jointly run by agriculture sector and mobile telecom providers); self-support online community, information services provided by a community to its members (interactive service platforms); (d) interactive video conferencing service, using online multimedia technology to facilitate information services (“One Click and Go” service); (e) mobile internet based service, information disseminated through smartphone services; (f) unified multi-channel service, utilizing multiple methods to effectively disseminate information through telephones, computers, and mobile phones. The finding suggests that both extension providers and farmers use ICTs to disseminate and access agricultural information and services.

These findings imply that the ICT-based models of delivery influence the use of mobile phones to access agricultural information and extension services. For instance, private extension providers in Uganda have adapted the ICT-based models into three platforms to deliver agricultural advisory and extension services. These include: phone-based (i.e., call, SMS and USSD), web-based and mobile app-based platforms. These platforms influence the use of mobile phones to access agricultural information and services. For instance, a phone-based platform enables farmers to use basic and/or feature phones to access agricultural services through SMS, USSD and Calls. The web- or app-based platforms enable farmers to use smartphones to access agricultural information and services through websites and mobile applications.

Moreover, the local context of Uganda, especially Luwero district determines the preferred ICT-based dissemination model. Alant and Bakare (2021) observed that ICT based agricultural advisory and extension systems frequently neglect to consider the context of use and adoption by smallholder farmers in rural areas. These conditions range from high illiteracy rates to poor mobile technology infrastructure and requirement for smartphone-based applications that few farmers can afford. This finding suggests that digital literacy influences the use of mobile phones to access agricultural information and services.

Some studies have focused analysis on the use of mobile phones to access agricultural information and services (UCC, 2023; Alant & Bakare, 2021; Islam *et al*., 2017; Salampasis & Theodoridis, 2013). Mobile phones are the most common ICTs in agricultural advisory and extension services used by farmers to access agricultural related information and services

(Alant & Bakare, 2021; Salampasis & Theodoridis, 2013). For that reason, this study analyses mobile phones, especially the basic phone, feature phone and smartphone as the ICTs in agricultural advisory and extension services used by farmers for accessing information. Other studies have attempted to analyze the challenges of using mobile phones to access agricultural information and services (Misaki *et al*., 2018; Nyamba, & Mlozi, 2012). For instance, Misaki, *et al*. (2018) explored the challenges farmers in sub-Saharan Africa face in using mobile phones to access agricultural information and services. Findings indicate that inappropriate use of foreign language (English) in a local context, bureaucracy and theft of mobile phones as challenges of using mobile phones to access agricultural information and services. Nyamba and Mlozi (2012) examined factors influencing the use of mobile phones to access agricultural information and services. Findings show that phone ownership, type of agricultural information, network coverage, and socio-economic characteristics of farmers were the factors that influenced the use of mobile phones to access agricultural information and services. This finding suggests that factors, such as phone ownership, type of agricultural information and network coverage influence the use of mobile phones to access agricultural information and services.

2.2.5 The impact of digital literacy on the use of ICTs to access agricultural information and services

Studies on the impact of farmers' digital literacy on the use of ICTs and/or mobile phones to access agricultural information and services are scarce. The growing number of studies have focused analysis on the impact of farmers' digital literacy on various themes (Liu *et al*., 2025; Oladele, 2015). For instance, Liu *et al*. (2025) examined the impact of digital literacy on farmers' adoption of behaviors of green production technologies. The baseline regression results using Probit model show that digital literacy can significantly increase farmers' adoption of green production technologies. A mechanism analysis revealed that enhanced farmers' digital literacy promotes the adoption of green production technologies through three pathways: enhancing farmers risk perception, expanding farmers' digital social capital, and strengthening the effectiveness of technology promotion. Heterogeneity analysis demonstrates that improved digital literacy significantly enhances the adoption of four technologies – water-saving irrigation, pest control, pollution-free pesticides, and straw return fields – and exerts a stronger impact on large-scale and middle-generation farmers. This finding implies that digital literacy impacts on the use of ICTs to access agricultural information and services thereby strengthening adoption of agricultural advisory and extension service.

Oladele (2015) determined the impact of ICTs on access to agricultural information among extension officers in South Africa. A simple random sampling technique was employed to select 169 officers in which data was collected using a questionnaire. Fourteen statements were perceived by extension officers as having an impact on agricultural information access. These include: increase information availability, increase knowledge on farming activities, improve quality of information and record keeping respectively, improves awareness of agricultural events, news and information flow respectively, enhances accuracy of information, enhances capacity building agricultural markets, enhances timeliness of information and improve the relevance of research respectively. Significant determinant of access to agricultural information using ICTs were education ($t= 2.61$, $p = 0.11$); constraints to ICT tools ($t= 2.60$, $p = .010$), use of ICT tools ($t = 4.67$, $p = .000$) and e-readiness ($t= -3.01$, $p =.003$). This finding suggest that digital literacy is critical determinant to use of ICTs to access agricultural related information and services.

Despite the growing number of studies on the subject area (Liu *et al*., 2025; Oladele, 2015), there remains limited knowledge about the impact of farmers' digital literacy on the use of mobile phones to access agricultural information and services. This study attempts to fill the knowledge gap by investigating the impacts of farmers' digital literacy on use of ICTs (mobile phones) in agricultural communication to access agricultural information and services in Kamuli district. It assumes that farmers' digital literacy impacts on the use of mobile phones to access agricultural information and services. The impact is operationalized in terms of increased access to agricultural advisory and extension services in the study area. In turn, increased access go agricultural advisory and extension services will improve production and productivity, and consequently their livelihoods.

2.2.6 The influence of farmers' digital literacy levels on the use of mobile phones to access agricultural information and services

Studies on the influence of farmers' digital literacy level on the use of mobile phones to access agricultural information and services are scarce. Some studies have attempted to analyze farmers' digital literacy against various themes (Magesa *et al*., 2023; Alant & Bakare, 2021; Salampasis & Theodoridis, 2013). For instance, Magesa *et al*. (2023) developed measurement of digital literacy (DL) level based on six proposed factors. On a 5-point Likert scale, 23 questions were developed to measure farmers' ability to access, manage, interpret, evaluate, create and communicate agricultural information online. To measure DL level, descriptive statistics and mean scores for the responses were calculated. A comparison of low and high levels of DL with demographic variables was conducted. The item-wise distribution of responses show that smallholders have high DL in accessing and communicating information, while they had low DL in managing, integrating, evaluating and creating information. The study findings of this study may help governments and responsible institutions to develop strategies to ensure smallholders are digitally literate and use digital technologies in agricultural activities. This finding suggests that digital literacy varies according to the ICT model of accessing agricultural related information.

Alant and Bakare (2021) identified the five levels of digital literacy. First level digital literacy foregrounds the farmer's ability to recognize and identify mobile phone symbols (access components). Technical skills to press the On, Off, Call, pick calls, and terminate calls. Second level of digital literacy requires skills to perform common basic phone operations (interpret component). Farmers must have both technical and cognitive skills. Cognitive skills to interpret when the mobile phone is ready to disseminate information. Third level of digital literacy (semi-medium) requires skills to document caller contacts, type, and read text messages (management component). Farmers must be able to carry out tasks involving the documentation of information. Fourth level of digital literacy (medium) require skills to use a smartphone tasks, such as sending, receiving and accessing audio and video messages (evaluate component). Cognitive and technical skills are required to make judgments about the quality, relevance, usefulness or efficiency of the audio and video messages to be sent out or retried from other farmers. Fifth level of digital literacy (advanced) requires skills to use smartphone to access Internet facilities (create). Requites high cognitive proficiency to generate or create information for the farmer.

Other studies have attempted to analyze the use of mobile phones to access agricultural information and services (UCC, 2023; UCC, 2022). According to UCC (2023), the telecom market reflects a growing mobile internet dependency as well as an environment conducive to the delivery and adoption of ICTs in agricultural advisory and extension services such as mobile apps, websites, phone platforms as well as mobile money. Smartphones are able to access all these digital services, though the literary of the farmers limits their access to agricultural information on these digital platforms. The prevailing smartphone adoption trends underscore the popularity of these devices, even in the face of a substantial 49% tax burden. Engaging in discussions aimed at revising downward the existing tax policies on these devices becomes imperative. The revisions hold the potential to narrow ICT access disparities, fostering increased adoption and utilization of ICT services (ibid).

According to UCC (2023), there were about 40 million gargets on the network. This is 3% increases from the 39 million that were posted in the first quarter of 2023. Of the 1 million new devices about 634,000 were smartphones, 58,000 were basic phones and 383,000 were feature phones. As of June 2023, there 1.9 million basic phones and 25 million feature phone compared to 13.3 million smartphones were connected to the network (UCC, 2023; UCC, 2022).

2.2.7 Summary

Studies on the impact of digital literacy on Farmers' use of ICTs in agricultural advisory and extension services to access information are scarce. Oladele (2015) determined the impact of ICTs on access to agricultural information among extension officers in South Africa. Significant determinant of access to agricultural information using ICTs were education, constraints to ICT tools, use of ICT tools and e-readiness. Some studies have focused analysis on the link between ICTs and agricultural advisory and extension services (Van Campenhout *et al*., 2021; Norton & Alwang, 2020; Zhang, Wang & Duan, 2016). Other studies have analyzed the link between digital literacy and ICTs in agricultural advisory and extension services used for accessing agricultural advisory and extension services (Magesa, Jonathan & Urassa, 2023; Gow *et al*., 2023; Oladele, 2015).

Studies on the influence of digital literacy on Farmers' use of mobile phones to access agricultural related information are scarce. Some studies have focused on the link between agricultural information and mobile phones (UCC, 2023; Alant & Bakare, 2021; Islam *et al*., 2017; Salampasis & Theodoridis, 2013). Other studies have focused analysis on the link between digital literacy and the use of mobile phones in agricultural advisory and extension services (Magesa, Jonathan & Urassa, 2023; Alant & Bakare, 2021; Salampasis & Theodoridis, 2013). However, there is limited on the influence of digital literacy, smartphone use and basic phone use in the use of ICT to access agricultural information and services. Thus, this study sought to fill this gap.

Chapter Three: Research Methodology

3.0 Introduction

This chapter presents the methodology that guided the study. It outlines the philosophical foundation, research design, population and sample, sampling techniques, data collection methods, instruments, procedures, data analysis plan, quality control measures (validity and reliability), measurement of variables, and limitations encountered during the research process. The approach adopted in this study was carefully selected to ensure that the findings are credible, reliable, and relevant to addressing the research objectives.

3.1 Research Paradigm

This study adopted a positivist paradigm. Positivism held that reality existed objectively and independently of human perceptions, and that knowledge arose from observable, measurable phenomena through empirical observation and logical reasoning. The researcher assumed an objective stance, detached from the subjects, to ensure findings reflected generalizable truths about the social world rather than subjective interpretations. The positivist paradigm suited this study because the investigation focused on testing established relationships and hypotheses regarding the influence of digital literacy on farmers' use of mobile phones for accessing agricultural information and services in Luwero District. Existing literature already identified digital literacy as a key determinant of ICT adoption in agriculture, and the study aimed to quantify extents of influence, compare basic phones versus smartphones, and test null hypotheses for statistical significance. Such emphasis on measurement, causality, and replicability aligned closely with positivist principles, which prioritized empirical data, objectivity, and the search for law-like patterns akin to natural sciences. This philosophical stance drew from the Research Onion framework adopted from Saunders *et al.* (2012). The outermost layer of the onion represented research philosophies, where positivism occupied a prominent position for studies seeking to explain phenomena through observable facts and avoid researcher bias. In line with this framework, the positivist philosophy informed the subsequent layer: the research approach.

3.2 Research Approach

The study employed a deductive research approach. Deduction proceeded from general theories and existing knowledge to specific testable predictions. Researchers first reviewed established theories on digital literacy, ICT adoption in agriculture, and mobile phone usage (Misaki *et al*., 2018; Nkonya *et al*., 2020), formulated hypotheses (null forms stating no significant influence), and then collected quantitative data to test those hypotheses. Data analysis involved statistical methods to confirm or reject the propositions, thereby moving from the general to the particular in a logical, linear sequence. The deductive approach complemented the positivist paradigm because it facilitated hypothesis testing through structured, quantifiable methods, ensured reliability and validity via standardized instruments, and supported generalizability of findings to the broader population of farmers in similar rural Ugandan contexts. Saunders *et al*. (2012) noted that deductive reasoning associated with positivism enabled researchers to apply rigorous controls and achieve explanatory power, which proved essential for addressing the objectives of the study in a measurable way.

3.3 Research Method

This study employed a quantitative research method specifically survey research as the means of data collection and analysis. The survey method involved the administration of a structured questionnaire to a representative sample of farmers in Luwero District to gather numerical data. This approach aligned with the positivist paradigm and deductive research approach adopted earlier, as it enabled the objective measurement of variables, hypothesis testing through statistical techniques, and the establishment of generalizable relationships (Saunders *et al*., 2012; Creswell & Creswell, 2023). The choice of a quantitative survey method was due to the need to assess extents of influence and test the formulated null hypotheses regarding the significance of influence of digital literacy on ICT use and the differential effects of basic phones versus smartphones. Structured questionnaires facilitated the collection of standardized, measurable responses on scales, demographic characteristics, frequency of mobile phone application in agriculture and perceived access outcomes. Quantitative surveys have been widely applied in analogous research on digital literacy, ICT adoption, and mobile phone use among smallholder farmers in Uganda and sub-Saharan Africa, as they capture adoption patterns, barriers, and impacts while allowing hypothesis testing (Ogutu *et al*., 2024; Kiiza & Pederson, 2012). Such approaches ensured reliability through validated scales, minimized researcher bias via structured instruments, and provided empirical foundations for policy recommendations on enhancing ICT-enabled extension services.

By following the Research Onion framework (Saunders *et al*., 2012), the survey method occupied the strategy layer, fitting seamlessly with the preceding positivist philosophy and deductive approach, and paving the way for subsequent decisions on time horizon (cross-sectional) and data collection techniques (self-administered or enumerator-assisted questionnaires). This methodological coherence strengthened the study's validity and contributed actionable insights into how digital literacy shaped farmers' engagement with mobile technologies for agricultural advancement in the study area.

3.4 Research Design

This study adopted a cross-sectional research design. The cross-sectional time horizon involved the collection of data at a single point in time, providing a snapshot of the phenomena under investigation rather than tracking changes over an extended period (Saunders *et al*., 2012). Data were gathered during a defined fieldwork period in Luwero District to capture farmers' current levels of digital literacy, their patterns of mobile phone usage. The cross-sectional approach suited this study because the research objectives focused on assessing the extent of influence and testing hypotheses about relationships among variables at the present moment, without requiring observation of temporal changes or trends. The emphasis on measuring current extents of digital literacy's impact and comparing basic versus smartphone use aligned with a snapshot design, which facilitated efficient data collection from a representative sample of farmers and supported statistical analysis for generalizability within the study (Saunders *et al*., 2012; Bryman, 2012). Cross-sectional designs have been employed in similar quantitative studies in Uganda and sub-Saharan Africa, where they capture adoption patterns, barriers, and influences without the resource demands of longitudinal tracking (Ogutu *et al*., 2024).

At the innermost layer of the Research Onion (Saunders *et al*., 2012), the study used quantitative data collection and analysis techniques, specifically structured questionnaires as the primary tool. Questionnaires were administered to respondents, with trained field assistants reading questions aloud, recording responses, and clarifying where necessary to accommodate varying literacy levels among participants. The questionnaire incorporated Likert-scale items to measure digital literacy competencies, frequency and purpose of mobile phone use in agriculture and perceived access outcomes. Demographic variables were also collected to control for potential confounding factors. This technique ensured standardized, reliable, and quantifiable data suitable for inferential statistical analysis, including descriptive statistics, correlation, multiple regression, and hypothesis testing. The instrument was pre-tested prior to the main data collection on a small sample drawn from a population similar to the study participants to assess clarity, reliability, and validity of the items.

3.5 Area of Study

The study was conducted in Luwero District, which is situated approximately 75 kilometres by road north of Kampala, the capital city of Uganda. The district lies at latitude 0°50'57.01" N and longitude 32°28'23.02" E, covering a total area of approximately 2,577.49 square kilometres. Luwero is bordered by Mukono District and Wakiso District to the south, Nakaseke District to the west, Nakasongola District to the north, and Kayunga District to the east. The district lies at an altitude ranging between 1,219 and 1,524 meters above sea level. The landscape is characterized by an elevated and dissected plateau with flat-topped hills and intervening valleys, which provide fertile ground for agricultural activities. The area receives a mean annual rainfall of approximately 1,300 mm, with precipitation evenly distributed throughout the year. Temperatures range between a mean annual maximum of 27.5 °C to 30 °C and a mean annual minimum of 15 °C to 17.5 °C. Luwero is predominantly rural, with farming serving as the primary source of livelihood for the majority of the population, particularly women. The favourable climate and topography support the cultivation of various crops and livestock farming, making the district a significant agricultural hub in central Uganda (Luwero District Local Government, 2025).

3.6 Sources of Information

The sources of information for this study were drawn from key actors within the agricultural sector of Luwero District. These included farmer groups, village agents, and extension staff operating across three of the fourteen sub-counties purposively identified for the study. These sources were selected because they are directly involved in agricultural production, service delivery, and information dissemination at the community level, thus providing relevant and credible data to address the research objectives.

Data collection took place between 1st and 30th March 2025, allowing sufficient time to engage with respondents across the selected sub-counties. This period was chosen strategically to align with the agricultural calendar when farmers are actively involved in farming activities, ensuring the data collected accurately reflected the prevailing conditions and practices.

3.7 Target Population

The target population for this study comprised farmers in Luwero District specifically, the study focused on farmer groups operating in the selected sub-counties that have integrated ICT tools into their farming practices. A purposive sampling technique was employed to select three sub-counties: Zirobwe Sub-county, Kalagala Sub-county, and Kamira Sub-county. These areas were chosen based on their diverse geographical and agricultural characteristics, as well as their demonstrated engagement with ICT-based agricultural initiatives. The selection was guided by expert recommendations from the District Production and Marketing Officer, ensuring that the study captured a representative cross-section of farming contexts within the district. Within each of the selected sub-counties, random sampling was used to select respondents from farmer groups. This approach minimized selection bias and enhanced the objectivity and representativeness of the findings. By combining purposive and random sampling techniques, the study ensured both strategic site selection and fair representation of individual farmers, thereby strengthening the validity and generalizability of the results.

3.8 Sample Size Determination

The sample size for this study was determined using the Krejcie and Morgan (1970) table for determining sample sizes for a given population at a 95% confidence level and a 5% margin of error. The total study population consisted of 320 individuals, comprising both extension workers and farmers. According to the Krejcie and Morgan table, a population of 320 corresponds to a sample size of 175 respondents, which was considered sufficient to provide statistically reliable and generalizable findings. The study population included 25 extension workers and 295 farmers across the selected sub-counties. From these groups, 14 extension workers and 150 farmers were selected, making a total of 175 respondents. Simple random sampling was used for both categories to ensure that each individual had an equal chance of being selected, thereby minimizing bias and enhancing the representativeness of the sample.

Table 1

Showing Study Population, Sample Size, and Sampling Techniques

Category	Study Population	Sample Size	Sampling Techniques
Extension workers	25	14	Simple random
Farmers	295	150	Simple random
Total	**320**	**175**	

3.9 Sampling Techniques

The study employed simple random sampling as the primary probability sampling method to select a subset of farmers and extension workers in Luwero District.

3.9.1 Simple Random Sampling

A simple random sampling technique was adopted to select respondents from the target population. This method is the most fundamental form of probability sampling, where every individual has an equal chance of being chosen (Clark *et al*. (2021). The study targeted a total sample size of 175 respondents, comprising farmers and extension workers. The sampling fraction was determined using the formula n/N, where n represents the sample size and N represents the total population size. In this study, the sampling fraction was calculated as 175/320.

3.10 Data Collection Methods

For this study, data collection involved primary sources where quantitative methods were utilized. The primary data was gathered through self-administered questionnaires.

3.10.1 Survey

A survey method was employed as the primary data collection approach for this study. The survey involved administering structured questionnaires to farmers and extension workers in Luwero District. The questionnaires were designed in a digital format, which permitted respondent anonymity and increased the likelihood of receiving honest and accurate responses. According to Saunders *et al*. (2019), anonymity enhances response rates and improves data quality by encouraging participants to provide genuinely held opinions without fear of identification.

The use of questionnaires enabled the collection of a broad range of information on key variables relevant to the study objectives. In addition, the structured nature of the tool simplified the coding, analysis, and interpretation of responses, ensuring consistency and efficiency. The questionnaires contained closed-ended questions, allowing for standardized responses that facilitated quantitative analysis and reduced interviewer bias.

Data collection was conducted in various locations, including farmer group meeting points, villages, and extension offices. Appointments were scheduled in advance with relevant authorities and potential respondents to ensure smooth data collection procedures and minimize disruptions to participants' daily activities. The data collection period was set between 1st and 30th August 2025, providing sufficient time to engage with the target population and accommodate any scheduling conflicts. This structured and well-coordinated survey process contributed to the reliability and validity of the data gathered for the study.

3.11 Data Collection Instruments

The following data collection instruments were used to collect quantitative data to meet the features of respondents for the study.

3.11.1 Self-Administered Questionnaires

The study employed self-administered questionnaires as the primary data collection instrument because they were suitable for gathering the necessary data to address the research questions and achieve the study objectives. Given that the research adopted a cross-sectional survey design, the use of self-administered questionnaires offered significant advantages, including time efficiency, cost-effectiveness, and the provision of reliable and valid information. These advantages are consistent with the views of Malunda & Atwebembeire (2022), who emphasize the suitability of structured questionnaires in quantitative research designs. The questionnaire was organized using a five-point Likert standardized rating scale, ranging from 1 to 5 (5 - strongly agree, 4 - agree, 3 - undecided, 2 - disagree, 1 - strongly disagree).

3.12 Measurement of Variables

The independent variable, farmers' digital literacy, was operationalized as a multi-level composite construct following established frameworks (UNESCO, 2018). These levels included: (1) access component (ability to obtain digital resources, such as connecting to networks, locating agricultural content via calls/SMS/apps); (2) interpret component (skills to comprehend digital information, for example, understanding SMS advisories, weather updates, or basic interfaces); (3) manage component (saving messages/contacts, storing market data); (4) evaluate component (assessing quality/accuracy of information, discerning reliable sources for agronomic practices or prices); and (5) create component (generating or contributing content, e.g., sending queries via USSD/SMS, sharing crop photos in groups, or posting in farmer apps). Each level was measured via 3–5 Likert-scale items (1 = Strongly Disagree/Not at all capable to 5 = Strongly Agree/Highly capable), with an overall digital literacy score computed as the mean of responses across items for higher reliability and use in regression models. The dependent variable, farmers' access to agriculture information and services, was measured as access to agro-inputs (seeds/fertilizers via digital advisories), agro-insurance (scheme details/claims info), market prices, good agronomic practices (extension tips on planting/pest management), and weather information. Measurement used 5-point frequency/Likert scales on items. Control variables included standard demographics: age, gender, and education level.

3.13 Data Collection Procedure

Upon the successful defense of the research proposal, the researcher obtained an introduction letter from Uganda Christian University (UCU). This letter was formally presented to the relevant authorities at Luwero District administration to seek permission to conduct the study. Securing official authorization ensured that the research adhered to institutional and district protocols, thereby enhancing its credibility and acceptance within the community. Before the actual data collection commenced, the research instruments were piloted to assess their clarity, relevance, and reliability. A pilot test of the questionnaire was conducted with 10 respondents, and the interview guide was tested with 2 respondents from Luwero District. Feedback from the pilot exercise was carefully reviewed and used to refine and improve the tools, ensuring they were well-adapted for the main study and capable of eliciting accurate and meaningful responses.

Following this, the researcher scheduled appointments in advance with both relevant authorities and potential respondents. This step was crucial for ensuring smooth coordination and minimizing disruptions during the data collection period. Data collection was carried out over one to three weeks, allowing for adequate engagement with the target population of farmers and extension workers.

During the data collection process, sessions were held in conducive environments to encourage open communication and honest responses. To ensure data validity and reliability, the researcher explained any unclear questions to respondents and made real-time adjustments when necessary to minimize non-compliance and inaccuracies. Flexibility was maintained to accommodate scheduling conflicts or incomplete exercises, which were rescheduled in consultation with respondents. After completing data collection, the researcher proceeded with data analysis and the preparation of a final report, marking the conclusion of the research process. This structured and systematic procedure ensured the collection of high-quality data essential for addressing the study's objective

3.14 Data Quality Control

To guarantee the control and quality of data, the researcher took necessary measures to ensure the study's validity and reliability by properly managing extraneous variables, as explained in the following concepts:

3.14.1 Validity of the Instrument

In this study, content validity was employed to ensure data quality and control. Content validity refers to the extent to which the data collected using a particular instrument accurately represents a specific domain of indicators or the content of a particular concept. According to Malunda & Atwebembeire (2022), validity is essential for ensuring the accuracy and meaningfulness of inferences derived from research results. It measures the extent to which the results obtained from data analysis truly reflect the phenomenon under investigation.

To ensure content validity, the researcher constructed instruments that directly measured the study's variables. Guidance from the research supervisor was sought during instrument development, and the tools were subjected to a pre-test to assess their clarity and appropriateness. Ambiguous or poorly structured questions were revised or eliminated after pre-testing to enhance the instrument's precision and relevance.

In addition to content validity, face validity was conducted to ensure the linguistic and analytical clarity of the questionnaire items. Face validity refers to the degree to which the measures (e.g., Likert scale questions) appear to reflect the content of the concepts explored, such as attitudes and beliefs towards mobile phone usage, literacy levels, contextual environment, and access to agricultural information (Clark *et al*. (2021).

A pilot test of the questionnaire was administered to a small group of respondents who were asked to indicate their understanding of each item using a dichotomous scale of "yes" (favourable) or "no" (unfavourable). The feedback obtained was used to refine and polish the wording, structure, and sequencing of questions, ensuring that the instrument was clear, relevant, and comprehensible to the target population.

3.14.2 Reliability of the Instrument

To ensure the reliability of the research instrument, the test–retest method was employed, following the approach outlined by Malunda & Atwebembeire (2022). Reliability refers to the degree of consistency and stability of an instrument in measuring what it is intended to measure over time. A reliable instrument produces similar results under consistent conditions, thereby increasing the credibility of the study's findings.

In applying the test–retest method, the same research instruments were administered twice to the same group of respondents. An appropriate group of respondents was selected, and the instruments were administered to them during the first phase. After a one-week interval, the instruments were re-administered to the same group to assess the stability and consistency of their responses over time. The results from both tests were then correlated to compute the coefficient of reliability.

In line with the recommendation by Yin (2018), a reliability coefficient exceeding 0.6 was considered acceptable and indicative of sufficient instrument reliability. This threshold ensured that the instrument demonstrated internal consistency and stability, which are essential for producing dependable research results. The reliability test was conducted in Kamuli District, chosen because it possesses similar structural and demographic characteristics to the actual study area. This site was also selected due to financial and logistical constraints that made it more practical to conduct the reliability test outside the primary study population.

3.15 Data Analysis

This study conducted data analysis using SPSS version 26. Questionnaire responses were coded, cleaned (handling missing values via listwise deletion or mean imputation where appropriate), and entered into the software for accuracy. Descriptive statistics summarized sample characteristics and key variables, including frequencies, percentages, means, and standard deviations for demographics (age, gender, and education), digital literacy levels, mobile phone use patterns (overall, basic phones, smartphones), access to agriculture-related information and services (agro-inputs, agro-insurance, market prices, good agronomic practices, weather information); visual aids such as bar and pie charts illustrated distributions and trends. Inferential analysis employed hierarchical regression where to test the three null hypotheses. Regression assumptions (linearity, independence, homoscedasticity, normality of residuals, no multicollinearity via $VIF < 5$) were checked using SPSS diagnostics. Model fit was evaluated through adjusted R^2, F-statistic, and standardized beta coefficients, with significance tested at $p < 0.05$ to determine rejection of null hypotheses. This approach aligned with the positivist paradigm, deductive reasoning, and quantitative method, enabling objective hypothesis testing and empirical data.

3.16 Ethical considerations

Ethical principles were strictly observed throughout the research process to ensure the protection, dignity, and rights of participants, as well as the integrity of the study. Necessary permissions were obtained from relevant authorities, including the Research Ethics Committee of Uganda Christian University (UCU) and the Luwero District Local Government headquarters, which served as the research site. Conducting the study with honesty and integrity created a trustworthy environment, encouraging respondents to participate openly and truthfully (Israel and Hay (2016)).

Prior to administering the questionnaires, informed consent was sought from all respondents. The researcher provided a clear explanation of the study's objectives, its significance, and the voluntary nature of participation. This allowed respondents to make informed decisions about their involvement. In addition, permission was obtained from relevant district authorities to access organizational documents, reports, and staff, ensuring that the research complied with local governance protocols (Yip (2016)).

Confidentiality was strictly maintained throughout the data collection, analysis, and reporting process. All information provided by respondents was used solely for academic purposes and treated with the utmost confidentiality (Saunders *et al*. (2019)). Respondents were not required to include their names or any personally identifying information on the questionnaire. Any quotes or excerpts drawn from interview transcripts were anonymized to protect participants' identities (Resnik (2020). Furthermore, respondents were informed of their right to withdraw from the study at any point without any repercussions.

3.17 Limitations of the Study

Like many field-based studies, this research faced several potential limitations that could influence data collection and analysis. One major challenge anticipated was restricted access to sensitive information due to the nature of local government institutions and their information disclosure protocols. Some participants, particularly government officials and extension staff, might have been hesitant to cooperate fully during interviews and questionnaire completion for fear of appearing insubordinate or disclosing confidential information.

To address this challenge, the researcher implemented strict confidentiality measures. Questionnaires were labeled using alphabetic codes rather than names to ensure anonymity. Participants were clearly informed that all information collected would be treated with the utmost confidentiality and would be used solely for academic purposes. This assurance was intended to increase their trust and willingness to participate. In addition, the researcher secured formal permissions from relevant authorities prior to data collection and obtained documented informed consent from all participants. These steps helped to build credibility and foster cooperation during the data collection process.

Another limitation anticipated was the limited availability of current local literature on the topic of ICT use in agricultural communication and service delivery. To mitigate this gap, the researcher relied on comparative empirical studies conducted both regionally and internationally to enrich the conceptual and empirical foundations of the study.

Chapter Four: Presentation of Findings

4.1 Introduction

This fourth chapter answered research questions in achieving the objectives set in the first chapter. The study sought to answer the overarching research question on what is the impact of farmers' digital literacy on use of ICTs in agricultural communication to access information and services in Luwero district? To answer this overarching research questions, the study set out to answer three specific research questions: (1) To what extent does digital literacy influence farmers' use of mobile phones to access agricultural information and services in Luwero district? (2) To what extent does the use of basic phones in agricultural communication influence farmers' ability to access agricultural information and services in Luwero district? (3) how does the use of smartphones in agricultural communication influence farmers' ability to access information and services in Luwero district. The study results are presented according to specific research questions using tables, graphs, charts and quotation of texts from the interviews.

4.2 Demographic Information

The survey questionnaire was administered by three interviewers via Google Forms to 351 farmers in Luwero district. All the 351 farmers agreed to be interviewed representing a response rate of 100%. From the analysis as shown in Figure 2, slightly less than half 49% (n=175) of farmers interviewed were male, while about half 51% (n=176) were female. This suggests that both men and women were involved not only in farming but also in membership of farmers groups at the village level.

Figure 2

Showing gender

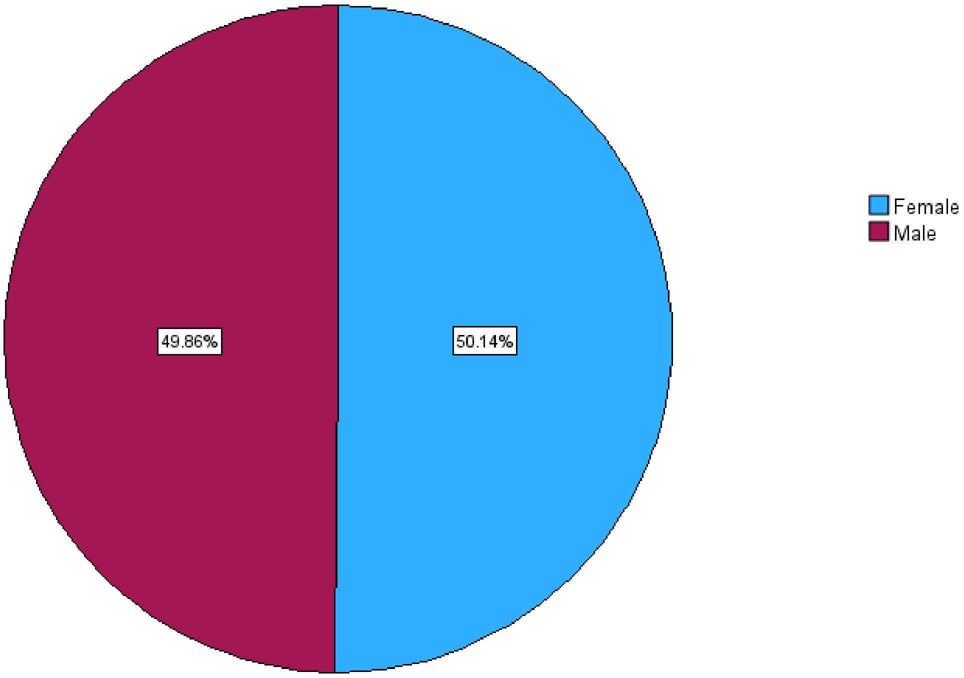


Figure 3 shows that all the farmers interviewed in Luwero district where between the ages of 15-19 years and 60 years and above. Majority of the respondents were in 45-49 age bracket at 16% (n=56) and 25-29 age bracket at 14% (n=49) and 40-44 age bracket at 13.4% (n=47). There were few farmers in the 15-19 age bracket at 2.6% (n=9) and 55-59 age bracket at 5.4% (n=19).

Figure 3

Showing count of age

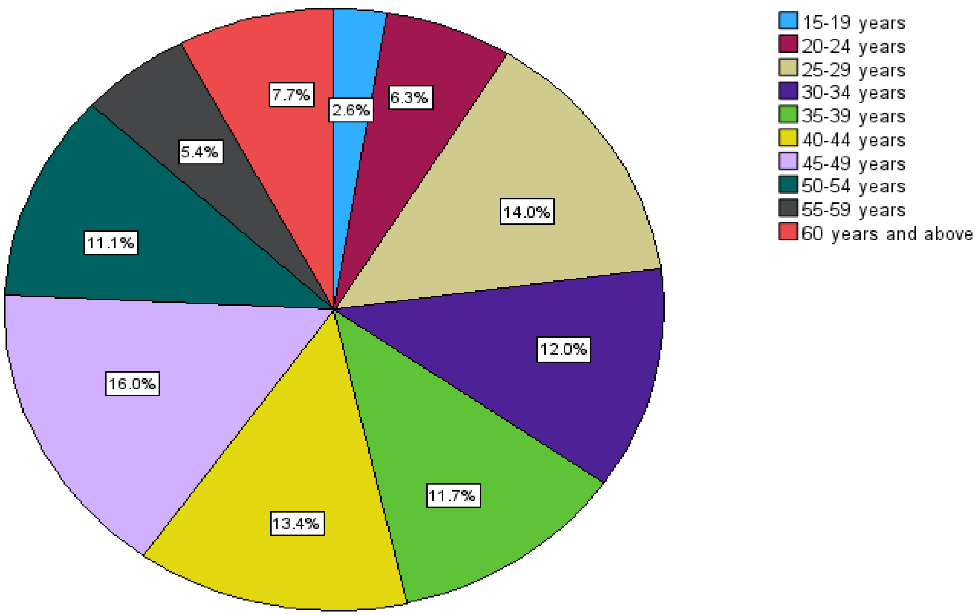


Figure 4 indicates that the number of farmers with primary education and secondary education was higher at 48.4% (n=170) and 34.2% (n=120) respectively. According to Figure 4, the farmers with no formal education accounted for 8.3% (n=29), while farmers with tertiary education and university level accounted for 6% (n=21) and 3.1% (n=11) respectively.

Figure 4

Showing count of education level

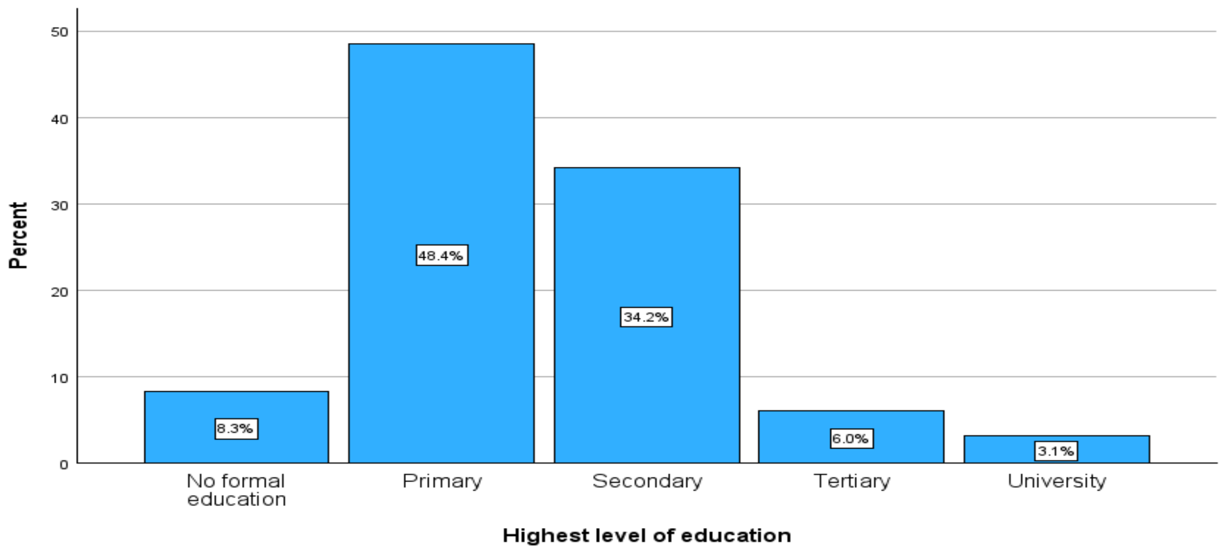
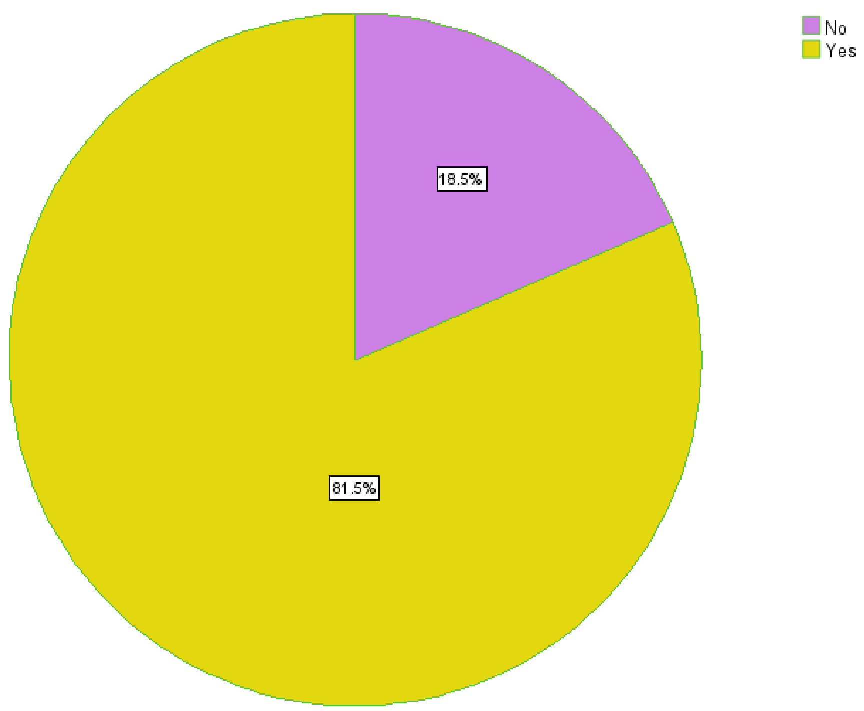


Figure 5 reveals that 8.3% (n=29) of farmers had no formal education and could not read and write. According to Figure 5, majority 81% (n=286) of farmers with primary education could read and write. The implication of these findings is that literacy levels among farmers are generally moderate but unevenly distributed, with a small yet significant minority (8.3%) lacking any formal education and therefore facing clear barriers to accessing written agricultural information, digital tools, and extension materials. Although the majority (81%) of farmers with primary education can read and write, this level of literacy is often basic and may still limit their ability to fully interpret technical agricultural messages, especially those delivered through mobile phones or printed advisory materials.

Figure 5

*Showing count of those with primary level and could not rea*d



4.3 The influence of digital literacy on use of mobile phones in agricultural communication to access information and services

This section answers the overarching research question on what is the impact of farmers' digital literacy on use of ICTs (i.e., mobile phones) in agricultural communication to access information and services in Luwero district. To answer this question, the study established digital literacy levels among farmers, types of mobile phones used, and agriculture-related information and services accessed.

4.3.1 Descriptive Statistics for Digital Literacy

Digital literacy was assessed using seven 5-point Likert items (1 = Strongly Disagree to 5 = Strongly Agree) measuring attitudes toward ICTs and self-reported competencies in mobile phone functions relevant to agriculture.

Table 2

Showing count of digital literacy

Statements	SD *f(%)*	D *f(%)*	N *f(%)*	A *f(%)*	SA *f(%)*	Total *f(%)*
I like to receive agriculture-related information and services using ICTs	2 (0.6%)	15 (4.3%)	17 (4.8%)	161 (45.9%)	156 (44.4%)	351 (100%)
I find a mobile phone useful for accessing agriculture-related information and services	3 (0.9%)	16 (4.6%)	16 (4.6%)	178 (50.7%)	138 (39.3%)	351 (100%)
I can recognize and identify mobile phone symbols	3 (0.9%)	39 (11.1%)	25 (7.1%)	165 (47.0%)	119 (33.9%)	351 (100%)
I can perform basic phone functions	4 (1.1%)	39 (11.1%)	26 (7.4%)	178 (50.7%)	104 (29.6%)	351 (100%)
I can save contacts, type and read messages	9 (2.6%)	53 (15.1%)	24 (6.8%)	157 (44.7%)	108 (30.8%)	351 (100%)
I can use a smartphone to send, receive, and access audio and video messages	23 (6.6%)	66 (18.8%)	24 (6.8%)	153 (43.6%)	85 (24.2%)	351 (100%)
I can use a smartphone to access internet facilities	25 (7.1%)	64 (18.2%)	21 (6.0%)	164 (46.7%)	77 (21.9%)	351 (100%)

Table 2 shows that the majority of respondents strongly agreed 156(44.4%) or agreed 161(45.9%), together representing 90.3% of the sample. This was followed by neutral responses 17(4.8%), disagree 15(4.3%), and a very small proportion who strongly disagreed

2(0.6%). Since the vast majority expressed a positive attitude toward receiving agricultural information via ICTs, it implies that farmers in Luwero District show strong motivation and openness to adopting digital tools for accessing farming-related information and services. In addition, Table 2 indicates that the majority agreed 178(50.7%) or strongly agreed 138(39.3%), totaling 90.0%. This was followed by neutral responses 16(4.6%), disagree 16(4.6%), and strongly disagree 3(0.9%). Since majority perceived mobile phones as useful for agricultural purposes, it implies that farmers recognize the benefits of mobile technology in supporting their farming decisions.

Table 2 also reveals that the majority agreed 165(47.0%) or strongly agreed 119(33.9%), totaling 80.9%. This was followed by disagree 39(11.1%), neutral 25(7.1%), and strongly disagree 3(0.9%). Since the majority reported confidence in identifying mobile phone symbols, it implies that most farmers possess adequate visual literacy to interpret icons, menus, and notifications on mobile interfaces. Also, Table 2 shows that the majority agreed 178(50.7%) or strongly agreed 104(29.6%), totaling 80.3%. This was followed by disagree 39(11.1%), neutral 26(7.4%), and strongly disagree 4(1.1%). Since the majority felt capable of performing basic phone functions, it implies that farmers have the core operational skills required to handle calls, basic navigation, and simple device management. Similarly, Table 2 indicates that the majority agreed 157(44.7%) or strongly agreed 108(30.8%), totaling 75.5%. This was followed by disagree 53(15.1%), neutral 24(6.8%), and strongly disagree 9(2.6%). Since the majority reported ability to save contacts, type, and read messages, it implies that most farmers have the necessary text-handling and organizational skills to engage with SMS/USSD services, read extension messages, and maintain contacts with agricultural input suppliers, markets, or extension agents.

Table 2 further reveals that the majority agreed 153(43.6%) or strongly agreed 85(24.2%), totaling 67.8%. This was followed by disagree 66(18.8%), strongly disagree

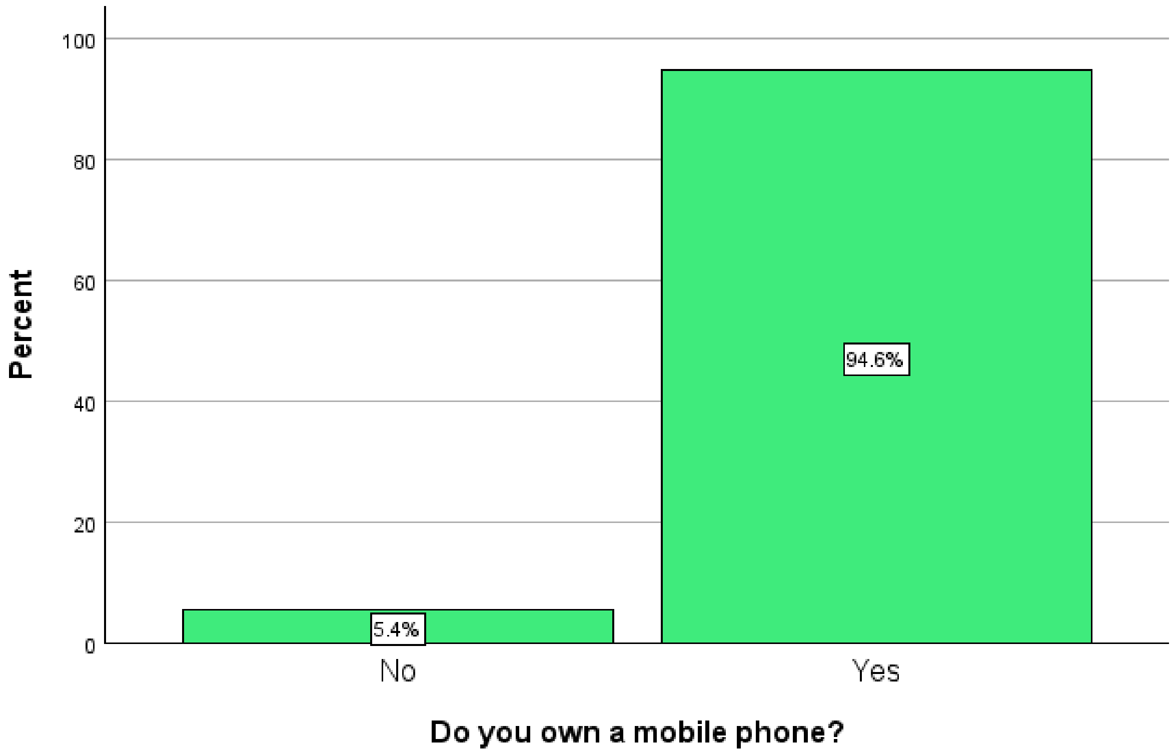
23(6.6%), and neutral 24(6.8%). Since the majority reported capability in handling audio and video messages on smartphones, it implies that most farmers (those with smartphones) possess advanced multimedia skills, enabling them to benefit from richer content formats such as video extension tutorials, voice advisories, or multimedia market information.

In addition, Table 2 shows that the majority agreed 164(46.7%) or strongly agreed 77(21.9%), totaling 68.6%. This was followed by disagree 64(18.2%), strongly disagree 25(7.1%), and neutral 21(6.0%). Since the majority indicated ability to access internet facilities on smartphones, it implies that farmers have the skills needed for online information retrieval, such as browsing agricultural websites, using mobile apps for updated market prices or weather forecasts, or engaging in digital farmer networks.

Figure 6 shows that a small proportion 5% (19) of respondents did not own mobile phones. This suggests that they didn't use mobile phones in agricultural communication to access information and services. Majority 95% (332) of respondents owned mobile phones. This indicates that these farmers could use mobile phones in agricultural communication to access information and services.

Figure 6

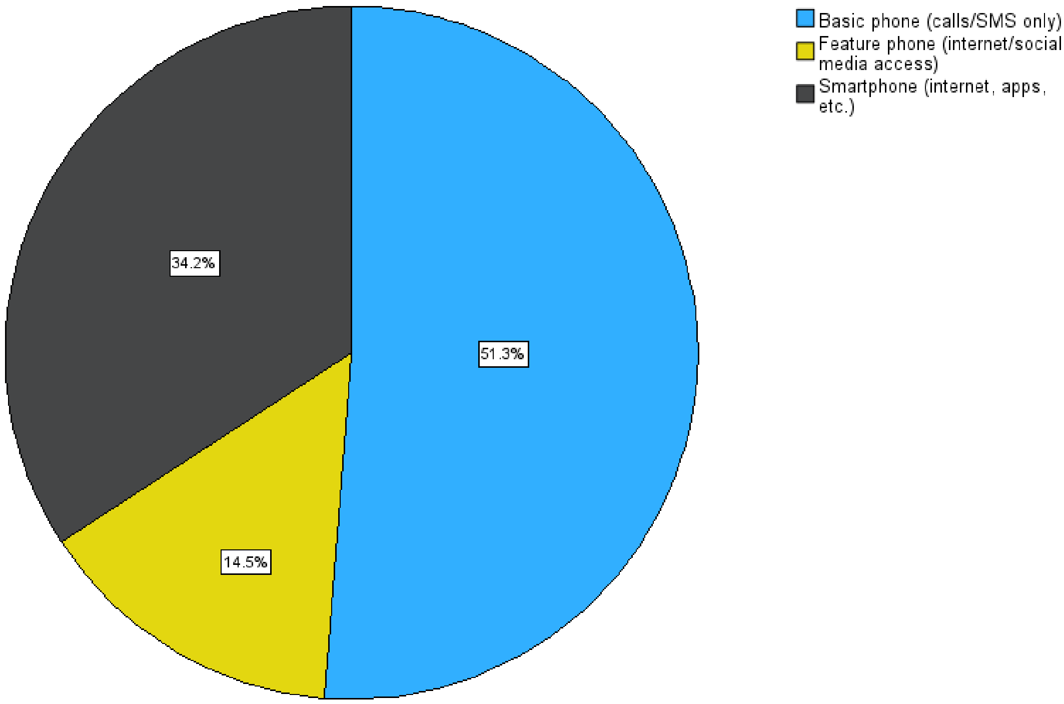
Showing count of mobile phone ownership



Further analysis was conducted to establish the type of mobile phone owned. When survey respondents were asked what type of mobile phones they use, their responses are shown in Figure 7. At least 51% (n=180) and 34% (n=120) of respondents reported using a basic phone and smartphone respectively. However, minority 15% (n=51) of the respondents reported using a feature phone. This indicates that most farmers use basic phones and smartphones in agricultural communication to access information and services.

Figure 7

Showing digital literacy by phone type



4.3.2 Overall Use of Mobile Phones in Agricultural Communication

Overall use was proxied by combining: number of information/services accessed, reception methods used (Item 8), and basic/advanced skill affirmations. Figure 8 shows that market price information was the most frequently accessed service, reported by 104 (29.6%), followed closely by weather forecast information accessed by 88 (25.1%). Good agronomic practices ranked third, with 86 (24.5%) reporting access to this service. Agro-inputs (fertilizers, pesticides) were accessed by 43 (12.3%), while agro-insurance was the least accessed, with only 30 (8.5%) indicating they received information or services related to it. Since market prices and weather forecasts together accounted for over half of the reported access (54.7%), it implies that farmers prioritize updated, decision-critical information that affects daily sales, planting, and harvesting decisions, while access to longer-term or specialized services such as agro-insurance remains limited.

Figure 8

Showing count of frequency of access to agriculture-related information/services

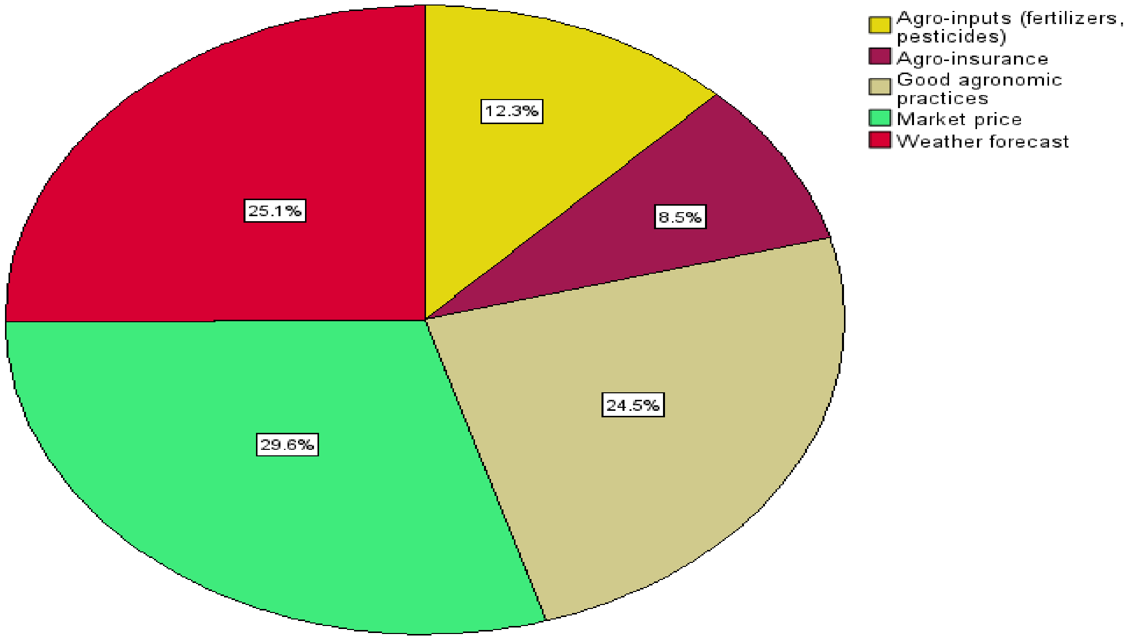


Table 3 indicates that the call method was the most common way farmers received agriculture-related information and services, used by 181 (51.6%), followed by SMS/USSD code, reported by 99 (28.2%). Websites were used by 40 (11.4%), while mobile apps were the least frequent method, accessed by only 31 (8.8%). Since traditional voice-based (call) and text-based (SMS/USSD) methods together dominated (79.8% of responses), it implies that farmers still rely heavily on simple, low-bandwidth, and low-digital-literacy methods for receiving agricultural information.

Table 3

Showing count of reception method

Method	Frequency	Percent
Call	181	51.6
Mobile app	31	8.8
SMS/USSD code	99	28.2
Website	40	11.4
Total	351	100.0

Table 4 reveals that most all farmers reported the ability to identify basic phone buttons such as power on/off, call, and end call, with 330 (94.0%) answering "Yes" and only 21 (6.0%) answering "No". The majority could receive a call and send an SMS, with 281 (80.1%) affirming this skill compared to 70 (19.9%) who could not. Similarly, 284 (80.9%) reported being able to save contacts, while 67 (19.1%) could not. For more advanced features, 217 farmers (61.8%) indicated they could use audio or video features to receive or send information, compared to 134 (38.2%) who could not. Finally, 198 (56.4%) reported the ability to use a smartphone to browse the internet, social media, or download apps, while 153 (43.6%) could not. Since basic operational skills (identifying buttons, receiving calls/SMS, saving contacts) were reported by over 80% of respondents, it implies that the majority of farmers possess foundational competencies required for basic mobile communication. However, a drop to 56-62% for advanced multimedia and internet-based skills suggests a digital divide where many farmers (basic phone users) lack the capabilities needed for richer agricultural content delivery.

Table 4

Showing count of mobile phone operational skills

Statement	**No *f*(%)**	**Yes *f*(%)**	**Total *f*(%)**
Can you identify basic phone buttons such as power on/off? Or call and end call?	21 (6.0%)	330 (94.0%)	351 (100.0%)
Can you receive a call and send an SMS using a mobile phone?	70 (19.9%)	281 (80.1%)	351 (100.0%)
Can you save contacts in a phone?	67 (19.1%)	284 (80.9%)	351 (100.0%)
Can you use audio or video features to receive or send information in a mobile phone?	134 (38.2%)	217 (61.8%)	351 (100.0%)
Can you use a smartphone to browse the internet, social media, or download apps?	153 (43.6%)	198 (56.4%)	351 (100.0%)

4.3.3 Testing Hypothesis One

The null hypothesis (H_{01}) stated that there is no significant influence of digital literacy on farmers' use of ICTs in agricultural communication to access information and services in Luwero District. The alternative hypothesis (H_{11}) proposed that there is a significant influence of digital literacy on farmers' use of ICTs for the same purpose. The regression results show that the inclusion of digital literacy in Model 2 led to a negligible improvement in explanatory power. Specifically, R increased marginally from 0.073 to 0.075, while R Square rose only from 0.005 to 0.006, indicating that digital literacy contributed an additional 0.1% of the variance in ICT use for agricultural information access. Furthermore, the adjusted R Square remained negative (-0.006), suggesting that the model does not improve prediction beyond the mean of the dependent variable. The high and stable standard error of the estimate (1.29) further indicates poor model precision.

The results imply that digital literacy does not meaningfully explain variations in farmers' use of ICTs for accessing agricultural information and services. The extremely weak relationship between the predictors and the dependent variable, combined with the minimal change in explanatory power after introducing digital literacy, indicates a lack of statistically and practically significant influence. Therefore, the null hypothesis (H_{01}) is accepted, and the alternative hypothesis (H_{11}) is rejected.

Table 5

Regressing digital literacy on farmers' use of mobile phones to access information and services

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.073[a]	.005	-.003	1.29096
2	.075[b]	.006	-.006	1.29256

a. Predictors: (Constant), Education, Gender, Age
b. Predictors: (Constant), Education, Gender, Age, Digital literacy

Table 6 reveals that the overall regression models are not statistically significant. In Model 1 (controls only: gender, age, education), the F-statistic was 0.614 with a p-value of 0.606 (well above 0.05), indicating that the control variables do not significantly improve the explanation of farmers' main accessed agricultural information or service beyond a null model. The regression sum of squares (3.072) was very small relative to the residual sum of squares (578.301), confirming minimal explanatory contribution from the controls. In Model 2, after adding digital literacy, the F-statistic decreased further to 0.495 with a p-value of 0.739, showing no improvement in model fit. The slight increase in regression sum of squares (3.308) remained negligible compared to the residual (578.065). This implies that neither the demographic controls nor digital literacy meaningfully account for variation in the dependent variable. The high p-values and statistical insignificance provide support for accepting the hypothesis and indicate that the relationship between digital literacy and farmers' use of ICTs to access agricultural information and services is not statistically detectable in this sample.

Table 6

Regressing digital literacy on farmers' use of ICTs to access information and services

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	3.072	3	1.024	.614	.606[b]
	Residual	578.301	347	1.667		
	Total	581.373	350			
2	Regression	3.308	4	.827	.495	.739[c]
	Residual	578.065	346	1.671		
	Total	581.373	350			

a. Dependent Variable: ICT use for Agri-info access
b. Predictors: (Constant), Education, Gender, Age
c. Predictors: (Constant), Education, Gender, Age, Digital literacy

Table 7 indicates no significant individual effects from any predictor. In Model 1, gender, age, and education all had non-significant coefficients ($p > 0.05$), showing that demographic factors do not influence the agriculture-related information or service accessed. In Model 2, after adding digital literacy, the coefficients for gender, age, and education remained non-significant. Digital literacy had a very small positive standardized coefficient ($\beta = 0.020$, $t = 0.376$, $p = 0.707$), which was also not statistically significant ($p > 0.05$). The unstandardized coefficient ($B = 0.024$) suggests that a one-unit increase in digital literacy is associated with only a 0.024-unit increase in the dependent variable. This implies that digital literacy does not exert any detectable influence on the agricultural information or service accessed by farmers via ICTs in Luwero District, after controlling for demographics.

Given the above findings the hypothesis is accepted that there is no significant influence of digital literacy on farmers' use of mobile phones in agricultural communication to access information and services in Luwero district.

Table 7

Regressing digital literacy on farmers' use of mobile phones ICTs to access information and services

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	3.887	.340		11.441	<.001
	Gender	-.131	.139	-.051	-.946	.345
	Age	-.009	.029	-.017	-.316	.752
	Education	-.069	.083	-.046	-.834	.405
2	(Constant)	3.848	.356		10.811	<.001
	Gender	-.135	.139	-.052	-.967	.334
	Age	-.010	.029	-.018	-.327	.744
	Education	-.072	.083	-.048	-.869	.386
	Digital literacy	.024	.063	.020	.376	.707
	Basic phone	.634	.154	.246	4.113	<.001
	Smartphone use	-.499		-.292	-4.767	<.001

a. Dependent Variable: ICT use for Agri-info access

4.4 The influence of basic phone use in agricultural communication on farmers' access to information and services

This section presents results on the hypothesis that the use of basic phones in agricultural communication does not significantly influence farmers' access to information and services in Luwero District.

4.4.1 Contextual factors influencing access

To further understand the environment in which basic phone use occurs and its potential influence on access to agricultural information and services, respondents were asked about training, network coverage, charging access, external program support, and cost barriers. The results are presented in Table 8.

Table 8 shows that a majority of respondents (54.4%) had attended training on using digital tools for farming, indicating moderate exposure to capacity-building efforts in the district. Mobile network coverage was reported as supportive by 76.6% of farmers, suggesting relatively good infrastructure for phone-based information delivery, though nearly one-quarter (23.4%) still face coverage challenges. Access to regular charging (electricity or solar power) was high, with 82.1% affirming reliable access and only 17.9% reporting difficulties. Over half (58.4%) indicated that government or NGO programs had helped them access digital agricultural services, reflecting some positive impact from external interventions. However, a substantial majority (67.8%) reported that the cost of data or airtime had limited their access to agricultural information or services for basic phone users who rely heavily on airtime for calls and SMS/USSD services rather than data-heavy applications. These contextual factors suggest that while infrastructure and program support are reasonably available, economic constraints (cost of airtime) remain a limitation that reduce the effectiveness of basic phone use in agricultural communication.

Table 8

Showing contextual factors

Question	Yes f(%)	No f(%)	Total f(%)
Have you attended training on how to use digital tools for farming?	191 (54.4%)	160 (45.6%)	351 (100%)
Does mobile network coverage in your area support phone-based farming information?	269 (76.6%)	82 (23.4%)	351 (100%)
Do you have access to electricity or solar power to charge my phone regularly?	288 (82.1%)	63 (17.9%)	351 (100%)
Has any government or NGO programs helped you access digital agricultural services?	205 (58.4%)	146 (41.6%)	351 (100%)
Has the cost of data or airtime limited access to agriculture information or services?	238 (67.8%)	113 (32.2%)	351 (100%)

4.4.2 Testing hypothesis two

Hypothesis two stated that basic phone use in agricultural communication does not significantly influence farmers' access to information and services in Luwero District (H_{02}), against the alternative that it does have a significant influence (H_{12}). The standardized beta coefficient ($\beta = 0.246$) indicates a positive and moderate effect, meaning that a one standard deviation increase in the use of basic phones is associated with a 0.246 standard deviation increase in farmers' access to agricultural information and services. This positive and statistically meaningful relationship suggests that basic phone use plays an important role in enhancing farmers' access to agricultural communication channels such as voice calls and SMS-based services, including market price updates and weather information. Based on these results, the null hypothesis (H_{02}) is rejected, while the alternative hypothesis (H_{12}) is accepted. This implies that the use of basic phones in agricultural communication significantly influences farmers' access to information and services in Luwero District.

4.5 The influence of smartphone use in agricultural communication on farmers' access to information and services

This section presents results to analyze the extent to which the use of smartphones in agricultural communication influences farmers' access to agricultural information in Luwero District. It also tests the corresponding null hypothesis: "The use of smartphones in agricultural communication does not significantly enhance access to information and services in Luwero District." The results are presented in Tables 7. Smartphone use had a negative unstandardized coefficient of -0.499 (standardized $\beta = -0.292$, $t = -4.767$, $p < 0.001$), which was statistically significant at the 0.001 level. This means that, holding controls constant, farmers using smartphones are predicted to have a 0.499-unit lower score on use of ICTs to access agricultural information and services to non-smartphone users. The standardized beta of -0.292 indicates a one standard deviation increase in smartphone use is associated with a 0.292 standard deviation decrease in use of ICTs to access agricultural information. This significant negative relationship implies that smartphone use is associated with accessing a different or lower-ranked set of agricultural services compared to basic/feature phone users (for example possibly fewer reports of accessing basic services like market prices via calls/SMS, or different preferences such as agronomic practices via apps). The null hypothesis is therefore rejected, and it is concluded that there is a significant influence of smartphone use in agricultural communication on farmers' access to information and services.

Chapter Five: Discussion of Results

5.1 Introduction

This fifth chapter discusses key findings in light of the literature review and the theoretical framework presented in the second chapter. The discussion highlights the areas in which the key findings corroborate and contradict studies cited in the literature review. It also explains the impact of digital literacy on farmers' use of ICTs in agricultural communication to access information and services through a theoretical lens of communication technology affordance theory and technology acceptance model.

The discussion is organised according to the study objectives. The study sought to assess the extent to which digital literacy influences farmers' use of mobile phones to access agricultural information and services; analyse how the use of basic phones in agricultural communication impacts farmers' ability to access information and services; and analyse the extent to which the use of smartphones in agricultural communication affects farmers' ability to access information and services.

5.2 The influence of digital literacy on farmers' use of mobile phones in agricultural communication to access information and services

The regression results indicate that digital literacy has a negligible effect on farmers' use of mobile phones for accessing agricultural information and services in Luwero District. The inclusion of digital literacy in the model produced only a very slight increase in explanatory power, with R rising from 0.073 to 0.075 and R Square from 0.005 to 0.006, meaning it explained just 0.1% of the variance. The adjusted R Square remained negative (-0.006), and the stable standard error (1.29) further confirmed poor model fit and low predictive accuracy. Overall, the findings show an extremely weak and statistically insignificant relationship, indicating that digital literacy does not meaningfully influence ICT use among farmers; therefore, the null hypothesis is accepted and the alternative hypothesis is rejected.

The study found that digital literacy did not significantly influence farmers' use of mobile phones in agricultural communication to access information and services in Luwero District. This result contrasts with much of the existing literature that positions digital literacy as a central determinant of ICT adoption and effective use in agriculture, particularly in developing contexts where mobile phones serve as the primary digital tool for farmers (Misaki *et al*., 2018; Alant & Bakare, 2021; Magesa *et al*., 2023; Ogutu *et al*., 2024). The non-significant finding suggests that, in the specific socio-technical environment of Luwero District, digital literacy does not play a decisive role in determining which agricultural information or service farmers primarily access via mobile phones.

Descriptive results revealed positive self-perceptions of digital literacy across the sample. Attitudes were particularly strong: 90.3% of respondents (strongly) agreed that they liked receiving agriculture-related information and services using ICTs (Item 14), and 90.0% (strongly) agreed that mobile phones are useful for this purpose (Item 15). These high levels of perceived usefulness and motivation align closely with the core constructs of the Technology Acceptance Model (TAM), which posits that perceived usefulness and perceived ease of use are primary drivers of technology acceptance and usage behavior (Davis, 1989; Chuttur, 2009). The strong agreement on usefulness (90.0%) indicates that farmers recognize the potential value of mobile phones for timely access to market prices, weather forecasts, agronomic advice, and other services, a perception that likely sustains use even among those with limited advanced skills.

Basic operational competencies were also widely reported. Between 80.3% and 94.0% of respondents affirmed ability to perform foundational tasks such as identifying phone buttons (power on/off, call/end), receiving calls and sending SMS, and saving contacts (Items 16–18). These results correspond to the lower levels of the digital literacy framework (access and interpret components), where farmers demonstrate sufficient skills to engage with voice calls and basic text messaging — the dominant channels for agricultural information delivery in the study (51.6% via calls, 28.2% via SMS/USSD). The high prevalence of these basic skills supports the argument that, for the majority of farmers who rely on basic phones (51.3%), minimal digital literacy is adequate to meet core information needs (e.g., market prices and weather forecasts, accessed by 29.6% and 25.1% respectively). This pattern is consistent with earlier studies in rural Uganda and sub-Saharan Africa, which found that basic mobile functions (calls, SMS) are sufficient for delivering essential advisory content when infrastructure and content are appropriately aligned (Nyamba & Mlozi, 2012; Misaki *et al*., 2018).

Advanced digital literacy competencies were lower. Only 56.4% to 68.6% of respondents reported confidence in using audio/video features, browsing the internet, or accessing internet facilities on smartphones (Items 19–20). These figures reflect a clear digital divide: while basic phone users can meet immediate needs with minimal skills, smartphone owners (34.2%) possess greater potential for richer content engagement (e.g., apps, websites), but many still lack full proficiency in advanced tasks. The lower agreement on these items aligns with the affordance's perspective, which emphasizes that the actual use of technology depends on the relational interplay between user capabilities, device materiality, and contextual constraints (Evans *et al*., 2017; Leonardi, 2011). In Luwero, where cost of airtime/data limited access for 67.8% of respondents and network coverage was unsupportive for 23.4%, the affordances of smartphones may be under-realized even among owners.

The non-significant regression result for digital literacy suggests that the relationship between digital literacy and ICT use for agricultural access is not linear or direct in this context. Several factors may explain this finding. First, the dependent variable captured only one nominated service per farmer, limiting variability and masking potential differences in the diversity or frequency of access. Farmers prioritized market prices and weather forecasts (54.7% combined), services that are effectively delivered via basic voice and SMS/USSD channels regardless of advanced literacy. This ceiling effect reduces the observable impact of higher-order digital skills. Second, the self-reported Likert scale for digital literacy (Items 14–20) overestimate actual competencies due to social desirability bias or lack of objective assessment, a common limitation in rural low-literacy settings (Alant & Bakare, 2021). Third, external contextual constraints (e.g., airtime cost, network reliability, content relevance) appear to dominate access decisions more than individual skills, consistent with studies highlighting infrastructural and economic barriers in rural Uganda (Nyamba & Mlozi, 2012; UCC, 2023).

From the TAM perspective, the high perceived usefulness (90.0%) and reasonable perceived ease of use for basic functions (80–94%) explain why most farmers actively use mobile phones for agriculture despite varying digital literacy levels (Davis, 1989). The affordances framework further clarifies that farmers perceive basic phones as offering sufficient affordances (reliable voice/SMS access to critical information) for their priority needs, reducing the relative importance of advanced literacy (Evans *et al*., 2017). The non-significant result therefore does not diminish the value of digital literacy but indicates that, in Luwero's current context, it is not the primary driver of which service farmers report as their main source of agricultural information.

5.3 The influence of basic phone use in agricultural communication on farmers' access to information and services

The findings indicate that basic phone use has a statistically significant and positive influence on farmers' access to agricultural information and services in Luwero District ($\beta = 0.246$), leading to the rejection of the null hypothesis and acceptance of the alternative hypothesis. This suggests that even relatively simple mobile technologies, such as basic phones, remain highly relevant in improving agricultural communication, particularly through voice calls and SMS-based services that provide timely market prices, weather updates, and extension information. The results imply that accessibility and affordability of basic phones make them an effective communication tool for a wide range of farmers, including those in rural settings with limited access to advanced ICTs. This finding is consistent with the study's overall results, which show that mobile-based communication tools contribute meaningfully to improving farmers' information access and decision-making in agriculture, reinforcing the role of basic ICTs in rural development contexts. Basic phones were the most commonly owned device type (51.3%, n = 180), reflecting their affordability and widespread availability in rural Uganda.

Reception of agricultural information occurred predominantly through channels well-suited to basic phones: calls (51.6%) and SMS/USSD codes (28.2%), together accounting for 79.8% of reported methods. These simple, low-bandwidth channels are reliable even in areas with limited data coverage or low digital literacy, enabling farmers to access time-sensitive, decision-critical information such as market prices (29.6%) and weather forecasts (25.1%), which together comprised over half (54.7%) of the main services reported. The Technology Acceptance Model (TAM) explains this continued reliance through high perceived usefulness (90.0% agreement that mobile phones are useful for agricultural information) and perceived ease of use for basic functions (80.1–94.0% proficiency in receiving calls/SMS, saving contacts, and performing basic operations) (Davis, 1989; Chuttur, 2009). Farmers perceive basic phones as offering sufficient affordances for their immediate farming needs (Evans *et al*., 2017; Leonardi, 2011).

Basic phones require minimal literacy beyond foundational skills (e.g., making/receiving calls, reading SMS), which the majority of farmers possess (80–94%). The affordances framework underscores that basic phones afford effective communication for priority services without demanding advanced interpret, evaluate, or create competencies (Evans *et al*., 2017). This finding corroborates earlier research in rural sub-Saharan Africa, which consistently shows that voice and SMS-based platforms remain highly effective for smallholder farmers, particularly where smartphones are less affordable or accessible (Misaki *et al*., 2018; Nyamba & Mlozi, 2012; Ogutu *et al*., 2024).

Contextual factors further explain why basic phones exert a positive influence. Mobile network coverage was supportive for 76.6% of respondents, enabling reliable call and SMS/USSD delivery. Regular access to charging (electricity or solar power) was reported by 82.1%, ensuring devices remained operational. External support from government or NGO programs assisted 58.4% of farmers in accessing digital services, likely including SMS-based advisory platforms that are compatible with basic phones. However, cost barriers were prominent: 67.8% reported that airtime or data costs limited access. This economic constraint is particularly relevant for basic phone users, who depend heavily on airtime for voice calls and SMS rather than data bundles required for apps or websites. The high prevalence of cost limitation suggests that while basic phones are functionally effective, their full potential is constrained by affordability; a finding consistent with studies highlighting economic barriers to sustained mobile-based agricultural communication in rural Uganda (Alant & Bakare, 2021; UCC, 2023).

Theoretically, the significant positive effect of basic phone use supports TAM's emphasis on perceived ease of use and usefulness as key drivers of technology acceptance (Davis, 1989). Farmers perceive basic phones as easy to operate for essential tasks and highly useful for obtaining market prices and weather information needs that are immediate and directly impact daily decisions. The affordances perspective adds depth: basic phones afford reliable, low-cost, low-literacy communication that matches the material and contextual realities of smallholder farming in Luwero (Leonardi, 2011; Evans *et al*., 2017). The relational nature of affordances explains why basic phones outperform expectations based on digital literacy alone: farmers actively appropriate the device's simple features to meet priority needs, regardless of advanced skill levels.

5.4 The influence of smartphone uses in agricultural communication on farmers' access to information and services

As indicated in the results the null hypothesis that the use of smartphones in agricultural communication does not significantly enhance access to information and services in Luwero District was accepted. Smartphone use emerged as a significant predictor, but the relationship was negative: farmers using smartphones were predicted to have a 0.499-unit lower score on the dependent variable (main service accessed) compared to non-smartphone users, holding gender, age, and education constant. The standardized beta coefficient of -0.292 indicates a moderate negative effect, meaning that a one standard deviation increase in smartphone use is associated with a 0.292 standard deviation decrease in the main agricultural information or service accessed.

Findings showed that smartphones were owned by 34.2% of respondents (n = 120), making them the second most common device type after basic phones (51.3%). Smartphone users reported higher proficiency in advanced competencies: 56.4% could use audio/video features, 56.4% could browse the internet/social media/download apps, 68.6% could access internet facilities, and 67.8% could handle audio/video messages (Items 12–13, 19–20). Reception methods among the full sample were dominated by calls (51.6%) and SMS/USSD codes (28.2%), but smartphone-specific channels (mobile apps 8.8%, websites 11.4%) were more prevalent among smartphone owners. These patterns indicate that smartphone users have the technical capacity and device affordances for richer, internet-based content delivery (Evans *et al.*, 2017; Leonardi, 2011), yet the negative regression coefficient suggests they report a different or lower-ranked "main" service compared to basic/feature phone users.

Several factors may explain the negative association. First, the dependent variable — the single "main" service selected from Question 7 — likely introduces measurement bias. Smartphone users may access a broader range of services (e.g., agronomic practices or agro-inputs via apps/websites) but, when forced to nominate one primary service, select something other than the dominant basic-phone services (market prices 29.6%, weather forecasts 25.1%). Basic phone users, reliant on calls/SMS/USSD, consistently prioritize these time-sensitive, voice/text-deliverable services. The single-choice format thus masks diversity and creates an apparent "lower" score for smartphone users. Second, transitional barriers may limit effective smartphone use: 67.8% of respondents reported that airtime/data costs restricted access, and 23.4% noted unsupportive network coverage; challenges more pronounced for data-dependent smartphone functions than for basic voice/SMS. The Technology Acceptance Model (TAM) posits that perceived ease of use and usefulness drive adoption (Davis, 1989). While smartphone users report higher advanced skills, perceived ease of use for internet/app functions may be lower due to cost, coverage, or content unfamiliarity, reducing their reported reliance on smartphone channels for the "main" service.

While smartphones offer greater affordances (multimedia, interactivity, real-time data), actual use often lags behind ownership due to economic, infrastructural, and literacy barriers (Alant & Bakare, 2021; Magesa *et al*., 2023; Ogutu *et al*., 2024). In Luwero, basic phones afford reliable, low-cost access to priority services (market prices, weather) via familiar channels, while smartphones afford potential for more comprehensive or specialized content (e.g., detailed agronomic advice via apps. The moderate negative effect (β = -0.292) is statistically robust but likely reflects measurement artifact rather than a true reduction in access. Smartphone users probably access more diverse or higher-value information overall, but the question format forces a single nomination that favors basic services among basic phone users.

Chapter Six: Conclusion and Recommendations

6.0 Introduction

This chapter presents the conclusions and recommendation. The conclusions are drawn from the discussion of results presented in the previous chapter while the recommendations are drawn from the conclusions presented in this chapter.

6.1 Conclusions

The study drew the following conclusions in the esctions below based on the findings.

6.1.1 Digital literacy on farmers' use of ICTs in agricultural communication to access information and services

The regression analysis demonstrates that digital literacy has no meaningful or statistically significant influence on farmers' use of ICTs for accessing agricultural information and services in Luwero District. The minimal change in explanatory power, combined with the very low R^2 value and negative adjusted R^2, indicates that the model explains virtually none of the variation in ICT use. This suggests that other factors beyond digital literacy are likely more important in shaping farmers' engagement with ICT tools. Consequently, the study fails to provide evidence for a relationship between digital literacy and ICT use, leading to the acceptance of the null hypothesis and rejection of the alternative hypothesis. The study concludes that digital literacy does not significantly determine farmers' use of mobile phones in agricultural communication to access information and services. Farmers with varying levels of digital literacy still access essential services such as market prices and weather forecasts through simple voice calls and SMS/USSD. Basic phone functions are sufficient for meeting immediate information needs, and higher-level digital skills (such as internet browsing or multimedia use) are not required for the core services farmers prioritize. This showed that access is driven more by device simplicity, perceived usefulness, and channel availability than by advanced individual competencies.

6.1.2 Basic phone use in agricultural communication and farmers' access to information and services

The basic phone use significantly improves farmers' access to information and services. Basic phones enable reliable and widespread delivery of time-sensitive agricultural information especially market prices and weather forecasts through familiar and low-literacy channels such as voice calls and SMS/USSD codes. These simple methods match the needs and capabilities of most smallholder farmers, ensuring continuity of access even in resource-constrained settings. The study concludes that standardized beta coefficient ($\beta = 0.246$) indicates a positive and moderate effect, meaning that a one standard deviation increase in the use of basic phones is associated with a 0.246 standard deviation increase in farmers' access to agricultural information and services. This positive and statistically meaningful relationship suggests that basic phone use plays an important role in enhancing farmers' access to agricultural communication channels such as voice calls and SMS-based services, including market price updates and weather information. Based on these results, the null hypothesis (H_{02}) is rejected, while the alternative hypothesis (H_{12}) is accepted. Basic phones therefore remain an effective and dominant tool for supporting day-to-day farming decisions.

6.1.3 Smartphone use in agricultural communication and farmers' access to information and services in Luwero district

The study concludes that smartphone use significantly influences farmers' access to information and services, but the current pattern shows a different set of accessed services compared to basic phone users. Smartphone owners tend to report a different primary service as their main source, likely due to the availability of richer content through apps and websites. However, full benefits are constrained by barriers such as cost of data, network reliability, and transitional skill gaps. Smartphones therefore offer potential to expand the range and depth of agricultural information and services, but their impact is not yet fully realized in this context.

6.2 Recommendations

There is need for government, civil society organizations and academic institutions to tailor programmes to improve the digital literacy of farmers in Luwero district. This will go a long way in improving farmers' use of ICTs in agricultural communication to access information and services.

Agricultural Extension Officers should be deliberately repositioned as *digital intermediaries* within agricultural communication systems, rather than being treated only as traditional field-based advisors.

There is need for policy makers and implementers to provide a conducive environment for mobile network operators to improve network coverage in remote areas in Uganda. There is need for mobile telecom operators to reduce the cost of data and airtime to increase internet access among farmers in rural areas. This will improve the use of mobile phones in agricultural communication to access information and services in Luwero district.

There is also need for government to improve access to electricity and/or solar power in rural areas of Luwero district. This will improve the use of ICTs in agricultural communication to access information and services in Luwero district.

There is need for government to reduce the tax on mobile phones, in order to reduce the cost of smartphones and make them affordable to the rural farmers. This will improve the use of smartphones in agricultural communication to access information and services in Luwero district.

6.3 Researcher's Contribution to the Body of Knowledge

This study makes the following contributions to the existing body of knowledge on digital literacy, mobile ICT adoption, and agricultural information access among smallholder farmers:

The research provides empirical evidence that basic phone use significantly improves farmers' access to essential agricultural information and services in a rural Ugandan context. By demonstrating a positive and significant influence of basic phones ($\beta = 0.246$, $p < 0.001$), the study confirms that simple, low-literacy devices remain effective for delivering time-sensitive information (market prices, weather forecasts) through voice calls and SMS/USSD channels. This finding strengthens the argument that basic mobile platforms are not just transitional but continue to serve as a strategic and dominant tool for agricultural communication in resource-constrained settings.

The study also shows that digital literacy does not significantly determine farmers' use of mobile phones to access agricultural information and services ($\beta = 0.020$, $p = 0.707$). This challenges assumptions in prior literature that higher digital literacy automatically leads to better ICT-enabled outcomes and shows that, in Luwero District, access is driven more by device simplicity, perceived usefulness, and channel appropriateness than by advanced individual skills.

Furthermore, the research reveals a significant but negative association between smartphone use and the measured main service accessed ($\beta = -0.292$, $p < 0.001$). This finding contributes new evidence by suggesting that smartphone ownership shifts farmers toward different information sources. It explains the transitional nature of smartphone adoption in rural areas where benefits are constrained by cost, coverage, and skill gaps.

Theoretically, the study extends the application of the Technology Acceptance Model and the Theory of Communication Technology Affordances to a low-resource agricultural context. It indicates that perceived usefulness and ease of use sustain basic phone use for core needs, while device-specific affordances (basic vs. smartphone) interact with contextual barriers to shape actual access patterns.

Methodologically, the research advances understanding by applying hierarchical multiple linear regression to isolate the unique effects of phone type while controlling for demographics, providing clearer evidence of device influences than many prior studies in Ugandan agriculture.

6.4 Areas for Further Research

The following areas are recommended for further investigation:

A similar study should be conducted in other regions of Uganda (such as northern, western, or eastern districts) with different agro-ecological conditions, market access, and infrastructure levels to determine whether the positive influence of basic phone use and the non-significant role of digital literacy observed in Luwero can be generalised across diverse rural farming contexts.

In addition, a similar study should focus on women farmers and youth farmers as distinct sub-groups to examine whether gender or age moderates the relationships between phone type, digital literacy, and access to agricultural information and services.

Research should employ multi-item, behavioural measures of access to better capture the full range and quality of benefits from smartphone.

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Appendix A: Survey Questionnaire

Impact of digital literacy on farmers' use of mobile phones to access agriculture related information: A case study of Luwero district

Introduction

My name is Naisanga Priscilla a student of Uganda Christian University, pursuing a Master of Arts in Strategic Communications. *I am carrying out research on* "*the impact of Farmers' Use of Mobile Phones to Access Information on Agriculture and Services in Uganda.*" You have been selected to participate in this study. Results will be used for academic purposes and published in a dissertation.

Thank you for accepting to participate in the study.

Demographic Info

Please tick against your most appropriate answer.

What is your gender?

☐ Male

☐ Female

What is your age?

☐ Below 20 years

☐ 21-30 years

☐ 31-40 years

☐ 41-50 years

☐ Above 50 years

What is your highest level of education?

☐ Primary

☐ Secondary

☐ Tertiary

☐ University

If primary, can you read and write?

☐ Yes

☐ No

Phone ownership

Please tick against your most appropriate answer

Do you own a mobile phone?

☐ Yes

☐ No

If yes, what type of mobile phone do you use?

☐ Basic phone

☐ Feature Phone

☐ Smart Phone

Do you use a basic phone to access agriculture-related information and services?

☐ Yes

☐ No

Do you use a smartphone to access agriculture-related information and services?

☐ Yes

☐ No

If yes, what agriculture-related information and services do you access?

☐ Weather forecast

☐ Market price

☐ Agro-insurance

☐ Agro-inputs (fertilizers, pesticides)

☐ Good agronomic practices

How do you receive agriculture-related information and services?

☐ SMS/USSD code

☐ Call

☐ Website

☐ Mobile app

Digital Literacy

Please indicate your level of agreement/disagreement with these statements

I like to receive agriculture-related information and services using ICTs

☐ Strongly Agree

☐ Agree

☐ Neutral

☐ Disagree

☐ Strongly Disagree

I find a mobile phone useful for accessing agriculture-related information and services

☐ Strongly Agree

☐ Agree

☐ Neutral

☐ Disagree

☐ Strongly Disagree

Digital Learning

Please indicate your level of agreement/disagreement with these statements

I can recognize and identify mobile phone symbols

☐ Strongly Agree

☐ Agree

☐ Neutral

☐ Disagree

☐ Strongly Disagree

I can perform basic phone functions.

☐ Strongly Agree

☐ Agree

☐ Neutral

☐ Disagree

☐ Strongly Disagree

I can save contacts, type and read messages.

☐ Strongly Agree

☐ Agree

☐ Neutral

☐ Disagree

☐ Strongly Disagree

I can use a smartphone to send, receive, and access audio and video messages.

☐ Strongly Agree

☐ Agree

☐ Neutral

☐ Disagree

☐ Strongly Disagree

I can use a smartphone to access internet facilities.

☐ Strongly Agree

☐ Agree

☐ Neutral

☐ Disagree

☐ Strongly Disagree

Contextual Environment

Please indicate your level of agreement/disagreement with these statements

The government policies regulating telecom companies have increased internet access in rural areas.

☐ Strongly Agree

☐ Agree

☐ Neutral

☐ Disagree

☐ Strongly Disagree

Digital capacity-building programs have increased access to agricultural information.

☐ Strongly Agree

☐ Agree

☐ Neutral

☐ Disagree

☐ Strongly Disagree