An Analysis Of The Role Of Information Communication And Technology Towards Food Security: A Case Study Of Musana Communal Area

A dissertation submitted in partial fulfilment of the requirements for the Master of Science Degree in Food Security and Sustainable Agricultural Production

Bindura University of Science Education

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DECLARATION

I hereby declare that the research project entitled "**AN ANALYSIS OF THE ROLE OF INFORMATION COMMUNICATION AND TECHNOLOGY (ICT) TOWARDS FOOD SECURITY**" submitted to Bindura University of Science Education, Department of Agricultural Economics, Education and Extension is a record of an original work done by me under the guidance and supervision of **Mr VT Munyati** and this work is submitted in partial fulfilment of the requirements for the award of a Master of Science Degree in Food Security and Sustainable Agriculture. The results embodied in this thesis have not been submitted to any University or Institute for the award of any degree of diploma.

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DEDICATION

This research project is dedicated to my mother as I am indebted for all the sacrifices she has made throughout my life, as she has been a persistent source and inspiration in my life.

This one is for you.

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ABSTRACT

Rural communal household food insecurity has become a protracted problem that unceasingly need urgent attention as it threat to developing countries such as Zimbabwe. The study made an analysis on the role of ICT amongst small scale farmers in Musana communal area it investigated small-scale farmer's attitudes and perceptions towards the role and use of ICT in agricultural marketing and the type of ICT currently being used and the factors affecting adoption. The study employed a multi-stage sampling technique which assisted selection of 90 households that were drawn from 3 wards identified from Musana communal area in Bindura District. The survey used a questionnaire that collected demographic information and attitudes and perceptions of the farmers towards the use of ICT by the farmers in agricultural marketing and a multi variate backward regression model. The data collection procedure was improved by the use of a combination of a direct interview and closed ended questionnaire that were effected at ward level collecting. The study used SPSS version 24 to process and analyse the data. The study unravelled that 95% of the respondents revealed that they have a functioning mobile phone, whilst 80 % confirmed ownership of a radio set, 45% had a television set and 30% had internet access with only 5 % having access to a computer. The study discovered that 38% of the respondents strongly agreed that mobile phones can be a useful source of agricultural information with 42% strongly agreeing that mobile phone have a role to play in finding markets for their produce. The study indicated a negative attitude towards ICT as the ranking was 3.44 (34%) which is low towards the use of ICT although 77% of the respondents were willing to use ICT in agricultural marketing with only 13% indicating that they were not willing to use. The results attained incidental that the majority of the rural households were not using ICT. The study found that several factors were statistically significant at the 5% level in a regression model analysing the adoption of ICT in agricultural marketing by small-scale farmers in the Musana communal area. These factors included the age of the farmer, willingness to pay, education level, type of crop grown, and language on device. Key recommendations include improving access to ICT infrastructure such as smartphones, tablets, and computers, providing training on how to effectively use ICTs for agricultural activities and marketing. Identifying the specific barriers that prevent farmers from adopting ICT, such as cost, access to technology, or lack of training factors and communicate the potential benefits of ICT for farmers, such as improved crop yields, reduced labour costs, and better access to market information.

Keywords: ICT, Perceptions, Attitudes, Ranking, Food Security

LIST OF ACRONYMS AND ABBREVIATIONS

AGRITEX:	Department of Agricultural Technical and Extension Services
ICT:	Information Communication and Technology
PEOU:	Perceived Ease of Use
PU:	Perceived Usefulness
TAM:	Technology Acceptance Model
TV:	Television
UN:	United Nations
USAID:	United States Agency for International Development
WFP:	World Food Programme
WFP:	World Food Summit
WHO:	World Health Organisation

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CHAPTER ONE

Introduction

1.1 Background of the study

Food security has been a major concern on the African continent especially amongst the less developed countries, Globally, the pressure from population growth and climate change has positioned a bigger demand on farmers to advance farm productivity while the need for food security remains to be an importance in many developing countries.

The agricultural sector in most African countries is still not yet developed and food insecurity is still a major challenge. By contrast African continent has enormous natural resources, and the agricultural prospective is high, but most less developed countries are still large importers of food and exporters of unprocessed raw material. Smallholder farmers are the mainstream of rural poor in many developing countries in Africa. Small scale farmers in Zimbabwe are mainly involved in subsistence agriculture, which is regularly categorised by little productivity, little marketable surplus and little investment a condition labelled as low equilibrium poverty trap.

Zimbabwe was said to have a total of 5.6 million in urgent need of food aid in 2023 according to USAID 2022. Food security is rapidly deteriorating in communal areas so necessary interventions should be made. The unfortunate performance of the rains is probable to consequence in widespread crop damages. Truncated household food stocks will result in substantial food deficits, predominantly for the actual deprived households throughout the year.

Before any developmental issue in an economy the population must be fed as food is the basic need. Insufficient nutrition is well-thought-out as degree of poverty in numerous societies or tantamount to poverty (Datt, 2020). According to Helen (2022), food security is recognised to uphold political stability and safeguards non-violent synchronicity among people while food insecurity on the other hand consequences into poor health and reduces performance of both children and adults. Food security is therefore defined as a state of concerns when all people at all periods have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for a healthy and active life (World Food Summit, 2003).

They are three pillars foundation on food security has been identified according to World Bank report these include, food utilization food accessibility and food availability. This incomes that any country whose food manufacture level is incapable to placate these three dimensions standards is labelled to be food insecure. Food availability, access and utilization are foremost difficulties in many African countries and as a result, food catastrophes are always existing.

Zimbabwe like any other country is facing climate change and this has led to poor rainfall and food shortages, one of the major causes of these calamities is communication and insufficient knowledge. A critical influence in dealing with the challenge of guaranteeing food security among rural households in developing countries is human capital development through knowledge building and information sharing (Murithii, 2009). According to Rafea (2009), there is an absence of interface between small scale famers and extension services, there is over-all lack of pertinent and exact information on sustainable farming practices, basic farm management, value addition of agricultural harvest and a reliable market for produce at sustainable prices.

ICT encompasses of numerous assemblages of properties and technical apparatuses that are used for linking, diffusion, storing and handling information (Pigato, 2004). Information and Communication Technology (ICTs) consequently takes the principal of all the approaches for safeguarding household food security amongst rural population through the propagation of pertinent information (Batchelor et al., 2005).

Though, Chowdhury (2001) reckoned the significance of ICTs in relation to food security and poverty reduction. This is attained by construction of information available on food security dimensions, marketing of produce and in inclusively aiding farmers in making lucid decisions as appropriate reporting of trans-boundary animal diseases using mobile technology would save the lives of a large number of animals and minimize financial losses.

ICTs plays an imperative role in stimulating innovation in the agriculture sector. Amid others, mobile phones have been very influential. At current, 6.8 billion mobile connections have been reputable for a 7 billion world populace. By using mobile phone technology, diverse types of innovations have occurred in the agricultural sector, which comprise of commodity and stock market price data and analysis, weather-related data collection, advisory facilities to farmers for agricultural extension, GIS and early warning systems, financial services, traceability of agricultural products, agricultural statistical data gathering,

etc. The worth of these state-of-the-art technologies and facilities should not be undervalued, as refining agricultural extension services to farmers using mobile technology would efficiently advance the broadcast of agricultural research results for application in farmer's fields.

In ICT mobile phone technology is extensively available to all populaces and has been contributing an irreplaceable role in cultivating social, economic and environmental expansion in developing markets. In order to enable food modicum in present-day Africa, it is essential to discover and exploit all aids derivable from immeasurable ICT applications, specifically at all stages.

Agricultural marketing data accessible to farmers would not solitary aid farmers to trade their products at better prices, but also bring dependable food price information to policy makers to avert price unpredictability and speculation as these all would contribute to enhancing food security by being believed to be the continent with the uppermost "demographic divide" internationally as meditative of its accumulative number of young populations, Africa needs to influence this position by digitalising its agricultural value chain.

1.2 Problem statement

Food insecurity has become a common phenomenon amongst smallholder farmers in Zimbabwe due to climate-induced droughts, lack of Information and Communication Technology (ICT) adoption and low usage by small-scale farmers in Zimbabwe has resulted in limited access to information, knowledge, and market opportunities, hindering their agricultural productivity and income generation.

The absence of reliable and affordable ICT infrastructure and services has rendered small-scale farmers unable to access and leverage valuable resources such as weather and market information, agricultural extension services, and financial services, thus posing a substantial threat to the development of the agricultural sector and rural livelihoods in Zimbabwe.

The lack of access to Information and Communication Technology (ICT) is a significant problem for small-scale farmers in Zimbabwe. This is because they absence to access to data about weather patterns, market prices, and best practices for farming. This can make it problematic for them to make conversant choices about what crops to plant, when to plant them, and where to sell them.

ICT can also be a valuable tool for lifelong learning, allowing farmers to learn about improved farming techniques and innovations. Without access to ICT, small-scale farmers may struggle to keep up with the latest developments in agriculture.

Due to lacking of access to ICT, small-scale farmers in Zimbabwe have struggled to connect with buyers and access markets beyond their local area. This can limit their ability to sell their crops and earn a sustainable income.

Due to lack of ICT small-scale farmers may also struggled to access financial facilities, such as credit and insurance, without access to ICT. This has made it difficult for them to invest in their farms and manage risks as without access to ICT, small-scale farmers have struggled to access government services, such as agricultural extension services and subsidies. This has limited their ability to access resources they need to succeed in farming.

The lack of access to ICT has play a huge devastating role for small-scale farmers in Zimbabwe. As it has limited their access to information, markets, financial services, education and training, and government services, all of which are essential for their success. Addressing this problem will require investment in ICT infrastructure and programs that are custom-made to meet the needs of small-scale farmers

1.3 Objectives

1.3.1 Main objective

To evaluate the role of ICT in improving food security

1.3.2 Specific objectives

1. To determine the type of ICT technology used in agricultural marketing
2. To assess the farmers perceived benefits from the use of ICT towards food security
3. To assess if they use ICT in the marketing of their crops
4. To determine the attitudes of the farmers toward the use of ICT
5. To determine challenges being experienced by small scale farmers in accessing ICT

1.3.3 Research questions

- What type of ICT does small scale farmers have in Musana communal area?
- Do they use ICT in agricultural marketing?
- What are they perceived benefits from using ICT?

- What are their attitudes towards the use of ICT?
- What are the challenges being experienced in accessing ICT?

1.4 Hypothesis

1.4.1 Hypothesis 1

The research study hypothesised that the rural households in Musana communal area use ICT in agricultural marketing and believe that has a significant role to play amongst small scale farmers towards food security

1.4.2 Hypothesis 2

The research study hypothesised that the rural households in Musana communal area do not use ICT in agricultural marketing and believe that it has no significant role to play amongst small scale farmers towards food, and that it is not worth using.

1.5 Motivation of the study

Zimbabwe as a country is experiencing food insecurity especially amongst rural population which has seen its resilience dwindle due to climate change and poor farming systems. The study of role of ICT amongst small scale farmers in Zimbabwe is a very crucial part of research that has very serious part to play in the expansion of the agricultural sectors in the nation. The Zimbabwe was once considered the bread basket of Africa, with its large population engaged in small scale agriculture, however these farmers are facing a numeral challenges which include unsustainable prices, poor markets, information asymmetry and low productivity.

The use of ICT in agricultural marketing has potential to address some of these challenges and this is possible by improving extent in which small scale farmers use ICT therefore the motivation of this study is to provide a comprehensive understanding of the role of ICT in agricultural marketing amongst small scale farmers in Zimbabwe.

1.6 Justification of the study

This study is crucial as small-scale farmers in Zimbabwe are often among the poorest members of society, and improving their livelihoods is an important goal for poverty reduction. By studying the part of ICT amongst small-scale farmers, we can identify ways to help them access markets, information, and financial services, which can improve their income and reduce poverty, also by studying the role of ICT amongst small-scale farmers, we

can identify ways to bridge this digital divide and promote digital inclusion. By studying the role of ICT amongst small-scale farmers in Zimbabwe is important for economic development, poverty reduction, sustainable agriculture, digital inclusion, and policy implications.

So by understanding the challenges and opportunities associated with ICT adoption amongst small-scale farmers, we can identify ways to support their success and improve their livelihoods.

1.7 Scope of the study

The study is restricted to communal rural households in Musana communal area and will exhume information only from the recent agricultural marketing trends of their life not the far past experiences. It pursues to do an investigation of demographics, agricultural production and ICT use contribute to food security. This tangled the modelling of rural people types of ICT used. The project will not intend to at the farmer's perceptions and attitudes of using ICT. The assumptions are that people in the area use ICT in their agricultural marketing.

1.8 Limitations

During the study period Zimbabwe was gearing towards presidential elections and this made some respondents unwilling to participate in the study as they feared victimisation. This in turn reduced the gathering of statistics from the wards. However the challenge had to be solved by taking a longer period collecting data in the field than the expected. Due to financial challenges, the researcher could only to use workmates in order to gather data.

1.9 Outline of Thesis

The study was organised into 6 chapters.

- Chapter 1 (Introduction):

  This encompasses of the background of the study, problem statement, objectives, research questions, hypothesis, and motivation of the study, justification, scope of the study, limitations and outline of the thesis.

- Chapter 2 (Literature Review):

  Encompasses of the introduction, study conceptual framework and summarization of literature.

- Chapter 3 (Methodology):

  This postulates the description of the study site, research design, sampling procedure, data analysis procedure, ethical considerations summary and references.

- Chapter 4 and 5 (Results):

  Each chapter has a manuscript signifying the study each encircling of an abstract, introduction, materials and methods, description of the study area, sampling procedure, data collection and analysis procedure, challenges encountered during data collection, results and discussion of results, recommendations, conclusion and references.

- Chapter 6:

  Comprises of the introduction, research summary, conclusions, policy implication and recommendations, areas for further research, references and appendices.

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CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter covers the numerous studies that were undertaken by different scholars globally. The researcher has revised these studies and managed to associate and narrate them to the role of ICT towards food security amongst small holder's farmers. The chapter highlighted the applicable literature, information and other studies supported out in the field of food security by various scholars and researchers and provided comprehensive discussions on theoretical review, empirical review, and research gaps as well.

2.1.1 The type of ICT technology used in Agricultural Marketing

Use of ICT in agriculture

ICTs have been used to improve agriculture productivity, access to information and markets, and to increase the resilience of smallholder farmers. According to a study by Kshetri et al. (2015), In Zimbabwe ICTs have facilitated better access to weather information, crop management techniques, and market prices, which have in turn led to increased yields and income for small scale farmers.

2.1.1.1 Mobile phones

Mobile phones have been the most widely used ICT tool by rural farmers. They allow farmers to access information on weather forecasts, market prices, and crop management techniques quickly and efficiently. A study by Qamar et al. (2016) originate that mobile phones have improved the livelihood of farmers in Pakistan by providing admittance to timely and accurate information on crop management and market prices. Cellphones provide access to agricultural information services such as weather forecasts, market prices, and advisories. The use of cellphone-based market information systems has resulted in improved market access and better prices for smallholder farmers in India and Bangladesh Nwafor (2020).

Katunyo (2018) indicated that in Malawi, the use of cellphones has facilitated the delivery of extension services, leading to increased maize yields and farmer adoption of new technologies. Tambo (2019) established that about 79% of livestock farmers in Kenya had access to both radio and mobile phones which mostly they use for farming activities. These findings reach agreement with Chikaire (2017) who reiterated that ownership and access to radio and mobiles is critical as sources of agricultural information and communication technologies which may support the majority of the farmers with up-to-date information and agricultural practices.

2.1.1.2 Radios

Radios have been used for the dissemination of information on agriculture and food security. The radio-based extension services in Egypt, for instance, have proven effective in increasing knowledge levels of farmers (Ajani, 2014). A survey conducted in Ethiopia revealed that radio messages on agricultural information have a significant impact on farmers' behavior, with over 83% of farmers exhibiting a positive change. Radio-based communication strategies aimed at promoting food security have had notable impacts on rural communities' livelihoods by facilitating communication and learning. (Martin, 2011)

2.1.1.3 Television

Television has been used as a media platform to promote food security by empowering viewers with information on agricultural practices and the benefits of consuming nutritious food. (Ficarelli, 2012). Examples of successful TV programs include Talking Farming and Murimi Wa Nhasi are LIVE programme that talks about agriculture and its development in Zimbabwe.

Rohila, (2017) highlighted that popular Nigerian TV show "Farmers' Forum" which reaches over 20 million Nigerians and the Tanzanian program "Mkulima Young" which focuses on youth engagement in agriculture. To increase the effectiveness of TV programs, interactive programs and accompanying mobile applications have been developed to complement the information disseminated through these programs.

2.1.1.4 Internet

The internet provides access to vast pools of information on agriculture and food security. Online platforms such as Smart connect, Zim-Agri Hub and others provide farmers, researchers, and policymakers with easy-to-access knowledge on issues related to food

security. The use of online platforms has facilitated the sharing of knowledge, best practices, and lessons learned on food security issues.

2.2 The perceived benefits by small scale farmers from the use of ICT towards food.

Information and communication technologies has exceptional features that offer chances to connect them in ways which are dissimilar from outdated media. ICT offers collaborative communication amongst rural communities and development organizations. (Meera, 2017)

ICTs has the ability to improve the dimensions to search for information and increase the number of information accessible, deliver quality information, decreases vagueness and improve market participation.

Several studies have explored small-scale farmers' perceptions of ICTs in agriculture. For example, a study undertaken by Kariuki (2020) in Kenya found that small-scale farmers had a positive perception of mobile phones and used them primarily for communication and accessing market information. However, the study also identified challenges such as deprived network connectivity and high costs of data, which limited farmers' ability to fully utilize the technology.

Similarly, a study conducted by Kimaro (2018) in Tanzania found that small-scale farmers were interested in using ICTs for accessing market information, weather forecasts, and farming techniques. However, the research also identified challenges such as low levels of digital literacy and limited access to ICTs, particularly among women and marginalized groups.

Another study conducted by Okello (2018) in Uganda found that small-scale farmers perceived ICTs as useful for accessing information on market prices, weather forecasts, and pest and disease management. However, the study also found that farmers had limited access to ICTs and faced challenges such as high costs of devices and poor network connectivity.

Overall, these studies suggest that small-scale farmers perceive ICTs as useful for improving their agricultural productivity and livelihoods. However, the implementation and use of ICTs among small-scale agronomists in unindustrialized countries are hindered by encounters such as limited access to technology and poor network connectivity. Addressing these challenges

will be critical in ensuring that small-scale farmers can fully utilize ICTs to improve their livelihoods and contribute to agricultural development.

ICT-based extension services

ICT-based extension services have been used to provide farmers with information on crop management techniques, market prices, and weather information. These services have been found to be effective in improving yields and income for farmers. A study by Katungi et al. (2016) found that ICT-based extension services in Uganda led to amplified yields for farmers by providing them with information on best practices for crop management.

ICT and market access

ICTs have also been used to improve market access for farmers. There is a significant digital gap between urban and rural areas in Zimbabwe, with rural areas often lacking access to ICT source and services. By studying the role of ICT amongst small-scale farmers, we can identify ways to bridge this digital divide and promote digital inclusion. Online marketplaces and mobile-based platforms have been developed to connect farmers directly with buyers. A study by Akter (2016) found that online marketplaces in Bangladesh have improved market access for smallholder farmers, leading to increased income and improved food security.

Small-scale farmers in Zimbabwe are often among the poorest members of society, and improving their livelihoods is an important goal for poverty reduction. By studying the role of ICT amongst small-scale farmers, we can identify ways to help them access markets, information, and financial services, which can improve their income and reduce poverty.

Economic development:

Agriculture is a key sector of the Zimbabwean economy, and small-scale farmers has an important role in this sector. By studying the role of ICT amongst small-scale farmers, we can identify ways to improve their productivity and profitability, which can contribute to overall economic development.

ICT can also help with reducing poverty amongst small scale farmers as they can now be able to practice sustainable agriculture as farmers in Zimbabwe often rely on traditional farming methods that may not be sustainable in the long term so by studying the role of ICT amongst small-scale farmers, we can identify ways to promote sustainable agriculture practices, such as conservation agriculture and precision farming.

In conclusion, studying the part of ICT amongst small-scale farmers in Zimbabwe is important for economic development, poverty reduction, sustainable agriculture, digital inclusion, and policy implications. By understanding the challenges and opportunities associated with ICT adoption amongst small-scale farmers, we can identify ways to support their success and improve their livelihoods.

2.5 The attitude of small scale farmers towards the use of ICT

Small-scale farmers have a crucial role in agricultural production and food security in many countries, particularly in developing countries. In Zimbabwe with the increasing availability and accessibility of Information and Communication Technologies (ICTs), which include mobile phones and the internet, there is growing notice in considering the way such technologies can support small-scale farmers in improving their productivity, profitability, and livelihoods.

Several studies have explored small-scale farmers' perceptions of ICTs in agriculture. For example, a research undertaken by Kariuki (2020) in Kenya found that small-scale farmers had a positive perception of mobile phones and used them primarily for communication and accessing market information. However, the research also identified challenges such as lack of network connectivity and high costs of data, which limited farmers' ability to fully utilize the technology.

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Another study conducted by Okello (2018) in Uganda established that small-scale farmers perceived ICTs as useful for accessing information on market prices, weather forecasts, and pest and disease management. However, the study also found that farmers had limited access to ICTs and faced challenges such as high costs of devices and poor network connectivity.

Overall, these studies suggest that small-scale farmers perceive ICTs as beneficial for improving agricultural productivity and resilience.

However, the implementation and usage of ICTs amid small-scale farmers in unindustrialized countries is hindered by challenges such as limited access to technology and poor network

connectivity. Addressing these challenges will be critical in ensuring that small-scale farmers can fully utilize ICTs to improve their livelihoods and contribute to agricultural development and this study seek to address that gap.

2.6 Challenges being faced by small scale farmers in accessing ICT

The lack of Information and Communication Technology (ICT) acceptance and usage amongst small-scale farmers in Zimbabwe has resulted in limited access to information, knowledge, and market opportunities, hindering their agricultural productivity and income generation. The absence of reliable and affordable ICT infrastructure and services has rendered small-scale farmers unable to access and leverage valuable resources such as weather and market information, agricultural extension services, and financial services, thus posing a significant challenge to the expansion of the agricultural sector and rural livelihoods in Zimbabwe.

2.6.1 Infrastructure Inadequacies

Farmers face significant obstacles in accessing and utilizing ICT due to inadequate infrastructure in many regions. For instance, there are limited mobile networks in rural, remote, and hard-to-reach areas, which often have fatigued networks and inadequate broadband connectivity, making it hard to access ICT tools (Raza & Qureshi, 2013). Consequently, farmers face challenges in retrieving market information, weather data, and extension services, which are crucial for their agricultural activities.

However despite the benefits of ICTs in agriculture, there are challenges that need to be addressed and this study seek to address the gap and these include low literacy rates, limited access to electricity and the internet, and the high cost of ICT equipment. A study by Awotide (2015) found that limited access to electricity and the internet was a major challenge for farmers in Nigeria, which limited their ability to access and use ICTs.

2.6 2 Lack of Technical Skills

The second challenge that farmers face in accessing ICT is inadequate technical skills, primarily due to inadequate education and awareness on ICT. Most farmers have basic

knowledge and skills on traditional farming approaches, while limited exercise is accessible on the use of ICT tools in agriculture (Kouassi et al., 2016). Consequently, farmers face difficulty in utilizing ICT technologies to retrieve information, market, and financial services. Some farmers are not competent in utilizing essential ICT devices such as computers and smartphones, resulting in decreased efficiency and slow adoption rates of ICT tools.

2.6.3 Cost of Access and Ownership

Farmers often face a barrier to accessing and owning ICT tools, mainly due to the high utilisation costs or investments that come with these tools. Most small-scale farmers have limited financial resources, making it difficult for them to purchase and maintain ICT equipment such as smartphones, computers, and reliable internet connectivity (Raza & Qureshi, 2013). Concurrently, necessary program instalments for running the ICT applications require computer and other high-tech gadget, which positions farmers at a disadvantage point.

2.6.3 Digital Divide

Digital gulf is a significant challenge for the embracing of ICT tools between small-scale farmers. The majority of farmers who are vulnerable and live below the poverty rates are often neglected by the ICT tools' strategic plans. The digital divide persists in most parts globally, with a significant disparity between rural and metropolitan areas in terms of access to ICT and adoption rates. This gap results in different levels of digital exclusion or marginalization and hinders the desired progress of maximizing the efforts and impact ICTs (Kouassi et al., 2016).

2.6.4 Conclusion

The adoption of ICT tools and other digital platforms in agriculture is still relatively low, mainly due to significant challenges experienced by farmers in accessing them. The review has revealed that inadequate ICT infrastructure, technical skills, cost, and digital divide remain significant obstacles that hinder small-scale farmers' potential to develop, progress and benefit from ICT tools. Although impressive efforts have been made to resolve these challenges, developing policies for hosting programs on affordable devices and providing

free ICT training aimed at enhancing technology adoption among small-scale farmers still need to be formulated.

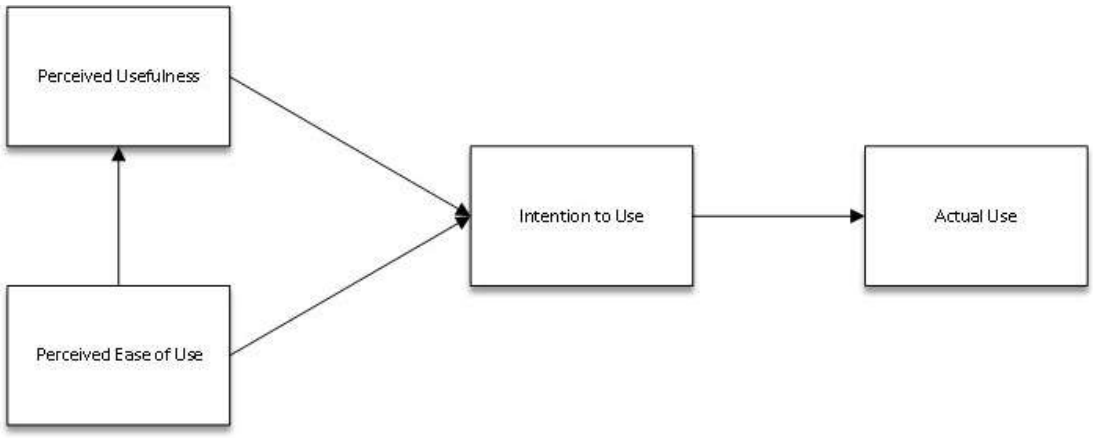
2.3 Theoretical Framework

Adoption of technology is essential to economic progression, yet in developing countries the rate of technology adoption has been very low (Hooks, 2021). While acceptance of technology in agriculture is essential to refining farm productivity, immense literature confirms that acceptance levels of external encouraged technologies persist to be little and the rate of implementation is very sluggish amid small-scale farmers in developing countries (Curry, 2021).

Factors which encourage implementation are highly reliant on overlooked cultural, background, and policy factors, which is evinced by the low adoption in rural areas (Ruzzante, 2021). Information and Communication Technologies have revolutionized many aspects of the modern world, including agriculture. However, small-scale farmers in African countries like Zimbabwe have significantly lagged behind in the embracing of these tools. This study aims to investigate the role of ICT amongst small-scale farmers in Zimbabwe using Technology Acceptance Model (TAM) as a theoretical framework.

The Technology Acceptance Model (TAM) has been widely used in researching the embracing and usage of technology. The model consists of two key variables; perceived usefulness (PU) and perceived ease of use (PEOU) which unswervingly influence the user's assertiveness and intention towards using the technology. Additionally, the model suggests that an external variable such as the social and cultural environment in which the technology is used can have a significant impact on the user's attitude and intention.

Figure 2.3 showing the components of the TAM



Source: *open.ncl.ac.uk*

2.3.1 Applying TAM to the adoption of ICT amongst small-scale farmers in Zimbabwe

2.3.1.1 Perceived Usefulness (PU)

Small-scale farmers especially in developing countries will only adopt and utilize ICT if they perceive it to be useful and advantageous in their farming activities. In Zimbabwe, ICT can assist small scale farmers in accessing agricultural information, weather forecasting, marketing their products, and making informed decisions especially in Musana communal areas. Therefore, it would be critical to evaluate the extent to which these technologies can improve the productivity and profitability of smallholder farming in Zimbabwe. (Araújo & Casais, 2020)

2.3.1.2. Perceived Ease of Use (PEOU)

The second variable to be considered is the perceived ease of use of ICT by small-scale farmers. The ease of use will determine if a farmer can easily integrate the technology into their farming activities. For instance, some ICT tools may require skills that are not common amongst smallholder farmers. This variable will be critical to determining which ICT applications are adopted and utilized by smallholder farmers.

2.3.1.3. Social and cultural environment

The social and cultural environment of small-scale farmers in Zimbabwe can significantly influence their attitude and intention towards the adoption of ICT. Social and cultural norms,

beliefs, and values can determine the level of acceptability of ICT among smallholder farmers. Therefore, it is crucial to explore the social and cultural dimensions of the setting in which these technologies are introduced amongst rural farmers. (Gefen, Karahanna & Straub, 2003)

In conclusion, the TAM framework is an appropriate theoretical lens through which to explore the embracing and usage of ICT amongst small-scale farmers in Zimbabwe. The framework highlights the importance of perceived worth, perceived ease of usage, and the social and cultural environment of the user in determining their attitude and intention towards the adoption of these technologies. A better understanding of these variables can facilitate the development of effective strategies for promoting the adoption and use of ICT amongst small-scale farmers in Zimbabwe.

2.4 Research gap

Despite the widespread acknowledgment of the importance of information and communication technologies (ICTs) in enhancing food security, there is an absence of research that specifically investigates the role of ICT in improving food security in the context of Zimbabwe. This gap in the literature fails to provide a comprehensive appreciative of the extent to which ICTs can be effectively used to address food insecurity in the country despite the existing literature there is a major gap since previous literature focused on large scale Farmers as hot spots neglecting the small scale farmers and this study seeks to address that. There is a crucial need for research in this field to identify specific ICT tools, strategies, and their usability to improve food security in Zimbabwe.

2.5 Summary

This chapter looked at the type of ICT technology used in Agricultural Marketing. The researcher also explored the benefits perceived by small scale farmers from the use of ICT towards food. Security. This chapter concentrated on how small scale farmers use ICT in marketing their crops. The Researcher also looked at Challenges being faced by small scale farmers in accessing ICT.

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CHAPTER THREE

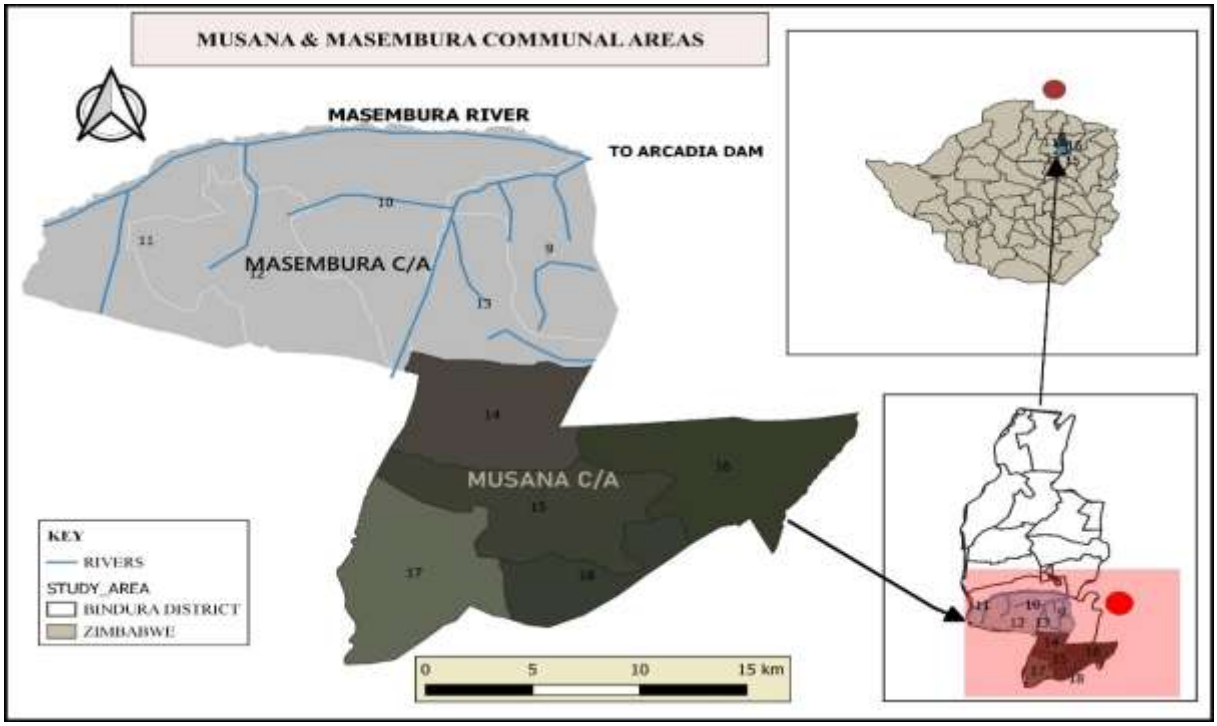
3.1 Introduction

This chapter expounds on the techniques which were employed and the data collection and analysis techniques. The procedures employed in order to attain the stated aims of the study are outlined which farmers perceptions on small on ICT. It also gives the description of the study sites in which the research was done and also the research design that was employed. It also outlines the sampling procedure that was to assess the farmer's perceived benefits from the use of ICT towards food security. The ethical considerations are also outlined in this chapter and it end with a brief summary.

3.2 Description of study site/s

The Musana communal area is located in the Bindura district (16^0 450–17^0 400 S, 31^0 050–31^0 350 E) in Mashonaland Central province of Zimbabwe. The study area covers a zone of approximately 525 km2. The Musana communal area accumulates a mean annual rainfall ranging between 700 mm to 1000 mm and is dispersed from end of October to mid-March.

Fig 3.2 Map showing Musana communal area



3.3 Research design

The purpose of this study was to investigate the role of Information Communication Technologies (ICT) in improving food security in the Musana communal area. The study will take a multi-stage sampling design approach, which will allow for the collection of data from a random sample of households in the area. This methodology provided a reliable and representative sample of the population, allowing for the inferences to be made about the population based on the information collected.

3.4 Sampling design

The study utilized a multi-stage sampling design, which was composed of four stages:

Stage 1: The Musana communal area is divided into clusters based on geographic location of wards which is 10 wards.

Stage 2: A random sample of clusters was selected from the 10 wards using probability proportional to size (PPS) sampling technique.

Stage 3: three wards were randomly chosen from Musana communal area which were ward 9, 16 and 18, from the selected clusters, households were selected using systematic random sampling.

d. Stage 4: Finally, eligible participants were identified based on pre-determined criteria such as demographics, access to ICT, and other information related to food security.

The sample size of respondents was determined by using the Cochran formula below.

$No= (z^2 \times p\ (1-p))/e^2$

In directive to estimate the appropriate district level sample magnitude for farmers, the study based on the entire population of farmers in the three districts and using the following formula for calculating the sample size below:

$n= DEFF * (z^2 * (p)\ (1-p))\ /d^2$

DEFF = Design effect (1.2)

Z value = 1.645 for *p* = 0.1 or 90% confidence intervals

P = Estimated is not known, so we assume that 50%

$q = 1 - p$

$= 1 - 0.5$

$= 0.5$

Therefore, the sample size required was calculated as follow:

$n= DEFF * (z^2 * (p)(1-p))\ /\ d^2$

$n =0.7*(((\ 1.6452\ )*(0.5)*(0.5))/(0.052))$

n=89.5

n=90

Therefore the number of respondents was to be 90, 30 selected from each ward.

3.5 Questionnaires

Questionnaires were used to gather information from farmers in Musana district who are currently undertaking pig production in the district. The questionnaires were handed to the famers by the researcher and each farmer was interviewed separately due to the haphazard of the location of the respondents' in order to collect factual information about farmers and to be able to analyse the profitability and efficiency. Open ended and closed ended questions were both used. Questionnaires were easy to administer and informants had enough time to filling information as farmers were interviewed individually and on different occasions but in the same timeline to maintain relevance. Informants had enough time to fill in the questionnaires at their own pace. The open ended questionnaires allowed respondents to fill information in blank spaces and the advantage of this was not to sway their responses in any direction but to have their own information given. The questionnaire was pilot surveyed with 10 farmers from Matapi (ward 10) area in Chiveso to conclude the efficiency of the questions and this area was not included in data collection.

3.5 Data analysis procedure

Table 3.3 showing data collection tools

Objective	**Data obtained**	**Data analysis**
To determine the type of ICT technology used in agricultural marketing	Qualitative	Descriptive statistics
To assess the farmers perceived benefits from	Qualitative	Thurstone scale

the use of ICT towards food security		
To assess if they use ICT in the marketing of their crops	Quantitative	Descriptive
To determine the attitudes of the farmers toward the use of ICT	Qualitative	Likert scale
To determine factors affecting the use of ICT amongst small scale farmers in accessing	Independent variables	Multivariate regression

3.5.1 Data Cleaning and Analysis

Data cleaning was done through running frequencies and cross-tabulations. Outlier data or responses were verified and cleaned from the data set. Quantitative data was analysed using SPSS and Excel. Descriptive statistics, measures of demographics data.

3.5.6 Multivariate regression

A Multivariate regression model, was tasked to detect factors distressing the usage of ICT by farmers. In this circumstance, the dependent variable was the total score of the respondents on different marketing practices and the independent variables were age, education level, size of family, farming experience, willingness to pay and cultivated land of the farmers. The elimination method commences with a full model loaded with several variables and then removes one variable to test its significance relative to overall results.

Figure 3.5 regression variables

Y = β0 + β1X1 + β2X2 + β3X3 + β4X4 + β5X5 +β6X6 + β7X7 + β8X8 + β9X9 + μi Where:

Y …….....ICT use in marketing of crops

X1 ……..…..Age of the farmers (in years)

X2 …….. Farming experience (years)

X3……Willingness to pay(if yes=1, otherwise, 0)

X4 ……. Level of education (0= primary, secondary= 1, tertiary = 2, vocational training = 3)

X5 ……..…… Network availability

X6 ……..……. Membership of Social Organization (if yes=1, otherwise, 0)

X7 ……..……..... Types of crop grown (horticulture =1, Maize =2,Other =3

X8 ……Access to a device (if yes=1, otherwise, 0)

X9…….…… ...Language on device(If local language=1, otherwise, 0)

β0 ……..……..…...Constant

β1 – β9 ……. …Parameter estimates

μ …….Error term

The significance level was set at 5% and was also considered at 1% and SPSS was be used for data analysis

3.6 Ethical considerations

Participants were informed about the nature and determination of the study. Verbal consent was pursued from each applicant with a right to halt the interview at any stage due to uneasiness or any other circumstances.it also included that the researchers do not place contributors in a position where they might be in risk of harm as a result of their participation in the study, So anonymity and confidentiality were guaranteed to reduce any fear as information which acquired will not be availed to anyone else not involved the study All protocols were observed with relevant authorities such as Chief, Bindura rural District Administrator, Headman and Village Heads being notified of the study prior to the interviewer's data collection commencement. These.

3.7 Conclusion

In conclusion, this research methodology intended to realize the role of ICT in small-scale farmers' lives and agricultural practices. To achieve this, a comprehensive approach was adopted, which involved an extensive literature review and usage of a combination of qualitative and quantitative research methods.

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CHAPTER 4

AN INVESTIGATION INTO FARMERS ATTITUDES AND PERCEPTIONS TOWARDS THE USE OF ICT IN AGRICULTURAL MARKETING IN MUSANA COMMUNAL AREA.

Abstract

The paper concentrated on the investigation of small-scale farmer's attitudes and perceptions towards the role and use of ICT in agricultural marketing and the type of ICT currently being used in Musana communal area. The study employed a multi-stage sampling technique which assisted selection of 90 households that were drawn from 3 wards identified from Musana communal area in Bindura District. The survey used a questionnaire that collected demographic information and attitudes and perceptions of the farmers towards the use of ICT by the farmers in agricultural marketing. The data collection procedure was improved by the use of a combination of a direct interview and closed ended questionnaire that were effected at ward level collecting data to do with the types of ICT used and farmer's attitudes and perceptions. On analyse the data, the study used SPSS version 24 to process the data to which frequency tables and ranking calculator were used to determine the attitudes and perceptions of the farmers. The study unravelled that 95% of the respondents revealed that they have a functioning mobile phone, whilst 80 % confirmed ownership of a radio set, 45% had a television set and 30% had internet access with only 5 % having access to a computer. The study discovered that 38% of the respondents strongly agreed that mobile phones can be a useful source of agricultural information with 42% strongly agreeing that mobile phone have a role to play in finding markets for their produce. The study indicated a negative attitude towards ICT as the ranking was 3.44 (34%) which is low towards the use of ICT although 77% of the respondents were willing to use ICT in agricultural marketing with only 13% indicating that they were not willing to use. The results attained incidental that the majority of the rural households were not using ICT. Key recommendations include using interventions such as awareness campaigns, training and education programs, and provision of technical support, identifying the specific barriers that prevent farmers from adopting ICT, such as cost, access to technology, or lack of training factors and communicate the potential benefits

of ICT for farmers, such as improved crop yields, reduced labour costs, and better access to market information.

Keywords: ICT, Perceptions, Attitudes, Ranking, Intervention

4.1 Introduction

Information and Communication Technologies (ICT) has proven to be an effective tool for enhancing agricultural productivity through improved information access, sharing, and management. Farmers use ICT to access crucial information on seed varieties, agricultural practices, weather patterns, and market prices, among others. However, despite the benefits of ICT, many farmers in developing countries are yet to appreciate/ the technology.

Agricultural marketing plays a key role in promoting the economic growth of rural communities, especially in developing countries like Zimbabwe. However, the ability of rural smallholder farmers to access markets and receive fair prices for their produce remains a daunting challenge. Recent advancements in Information and Communication Technologies (ICTs) have provided opportunities for smallholder farmers to access relevant market information, connect with buyers and market their produce more effectively (Chikaire, 2017).

The study aims to investigate farmers' attitudes and perceptions towards the use of ICT in agricultural marketing in the Musana communal area. Musana communal area is located in the Zimbabwean Midlands province, and it is characterised by subsistence farming. Despite there being several ICT-driven agricultural marketing initiatives introduced in the area, the uptake by smallholder farmers remains a challenge.

Agricultural marketing is crucial for the livelihoods of small-scale farmers in Musana communal area, Zimbabwe. The use of Information and Communication Technology (ICT) in agricultural marketing is becoming increasingly important, as it has the potential to transform marketing systems and increase farmer incomes.

ICT tools such as social media platforms, mobile applications, and e-commerce platforms have been developed to improve access to information, markets, and finance for farmers. However, there is a lack of understanding of farmers' attitudes and perceptions towards ICT in agricultural marketing in this area. This study aims to investigate farmers' attitudes and perceptions towards the use of ICT in agricultural marketing in Musana communal area. By understanding these attitudes and perceptions, stakeholders can design better interventions and policies that address farmers' needs and preferences. The findings of this research will

contribute to the body of knowledge on the adoption and use of ICT in agricultural marketing and inform policy recommendations for promoting sustainable agricultural development in the area (Luqman, 2019).

The research used a quantitative research design to collect data from farmers in Musana using a structured questionnaire. The study aims to identify the factors that influence the use of ICT in agricultural marketing, the benefits of using ICTs in marketing, and the challenges faced by farmers in utilising ICTs.

The findings of the research will contribute to a better understanding of the role of ICTs in agricultural marketing in rural areas. The results can be used to develop policies and strategies that encourage ICT adoption in smallholder farming communities, with the potential to improve farmers' access to markets, income and livelihood.

Luqman et al. (2019), Mdoda and Obi (2019), and Onyeneke et al. (2016)

4.2 Material and Methods

4.2.1 Description of study area

The study was carried out in Musana communal area in Bindura district which has 10 wards. The area was mainly chosen as there was no similar studies of this nature have been registered yet to have been carried out in the area. More description of the study area has been given in section 3.2 with the study area map provided in 3.1

4.2.2 Research Design

A mixed method of both quantitative and qualitative was used to unravel the demographics, the farmers' attitudes and perceptions in the use of information's communication technology (ICT).

4.2.3 Sampling procedure

The research study targeted people in Musana communal area district. A multi stage sampling techniques was employed. For the sample size and sampling technique, refer to section 3.4.

4.2.4 Data collection procedure

The study used primary data sources only which included both qualitative and quantitative data. Information collected included type of ICT used and perceptions on the use of ICT to which detail has been provided in section 3.5 of chapter 3.

4.2.5 Data analysis procedure

The data collected was coded and cleaned thoroughly before it was subjected to the Statistical Package for the Social Sciences (SPSS version 24) for analytical purpose. The data was analysed as descriptive and ranked.

4.2.6 Descriptive statistics

Descriptive statistics were used to summarise the household characteristics and ICT type that is used. In the study, a Likert scale was employed to gauge the opinions and attitudes held by farmers concerning the integration of Information and Communication Technology (ICT) into agriculture. The scale consisted of a succession of statements regarding the use of technology in farming, to which participants had to indicate their level of agreement or disagreement on a five-point scale ranging from strongly agree to strongly disagree. This methodology was chosen as it allows for a quantitative analysis of the data, while still providing insight into the complexities and nuances of the farmers' views towards ICT integration in their agricultural practices.

4.2.8 Challenges encountered during data collect

The sparseness of the Musana communal area presented a significant challenge when it came to collecting data. Due to the low population density of the area, This was dealt with by engaging some moderators to help in data collection.

4.3 Results

4.3.1 Demographic characteristics of farmers

VARIABLE	CATEGORICAL	FREQUENCY	PERCENTAGE
GENDER	Male	75	84
	Female	15	16
MARITAL STATUS	Divorced	10	12
	Married	62	67
	Single	5	6
	Widowed	13	15
AGE OF FARMERS	25 – 35	5	6
	35 - 45	38	42

	45 - 55	37	40
	55 - 65	6	7
	65 - 75	4	5
LEVEL OF EDUCATION	Primary	21	23
	Secondary	53	58
	Tertiary	10	12
	technical	6	7
	Christian		
RELIGION	Christianity	78	86
	Muslim	5	6
	African tradition	7	8

4.1.1 Demographics of the Respondents

Table 1 above shows the age distribution of small-scale farmers in Musana communal area district which the study area.

The majority of the farmers' age was between 35-55 years and the mean age of the sampled respondents was 46 years with modal class between 41 and 60 years. This indicates that majority of the respondents are still in their economically active years in the productive enterprises. On level of education 59% revealed a highest education level of only secondary education whilst 23% of the farmers indicated a highest qualification level of primary school 10% had tertiary and 6 % with technical skills attained at vocational colleges.

On religion 86% of the respondents confirmed to be of Christian domain whilst 6 percent of Islamic beliefs and 8 % were of African tradition

4.1.2 Table 4.1: Distribution of Respondents according to personal profile

Variable	Mean	Modal Class

Household size	6 members	4-6 members
Farming experience	19.5 years	80% 10 and above
Farm size	1.94 hectares	1 and 2.99hectares
Membership of social organization		56% members

4.1.2.1 Household size

The house holds of the respondents had a mean of 6 members which had a modal class of 4-6 members meaning there was a range of 4-6 members per each family. This infers that majority of the respondents had a large household size.

The mean years of farming experience of the respondents was 19.5 years, and 80% of the respondents had a modal class of 10 years and above meaning that all the farmers had a minimum of 10 years' experience in farming which is in direct correlation with the average age of the farmers.

4.1.2.2 Farm size

On farm sizes they had an average of 1.5 hectares with the modal class ranging between 1 hacter3 hectares.

4.1.2.3 Membership of social organisation

On membership of social organisation this included social clubs which include rotating savings or credits associations in Shona known as "*mukando",* 56% of the members indicated that they were part of a social organisation.

4.3 Main crops grown

4.3.1 Table showing main crops grown

Horticulture	**80%**
Maize	75%
Tobacco	50%
Other	70%

On investigating on the crops that are mainly grown horticulture was grown by 80% of the respondents which is influenced by their close vicinity to town such as Bindura and Harare, maize was also being grown by 75% of the respondents whilst 50% of the population grow tobacco and other produce such as ground nuts, beans and sorghum.

4.4 Results showing usage of ICT in the marketing of their crops

4.4.1 Table indicating usage of ICT

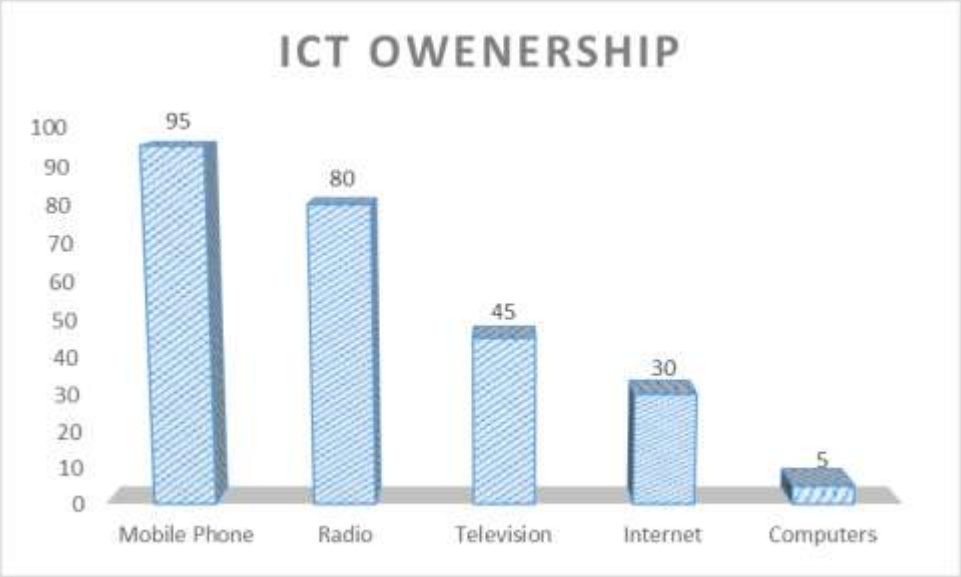
Response	**Percentage**
Yes	58
No	42

The study investigated the number of farmers who use any form of ICT in marketing their crops and livestock and 58% of the respondents indicated yes and 42% said they do not use ICT in marketing their crops.

4.5 ICT ownership tools used by small scale farmers

4.5.1 The graph below indicates the type of ICT that is owned by the respondents in the study.

Figure 4.5 ICT ownership statistics



95% of the respondents revealed that they have a functioning mobile phone, whilst 80 % confirmed ownership of a radio set, 45% had a television set and 30% had internet access with only 5 % having access to a computer.

The study discovered that about 89% of livestock farmers had access to and own both radio and mobile phones which most they use for farm and household activities. These findings agree with Tambo et al. (2019) that ownership and access to radio and mobiles are very crucial sources of agricultural information and communication technologies that assist the majority of the farmers with current information and agricultural techniques.

4.6 Farmer's perceptions of benefits of ICT

Table 4.6.1. Perceptions of farmers benefits from the use of ICT towards food security.

Statement	**SD**		**D**		**UD**		**A**		**SA**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Mobile can be a useful source of agricultural information	**6**	**6.5**	**14**	**15**	**3**	**3.5**	**33**	**36.5**	**34**	**38**
Mobiles have a role to play in finding markets	**5**	**5.5**	**11**	**12.2**	**3**	**3.5**	**30**	**33.4**	**37**	**42**
Internet can be a useful source of agricultural information	**11**	**12.5**	**15**	**16.5**	**5**	**5.5**	**29**	**32.5**	**30**	**35**

Statement	SD		D		UD		A		SA	
	N	%	N	%	N	%	N	%	N	%
Agricultural extension helpline can be a useful source of agricultural information	**20**	**22.2**	**12**	**13.1**	**8**	**8.8**	**19**	**21.1**	**21**	**23.3**
TV broadcast programs provide sufficient agricultural information	**–**	**–**	**–**	**–**	**27**	**32**	**28**	**31.2**	**35**	**38.8**
TV program have positive effect on agricultural production	**–**	**–**	**–**	**–**	**28**	**32**	**19**	**22.2**	**43**	**48.8**
Radios broadcast programs provide sufficient agricultural information	**–**	**–**	**7**	**7.8**	**22**	**25**	**38**	**42.2**	**23**	**25.5**

SD = Strongly Disagree; D = Disagree; UD = Undecided; A = Agree; SA = Strongly Agree; N = Number; % = Percentage.

4.6.1 Farmer's perceptions on Mobile phones as a useful source of agricultural information

As shown on the table above 33% of the farmers agreed and 34% of the respondents strongly agreed that mobile can be a useful source for agricultural information which can help improve food security, 3.5% of the farmers chose undecided on the effectiveness of mobile phones whilst 14% highlighted disagree and 6.5% did not agree with the usefulness of a mobile phone as the source of agricultural information.

4.6.2 Farmer's perceptions on mobiles phones role to play in finding markets

On farmers perceptions on mobile phones playing a role in helping them find market for their produce 42% strongly agreed whilst 33.4% agreed, 3.5% of the respondents were undecided, 12.2% disagreed with 5.5% strongly disagreeing that mobile phones have a role to play in finding markets for their agricultural products.

4.6.3 Farmer's perceptions on whether internet can be a useful source of agricultural information

35% of the respondents strongly agreed whilst 32.5% agree with 5.5% of the respondents were undecided, 16.5% of the respondents disagreed whilst 12.5% strongly disagreed to whether the internet can be a source of agricultural information

4.6.4 Farmer's perceptions on whether agricultural extension helpline can be a useful source of agricultural information

23.3% of the respondents strongly agreed whilst 21% agreed, whilst 9% of the respondents were undecided, with 22.2 disagreeing and 13.1% of the farmers strongly disagreeing on whether a helpline centre can be a useful source of agricultural information

4.6.5 TV broadcast programs provide sufficient agricultural information

32% were not decided and only 31.2% of the farmers agreed with the sand 38.8% of the farmers were strongly agreed about the statement that the TV broadcast programs provide sufficient and useful information whilst 0% indicated disagree and strongly disagree.

4.6.6 TV program have positive effect on agricultural production

32% indicated that they were undecided whilst 22.2 revealed that they agreed and 48.8% of the respondents strongly agreed, 0% indicated disagree and strongly disagree.

4.6.7 Radios broadcast programs provide sufficient agricultural information

7.8% of the farmers disagreed whilst 25% were undecided with 42.2% agreeing and 25.5% of the farmers strongly agreeing and 0% of the respondents strongly disagreed.

4.7 Farmers attitudes towards ICT

4.7.1 Table indicating the attitudes of the farmers toward the use of ICT

ATTITUDE VARIABLE	Participant response			Preferred response	Score
		n	%		
ARE YOU WILLING TO USE ICT	Yes	70	77	YES	0.77
	No	9	10		
	Don't know	11	13		
ICT IS COSTLY TO USE	Yes	85	94	NO	0.06
	No	5	6		

	Don't know	0	0		
ICT DIFFICULT TO USE	Yes	85	94	NO	0.05
	No	4	5		
	Don't know	1	1		
ICT INCLUDES COMPUTERS ONLY	Yes	75	82	NO	0.07
	No	6	7		
	Don't know	9	11		
ICT REQUIRES EDUCATIONAL QUALIFICATIONS	Yes	70	77	NO	0.08
	No	15	18		
	Don't know	5	6		
ICT IS EASILY ACCESSIBLE	Yes	20	23	YES	0.23
	No	69	76		
	Don't know	1	1		
INFORMATION PROVIDED THROUGH ICT IS NOT IN LOCAL LANGUAGE	Yes	88	97	YES	0.97
	No	0	0		
	Don't know	2	3		
ICT CAN IMPROVE FOOD SECURITY	Yes	65	72	YES	0.72
	No	15	16		
	Don't know	10	12		
ICT IS MORE ACCESSIBLE TO MALES	Yes	75	83	NO	0.11
	No	10	11		
	Don't know	5	6		
ICT HELPS IN PROVIDING INFORMATION	Yes	35	38	YES	0.38
	No	50	55		
	Don't know	5	7		
TOTAL ATTITUDE SCORE					**3.44**

From table 4.7.1 the attitude score is 3.44 out of 10 meaning the percentage attitude score is 34.4% which is very low as a percentage of the farmer's attitudes of using ICT.

77% of the respondents revealed that they are willing to use ICT whilst 10 revealed that they did not want to use it and the remaining 10% were undecided on whether they were willing to use ICT. A majority of the respondents 94% indicated that ICT is costly to use, whilst 6% revealed that it is not costly and 0% did not know.

94% of the respondents indicated that ICT is difficult to use whilst 5% indicated that it is not difficult to use and 1% stated that they did not know. 82% revealed that ICT includes computers only whilst 7% indicated that ICT does not only include computers and 11% revealing that they did not know.

In the study 77% indicated that ICT requires educational qualifications whilst18% indicated No to ICT requiring educational qualifications and 8% indicated that they did not know if use of ICT requires educational qualifications.

23% of the respondents indicated that ICT is easily accessible in their area whilst 76% indicated that it is not easily accessible and 1% indicating that they did not know. 72% of the respondents indicated that ICT can improve food security whilst 16% indicated no whilst 12 % indicated that they did not know.

83% believed that ICT is more accessible to males whilst 11% indicated that they did not believe that it is more accessible to men and 6% did not know. 38% indicated that ICT helps in providing information whilst a majority of 55% believed that ICT does not provide information and 7% indicated that they did not know.

4.4 Discussion

4.4.1 Discussion on the characterisation of households in the study area.

The results of the research study showed that the majority of farmers fell within the age range of 35-55 years which was 82% of the respondents. This finding was in line with previous studies undertaken by (Mequanent 2014, Sarani 2011) that have shown a similar trend among farmers in various parts of the world. The mean age of the sampled respondents was 46 years, further supporting the notion that most of the farmers are in their economically active years, which is a crucial time for productive enterprises. (Omonona, 2008)

Additionally, it was establish that the modal class range was between 41 and 60 years, indicating that this age range is the most common among the respondents in Musana communal area. This is also consistent with previous research (Murithii 2009, Danaan, 2016, Shimelis 2019) on the age distribution of farmers, which has shown that the trend towards older farmers is becoming increasingly prevalent. As many younger people are choosing not to pursue farming as a profession, this age-based disparity may impact the long-term sustainability of the agricultural sector.

Overall, the results of the study suggest that despite the challenges faced by farmers in terms of resource constraints and other barriers to success, there remains a significant percentage of farmers in their prime working years who are still heavily involved in productive enterprises.

The results of this study on the religious affiliations of farmers in Musana communal area reveal that the majority (86%) of the respondents were Christians, followed by those of African traditional beliefs (8%), while only a small percentage (6%) identified as Muslims.

The findings of the study show that religion plays a significant role in the agricultural practices of farmers in Musana communal area. Religion can influence farmers' decision-making, attitudes towards sustainability, and resource allocation. For example, religion can impact how farmers prioritize their resources, such as land, water, and inputs. Religious beliefs can also influence farmers' perception of climate change or environmental issues, which can shape their attitude towards sustainable practices.

The findings on the level of education among farmers are significant in showcasing the importance of education in the agricultural sector. The results indicate that a significant number of farmers have their educational background limited to primary and secondary education, with only a small percentage having tertiary qualifications or technical skills acquired through vocational colleges.

This may be a cause for concern, as a lack of formal education can significantly limit farmers' ability to adopt new technologies, access finance and be competitive in local or global markets. Education plays a vital role in ensuring that farmers are equipped with the necessary skills and knowledge to remain competitive in the agricultural sector. Without access to education, farmers may lack the necessary skills to operate their farms efficiently, implement innovations, or even manage their finances effectively.

4.4.2 Discussion on the farmer's perceptions on ICT

Mobile phones, television, radios, and the internet have revolutionized the way people access information, including agricultural information. While these technologies have been widely adopted in urban areas, farmers in rural areas may not have the same level of access or may have perceptions that differ from those living in urban areas. In this discussion, we will explore the perceptions of farmers towards these technologies as a useful source of agricultural information.

In this study 33% of the farmers agreed and 34% of the respondents strongly agreed that mobile can be a useful source for agricultural information which can help improve food security, 3.5% of the farmers chose undecided on the effectiveness of mobile phones whilst 14% highlighted disagree and 6.5% did not agree with the usefulness of a mobile phone as the source of agricultural information this low percentage of agreeing on the usefulness of

using mobile phones in attaining information was highlighted in a study undertaken by Mboho (2017) were he stressed that lack of ICT is one of the challenges facing farming households in promoting food security.

Based on recent studies, the majority of farmers in developing countries perceive mobile phones, television, and radios as important sources of agricultural information. However, the use of the TV broadcast programs in providing sufficient agricultural information in this study 32% were not decided and only 31.2% of the farmers agreed with the sand 38.8% of the farmers were strongly agreed about the statement that the TV broadcast programs provide sufficient and useful information whilst 0% indicated disagree and strongly disagree this is in agreement with a study undertaken by Rohila (2017).

As a source of agricultural information is still low in many rural areas as highlighted in this research as the availability and cost of data in many regions are still a challenge and a barrier to its adoption.

Mobile phones have become one of the most useful technologies for farmers. Through mobile phones, farmers can receive important agricultural information such as weather updates, market information, and information on pests and diseases. In many rural areas, mobile phones have also aided in connecting farmers to service providers and input suppliers.

Television and radio have also been identified as important sources of agricultural information in the study. According to Raj (2013) radio stations are a valuable source of information, especially in remote areas, where access to information can be a challenge this was indicated by this study as 7.8% of the farmers in the study disagreed whilst 25% were undecided with 42.2% agreeing and 25.5% of the farmers strongly agreeing and 0% of the respondents strongly disagreed.

However, despite the importance of technology to farmers, it is worth noting that some farmers still prefer to rely on traditional and local sources of agricultural information. Many farmers still rely on their personal experiences, their social networks, and on community and traditional knowledge to make decisions related to farming practices.

In conclusion, while technology has the potential to revolutionize the way farmer's access information, it is still a challenge to reach the majority of farmers in rural areas. The perceptions of farmers towards these technologies vary by region and socio-economic status,

and there is still work to be done to ensure that all farmers have access to the most useful sources of agricultural information.

4.4.3 Discussion on the farmer's attitudes on ICT

By assessing the farmers' attitudes towards using ICT, you get a better understand of their beliefs, feelings, and perceptions towards technology. This information can be useful in identifying the factors that encourage or hinder the adoption of ICT among farmers, and in developing effective interventions to promote its use. Additionally, attitude scores provide a quantitative way of comparing the attitudes of different groups of farmers, which can be useful for identifying differences between individual farmers or groups of farmers based on factors like age, location, and farm size.

The farmers accumulated an overall attitude score that was 3.44 out of a possible 10, indicating a percentage attitude score of 34.4% which was very low as it suggests that a substantial proportion of farmers have a negative attitudes towards the use of ICT for farming. This finding is consistent with previous studies which include (Chiwawa, 2019; Tijjani, 2017) which have revealed that farmers are sometimes hesitant to adopt new technologies due to a variety of reasons such as perceived complexity, cost, and lack of skills.

Despite the low attitude score, it is noteworthy within the study that a majority (77%) of respondents indicated that they are willing to use ICT. This is a positive indication that farmers are receptive to ICT and could be encouraged to use it with appropriate support. This finding is consistent with the literature from studies undertaken by (Von Loeper 2016, Aldosari, 2017) which proved that farmers are often willing to adopt new technologies when they are provided with adequate information, training, and support.

Further analysis reveals that a minority of the population (10%) of the respondents were not willing to use ICT. The reasons for this were explored further to understand the underlying factors that influence their attitudes. As this helped in informing the development of appropriate interventions to address their concerns.

Overall, the low attitude score recorded among farmers highlights the need for interventions aimed at improving farmers' attitudes towards the adoption of ICT for farming. Such interventions could include awareness campaigns, training and education programs, and provision of technical support. These interventions should be designed to address the specific

concerns and challenges faced by farmers in their local contexts to increase their willingness to use ICT and leverage its potential benefits for their farming activities.

These findings have implications for policy and programmatic interventions aimed at supporting farmers' livelihoods, as well as for understanding the changing dynamics of agriculture in the wider economy.

4.5 Recommendations

The low attitude score recorded among farmers highlights the need for interventions aimed at improving farmers' attitudes towards the adoption of ICT for farming. Such interventions could include awareness campaigns, training and education programs, and provision of technical support. This study suggested that the Agricultural Advisory Services must take necessary steps to educate the respondents who remained undecided or disagreed on their effectiveness of mobile phones as the source of agricultural information. These interventions should be designed to address the specific concerns and challenges faced by farmers in their local contexts to increase their willingness to use ICT and leverage its potential benefits for their farming activities. There is also need to identify the specific barriers that prevent farmers from adopting ICT, such as cost, access to technology, or lack of training as a mitigation of these factors can help improve the adoption of ICT. There is also need to understand cultural factors that may influence attitudes towards technology, including beliefs about traditional farming methods and scepticism towards new technology amongst small-scale farmers. It is also recommended to examine the potential benefits of ICT for farmers, such as improved crop yields, reduced labour costs, and better access to market information, and exploring ways to communicate these benefits to farmers. Lastly there is need to investigate successful case studies of ICT adoption in agriculture and identifying key factors that contributed to their success especially those in developing countries.

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CHAPTER 5

AN ANALYSIS ON THE FACTORS AFFECTING THE ADOPTION OF ICT IN AGRICULTURAL MARKETING - A CASE STUDY OF MUSANA COMMUNAL AREA

Abstract

The focus of this paper was to examine the factors that impact the adoption of ICT in agricultural marketing by small-scale farmers in the Musana communal area. To achieve this, a multi-stage sampling technique was employed to select 90 households from three wards in the Bindura District of Zimbabwe. To collect data on the factors and challenges affecting the adoption of ICT in agricultural marketing by farmers in the Musana communal area, a questionnaire was utilized.

The questionnaire used in the study was designed to gather information on two main aspects: demographic information and factors that impact the adoption of ICT in agricultural marketing. The demographic questions aimed to gather information on the age, gender, level of education, type of crops grown, farm size, membership to social clubs or agricultural groups, and the primary language used on the device ,The collected data was analysed using SPSS version 24, which allowed for the a multivariate regression model and its assumptions

The study found that several factors were statistically significant at the 5% level in a regression model analysing the adoption of ICT in agricultural marketing by small-scale farmers in the Musana communal area. These factors included the age of the farmer, willingness to pay, education level, type of crop grown, and language on device. The study found that several factors were statistically insignificant at the 5% level in a regression model analysing the adoption of ICT in agricultural marketing by small-scale farmers in the Musana communal area. These factors included farming experience in years, network availability, internet access, and membership to a social club. Key recommendations include improving access to ICT infrastructure such as smartphones, tablets, and computers, providing training on how to effectively use ICTs for agricultural activities and marketing. Thirdly, efforts should be made to improve market information availability and accessibility to farmers. Access to relevant market information will enable farmers to make informed decisions and improve their chances of success in the market.

Keywords: ICT, Adoption, Willingness to Pay, Rural Development, Challenges

5.1 Introduction

Agriculture is one of the major sources of livelihood for people in rural areas. In recent years, the use of information and communication technologies (ICTs) in agriculture has provided opportunities to enhance agricultural marketing and improve the livelihoods of farmers. The adoption of ICTs in agricultural marketing has the potential to improve market access, reduce transaction costs, and increase farmers' income. However, despite the potential benefits of ICTs, the adoption of these technologies in agricultural marketing remains low in many rural areas, including in the Musana communal area. This study aims to analyse the factors affecting the adoption of ICT in agricultural marketing in the Musana communal area in order to identify strategies to promote the widespread adoption of ICTs by farmers.

Several studies have examined the factors that influence the adoption of ICTs in agricultural marketing. For instance, a study by Chauhan (2017) in India found that access to ICT infrastructure, such as mobile phones and internet connectivity, was a significant predictor of the adoption of ICTs in agricultural marketing. The study also found that farmers' education and income levels were positively associated with the adoption of ICTs.

Similarly, a study by Alemu (2019) in Ethiopia found that access to ICT infrastructure, particularly mobile phones, was a significant predictor of the adoption of ICTs in agricultural marketing. The study also found that farmers' age, education, and experience in farming were positively associated with the adoption of ICTs.

In addition to access to ICT infrastructure and farmers' education levels, other factors have been found to influence the adoption of ICTs in agricultural marketing. For instance, a study by Njoroge (2020) in Kenya found that trust in ICT service providers, farmers' attitudes towards ICTs, and the availability of ICT-related training were significant predictors of the adoption of ICTs in agricultural marketing. Furthermore, a study by Kikulwe (2015) in Uganda found that the availability of market information was a significant predictor of the adoption of ICTs in agricultural marketing. The study also found that farmers who perceived that using ICTs would improve their income were more likely to adopt these technologies.

Overall, the adoption of ICTs in agricultural marketing is influenced by a range of factors, including access to ICT infrastructure, farmers' education levels, and trust in ICT service providers, farmers' attitudes towards ICTs, the availability of ICT-related training, and the availability of market information. Understanding these factors is essential in developing strategies to promote the widespread adoption of ICTs in agricultural marketing in the Musana communal area and to improve the livelihoods of farmers in the region.

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5.2 Material and Methods

5.2.1Description of study area The study was carried out in Bindura district in the Musana communal area which is south east of Bindura, Musana shares its boundary with Masembura communal area. Detail on the study area is given in chapter 3.5 section 3.2.

5.2.2 Research Design

This study employed a qualitative research design that emphasizes an in-depth exploration of challenges experienced by farmers. Data was collected through semi-structured interviews and direct interviews. Collecting data using two different tools made sure that triangulation was employed in the data collection.

5.2.3 Sampling procedure

For the research study, the rural residents of Musana communal area were identified as the sampling frame. For analysis, the households from three randomly selected wards were chosen as the unit of analysis, as outlined in section 3.4 where the sampling procedure is detailed.

5.2.4 Data collection procedure

The conducted research solely relied on primary data sources, where a qualitative approach was implemented to obtain informative insights. The gathered information encompassed a comprehensive examination of the difficulties that hinder the effective adoption of ICT. This data, presented in section 3.5 of chapter 3, extensively elaborates on the challenges experienced in the integration process.

5.2.5 Data analysis procedure

The collected data underwent a rigorous process of coding and cleaning before undergoing analysis using the Statistical Package for the Social Sciences (SPSS version 24). The data was analysed using a multivariate regression model, where significant results were identified at a p-value of less than 0.05(5%) and 0.01(1%). In other words, the data was thoroughly prepared and carefully analysed to ensure that the results were accurate and reliable. This process is crucial in any research study as it enables the researcher to draw valid conclusions based on the data and ultimately contribute to the advancement of knowledge in their field.

5.2.5.2 Multiple linear regression

$Y_{f2i} = \beta_0 + \beta_1 X_i + \beta_2 X_{2i} + \beta_3 X_{3i} + \ldots\ldots\ldots\ldots \beta_z X_{zi} + e_i$ Y_{f2i} denotes ICT use and factors affecting the use of ICT.

Y	ICT use in marketing of crops	
β X1	Age of the farmers (in years)	+/-
β X2	Farming experience (years)	+/-
β X3	Level of education (0= primary, secondary= 1,tertiary = 2, vocational training = 3)	+/-
β X4	Network availability	+
β X5	Willingness to pay (if yes=1, otherwise, 0)	+
β X6	Membership of social organization	+
β X7	Types of crop grown (horticulture =1, Maize =2,Other =3)	+/-
β X8	Access to a device (if yes=1, otherwise, 0)	+
β X9	Language on device (If local language=1, otherwise, 0)	+/-

The significance level was set at 5% and was also considered at 1% and SPSS was be used for data analysis

5.2.5.6 Multicollinearity

Multicollinearity is often used in statistical analysis to identify and analyse the relationships between different independent variables in a regression model. In the context of studying factors affecting the use of ICT in agricultural marketing, multicollinearity may have been used to identify and understand how different variables, such as the availability of infrastructure, farmer education, and access to finance, may be related to each other and influence the adoption of technology. By identifying areas of high correlation between variables, researchers can better understand which factors have the greatest impact and how they are interrelated, helping to inform recommendations for intervention strategies to increase the use of ICT in agricultural marketing. The study utilized a statistical measure called the Variance Inflation Factor (VIF) to assess the presence of multicollinearity. Multicollinearity is a phenomenon that occurs when two or more independent variables in a

regression model are highly correlated, leading to an inflated variance of the estimator. The VIF value indicates the extent of multicollinearity in a regression model.

Upon computation, the study found that all the variables had a VIF value of less than 5. This indicates that there was no significant presence of multicollinearity in the model. The absence of multicollinearity suggests that the independent variables in the regression model were not highly correlated with each other, thereby reducing potential bias in the estimation of their respective effects on the dependent variable. Overall, this is a promising finding for the validity and reliability of the regression model used in this study.

5.2.6 Normality of data

The data was subjected to normality tests using both the Kolmogorov-Smirnov and Shapiro-Wilk methods. The tests resulted in a p-value greater than 0.05, indicating that the data was normally distributed.

When analysing statistical data, one important assumption is that the data follow a normal distribution. Normality indicates that the data is symmetrical, with most values clustered around the mean and a smaller number of values distributed evenly around the mean.

Testing for normality is important because many statistical methods require the data to be normally distributed for accurate results. Therefore, it is important to check the normality of the data before using these methods.

Two tests that were used for normality were the Kolmogorov-Smirnov (K-S) test and the Shapiro-Wilk test. The K-S test used a cumulative distribution function to compare the observed data to a theoretical normal distribution, whilst the Shapiro-Wilk test uses both the mean and variance of the data to determine if it is was normally distributed.

(Gujarati, 2007).

By performing a test for normality using either the K-S or Shapiro-Wilk tests, we were be able to determine if the data followed a normal distribution. If the data is normal, it can be analysed using statistical methods which assume normality. If the data is not normal, alternative non-parametric methods may need to be explored, or data transformation techniques can be applied.

Therefore, testing for normality using the K-S or Shapiro-Wilk tests can help ensure accurate statistical analysis by identifying any deviations from normality in the data, and help researchers choose appropriate statistical methods based on the normality of the data.

Table 5.2.6 data normality test

Tests of Normality

	Kolmogorov-Smirnov[a]	Shapiro-Wilk

	Statistic	df	Sig.	Statistic	df	Sig.
FACTORS	.276	3	001.	.942	3	.007

a. Lilliefors Significance Correction

5.2.6 Challenges encountered during data collect

The sparsely populated Musana communal area posed a significant hurdle during the data collection process. With a low population density, gathering accurate data was a daunting task. To address this challenge, moderators were recruited to assist in the data collection process. These experts played a significant role in ensuring that the data collection exercise was successful by working closely with community members to extract relevant information. Despite the challenges posed by the area's sparseness, the moderators' innovative tactics and unrelenting efforts proved crucial in obtaining quality data for analysis.

5.3 Results

5.3.1 Determining factors affecting the use of ICT amongst small scale farmers in accessing

VARIABLES	B (co-efficient)	Significance 't' value	Remark
Constant	2.12	0.74	
ICT use in marketing of crops	0.09	0.3	
Age of the farmers	-0.35	0.03*	Significant
Farming experience	0.168	0.62	Not significant
Willingness to pay	0.1224	0.001	Significant
Level of education	0.060	0.01**	Significant
Network availability	-0.87	0.62	Not significant
Membership of social organization	0.326	0.096	Not significant
Types of crop grown	0.567	0.002**	Significant
Internet access	0.153	0.46	Not significant
Access to a device	0.965	0.009**	Significant
Language on devices	-0.744	0.002*	Significant

R2 = 0.786. F = 8.25. Significant at 0.05.* Significant at 0.01. **

Results from the Table 4 found that the 9 independent variables with the attitude towards ICT tools by the farmers taken on Multiple Linear Regression analysis gave the Co-efficient of Multiple Determination (R2) value of 0.786, Henceforth, it is able be inferred that all the independent variables put together contributed 78.5 percent of the total variation in the

factors affecting the use of ICT tools by the farmers and remaining 22.50 per cent was due to extraneous factors.

5.3.2 Age of the farmers

Farmer's age had a t value of 0.03 which was below 5% therefore significant at 5% and not significant at 1%

5.3.3 Farming experience

Farmers number of years in farming had a significance value of 0.62 which was above 5% therefore it was not significant

5.3.4 Level of education

Level of education of the farmers had a t value of 0.01 which was significant at both 1 and 5% significance levels.

5.3.5 Willingness to pay

Willingness to pay had a t value of 0.001 highlighting it as statistically significant

5.3.5 Network availability

Network availability had a t value of 0.62 which is 62% and was not statistically significant

5.3.6Membership of social organization

The variable of belonging to a membership organisation had a significance value 0.096 which was not significant

5.3.7 Types of crop grown

3 levels were created according to crop type and there was significance level of 0.002 which means crop type was statistically significant in the use of ICT.

5.3.8 Internet access

Internet access was not statistically significant at both 1% and 5% significant level as it had a t value of 0.46 which was not significant

5.3.9 Access to a device

Access to credit had a significance value of 0.009 which was below 1% meaning that having access to a device was a contributing factor to ICT use

5.3.10 Language on devices

Default language which is used on the device was significant at 5% as it had a t value of 0.2% meaning it was significant at both 1 and 5% levels of significance.

5.4 Discussion

The use of information and communication technology (ICT) has been increasing significantly in the agricultural sector. Farmers are using ICT to enhance their production by improving yields, reducing costs and increasing their income. Age is an important factor in determining the adoption of ICT in agriculture. According to a study undertaken by Aboagye (2018) he indicated that older farmers are less likely to adopt ICT because they are less familiar with technology, this is confirmed by the results of the regression analysis in this study which showed a weak negative correlation between age and adoption of ICT. This suggests that younger farmers are more likely to adopt ICT than older farmers.

One study that examined the relationship between age and adoption of ICT among small-scale farmers was conducted in Nigeria by Koomson in 2017 the study used a logistic regression model to analyse the data collected from a sample of 300 small-scale farmers. The results showed that age was a significant factor in the adoption of ICT among small-scale farmers. Specifically, the study found that as age increased, the likelihood of adopting ICT decreased. Similarly, another study conducted in Ghana by Owusu-Ansah (2019) found that age was a significant factor in the adoption of ICT among small-scale farmers.

Farming experience:

Farming experience is another factor that influences the adoption of ICT in agriculture. Farmers who have more experience in farming are more likely to adopt ICT because they have a better understanding of the benefits it can provide. The regression analysis showed a that there was no significant relationship between farming experience and the adoption of ICT ,farming experience is a critical factor that can either facilitate or hinder the adoption of ICTs by these farmers. Several studies have examined the relationship between farming experience and the adoption of ICTs among small-scale farmers. One such study conducted by Woldie in 2021 examined the factors that influence the adoption of climate-smart agriculture (CSA) practices among small-scale farmers in Ethiopia. The study used a regression model to analyze the factors that influence adoption, including farming

experience. The results of the analysis showed that farming experience was not a significant predictor of adoption same as in this study as $\beta = 0.62$, $p > 0.05$.

Similarly, a study by Kassie et al. (2017) examined the factors that influence the adoption of improved maize varieties among smallholder farmers in Ethiopia. The study found that farming experience was not a significant predictor of adoption, indicating that other factors, such as access to credit and extension services, had a stronger influence on the adoption of improved maize varieties.

However, other studies have found a significant relationship between farming experience and the adoption of ICTs among small-scale farmers. For instance, a study by Fongwe et al. (2020) examined the factors that influence the adoption of mobile phone-based agricultural information services among small-scale farmers in Cameroon. The study found that farming experience was positively associated with the adoption of these services, indicating that farmers with more farming experience were more likely to adopt mobile phone-based agricultural information services.

Type of crop grown

The type of crop grown is also a factor that influences the adoption of ICT in agriculture. A study undertaken by Njoroge in 2019 indicated that farmers who grow fruits and vegetables are more likely to adopt ICT than those who grow grains and cereals. This could be because fruits and vegetables require more attention and precision, which ICT may provide. The regression analysis showed a significant positive correlation between the type of crop grown and the adoption of ICT in Musana communal area as those who undertake horticulture were the ones using ICT as compared to those farming other crops such as tobacco and maize.

One study that examined the relationship between the type of crop grown and the adoption of ICT among small-scale farmers was conducted in Kenya by Wambui in 2019 the study used a logistic regression model to analyse the data collected from a sample of 100 small-scale farmers. The results showed that the type of crop grown was a significant factor in the adoption of ICT among small-scale farmers. Specifically, the study found that farmers who

grew cash crops such as coffee and tea were more likely to adopt ICT than those who grew food crops such as maize and beans.

Willingness to pay

Willingness to pay is the amount of money a farmer is willing to pay for ICT services. Farmers who are willing to pay more for ICT services are more likely to adopt ICT. The results of the regression analysis showed a significant positive correlation between willingness to pay and the adoption of ICT of the farmers in Musana communal area. It is in correlation with a study conducted in Nigeria by Adeleke in 2017 that examined the relationship between WTP and the adoption of ICT among small-scale farmers the study used a binary logistic regression model to analyse the data collected from a sample of 200 small-scale farmers. The results showed that WTP was a significant factor in the adoption of ICT among small-scale farmers. Specifically, the study found that farmers who were willing to pay for ICT services were more likely to adopt ICT than those who were not willing to pay.
Similarly, another study came up with the same findings as this one as it was conducted in Kenya by Mwirigi in 2017 he found that WTP was a significant factor in the adoption of ICT among small-scale farmers. The study used a probit regression model to analyse the data collected from a sample of 400 small-scale farmers. The results showed that farmers who were willing to pay for ICT services were more likely to adopt ICT than those who were not willing to pay.

Level of education

Education level is an important factor that influences the adoption of ICT in agriculture. This study discovered that farmers with higher levels of education are more likely to adopt ICT because they have a better understanding of how it can benefit their farming practices. The regression analysis showed a significant positive correlation between the level of education and the adoption of ICT. A study conducted in Ethiopia by Asfaw in 2018 can support this as it examined the relationship between the level of education and the adoption of ICT among small-scale farmers the study used a regression model to analyse the data collected from a sample of 70 small-scale farmers. The results showed that the level of education was a significant factor in the adoption of ICT among small-scale farmers. Specifically, the study

found that farmers with higher levels of education were more likely to adopt ICT than those with lower levels of education.
Similarly, another study conducted in Uganda by Kikulwe in 2014 found that the level of education influenced the adoption of ICT amongst small-scale farmers. The study used a probit regression model to analyse the data collected from a sample of 300 small-scale farmers. The results showed that farmers with higher levels of education were more likely to adopt ICT than those with lower levels of education.

Access to device

Access to devices such as smartphones and computers is another important factor that influences the adoption of ICT in agriculture. The regression analysis showed a significant positive correlation between access to devices and the adoption of ICT, One study that can support this finding is one which was undertaken by Osei-Kwarteng 2018 in Ghana which examined the relationship between access to a device and the adoption of ICT among small-scale farmers, the study used a binary logistic regression model to analyze the data collected from a sample of 250 small-scale farmers. The results showed that access to a device was a significant factor in the adoption of ICT among small-scale farmers. Specifically, the study found that farmers who had access to a device such as a mobile phone or tablet were more likely to adopt ICT than those who did not have access.

Similarly, another study conducted in Kenya by Wambui in 2019 found that access to a device was a significant factor in the adoption of ICT among small-scale farmers. The study used a logistic regression model to analyze the data collected from a sample of 400 small-scale farmers. The results showed that farmers who had access to a device such as a smartphone or computer were more likely to adopt ICT than those who did not have access. The study also found that factors such as age and education were significant factors that influenced the adoption of ICT among small-scale farmers.

Membership to a club:

Membership to a club is another factor that could influence the adoption of ICT in agriculture. While being a member of a social group has been consistently found to influence the adoption of Information and Communication Technology (ICT) among small-scale

farmers, this study have found that the relationship between being a member of a social group and the adoption of ICT was not always significant at 5% significance level. For example, a study conducted in Tanzania by Kikulwe in 2016 found that being a member of a social group was not a significant factor in the adoption of ICT among small-scale farmers. The study used a regression model to analyse the data collected from a sample of 200 small-scale farmers. The results showed that while factors such as education and income were significant factors that influenced the adoption of ICT among small-scale farmers, being a member of a social group was not a significant factor.

Similarly, another study conducted in Ghana by Osei-Kwarteng in 2018 found that being a member of a social group was not a significant factor in the adoption of ICT among small-scale farmers. The study used a binary logistic regression model to analyze the data collected from a sample of 250 small-scale farmers. The results showed that while factors such as access to a device and education were significant factors that influenced the adoption of ICT among small-scale farmers, being a member of a social group was not a significant factor.

Internet access:

Internet access is another important factor that influences the adoption of ICT in agriculture. Farmers who have access to the internet are more likely to adopt ICT because they can easily access information about the latest farming techniques and services. The regression analysis showed a not significant correlation between internet access and the adoption of ICT at 5% level of significance.

Several studies have examined the relationship between internet access and the adoption of ICTs among small-scale farmers. One such study was conducted by Kariuki in 2019 he surveyed the impact of internet access on the adoption of mobile phone-based agricultural information services by small-scale farmers in Kenya. The study found that internet access was a significant predictor of the adoption of these services, indicating that farmers with internet access were more likely to adopt mobile phone-based agricultural information services, however, not all studies have found a significant relationship between internet access and the adoption of ICTs among small-scale farmers. For instance, a study by Kassie in 2017 observed the factors that influence the adoption of improved maize varieties among

smallholder farmers in Ethiopia. The study used a regression model to analyse the factors that influence adoption, including internet access. The results of the analysis showed that internet access was not a significant predictor of adoption, indicating that other factors, such as access to credit and extension services, had a stronger influence on the adoption of improved maize varieties.

Similarly, a study by Woldie in 2020 examined the factors that influence the adoption of climate-smart agriculture (CSA) practices among small-scale farmers in Ethiopia. The study found that although internet access was positively associated with the adoption of CSA practices, the relationship was not statistically significant which was also highlighted by this study in Musana communal area.

Language on device

The language used on devices can play a significant role in the adoption of information and communication technologies (ICT) among small-scale farmers. Language barriers can hinder the adoption of ICTs by small-scale farmers, particularly in contexts where farmers speak local languages that are not widely used in the ICT sector. In this study language on devices was statistically significant implying that it has an effect on the use of ICT in agricultural marketing, as seconded by several studies that have examined the relationship between language and the adoption of ICTs among small-scale farmers. For instance, a study by Adhikari in 2019 examined the factors that influence the adoption of mobile phone-based agricultural information services among small-scale farmers in Nepal. The study found that language was a significant predictor of adoption, with farmers who spoke Nepali being more likely to adopt these services than those who spoke other local languages.

Similarly, a study by Woldie et al. (2020) examined the factors that influence the adoption of climate-smart agriculture (CSA) practices among small-scale farmers in Ethiopia. The study found that language was a significant predictor of adoption, with farmers who spoke Amharic being more likely to adopt CSA practices than those who spoke other local languages.

However, not all studies have found a significant relationship between language and the adoption of ICTs among small-scale farmers. For instance, a study by Kassie et al. (2017) examined the factors that influence the adoption of improved maize varieties among smallholder farmers in Ethiopia. The study found that language was not a significant

predictor of adoption, indicating that other factors, such as access to credit and extension services, had a stronger influence on the adoption of improved maize varieties.

5.5 Recommendations

Local language ICTs should be made available to farmers to reduce language barriers and promote widespread adoption of ICTs. Governments, NGOs, and private sector actors can work together to develop and disseminate ICTs in local languages. Access to ICT Infrastructure should be improved as farmers need access to reliable and affordable ICT infrastructure, including mobile phones, computers, and internet connectivity, to fully benefit from ICTs. Governments and private sector actors can work together to improve ICT infrastructure in rural areas, such as by expanding mobile network coverage and providing subsidies for ICT equipment.

Access to Credit should be enhanced as lack of access to credit is a major constraint on small-scale farmers' ability to adopt ICTs. Governments and private sector actors can work together to provide affordable credit to farmers to enable them to invest in ICTs.

Extension services play a critical role in promoting the adoption of ICTs among small-scale farmers. Government and NGOs can work together to provide training and capacity building programs to extension workers to improve their knowledge and skills in using ICTs and to provide technical support to farmers.

Farmer education should be undertaken as farmer education is essential in promoting the adoption of ICTs. Governments and NGOs can work together to provide farmer education programs that teach farmers how to use ICTs and the benefits of using them.

Collaborative efforts should also be made as collaboration between governments, NGOs, and private sector actors is essential to promote the adoption of ICTs among small-scale farmers. Governments can provide an enabling environment for the private sector to invest in ICT infrastructure and services, while NGOs can provide technical assistance and capacity building programs to farmers.

Overall, the adoption of ICTs among small-scale farmers requires a collaborative effort by multiple stakeholders. Efforts should be focused on improving access to local language ICTs,

improving access to ICT infrastructure, providing affordable credit, strengthening extension services, providing farmer education, and fostering collaboration among stakeholders.

5.6 Conclusion

The multiple linear regression analysis revealed that age, type of crop grown, willingness to pay, level of education, access to device, membership to a club, internet access, and farming experience all influence the adoption of ICT in agriculture. These findings could provide useful insights for policymakers and agricultural stakeholders who are interested in promoting the adoption of ICT in the agricultural sector. They could also help to identify areas where investment in ICT infrastructure and services could be targeted to increase the adoption of ICT in agriculture.

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CHAPTER 6

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter gives an overview of the research study in a reduced manner giving a recap of the research ideology, method and findings of the study. The scope of the chapter is given out through information presented as the research summary, conclusions, policy implication and recommendations considering the research outcomes, areas for further research based on the noted gaps, References as well as appendices.

6.2 Research summary

This research study intended to investigate the adoption of Information and Communication Technology (ICT) among small scale farmers, their perceptions and attitudes towards ICT, and the factors that affect the adoption of ICT. The study was conducted through a triangulated approach, including a survey questionnaire and direct interview in three wards in Musana communal area in Zimbabwe.

The results showed that small scale farmers have a poor perception of ICT and do not believe that it can improve their agricultural production and marketing. The adoption of ICT among small scale farmers was found to be low, with only a small proportion of farmers using ICT tools such as mobile phones, computers, and the internet.

The study recognised several factors that affect the embracing of ICT among small scale farmers which include lack of access to affordable and reliable ICT infrastructure, limited digital literacy and skills, inadequate financial resources to invest in ICT tools and infrastructure, and poor ICT policy and regulatory frameworks.

The study also established that the adoption of ICT among small scale farmers is subjective by social and cultural factors, such as gender, age, education level, and social network influence. Female farmers and older farmers were found to have lower levels of ICT adoption compared to male farmers and younger farmers.

In conclusion, the study highlights the need for policymakers and stakeholders to address the factors that hinder the adoption of ICT among small scale farmers. This includes promoting access to affordable and reliable ICT infrastructure, developing farmer-oriented ICT tools,

providing digital literacy and skills training, promoting access to finance, and strengthening regulatory frameworks. The study also emphasizes the importance of addressing social and cultural factors that influence ICT adoption among small scale farmers.

6.3 Conclusions

In conclusion, the adoption of Information and Communication Technology (ICT) among small scale farmers is a complex and multifaceted issue that is influenced by a range of factors. This study has highlighted the positive perceptions and attitudes of small scale farmers towards ICT, but also revealed that the adoption of ICT among this group is still low. The study has also identified several factors that affect the adoption of ICT, including access to infrastructure, digital literacy and skills, financial resources, policy frameworks, and social and cultural factors.

To enhance the adoption of ICT among small scale farmers, policymakers and stakeholders must address these factors and develop targeted interventions that are tailored to the needs and context of small scale farmers. This may include the provision of affordable and reliable ICT infrastructure, the development of farmer-oriented ICT tools, the provision of digital literacy and skills training, the promotion of access to finance, and the strengthening of regulatory frameworks. Additionally, social and cultural factors such as gender, age, education level, and social networks must be taken into account when designing interventions to promote ICT adoption among small scale farmers.

Overall, this study has shed light on the challenges and opportunities of promoting ICT adoption among small scale farmers. Further research is needed to explore these issues in more depth and to develop evidence-based interventions that can effectively promote the adoption of ICT among small scale farmers, enhance their productivity, and improve their livelihoods.

6.4 Policy implication and recommendations

Policy implications: Finally, studying the role of ICT amongst small-scale farmers can have important policy implications. For example, it can inform the development of policies and programs that promote the adoption of ICT amongst small-scale farmers, or that address the barriers to ICT adoption that they face.

6.5 Areas for further research

While this study has provided valuable insights into the adoption of Information and Communication Technology (ICT) among small scale farmers, there are several areas that require further research. These include:

1. Exploring the specific ICT needs of different types of small scale farmers: Small scale farmers vary in terms of their farming practices, crop types, and geographical location. Further research is needed to understand the specific ICT needs and preferences of different types of small scale farmers, and to develop farmer-oriented ICT tools that are tailored to their specific needs.

2. Investigating the impact of ICT adoption on small scale farmers' livelihoods: While the study has highlighted the potential benefits of ICT adoption for small scale farmers, further research is needed to assess the actual impact of ICT adoption on their productivity, income, and livelihoods.

3. Examining the effectiveness of different ICT adoption interventions: To promote the adoption of ICT among small scale farmers, policymakers and stakeholders must implement targeted interventions. Further research is needed to assess the effectiveness of different types of interventions, such as digital literacy and skills training, access to finance, and policy frameworks.

4. Assessing the sustainability of ICT adoption among small scale farmers: While the study has identified several factors that hinder the adoption of ICT among small scale farmers, little attention has been paid to the sustainability of ICT adoption over the long term. Further research is needed to assess the sustainability of ICT adoption among small scale farmers, and to identify strategies to ensure that ICT adoption continues to be effective and beneficial over time.

5. Exploring the potential of emerging technologies for small scale farmers: With the rapid development of new technologies such as block chain, artificial intelligence, and the Internet of Things, further research is needed to explore the potential of these technologies for small scale farmers, and to assess their readiness and willingness to adopt these technologies.

Overall, further research is needed to deepen our understanding of the adoption of ICT among small scale farmers, and to identify effective strategies to promote the adoption of ICT and enhance the productivity and livelihoods of small scale farmers.

6.6 Appendices

BINDURA UNIVERSITY OF SCIENCE EDUCATION

The role of ICT in agricultural marketing

Household Questionnaire

Good day. Please note that this questionnaire is predestined to gather data to be used for the thesis work as part of an MSc in Food Security. Information gathered shall remain confidential and participation is strictly voluntary.

SECTION A: Demographics

Ward number ☐

Distance to closest market/big market ☐ **km, to place** ☐

Land ownership a. Owned ☐ **b. Rented** ☐

Age of farmer **21-30** ☐ **30-40** ☐ **40-50** ☐ **above 50** ☐

Gender: **Male** ☐ **Female** ☐

Marital status: **Divorced** ☐ **Married** ☐ **Single** ☐ **Widowed** ☐

Level of education: **Primary** ☐ **Secondary** ☐ **Tertiary** ☐ **Technical** ☐

Religion: **Christianity** ☐ **Muslim** ☐ **Other……**

Membership of Social Organization: **YES** ☐ **NO** ☐

Average Farm Size: _____

Farming Experience: _____

Household size: _____

Main crops grown: Horticulture ☐ **Tobacco** ☐ **Other** ☐

Do You Know what is ICT: **YES** ☐ **NO** ☐

Do You Use ICT: **YES** ☐ **NO** ☐

Which ICT Do You Have: Mobile Phone ☐ **Radio** ☐ **Television** ☐ **Internet** ☐

Computer ☐

Perceptions Ranking	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

Section B: Farmers perceptions on ICT

Mobile can be a useful source of agricultural information					
Mobiles have a role to play in finding markets					
Internet can be a useful source of agricultural information					
Agricultural extension helpline can be a useful source of agricultural information					
TV broadcast programs provide sufficient agricultural information					
TV program have positive effect on agricultural production					
Radios broadcast programs provide sufficient agricultural information					
TOTAL					

SECTION C: FARMERS ATTITUDES TOWARDS ICT:

ARE YOU WILLING TO USE ICT: YES ☐ NO ☐ DON'T KNOW ☐

ICT IS COSTLY TO USE: YES ☐ NO ☐ DON'T KNOW ☐

ICT DIFFICULT TO USE: YES ☐ NO ☐ DON'T KNOW ☐

ICT INCLUDES COMPUTERS ONLY: YES ☐ NO ☐ DON'T KNOW ☐

ICT REQUIRES EDUCATIONAL QUALIFICATIONS: YES ☐ NO ☐

DON'T KNOW ☐

ICT IS EASILY ACCESSIBLE: YES ☐ NO ☐ DON'T KNOW ☐

INFORMATION PROVIDED: YES ☐ NO ☐ DON'T KNOW ☐

THROUGH ICT IS NOT IN LOCAL LANGUAGE: YES ☐ NO ☐

DON'T KNOW ☐

ICT CAN IMPROVE FOOD SECURITY: YES ☐ NO ☐ DON'T KNOW ☐

ICT IS MORE ACCESSIBLE TO MALES: YES ☐ NO ☐ DON'T KNOW ☐

ICT HELPS IN PROVIDING INFORMATION: YES ☐ NO ☐

DON'T KNOW ☐

SECTION D: FACTORS HINDERING THE ADOPTION OF ICT

Does Age influence usage of ICT? **YES** ☐ **NO** ☐

Does farming experience influence your use of ICT? **YES** ☐ **NO** ☐

Are you willing to pay for ICT? **YES** ☐ **NO** ☐

Does your level of education influence ICT use? **YES** ☐ **NO** ☐

Is there Network connectivity? **YES** ☐ **NO** ☐

Is there influence in your social organization to use ICT? **YES** ☐ **NO** ☐

Does Type of crop grown influence ICT? **YES** ☐ **NO** ☐

Do you have Internet access? **YES** ☐ **NO** ☐

Do you have Access to a device? **YES** ☐ **NO** ☐

Which Language is used on devices? **YES** ☐ **NO** ☐