Faculty of Agriculture and Environmental Science

Department of Agricultural Economics, Education and Extension

TITLE OF THESIS

An assessment of the effects of mobile phone usage on maize profitability among communal farmers in Mashonaland East.

SUBMITTED BY

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REG NUMBER

B211858B

A Dissertation Submitted in Partial Fulfillment of the Requirements of the Bachelor of Science Honours Degree in Agricultural Economics and Management.

23 JUNE 2025

RELEASE FORM

AUTHOR : Tinotenda. P .Kawonza

REG NUMBER : B211858B

DEGREE TITLE :BACHELOR OF AGRICULTURAL SCIENCE HONOURS DEGREE IN AGRICULTURAL ECONOMICS AND MANAGEMENT.

RESEARCH PROJECT TITLE: "**AN ASSESSMENT OF THE EFFECTS OF MOBILE PHONE USAGE ON MAIZE PROFITABILITY AMOUNG COMMUNAL FARMERS IN MASHONALAND EAST".**

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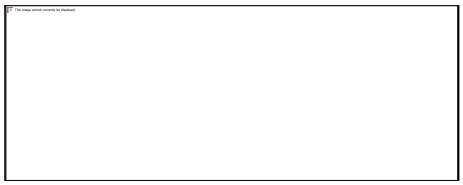

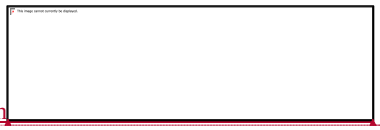

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DECLARATION

I, Tinotenda .P. Kawonza, declare that this dissertation titled "An Assessment of the effects of mobile phone usage on maize profitability among communal farmers in Mashonaland East " is my original work and has not been submitted elsewhere for any degree or qualification. I acknowledge that I have received guidance and support from my supervisor, DR. E. Zivenge, and other academic staff during this research, but the intellectual content and presentation of this dissertation are entirely my own. I have followed the guidelines and regulations of the Bindura University of Science Education regarding plagiarism and academic integrity, and I have properly cited and referenced all sources of information used in this dissertation.

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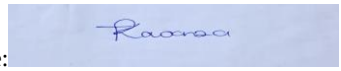
Signature: 

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DEDICATION

I dedicate this research study to my cherished family and close friends, who have provided me with unrelenting support, love and kindness, serving as a foundation of resilience throughout my academic pursuits. I would also like to express my sincere gratitude to my esteemed lecturers, whose expert guidance, mentorship and advice have been instrumental in shaping my academic endeavors. Their combined efforts have played a substantial role in the successful culmination of this research project.

ACKNOWLEDGEMENTS

I would like to convey my sincere appreciation to my respected advisor, Dr. E. Zivenge, for his exceptional mentorship, steadfast assistance, and professional guidance throughout my research endeavor. His considerable insight, remarkable tolerance, and motivating direction have played a crucial role in influencing this investigation.

I also appreciate the academic and professional personnel of the Department of Agricultural Economics, Education, and Extension at Bindura University of Science Education. Their combined expertise, assistance, and encouragement have substantially improved my understanding of the research subject.

Special appreciation is extended to my friends, Denzel, Tariro, Don, Praise, and Florence, for their companionship and motivation. Their backing has made this academic experience both pleasant and unforgettable.

I am grateful for the chance to have conducted this research and value the input of all participants. Your collaborative assistance, direction, and motivation have been essential to the successful conclusion of this investigation.

ABSTRACT

Maize production is essential for boosting food security and uplifting the well the being of agricultural communities in Zimbabwe. Unfortunately, farmers in Mashonaland East Province encountered difficulties in achieving maximum maize profitability.The main goal of this study is to assess the effects of mobile phone usage on maize profitability among communal farmers in Mashonaland East Province. The study addressed three specific objectives, to identify major mobile phone services utilized by communal maize farmers, to determine the effect of mobile phone use on maize profitability, and to evaluate obstacles encountered by farmers when using mobile phone for maize farming. The study employed original data. Data were gathered through structured questionnaires administered to 160 randomly selected communal farmers in the study area. The data were examined using a combination of regression analysis, SWOT analysis and regression analysis.

The study established that female farmers (55%) were more involved in maize production than male farmers (45%). The study also revealed that most farmers accessed weather updates, market information and mobile money services through their mobile phones. The regression analysis indicated a limited direct correlation between mobile phone usage and maize profitability. However, family size and cattle ownership were found to be significant positive predictors of maize profitability. Constraints to mobile phone usage included poor network coverage, high data costs, and limited training opportunities. Insufficient access to reliable mobile services was a major challenge affecting communal farmers Mashonaland East Province.

The research suggested that investments in rural telecommunications infrastructure and digital literacy programs should be prioritized. Furthermore, affordable data plans and accessible mobile agricultural services need to be availed to small scale farmers.

Keywords: Mobile Phone Usage, Maize Profitability, Communal Farmers, Regression Analysis, Agricultural Development.

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LIST OF ACRONYMS AND ABBREVIATIONS

AFC	Agricultural Finance Corporation
AMA	Agricultural Marketing Authority
ARDC	Agricultural and Rural Development Corporation
AREX	Agricultural Extension Services
DFID	Department for International Development (United Kingdom)
DIT	Diffusion of Innovations Theory
EGF	Evergreen Farming Group
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GMB	Grain Marketing Board
GSMA	Global System for Mobile Communications Association
ICT	Information and Communication Technologies
ISP	Internet Service Provider
ITU	International Telecommunication Union
IVR	Interactive Voice Response
KACE	Kenya Agricultural Commodity Exchange

KTA	Knowledge Transfer Africa
LFSP	Livelihoods and Food Security Program
MNO	Mobile Network Operator
MVNO	Mobile Virtual Network Operator
NAFIS	National Farmers Information Service
NALEP	National Agricultural and Livestock Extension Program
NGOs	Non-Governmental Organizations
POTRAZ	Postal and Telecommunications Regulatory Authority of Zimbabwe
RML	Reuters Market Light
ROI	Return on Investment
SMS	Short Message Service
SPSS	Statistical Package for the Social Sciences
TAM	Technology Acceptance Model
USAID	United States Agency for International Development
ZFU	Zimbabwe Farmers' Union

CHAPTER 1

INTRODUCTION

1.0 Introduction

This chapter establishes the groundwork for the research by providing a detailed examination of the study's background, problem statement, objectives, research questions, justification and organizational structure. It also presents the rationale behind the study, emphasizing its importance and applicability, while recognizing the constraints that define the research boundaries.

1.1 Background of the Study

The advent of mobile phone technology has transformed communication, access to information, and business operations. In agriculture, mobile phones can enhance farmers' access to market information, improve their interaction with suppliers and buyers and raise their incomes. Agriculture is an information-intensive activity that requires farmers to have access at all times to useful and timely information, which is fundamental to decision-making (Musungwini, 2016, 2018). Agriculture is faced with a number of risks and uncertainties from drought, pests, and soil erosion to land degradation (Zimbabwe United Nations Development Assistance Framework, 2014). By having access to timely and relevant information, farmers can make sound decisions on crop choice, time and location of selling produce, and procuring input at competitive prices.

In their document, Zimbabwe United Nations Development Assistance Framework (2014) pointed out that ICTs greatly assisted with many challenges of Zimbabwean farmers and enhanced the welfare of resettled farmers and rural communities. Mobile phone technology has become the most significant way of transmitting data and services in the Third World (Masuka et al., 2016; Mutisya, Kiai and Ndati, 2016; Musungwini, 2018).The existence of mobile phones in life has brought change to many sectors, including agriculture, with positive impacts for small farmers in the Third World. Amongst Zimbabwean farmers, the communal farmers are critically involved in the agricultural sector, and they contribute enormously to food security and rural wealth. Despite this, they tend to suffer from the absence of access to information, markets and capital, which tends to hamper their productivity and potential income-generating capacity.

Over 80% of Zimbabweans own mobile phones, but only 2% of the farmers utilize such mobile phones to obtain agricultural information. Cell phones are now a vital tool that can realistically overcome such issues by enabling immediate availability of critical information and services to farmers. For example, mobile technology can provide availability of farm advice, market prices, weather forecasts, and banking services, thus allowing farmers to make informed decisions that enhance productivity and profitability. Although the anticipated effects are tremendous, very few people know about the effects of mobile phone usage on maize profitability among communal farmers. Access to agricultural information would be a major contributor towards improvement in the livelihoods of individuals that rely on farming. Farmers can improve their farming practices when they receive agricultural information, and this would add to increased output.

Information is related to knowledge, and knowledge is derived from information (Fricke, 2009). Thus agriculture information access is challenged through communication channels or information dissemination channels. All these challenges can reduce profitability, productivity, and ultimately competitiveness. However, the use of farmers with mobile technology depends on infrastructure, literacy, and socio-economic status. Assessing the boundaries to use and use of mobile phones development of rural communities is important for policymakers trying to stimulate agricultural production. This study will add to this understanding by exploring the effects of mobile phone use and profitability on maize farmers in Mashonaland East.

The purpose of this study is to examine the relationship between mobile phone use, and profitability on maize profitability by communal farmers in Mashonaland East. In establishing the relationship between mobile technologies to farm outcomes, this study aims to produce recommendations that may inform agriculture policies and programs in order to help people improve the lives of communal farmers. The findings will be a complementary addition to our understanding of how digital technologies may enhance agricultural development and sustainability in Zimbabwe, as well as similar locations.

1.2 Statement of the problem

Musungwini (2016) states that Zimbabwean communal farmers encounter many barriers that negatively affect their ability to make profit. An example of such factors included not having

good access to timely agricultural information; fluctuating market prices and availability of good financial services are other challenges experienced by communal farmers in Zimbabwe. Most recently, the rise of mobile phone technology provides a good solution to the above problems as applications like eMkambo, e-Hurudza, Kurima Mari, Eco farmer, and Esoko provide meaningful services (Musungwini 2016).The services include weather, microloans, market prices, input prices and advisory on agriculture. Despite such advancements, there remains a knowledge gap concerning the effects of mobile phone usage on profitability and difficulties in the utilization of mobile phones on maize yields in Mashonaland East by communal farmers. Additionally, there is also little knowledge concerning the nature of the most utilized and most valued mobile phone services among such farmers. Therefore, this research purposes to close this gap by evaluating the impact of mobile phone use on communal farmers' economic returns in Mashonaland East, identifying most prevalent mobile phone services used by this community and evaluating hindrances that confront communal farmers when using mobile phones for maize cultivation in Mashonaland East.

1.3 Objectives of the study

1.3.1 Main objective

- To assess mobile phone usage among communal maize farmers in Mashonaland East.

1.3.2 Specific-objectives

- To identify major mobile phone services received by communal maize farmers in Mashonaland East.
- To determine the effects of mobile phone usage on maize profitability among communal farmers in Mashonaland East.
- To evaluate the challenges faced by communal farmers in using mobile phones on maize production in Mashonaland East.

1.4 Research questions

- What types of mobile phone services are most frequently accessed by communal maize farmers in Mashonaland East?
- How does mobile phone usage correlate with maize yield and overall profitability among communal farmers in Mashonaland East?
- What are the major challenges communal farmers face in accessing and using mobile phone services for maize production?

1.5 Justification of the study

Agriculture is key to Zimbabwe's economy, and maize is an important crop in Zimbabwe. However, communal farmers in Mashonaland East face a number of challenges surrounding maize profitability. The increasing adoption and use of mobile phones by farmers suggests possible solutions to these challenges. Despite the potential for mobile phones to increase agricultural productivity and profitability, there is a knowledge gap regarding how mobil.e

phones affect maize profitability in communal farmers in Mashonaland East. This study aims to address this knowledge gap and investigate the effect of mobile phone use on maize profitability of communal farmers in Mashonaland East. The capability of mobile phones to enhance agricultural productivity and profitability has been well documented (Davidson & Abiona 2017; GSMA 2019; ITU 2019). Mobile phones can give farmers access to market information, agricultural advice, and financial services, independently enabling farmers to make informed decisions, increase their productivity, and improve their incomes. Zimbabwe relies on agriculture for economic bases and to improve maize productivity and profitability will address poverty and food insecurity for smallholder farmers in Zimbabwe (FAO 2017; World Bank 2019) The outcomes of this study will help to create evidence-based policies and practices that structure the effective dimensions of mobile phone usage in agriculture for more efficient and sustainable agricultural systems (GSMA, 2019; ITU, 2019). Moreover, this study will contribute to the literature on mobile phone use in agriculture to provide guidance to researchers, policymakers and practitioners (Davidson & Abiona, 2017).

1.6 Scope and Limitations of the Study

This study seeks to examine the effect of mobile phone use on maize profitability for communal farmers in Mashonaland East, Zimbabwe. There are three main objectives of the study. The first objective is to identify the mobile phone services that are available to communal farmers. The second objective is to determine the effect mobile phone use has on maize profitability for communal farmers in Mashonaland East, Zimbabwe. Lastly, the study seeks to determine the challenges that communal farmers face in the use of mobile phones with regards to maize production in Mashonaland East.

The study will use a quantitative research methodology to analyzing the data collected from a sample of communal farmers in Mashonaland East, Zimbabwe. While the study can add to the body of knowledge, there are some inherent limitations. Geographically, the study will only be concerned with the farmers in the region of Mashonaland East, Zimbabwe, therefore generalizability outside of this one region, regionally or internationally, could pose a limitation of the study.

1.7 Organization of the Study

This thesis consists of five chapters, the first of which is the introduction of the study. Chapter 2 provides the theoretical and empirical literature from other scholars on mobile phone usage and maize profitability for communal farmers in Mashonaland East Province. Chapter 3 states the research methodology that was followed in the study. Chapter 4 discusses the results and the findings. Chapter 5 provides the conclusion and recommendations of the study and areas for future research.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter intends to provide an in-depth review of existing studies on the use of mobile phones in delivering agricultural information with a focus on the effects of mobile phone use on maize profitability of communal farmers in Mashonaland East. The review will consider the explanation of key concepts, theoretical frameworks, the use mobile phones in agriculture, level of access to mobile phones, mobile phones and profitability of agriculture, mobile phone agriculture projects in Zimbabwe, barriers to mobile phone use, opportunities and constraints of mobile phone use in agriculture, success stories on the use of mobile phones in agriculture.

2.1 Definition of terms

2.1.1 Communal farmers

Communal farmers are agricultural producers who manage small plots of land and typically utilize family labor and local resources (FAO, 2018; IFAD, 2019; World Bank, 2020). Communal farmers are said to have limited access to capital, technology, and/or markets (IFAD, 2019; World Bank, 2020). They are important producers for food security and rural development (FAO, 2018; IFAD, 2020).

2.1.2 Profitability

A farming operation is considered profitable if it can generate a profit, which is defined as revenue above expenses (Kay, 2009). Profitability in communal farming is typically determined by the net income or returns on investment (ROI) generated by the farm (Mwangi & Kariuki, 2018). Profitability is a crucial indicator of communal farming's sustainability and economic viability (FAO, 2017).

2.1.3 Agriculture

Agriculture is a method which human's take charge of rearing animals and growing useful plants (Kimaro, 2019). Therefore in this study, agriculture is referred to as the process of rearing animals and growing crops for human beings for consumption and to earn an economic benefit.

2.1.4 Information dissemination

Information dissemination refers to the proactive provision of information to individuals who are likely to seek it (Sturges & Sturges, 1997).

2.2 Theoretical Framework Review

2.2.1 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is a well-established theoretical framework for technology adoption and use (Davis, 1989). TAM hypothesized that technology use and acceptance are constituted by two primary constructs, perceived usefulness and perceived ease of use. Specifically, perceived usefulness is the degree to which a person believes that a specific technology will enhance his or her job performance (Davis, 1989, p. 320). For the application of mobile phones by communal farmers, perceived utility has been employed to suggest the extent to which farmers believe that mobile phones can make their farming profitable, aware of market trends and get in touch with other farmers and extension officers. Perceived user-friendliness, on the other hand, is a concept employed to suggest the extent to which one believes that a specific technological gadget is simple to use (Davis, 1989, p. 322). Perceived user-friendliness determines how willing farmers are to adopt and utilize mobile devices for agricultural use. TAM has been extensively used in many domains, such as agriculture, to comprehend technology adoption and implementation.

2.2.2 Diffusion of Innovations Theory

The Theory of Diffusion of Innovations (DIT) gives a useful framework for examining the use of mobile phone technology adoption and diffusion among communal farmers in Mashonaland East. Rogers (2003) defined diffusion as The process by which an innovation is communicated through certain channels over time among the members of a social system. This concept has been used extensively in explaining the adoption and use of new technology for example mobile phones. In determining the effects of mobile phone utilization on maize profitability for communal farmers, DIT posits that the use and adoption of mobile phones are determined by variables such as perceived benefits, compatibility, simplicity, testability, and visibility (Rogers, 2003). The perceived benefits are the degree to which mobile phone technology is believed to surpass existing methods of accessing agricultural services and information. Compatibility is the degree to which mobile phone technology is consistent with the prevailing values, experiences, and necessities of communal farmers. Furthermore, the theory also emphasizes the need to understand the social context in which the innovation is being introduced. In this case, societal context refers to the communal farming society in Mashonaland East.

2.3 Level of Access through Mobile Phones

The "availability of mobile phones has altered the ways in which farmer access to farm information, and arguably reaps better livelihoods." Across the globe, the coverage level of mobile phones has grown significantly, from "12%" in 1999 to "76%" in 2009 (Tegegn & Dafisa, 2017). In Africa, there has been a dramatic increase in the use of mobile phones in Nigeria, with "98.7%" of farmers with access to and "90.5%" of farmers owning mobile phones (Asa & Uwem, 2017). Similarly, Zimbabwe also has a high mobile subscription rate; as reported by POTRAZ (2017), the country's mobile phone penetration rate increased from "97%" to "100.5%" from the second to the third quarter of 2017.

This extensive coverage of mobile phones forms the background against which "the effect of the utilization of mobile phones on maize profitability among smallholder farmers in Mashonaland East is to be assessed." Since there is extensive penetration of mobile phones in

Zimbabwe, communal farmers in Mashonaland East are likely to have mobile phones through which they can access "information in agriculture, market prices, and other services that could improve maize profitability."

2.4 Application of Mobile Phones in Farming Operations

Application of mobile phones worldwide has revolutionized farmers' access to information, communication with markets, and maximization of their incomes. Ever since the establishment of the e-agriculture community, various organizations have developed e-agriculture programs such as Manobi, e-Choupals, Gyandoot, the Evergreen Farming Group (EGF), and participatory 3D mapping (Bertolini, 2004). These initiatives aim to provide farmers with vital, accessible, and timely information. The application of mobile phones in agriculture has far been accepted as one of the most important instruments for development. Bertolini (2004) indicates that "mobile phone short message service-application is a significant emerging ICT application used for conveying information in Africa." Sekabira and Qaim (2017) confirmed that since 2000, mobile phone technology has been used extensively in most developing countries, and studies have shown that the use of cell phones has increased farmers' revenue and market access.

There are several reasons why mobile phones are crucial in agricultural development. Donner (2006) emphasizes the convenience and protection offered by mobile phones. Rashid and Elder (2009) observe that mobile phones require low levels of literacy and do not rely on infrastructural elements such as telephone wires and roads. Bertolini (2004) and Rashid and Elder (2009) also emphasize the ability of mobile phones to communicate and reach poor rural communities. Mittal and Tripathi (2009) argue that mobile phones have three strengths over other ICTs: easy access to customized information, mobility, and time saving. Aker and Mbiti (2010) proved that mobile phones are the most employed ICTs among farmers due to them being simple to operate, inexpensive, and they raise their social status.

Mobile phones have been proven through studies to improve agricultural performance. Aker and Ksoll (2016) found that Niger farmers who possessed mobile phones and were capable of using them increased their crop output and diversification of cash crops. Aker (2010) also found that "mobile phone exposure reduced millet consumer price distribution by 10-15 percent in Niger.". With regard to maize production in Mashonaland East, mobile phone use can potentially enhance farmers' access to market information, productivity, and profitability. The aim of this research is to analyze the effects of mobile phone use on maize profitability by communal farmers in Mashonaland East.

2.5 Successful Mobile Phone-Based Agricultural Information Dissemination Projects

A number of successful projects are dispersed all over the globe. Some of the successful projects include Reuters Market Light (RML), Manobi, Web Portal, ONASA, Cocoa Link, NAFIS, and KACE, among others.

2.5.1 Reuters Market Light (RML)

RML delivers Indian farmers daily farm information in the form of customized short messages to their cell phones. The information is displayed in nine languages of a region and supports several telecommunication providers as well as a variety of cell phone models. RML provides information on 450 crop varieties, over 1300 markets, and 3500 weather stations. The service has "over 1.3 million registered farmers in 50,000 villages across 17 Indian states, and an additional million or so farmers through sharing" (Samhita, 2012).

2.5.2 Manobi – Senegal

One such example is the Xam Marsé project, which was launched in Senegal in 2001. The new program offers free access to internet market data and short message services. Manobi, a Senegalese company, collects and publishes agriculture products' prices on a database through cell phones, as recorded by Rashid and Elder in 2009. Farmers have access to the database and are informed about prices of different agriculture products, then determine the most suitable market for sale of their product. The Xam Marsé platform has enabled anglers to reduce quantities of fish lost looking for markets. It has also been understood by the growers and buyers that they can purchase more profits if they sell their produce to local markets rather than exporting it.

2. 5.3 China Web Portal

China's Ministry of Agriculture has constructed an agricultural web portal. The portal offers hyperlinks to the agricultural websites of China's provinces and districts, promoting information exchange and resource sharing. The web gateway enables agricultural workers and farmers to exchange agricultural information and farmers can send their agricultural information questions to a hotline number by voice call or via mobile phones. This system, through the end of 2013, had responded to 3.62 million farmers'.

2.5.4ONASA in Benin

In Benin, the internet and mobile phone SMS are employed to monitor the prices of the 25 most significant staple foods in the rural markets of Benin. ONASA is the name given to the service. ONASA sends the prices of the staple foods to an internet café after work hours, and the information is processed and sent to the subscribers as SMS. The subscribers are able to request the information on the SMS platform.

2.5.5 NAFIS and KACE in Kenya

The Kenyan National Farmers Information Service (NAFIS) in conjunction with the National Agricultural and Livestock Extension Programme (NALEP) bundles agricultural information in English and Kiswahili and delivers it to Kenyan farmers through cell phones as well as phones. The service provides electronic trading floors and market data traders and farmers on agricultural produce prices. There is another platform, KACE (Kenya Agricultural Commodity Exchange), that also offers agricultural produce market information via a cell phone's SMS platform and IVR (interactive voice response). IVR allows the use of the voice mail platform to transfer information about agriculture to farmers. KACE's main activities are to connect buyers and farmers through offering market prices of agricultural products daily. Besides, there

is yet another mobile phone agriculture information dissemination program in Kenya known as MFarm. MFarm is a market information system introduced in 2011 that offers market prices of 42 crops daily to Kenyan farmers. Farmers subscribe and become members of MFarm so that they can use their cellphones to send and receive market information daily.

2.5.6 Cocoa Link – Ghana

USAID in 2012 describes Cocoa Link as a cell phone-enabled platform launched in 2011 in Ghana that provides social, agricultural, and market information to cocoa farmers in 15 villages of Western Ghana. It has raised the incomes and livelihoods of Ghana's cocoa farmers. The cocoa farmers join Cocoa Link so that they can get the latest information through short message services text and voice calls, and also business experts and other farmers. Cocoa Link is available to all Ghanaian citizens with or with access to a mobile telephone, since the messages are sent in English or in the Ghanaian language. The connection now has over 4000 registered subscribers, and 95% of them are actually real cocoa farmers.

2.6 Mobile Phones and Agricultural Profitability

Mobile phones have transformed agriculture in developing nations, significantly boosting profitability among communal farmers. In "Aker and Mbiti (2010)", mobile technology usage boosts maize profitability in economies like Kenya and Tanzania by improving transaction efficiency and access to market information. "Sekabira and Qaim (2017)" established that mobile phone-facilitated agricultural advisory services improved maize yields and profitability among smallholder farmers in Uganda.

The benefits of mobile phones in agriculture are numerous. For instance, "mobile phones allow farmers to compare prices, buy inputs at lower prices, and arrange transport, resulting in cost and time savings" ("Jensen, 2007"). Mobile phones also connect farmers with buyers in distant markets, where they can potentially receive higher prices for their produce ("Aker, 2011"). "Real-time market price information also allows farmers to sell their produce at higher prices" ("Fafchamps & Minten, 2012").

Besides, mobile phones allow participation in off-farm activities, such as "mobile money-based businesses, generating additional income opportunities" ("Morawczynski, 2009"). Literature has consistently shown that "mobile phone technology has a positive impact on agricultural productivity in sub-Saharan Africa". For example, a study of 41 countries over 25 years concluded that mobile phone technology adoption led to a "12.7% increase in agricultural productivity" ("Adenubi et al., 2021").

Empirical evidence from a variety of countries supports the notion that mobile phones can add to agricultural profitability. In Niger, mobile phone usage reduced grain price dispersion among domestic and cross-border markets, increasing market efficiency ("Aker, 2011"). In Malawi, research confirmed that asset ownership and mobile phone access were the most important factors in "implementing mobile phone technology for agricultural marketing" ("Muto & Yamano, 2009"). In India, a study found that mobile phones enabled farmers to access timely information, which increased yields and improved decision-making ("Deichmann et al., 2016").

Literature explains that the mobile phone can "significantly improve agricultural profitability in developing nations". By improving access to information, markets, and finance services, the mobile phone can help farmers reduce costs, increase revenues and thus improve their net returns.

2.7 Zimbabwe mobile phone farming projects

There are certain farming information dissemination projects that depend on mobile phones and other ICT-based in Zimbabwe. The platforms available are E-hurudza, Eco Farmer, Esoko, Kurima Mari and e-Mkambo.

2.7.1 E-Hurudza- Zimbabwe

E-Hurudza is a computer farm management system providing farming information to farmers. It was developed by a Zimbabwean firm to support the land reform programme of the government of Zimbabwe (Chisita 2010). However, the system was developed in the lab and not piloted in the field (Musungwini 2016). The Department of Agricultural Extension Services (AREX) provides the e-Hurudza programme software to farmers and trains them on how to use it. E-Hurudza requires a computer, printer and good infrastructure.

2.7.2 Eco-Farmer

"Eco Farmer is an e-agriculture service to which Zimbabwean farmers have access," states "Econet Wireless (2018)." Econet Wireless created and introduced the service in 2013, which is an indexed weather-based natural disaster insurance service employed by Zimbabwean smallholder farmers to cover them for a cover of eight cents a day through insurance. The eight cents are charged to the farmer's prepaid mobile phone wallet every day during farming season. This service is accessible to Econet subscribers and "eco cash registered users only." In case his/her family is fully registered and subscribes every day, he/she shall get:

- Tips on farming and the market.

- Daily rainfall information.

- Best agric practices weekly.

- Crop updates weekly.

- Monthly free market price request.

- Loans ranking.

- Free advertisements and marketing links.

Eco-Farmer platform allows farmers to claim money in case of crop damage due to adverse weather conditions. The weather insurance network provides accurate information on rainfall in the farmer's field. The service gained popularity among Mashonaland East Province smallholder farmers and is being rolled out to other provinces.

2.7.3 Esoko

"Esoko is a mobile-led platform developed by the Zimbabwe Farmers' Union (ZFU) in 2012 utilizing the SMS platform to disseminate information on agriculture to ZFU member farmers" ("ZFU 2013"). It currently contains data on 33 commodities heading to 17 fresh produce markets in Zimbabwe and reaches over 170,000 smallholder farmers ("Odhiambo and Hove 2015"). Esoko has grown from Ghana to many countries, including Kenya, Uganda, Malawi, Nigeria, Sudan, and Mali ("News Day 2012").

2.7.4 Kurima Mari

"The Kurima Mari phrase is 'farming for money' in Shona" ("Dzenga 2016"). Kurima Mari, introduced in Zimbabwe in 2015, is an online platform providing agricultural information with the aim of raising farmers' income from agriculture. "The platform provides information on agricultural production and marketing of agricultural produce" ("Dzenga 2016"). This collaborative effort of the Zimbabwe Livelihoods and Food Security Programme (LESP) and the Ministry of Agriculture is financed by the United Kingdom's Department for International Development. Though it is designed for smallholder farmers, use is only feasible through smartphones, hence a limitation for some farmers ("Nyakudya 2017").

2.7.5 E-Mkambo

"The Ndebele word E-Mkambo means a market, therefore e-Mkambo can be defined as an electronic market" ("Kabweza 2014"). In 2012, Knowledge Transfer Africa (KTA) initiated e-Mkambo, in partnership with Afsoft Holdings ("Muza 2013"). e-Mkambo is a mobile-based information dissemination service for agriculture. The e-Mkambo services, illustrated by "Kabweza (2013)", are gathering and selling market information, grouping sellers, and providing premium SMS services with farming and market advisory intelligence. However, the service is limited to farmers who sell their produce in markets ("Musungwini 2016").

2.8 Challenges to the Utilization of Mobile Phones in Agriculture

The utilization of mobile phones among farmers has been proposed as a new method for improving productivity, market access, and farmer incomes. Despite the potential benefits, there are several challenges that hinder the efficient use of mobile phones in agriculture.

2.8.1 Education Level

The level of education of farmers directly influences their ability to use mobile phones effectively in agriculture. The majority of farmers in developing countries have low levels of literacy and numeracy, and therefore they are unable to read and obtain utility from mobile phone-based services ("Ali, 2012; Franklyn et al., 2012"). This is particularly important in the case of maize farming in Mashonaland East, where illiterate farmers may be unable to fetch and utilize mobile phone-based services, such as market prices and farm-related advice. A high education has been proven to have a positive effect on the embracement of new technologies, while low education will have a negative effect on acceptance ("Ali, 2012; Franklyn et al., 2012"). "The higher the level of education, the greater is the personal propensity towards

innovation and change" ("Ango et al., 2013"). Moreover, "education level impacts the perception, uptake, and exposure of an individual to new farm methods" (Okwu et al., 2007). The literacy level among farmers is critical in measuring if they can utilize cell phones to access farm information and use their phones to navigate (Okello-Obura et al., 2009). However, Zimbabwe has a relatively high rate of literacy, which may suppress the influence of level of education on mobile phone use by farmers.

2.8.2 Adoption, Funding, Cost, and Technical Expertise

"Agricultural adoption, financing, cost, and technical skills are significant impediments to using mobile phones in agriculture" ("Franklyn et al., 2012"). The majority of farmers in developing countries lack the technical competencies to make use of mobile phones for agricultural activities, and the cost of mobile phones as well as data bundles is a barrier to adoption ("Franklyn et al., 2012"). In Mashonaland East, "the absence of money and technical skills can limit the development and deployment of mobile phone-based services among maize producers, affecting profitability". Implementation of mobile phone-based agricultural services is generally limited by inadequate finance ("Raj, 2012"). "The majority of the ICT-based systems for agricultural information dissemination in India were canceled or were reduced in scale following the pilot stage due to lack of sufficient funds" ("Raj, 2012"). Saravanan (2011) indicated that farmers in developing countries are cautious about funding ICT-based services and expect the government to provide agricultural extension services ("Saravanan, 2011"). This reliance on donor funding can lead to sustainability problems as projects are suspended or cut back whenever donor funding is removed ("Oino et al., 2015")."The expense of ICTs is the greatest deterrent to adoption" ("Franklyn et al., 2012"). "The expense of ICTs was a barrier to the adoption of ICT-based information systems by farmers and organizations" ("Franklyn et al., 2012"). "ICT innovation must be governed and funded at a national scale" ("Easdown and Starasts, 2004"). "Affordability is another key driver affecting the adoption and embracement of new technologies" ("Ango et al., 2013"). "Poor farmers were less likely to embrace newer farm technologies due to affordability concerns" ("Ango et al., 2013"). "ICTs are capital-intensive in terms of technology tools and training, thus being costly for most farmers" ("Churi et al., 2012"). "Lack of technical knowledge and ICT awareness may constrain the use of mobile phone-based agro-services" ("Franklyn et al., 2012"). "Limited access to ICTs and digital literacy skills affected the adoption of ICTs in agriculture" ("Franklyn et al., 2012").

2.8.3 Infrastructure

The lack of Information Communication Technology (ICT) infrastructure in many rural contexts is one of the largest hindrances to mobile phone adoption for agricultural purposes. Rural areas have little to no coverage by the mobile network thus hindering farmers from using mobile phone services, as summarised by "Raj (2012)". This presents a significant challenge in Mashonaland East, since poor ICT infrastructure may limit maize farmers' accessibility to mobile phone based services, limiting their connectivity and possibly their profitability. The evidence demonstrates that ICT infrastructure is poor in rural areas, and this prevents ICT use by rural communities. For example, "Raj (2012) found that in three villages in India, no one had an internet connection or access to a computer." As stated in "Easdown and Starasts (2004),

rural citizens must be linked to the internet through multiple technological connections like good telecommunications infrastructure, computer hardware and software, and Internet Service Provider (ISP) infrastructure" ("Easdown and Starasts, 2004"). Poor infrastructure is also to blame for the introduction of ICT-based information services. "Kibet (2011) found that physical and road infrastructure in rural Kenya led to very costly transport, wastage of perishable produce, as well as immense losses to farmers" ("Kibet, 2011"). Similarly, "Cadilhon (2013) observed that poor infrastructure stifled Ghana's agricultural sector development" ("Cadilhon, 2013").The effect of poor infrastructure is simply astronomical. "Cadilhon (2013) noted that absence of infrastructure led to bad connectivity, resulting in slow response via e-mails and limited access to vital information" ("Cadilhon, 2013"). Agricultural communities in such regions, despite possessing mobile phones, faced challenges in receiving crucial market information, which has necessitated improved infrastructure for mobile phone services.

2.8.4 Connectivity

Connectivity remains one of the biggest impediments to mobile phone utilization in agriculture, especially in the developing world. Farmers lack access to affordable and reliable internet connectivity, which restricts them from accessing and utilizing mobile phone-based services (Franklyn et al., 2012). The issue is particularly relevant in rural areas, where "electricity supply is often unreliable or non-existent, resulting in poor or no connectivity" (Purnomo & Lee, 2010).

The high price of broadband connectivity is another point of entry for rural connectivity. Purnomo and Lee (2010) argue that "broadband prices are prohibitively expensive for people living in remote rural communities, limiting the adoption of Information and Communication Technologies (ICTs)." The International Telecommunication Union (ITU), however, reports that there has been a sharp rise in mobile broadband subscriptions from 2012 to 2017, and that less developed countries recorded the highest growth rate (ITU, 2017).

Poor connectivity also affects cell phone usage in information dissemination. Cadilhon (2013) found that "network congestion can keep text messages and phone calls from being delivered, emphasizing the necessity for better infrastructure to accomodate mobile phone-based services." The author finds that "poor infrastructure can prevent the agri-food production and marketing system from functioning" (Cadilhon, 2013).

Low connectivity in Mashonaland East will limit the coverage and effectiveness of mobile phone-based services to maize farmers, their viability. For this reason, addressing the connectivity problem is significant so that the mobile phone-based services can complement agricultural development properly in the province.

2.8.5 Language

Use of mobile phones in agriculture is, in most cases, hindered by language, especially in developing nations (Mugwisi et al., 2014). Farmers who lack proficiency in the prevailing language used in cellular phone services may face an issue in accessing and benefiting from

these services. The challenge is, in this context, particularly relevant in Zimbabwe because of the scarcity of research materials translated into local languages, enhancing the problem (Mugwisi et al., 2014). Mugwisi et al. (2014) cite that "the scarcity of research materials repackaged into local languages" is a big issue in Zimbabwe.Accessibility of technical farm data in indigenous languages is paramount to the success of e-agriculture initiatives. Localization and customization of research inputs continue to be a challenging exercise still.Raj (2012) asserts that "the success of e-agriculture schemes depends on making technical agricultural information available in local languages." According to Raj (2012), "customization and localization of research inputs remain a difficult task."

Agricultural information can be repackaged in regional languages and formats with the help of ICTs.Furthermore, Zimbabwean farmers who might be illiterate or unfamiliar with English faced difficulties because English is the main language used to communicate agricultural information (Mugwisi et al., 2014). For example, "the prevalence of the English language in the dissemination of agricultural information presents a challenge for Zimbabwean farmers who may be illiterate or unable to comprehend English," according to Mugwisi et al. (2014). Therefore, it is necessary to repackage agricultural information in a way that is both accessible to farmers and in their native tongues.By enabling the provision of agricultural information in multiple languages in even the most remote regions of the nation, ICT use can lessen this burden. This demonstrates how important it is to consider the language barrier when developing and executing mobile phone-based agricultural development services.

2.8.6 Age

One important predictor of whether farmers will adopt and use mobile phones for agricultural purposes is their age. According to Okello et al. (2012), younger farmers have a more positive attitude toward technology and are more willing to adopt new technologies. According to Okello et al. (2012), "Young people are more likely than older people to embrace and adopt new technology and develop a more favorable orientation toward them." "Use of cell phones in agriculture is inversely related to age; this suggests older farmers may face some difficulties using mobile phones for agricultural purposes," the authors added. Similar trends have been noted in other studies, which also acknowledged the challenges older farmers face when embracing and utilizing new technology, such as mobile phones (Okello et al. 2012)."Limited familiarity with mobile phone technology among older farmers may restrict their ability to use and benefit from mobile phone-based services, which can consequently limit their agricultural productivity and profit," according to Okello et al. (2012). The development and implementation of mobile phone-based interventions for agricultural productivity and profit among Mashonaland East's maize farmers must take age into account because age-related barriers may restrict older farmers' access to and usability of mobile phone-based services.

2.9 Conclusion

This review of the literature makes it clear that mobile phone use can boost maize profitability for communal farmers by lowering transaction costs, improving access to market data, and giving them more negotiating leverage. However, there are still certain issues, such as farmers'

low levels of digital competency, restricted access to mobile phone services, and rising mobile phone acquisition and usage costs.

CHAPTER 3

METHODOLOGY

3.0 INTRODUCTION

This chapter describes the methodology utilized to investigate how Mashonaland East communal farmers' use of mobile phones affects the profitability of their maize crops. It details the target population, the study's design, and its location. The sample size and sampling strategy are also covered. Additionally, it describes the instruments, procedures, and data collection strategies employed to investigate the relationship between mobile phone use and maize profitability. By giving a detailed account of the research techniques, this chapter guarantees the validity, reliability, and clarity of the study's conclusions.

3.1 Description of the study Area

Mashonaland East Province

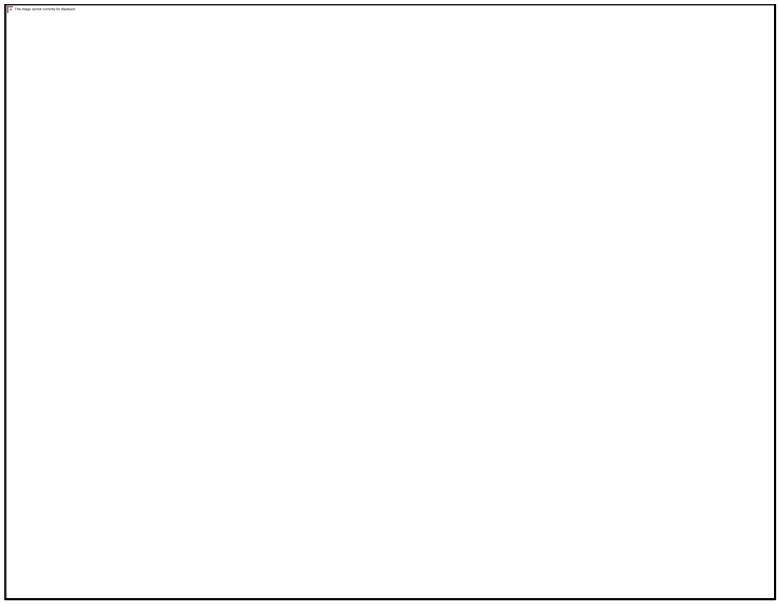

Fig 1: Map view of Mashonaland East Province

The research study was carried out in the northeastern region of Zimbabwe's ten provinces, specifically the Mashonaland East Province. Mashonaland East is a lowland and highland province that shares a southwest border with Harare. Situated in Zimbabwe's subtropical climate zone, Mashonaland East experiences distinct wet and dry seasons, with year-round temperatures averaging between 18°C and 32°C. Mashonaland East receives between 600 and 1200 mm of rain on average each year, with November through March seeing the most precipitation.This is the growing season of maize, the main crop grown in the province.

Mashonaland East is primarily rural and agricultural, with maize, sorghum, millet, and a variety of legumes commonly grown. All farmers confront a number of challenges, including limited market access, variable prices, and climate change's influence over agricultural productivity. The region has both adequate and non-adequate infrastructure, therefore getting to a market can influence farmer profits. Agricultural extension services exist but vary in effectiveness and ultimately their validity depends on whether or not the farmer has access to the means of communication - such as mobile phones.

3.2 Research Design

The study examined communal farmers in Mashonaland East, Zimbabwe, focusing specifically on four districts, Murehwa, Marondera, Goromonzi, and Mutoko which are renowned for agricultural productivity and cultivation of maize. The districts were carefully chosen due to their significance as major areas of maize production and the increasing reliance and use of mobile phone technology by farmers in the area. "Purposive sampling allowed the researchers to select farmers who would provide relevant insight to the topic of the study" (Etikan, 2016). Purposive sampling allows the researcher to specifically select individuals or cases that are unique in that they have characteristics that are important to the study, which increases the chances of getting rich and substantial data. There are a number of reasons why purposive sampling was appropriate for this study. First, the researcher desired "to obtain deep insights into the phenomenon being studied, and purposive sampling is appropriate when researchers feel they have cases they can exemplify, and thus purposive sampling allowed us to select cases to favour, in that could provide us with relevant detail" (Campbell, 2019). Secondly, the researcher sought "to explore specific characteristics or experience that are relevant to the research question," purposive sampling enabled the researcher to select cases based on those characteristics. This meant that through purposive sampling, this study was able to ensure clarity related to the samples with the research aim, which ultimately strengthens the validity and value of the results.

Subsiquently "simple random sampling was used to select the respondents, so that each farmer in the sampling frame unit had an equal chance of being selected" (Taherdoost, 2016). This study "used simple random sampling to select a representative sample for the population" (Sharma, 2017). Simple random sampling gives each population member an equal chance to be selected and lowers the influence of bias while increasing generalizability of findings. There are three reasons that justify the use of simple random sampling in this study. One, the researcher intends to generalize the findings to the larger population and "A simple random sample provides the opportunity to obtain a representative sample" (Alvi, 2016). Two, "Simple random sampling lets you calculate sampling errors, and gives you a measure of the accuracy of the estimates" (Foster, 2017). Using a simple random sampling procedure for this study, ensures that the sample selected and studied is representative of the population, increasing the validity and utility of study findings.

3.3 Data source

Information for this study was obtained from primary sources. Primary data were gathered through a well-structured survey, which was administered to the selected communal farmers in Mashonaland East.

3.4 Data collection techniques

3.5 Data analysis framework

A survey was chosen as the data collection instrument to meet the purposes of this research. So as to maintain anonymity, respondents were not required to provide identifying information on the survey. The chosen farmers were given a structured questionnaire. The questionnaire was given to the farmers in an online (web-based) format and was self-administered. The farmers completed the online survey by opening it and entering their responses. This implied that the farmers could respond to the questions whenever it was most convenient for them, even if no one was present. Data collection was made easier by the study's use of online survey tools, which allowed it to benefit from the advantages of a self-administered survey.

Table 1: Summary of objectives and analytical tools.

Objectives	Data Analytical tools
1. To evaluate the challenges faced by communal farmers in using mobile phones on maize production in Mashonaland East.	SWOT Analysis
2.To identify major mobile phone services received by communal maize farmers in Mashonaland East.	frequency analysis
3. To determine the effects of mobile phone usage on maize profitability among communal farmers in Mashonaland East.	Regression analysis

Source: Author field survey 2025

3.6.1Likert scale

This kind of rating scale is employed to gauge people's attitudes, beliefs, or perceptions. To rate the significance of each response, a Likert scale was employed in this study, and the responses were ranked from 0 to 5. The difficulties faced by communal farmers and their mobile phone services for growing maize were ranked using Likert scale responses. Average scores for each challenge and mobile phone service were calculated using responses on the Likert scale. The difficulties and mobile phone services were then ranked according to their significance using these average scores. The most important mobile phone services that communal maize farmers receive and the biggest obstacles they face were highlighted in this ranking.The unique use of a Likert scale to rank challenges and services enhanced understanding of the complexity of mobile phone usage among Mashonaland communal farmers.

3.6.2 Swot analysis

Using a SWOT analysis framework, the researcher looked at the difficulties communal farmers in Mashonaland East faced when using mobile phones to produce maize, concentrating on the weaknesses. The weaknesses that were identified and analyzed included high transaction costs, mobile phone costs, limited access to mobile agricultural advice, limited availability of online forums for farmers, limited access to mobile phone-based agricultural communities, poor network coverage, expensive data bundles, and limited mobile phone training sessions. In order to develop strategies to overcome these barriers and enhance agricultural productivity and livelihoods, the researcher focused on the shortcomings in order to comprehend the internal factors that hinder communal farmers from using mobile phones effectively. Additionally, each challenge's level was assessed using a Likert scale.

3.6.3 Multiple linear regression

A multiple linear regression model was used in this study to estimate the correlation between different independent variables and maize profitability. To estimate the relationship, the researcher use SPSS. The model was described as follows:

Maize Profitability = B0 + B1 (Mobile Phone Usage) + B2 (Land Size) + B3(Tractors) + B4(Types of Mobile Phones) + B5(Oxy-Drawn Cuts) + B6(Ploughs) + B7(Cattle) + B8(family Size) +U

Variables:

1. Dependent Variable: Maize Profitability (outcome variable)

2. Independent Variables:

- Mobile Phone Usage
- Land Size
- Tractors
- Types of Mobile Phones
- Oxy-Drawn Cuts
- Ploughs
- Cattle
- Family Size

The coefficients (B1-B8) signify the effects on maize profitability when each independent variable increases by one unit, with all other variables remaining constant. The goal of the model is to determine the key factors that affect maize profitability among communal farmers.

3.6.4 Description of variables

Table 2. Description of variables and expected signs

Explanatory variables	coding	Type of measure	Expected signs	Explanation of the expected signs
Mobile phone usage	MPU	Dummy (0:NO,1:YES)	-	Output is negatively related to mobile phone usage
Family Size	FS	Continuous	+	Output is positively related to family size
Land Size	LS	Continuous	-	Output is negatively related to land size
Tractor	TRACTOR	Continuous	-	Output is negatively related to tractors
Types of mobile phones	TOMP	Dummy (0:Ordinary phone,1:Smart phone)	-	Output is negatively related to types of mobile phone usage
Oxy-Drawn Cuts	ODC	Continuous	-	Output is negatively related to oxy-drawn cuts
Ploughs	PLOUGHS	Continuous	-	Output is negatively related to ploughs
Cattle	CATTLE	Continuous	+	Output is positively related to cattle

3.7 Conclusion

This chapter outlined the research methodology used to examine the relationship between mobile phone use and the profitability of maize produced by communal farmers in Mashonaland East. The study focused on communal farmers in the Goromonzi, Mutoko, Marondera, and Murehwa regions using a survey-based methodology. A structured questionnaire was used to gather primary data. The collected data was analyzed using frequency distribution, regression modeling, and SWOT analysis. It is expected that the study's findings will shed light on the advantages and difficulties of mobile phone use among

communal farmers and how it impacts maize profitability. The next chapter will provide a summary of the study's findings.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the findings and analysis of a study looking at the relationship between mobile phone use and the profitability of maize grown by communal farmers in Mashonaland East. There are four sections in the chapter.7The first section focuses on the demographics of the area's communal farmers. The second part explores the challenges encountered by these farmers in leveraging mobile phones for maize production, utilizing SWOT analysis. The third part assesses the primary mobile phone services accessed by communal farmers in Mashonaland East through frequency analysis. Lastly, the fourth part investigates the influence of mobile phone usage on maize profitability among communal farmers using regression analysis.

4.2 Respondents demographic information

The initial segment provides an overview of the demographic details of the survey participants. Although the study's objectives did not explicitly include respondent demographics, collecting this data was crucial for understanding the background characteristics of the target demographic. Participants were asked to provide details regarding their farm size, mobile phone ownership, gender, age category, owned assets, household data, and educational attainment. The district and ward of residence for each respondent were documented to verify their eligibility within the target population. Gender data was significant in determining the predominant gender within the farming sector. The age distribution was also documented to ascertain the average age of the farming population in the Province. Educational background was deemed crucial as it influences information requirements, preferred channels, sources, and formats. Furthermore, the assets owned by farmers were considered vital for evaluating their wealth, income levels, farming capabilities, and potential correlations.

Table 3. Demographic Profile of Farmers

Demographic Profile	Frequency	Percentage
Gender		
Male	72	45
Female	88	55
Age		
Under 20	23	14.38

21-30	34	21.25
31-40	28	17.5
41-50	38	23.75
50 and above	37	23.13
Marital status		
Single	50	31.25
Married	70	43.75
Divorced	40	25
Level of education		
No Formal education	46	28.75
Primary education	10	6.25
Secondary education	17	10.63
Vocational education	27	16.88
Tertiary education	60	37.5

Source: Author's field survey 2025

4.2.1 Survey respondents by gender

The study's findings revealed that the sample consisted entirely of communal farmers, with a notable gender imbalance, favoring women (55%) over men (45%) as indicated by Table 3. These findings agree with those of Mukasa et al. (2020), who highlighted that "women's involvement in agriculture is increasing, particularly in sub-Saharan Africa, due to changes in social and cultural norms, increased access to education and training, and growing recognition of women's contributions to agricultural development." More so, Ndiritu et al. (2019) established that "in Zimbabwe, approximately women constitute 86% of those involved in agriculture, with land being the main source of women's livelihood." However, this finding contradicts with those of Ogunlela and Mukhtar (2017) highlighted that "in Nasarawa State, men are in the forefront when it comes to issues related to research in agriculture." Adepoju (2021) also reports that "in Nigeria, agriculture is in most cases done by men." Machingura (2022) adds that "in Zimbabwe, during the land reform programme, just 10% of the land was given to women, and this was due to cultural practices where land is accessible to women through a patrilineal line."

4.2.2 Farmers by age group

Table 3 displays the results of the survey, which asked respondents to categorize themselves according to age. Of the 160 farmers who participated in the survey, the majority (53.13%) were younger, between the ages of 20 and 40, with the remaining farmers (46.88%) having more experience. The FAO (2019) discovered that as the value of agriculture in economic development is increasingly recognized, young farmers are becoming more involved in the industry, especially in developing nations. According to Kumar et al. (2019), "older farmers are more likely to use traditional farming practices that are adapted to the local climate and soil conditions because they have a deeper understanding of the local environment." In agricultural practices, this emphasizes the importance of both young energy and seasoned knowledge.

4.2.3 Farmers marital status and household size of farmers

A majority of the farmers (43.75%) were married, 31.25% were single, and 25% were divorced. Family size was relatively small, as 88.33% of the farmers had five or less family members and 11.67% had six and above as indicated by table 3. It has been noted that farm productivity is influenced by marital status. Married farmers have larger families and more labor available for use in farm production, which can result in higher productivity, according to a study by Doss (2018). "Married farmers have more household labor, which contributes to higher agricultural production," the FAO (2019) states.According to a study by Kumar et al. (2019), larger families may have more workers for agricultural production, which could result in increased productivity. Nevertheless, other researchers discovered that smaller families can become more efficient and productive because they can make decisions faster and react to market shifts (Smith et al., 2020).

4.2.4 Educational Background of Farmers

Farmers' educational backgrounds varied, according to the study's findings: 6.25% had finished primary school, 10.33% secondary school, 37.5% tertiary, 28.75% non-formal, and 16.88% vocational training. According to FAO (2019), "formal education equips farmers with the necessary skills and knowledge to adopt new technologies and practices, thereby improving their decision-making capacity and increasing productivity." Moreover, Smith et al. (2020) state that non-formal education equips farmers with the knowledge and skills necessary to improve agricultural practices and productivity. Furthermore, Doss (2018) underlined the importance of vocational training in giving farmers the skills and information they need to improve their practices and productivity.

4.2.5 Land Ownership among Smallholder Maize Farmers

According to the study, the majority of farmers (91.67%) owned little land (five hectares or less), while a minority (8.33%) owned large landholdings (six hectares or more). According to a 2019 report by the Food and Agriculture Organization (FAO), "farmers with larger plots of land are more productive than those with smaller plots of land and are more likely to adopt new

technologies and practices." Additionally, the amount of land that small-scale farmers own has an impact on how they use mobile phone services. According to Smith et al. (2020), "farmers with smaller plots of land are more likely to adopt mobile phone services as a way to access information and services that can help them to improve their agricultural productivity."

4.2.6 Mobile phone access

According to research, the province's 100% mobile access rate suggests that most farmers can use their phones to access agricultural information.This result is in line with research from Nigeria that showed 98.7% of farmers owned a cell phone (Asa & Uwen, 2017). According to Kumar et al. (2019), "farmers can access information and services that can help them to improve their agricultural productivity" through mobile phone access. The use of mobile phones by farmers is rapidly increasing. According to Smith et al. (2020), "mobile phones are becoming an essential tool for farmers, giving them access to information and services that can help them to improve their agricultural productivity."

4.2.7 Mobile phone usage

Farmers were surveyed regarding their frequency of mobile device usage for agricultural purposes. The results are presented in the table below.

Table 4: Mobile phone frequency usage

Mobile phone usage respondents	Frequency
Yes	78.33%
No	21.67%

Source: Author's field survey 2025

The results of the survey indicate that while 78.33% of farmers use their mobile phones for agricultural purposes, 21.67% do not. This disparity suggests that a significant portion of farmers have not adopted mobile phones, despite the fact that a sizable majority have. Mobile phones are increasingly important farming tools, as evidenced by the fact that 78.33% of farmers own one. By using mobile phones to access vital information such as "market prices, weather forecasts, and best practices," farmers can improve their decision-making and productivity. Due to their limited mobile phone use, these farmers may have trouble accessing critical information "that could improve their farming practices."The study's findings are consistent with past research that highlights the potential of mobile phones to boost agricultural productivity and profitability (Tsan et al., 2019).

4.3 Challenges encountered by communal farmers in utilizing mobile phones for maize production in Mashonaland East.

The table below illustrates the minor, moderate, and major challenges faced by communal farmers in Mashonaland East.

Table 5: Challenges faced by communal farmers in Mashonaland East.

Challenges	Not a problem at all	A minor problem	A moderate problem	A major problem	Average %
Poor network coverage	0%	0%	10%	90%	96.7%
Limited internet connectivity	0%	11.67%	71.67%	16.67%	68.3%
Cost of mobile phones	50%	36.67%	11.67%	1.67%	21.7%
Expensive data bundles	10%	3.33%	23.33%	63.33%	80%
Transaction fees	35%	55%	8.33%	1.67%	25.7%
Lack of access to mobile agricultural advice	48.33%	33.33%	13.33%	5%	25%
Limited availability of farmer groups	68.33%	15%	13.33%	3.33%	17.33%
Lack of experience with agri-tools	51.67%	40%	3.33%	3.33%	19%
Short battery life	58.33%	25%	13.33%	1.67%	19%
Limited online forums	58.33%	23.33%	10%	8.33%	22.7%
Limited training opportunities	20%	10%	16.67%	53.33%	67.7%
Limited mobile platforms	45%	38.33%	3.33%	13.33%	28.3%
Difficulty participating in online forums	11.67%	45%	38.33%	5%	45.7%
Limited mobile phone training sessions	11.67%	18.33%	20%	50%	69.3%

Source: Author's field survey 2025

Poor network coverage and expensive data bundles are the major challenges, affecting 96.7% and 80% of farmers, respectively as indicated by table 5.

4.3.1 Poor Network Coverage

Insufficient network coverage in rural areas stems from a variety of factors. For instance, the usability of sim cards from Liquid Home, Utande, and TelOne is often limited due to regional restrictions. Additionally, the promotion of network coverage faces challenges from the poor infrastructure in these areas, which is characterized by a lack of base stations and cell towers (Smith et al., 2020). Another key factor is the distance from cell towers; many farms are located

quite far from these towers, resulting in weak signal strength (Johnson et al., 2018). This inadequate network coverage restricts farmers' access to vital information and connections with other farmers and markets, ultimately hindering their ability to enhance their farming practices, as highlighted in research by Vidyanova (2021).

4.3.2 Expensive Data Bundles.

The steep prices of data bundles present a major hurdle for farmers relying on various service providers.For instance; Telone it offers the most affordable data in Mashonaland East, but there's a catch it's geo-locked. Their average rate is around $1 per gigabyte, while Netone's packages are on the pricier side, averaging $7 for 5 gigabytes, and they aren't geo-locked. In rural areas, data bundles tend to be even more expensive, largely due to the hefty costs associated with building and maintaining infrastructure (Johnson et al., 2018). Additionally, taxes and regulatory fees play a significant role in driving up these prices (Kumar et al., 2019). Consequently, the high cost of data bundles in Mashonaland East limits farmers' access to vital information and their ability to connect with fellow farmers and markets, ultimately stifling the potential for communal farmers to improve their agricultural practices.

4.3.3 The limited opportunities for mobile phone training sessions focused on agriculture

The lack of training opportunities centered around mobile phone use in agriculture is a major hurdle for farmers, impacting about 69.3% of them. In Mashonaland East, limited infrastructure and resources play a big role in this training gap (Smith et al., 2020). These challenges really restrict farmers' chances to get the training they need. However, research by Kumar et al. (2019) suggests that if farmers do receive training, it could significantly enhance their ability to use mobile phones for agricultural tasks, ultimately leading to better farming practices.

4.3.4 High Transaction Fee

High transaction fees are a moderate hurdle for farmers, impacting about 25.7% of them, as shown in Table 5. The costs associated with maintaining mobile networks, along with the lack of competition in the mobile financial services market in Mashonaland East, contribute to these high fees (Johnson et al., 2018). These factors drive up expenses for farmers and make it tougher for them to access financial services. As noted in a study by Smith et al. (2020), "High transaction fees can limit farmers' ability to access financial services, which can affect their ability to improve their farming practices."

4.3.5 Lack of Access to Mobile Agricultural Guidance

Another moderate challenge faced by farmers is the lack of access to mobile agricultural advice, which affects 25% of farmers, as indicated by table 5.The "limited availability of agricultural advice services" and "unfamiliarity among farmers about the availability of these services" are two of the factors that are blamed for this problem (Williams et al., 2019). These factors make it difficult for farmers to obtain important information, which makes it more difficult for them to "enhance their agricultural productivity." Yet, according to research by Vidyanova (2021), having access to agricultural advice can help farmers "utilize mobile

technology for agricultural purposes," which can have a positive impact on their farming methods.

4.3.6 Limited Availability of Online Forums for Farmers on Mobile Devices

According to Table 5, another moderate issue that affects 22.7% of farmers is "restricted access to online forums for farmers on mobile devices." Many factors contribute to this issue, including "inadequate provision of mobile internet services" and "insufficient knowledge among farmers about online forums," according to Kumar et al. (2019). These factors not only make it harder for farmers to "optimize their farming techniques," but they also make it harder for them to connect with other farmers and get important information. However, online forums can improve farmers' capacity to "connect with other farmers and access important information," which can have a positive effect on their farming practices, according to a study by Johnson et al. (2018).

4.3.7 Limited Mobile Platforms for Farmers to Connect with Markets

Another moderate problem that affects 28.3% of farmers is the "limited availability of mobile platforms for farmers to connect with markets."This issue has several causes, including "limited access to mobile internet services" and "farmers' unfamiliarity with online forums," according to Kumar et al. (2019). Farmers find it more difficult to "enhance their agricultural productivity" as a result of these factors, which also make it difficult for them to connect with other farmers and obtain important information. According to a 2013 study by Lapova, market accessibility can improve farmers' ability to "sell their produce and improve their farming practices," which can positively impact their livelihoods.

4.3.8 Cost of Mobile Phones

According to Table 5, 21.7% of farmers consider the "cost of mobile phones" to be a minor issue.Access to mobile services is made easier by the growing market for affordable mobile phones in Mashonaland East. A study published in the Journal of Development claims that a large portion of Zimbabwe's "affordable goods and services, including mobile phones," are provided by the unorganized sector. However, a number of factors, including manufacturing costs and the lack of affordable mobile phones in rural areas, affect the cost of mobile phones (Williams et al., 2019).Farmers incur higher expenses as a result of these factors, which also make it more difficult for them to connect with other farmers and markets and obtain critical information. A study by Vidyanova (2021) found that high mobile phone costs limits farmers' ability to "access important information and connect with other farmers and markets," which can negatively affect their farming practices.

4.3.9 Lack of Experience with Agri-Tools

Table 5 shows that 19% of farmers in Mashonaland East suffer from a lack of experience with agri-tools, which is another minor issue.This is because many organizations and institutions in Mashonaland East offer farmers training programs on the use of agricultural technologies and equipment. Additionally, communal farmers regularly share knowledge and perspectives, which bridges the experience gap with agri-tools. The tendency of communal farmers to

quickly adapt and learn new technologies and skills reduces the inexperience with agri-tools. According to a study published in the "Journal of Agricultural Education and Extension," farmers can benefit greatly from agricultural extension services that teach and help them use agri-tools.However, inexperience hinders farmers' ability to improve their farming practices, get important information, and connect with other farmers and markets. Farmers with greater agri-tool experience are better equipped to interact with other farmers and markets, get important information, and improve their farming methods, per a study by "Johnson et al. (2018)."

4.3.10 Short Battery Life

The short battery life is another small problem that 19% of farmers face. This is because solar chargers are readily available. Solar chargers are becoming more widely available and more reasonably priced, making it easier for farmers to charge their cell phones.According to a study that was published in the "Journal of Renewable Energy," farmers in rural areas can benefit from solar-powered mobile phone charging.

Along with the previously identified major, moderate, and minor issues, the analysis also identifies non-significant issues.The problems identified as not significant include language barriers (10%) and difficulty navigating apps (13.33%), as they affect a very small proportion of farmers. This suggests that these problems are relatively minor and may not have a substantial impact on farmers' ability to utilize mobile phones for agricultural purposes.

4.4 Major mobile phone services received by communal maize farmers in Mashonaland East.

Table 6: Major mobile phone services received by communal maize farmers in Mashonaland East.

Mobile phone services	Not important at all	Minor service	Moderate service	Significant service	Essential service	Major service	Average
Weather updates	0%	1.64%	6.56%	9.84%	24.59%	52.46%	80%
Market prices and information	3.28%	6.56%	16.39%	8.2%	32.79%	29.59%	74%
Mobile money services	1.64%	0%	3.28%	14.75%	31.15%	44.26%	78%
Production Information	1.64%	1.64%	1.64%	16.39%	31.15%	44.26%	78%

E-marketing	1.64%	0%	6.56%	13.11%	39.34%	36.07%	77%
Mobile Insurance	0%	4.92%	6.56%	9.84%	34.43%	39.34%	78%

Table 6 indicates that farmers in the region under study consider various services, including weather updates, social networking, mobile insurance, e- marketing, production information, market prices and information and mobile money services as major mobile phone services, with average scores of 80%, 77%, 78%, 77%, 78%, 74% and 78% respectively.

4.4.1 Weather Updates

According to Table 6, "weather updates is one of the major services received by communal farmers" in Mashonaland East, with 80% of respondents benefiting. The weather updates received by farmers typically include rainfall forecasts, temperature reports, humidity, and wind conditions, as well as current and predicted temperatures. 100% of farmers in Mashonaland East reveal that they require "accurate and timely weather information to make informed decisions about planting, harvesting, crop management, and risk management." This assertion is supported by Chouari (2024), who notes that weather updates are crucial for farmers to adapt to changing climate conditions and make informed decisions about "agricultural practices".60% of small scale farmers in Mashonaland East access weather updates through Eco Farmer on a daily basis, while 20% rely on traditional knowledge and peer-to-peer sharing with friends. Because Eco Farmer is affordable ($1 per month) and offers precise and timely weather forecasts, a significant portion of farmers use it to obtain weather updates. Farmers are able to make "informed decisions about their agricultural activities" as a result. However, 20% of farmers rely on peer-to-peer sharing and traditional knowledge because it is more accessible than official weather forecasting services. Additionally, using peer-to-peer sharing and traditional knowledge is free or inexpensive method of obtaining weather information. According to Nyantakyi-Frimpong (2019), traditional knowledge is important for agricultural decision-making and climate forecasting. Recognizing that peer-to-peer information and traditional knowledge might not always be accurate or trustworthy is crucial. According to Karen O'Brien (2018), incorporating scientific knowledge is essential for successful adaptation because traditional knowledge is inadequate for adjusting to the fast changing climate.

4.4.2 Market prices Information

Market price information is a crucial mobile phone service for farmers in Mashonaland East, with 74% of respondents benefiting from it as indicated by table 6.This emphasizes how crucial it is for farmers to have access to trustworthy market data in order to make knowledgeable decisions regarding their produce. Typically, the information received includes market trends, demand analysis, and the prices of produce and agricultural inputs. Kabiti and colleagues (2022) assert that "access to market information is vital for improving market access and

enhancing competitiveness among farmers." To obtain information on market prices, communal farmers in Mashonaland East use a variety of channels. It is noteworthy that 60% of farmers get their price information from the Eco Farmer app, which provides a "cost-effective choice for farmers seeking continuous access to essential market data" due to its "user-friendly interface and real-time updates" (Chikozho, 2021). The significance of mobile technology in improving smallholder farmers' access to market information is emphasized by Chikozho (2021), which adds credence to the Eco Farmer. Additionally, 30% of farmers get their market price information from the Esoko platform, which is renowned for its "comprehensive market analysis features" that aid farmers in better understanding market trends. Makhura (2023) emphasizes how farmers are empowered by this platform, which gives them the information they need to decide on pricing and sales tactics. A few farmers get their official market information from the AMA website. Despite having less use than the other platforms, the AMA website is respected for its dependability. But, as Nyanga et al. (2020) point out, accessibility concerns might reduce its efficacy.

4.4.3 Mobile money services

Mobile money services are also regarded as a major mobile service for farmers in Mashonaland East, with 78% of respondents benefiting from the services, as indicated by table 6. This statistic illustrates the region's increasing use of mobile financial services, which give farmers a practical and safe means of handling their money. By allowing farmers to save money, obtain credit, and receive payments, these services improve their financial stability and inclusion. As per Mwangi et al. (2018), "mobile money services have revolutionized financial management in rural areas, offering a practical solution for saving, borrowing, and transferring funds." Many mobile money platforms are used by communal farmers in Mashonaland East to make financial transactions easier. Remarkably, 40% of farmers use Eco Cash for mobile money transactions. Because of its "user-friendly interface and widespread acceptance," it is a well-liked option for farmers looking for a dependable way to handle their money.Chikozho (2021) highlights Eco Cash's contribution to smallholder farmers' increased financial accessibility, underscoring its importance in the area. Ten percent of farmers also use Mukuru for their mobile money needs. To meet the needs of rural communities, Mukuru provides a variety of financial products that make sending and receiving money easy. As noted by Munyanyi et al. (2020), "Mukuru contributes to financial inclusion by enabling farmers to engage in financial transactions that were previously difficult for them." In addition, half of farmers use Agri-Fin's mobile money services, which are centered on offering financial solutions designed especially for the agriculture industry, assisting farmers in obtaining credit and efficiently managing their money.

4.4.4 Production Information

Production information is considered a vital service for farmers in Mashonaland East, with 78% of respondents indicating its importance, as shown in Table 6.This emphasizes how crucial it is for farmers to have access to "reliable information on production practices, pest management, and disease control," as this can greatly improve crop quality and yields. For smallholder farmers in Kenya, production data is essential because it allows them to "improve both their crop yields and the overall quality of their produce," claim Kaguongo et al. (2019).

To get information on production, communal farmers use a variety of sources. Interestingly, 40% of farmers use the Eco Farmer app to obtain this data, which offers "real-time updates" and a "user-friendly interface." The features of the app make it a useful tool for farmers who want to enhance their "agricultural practices.This is consistent with Chikozo's (2021) research, which highlights "the role of mobile technology in disseminating agricultural information to smallholder farmers." The Zimbabwe Farmers Union (ZFU) is the primary source of production data for one fifth of the farmers. ZFU offers farmers resources and assistance to help them overcome production obstacles and put "best practices" into action.

4.4.5 E-marketing

E- Marketing is also a significant mobile phone service, with a substantial proportion (77%) of respondents considering it very important.These platforms provide farmers a safe and easy way to sell their produce and reach markets, which can increase their earnings. The use of e-marketing platforms is "essential in enhancing market access for smallholder farmers by providing them with real-time market information and connecting them directly to buyers," according to Mpinganjira (2019). Communal farmers in Mashonaland East use a variety of e-marketing platforms to sell their produce; 30% of them use sites such as Eco Farmer to communicate with prospective customers and obtain market data. Additionally, social media sites like Facebook and WhatsApp are used by 55% of farmers to market their produce and communicate with consumers.

4.4.6 Mobile insurance

Mobile insurance is another major mobile phone service, with 78% of respondents. This reflects how important it is for Mashonaland East farmers to have access to insurance services that can shield them from risks like livestock disease and crop failure. Mobile insurance can improve the resilience and financial stability of smallholder farmers in Kenya by protecting them against crop failure and other risks, claim Mwangi et al. (2018). According to Kibet and associates (2016), mobile insurance can assist farmers in risk management and livelihood enhancement, thereby mitigating poverty and vulnerability.To reduce risks and safeguard their incomes, communal farmers in Mashonaland East make use of a variety of mobile insurance services. Remarkably, according to the table, 70% of farmers use mobile insurance services via websites like Eco Farmer, which provides crop insurance and other risk management products.

Furthermore, the percentages for each mobile phone service do not exactly add up to 100%, as the researcher observed. This implies that some farmers might have omitted or failed to answer specific inquiries.

4.5 Effects of mobile phone usage on maize profitability among communal farmers in Mashonaland East.

Regression analysis was conducted to understand the relationship between various predictors and the dependent variable, profit. The R-squared value of 0.244 signifies that the model accounts for about 24.4% of the variation in profit. The adjusted R-squared value of 0.123 implies that, after adjusting for the number of predictors, the model's explanatory power is relatively moderate. The model lacks statistical significance at the 0.05 level, indicating that

the predictors collectively do not significantly forecast profit. While this does not meet the conventional threshold of 0.05 for statistical significance, it suggests that the model is approaching significance, indicating that there may be some relationship between the predictors and profit.

Table 7: Coefficients table

Variables	B (Unstandardized Coefficients)	t-value	p-value
Intercept	-12112.461	-1.335	0.188
Family size	4073.786	2.079	0.043
Land size	2443.473	1.687	0.098
Tractors	-12212.265	-2.849	0.006
Ploughs	769.765	1.142	0.259
Cattle	239.632	2.049	0.046
Mobile phone usage	4676.362	0.729	0.469
Types of mobile phone	-2396.940	-0.350	0.728
Ox drawn carts	-2095.198	-0.597	0.553

Source: Author's field survey 2025

4.5.1 Coefficients Analysis

The coefficients provides insight into the individual contributions of each variable to profit:

4.5.2 Mobile Phone Usage

Table 7 indicates a weak significant relationship (B = 4676.362, p = 0.469) between mobile phone usage and maize profitability with a significant level of more than 5%, indicating no statistically significant relationship between mobile phone usage and maize profitability. Several factors contribute to this lack of strong correlation; 20% of communal farmers in Mashonaland East lack the necessary digital skills to effectively use mobile phones. Chen and Liu (2021) argue that even with access to technology, farmers who are not digitally literate may struggle to leverage mobile tools for better decision-making, thus limiting the potential impact on profitability. While mobile phones can provide access to information, not all information is relevant or actionable for farmers. Green and Foster (2019) highlight that

farmers often face information overload or receive incorrect data, which can lead to poor decisions that do not improve profitability. However, Kumar and Singh (2020) argue that access to "real-time data on market trends and weather forecasts can empower farmers to make timely and informed decisions, potentially leading to improved profitability." Thompson (2022) emphasizes that farmers who connect with peers and experts are likely to benefit from shared knowledge and improved practices, positively affecting their profits.

4.5.3Family Size

Table 7 shows a significant positive relationship (B = 4073.786, p = 0.043) between family size and maize profitability with a significant level of less than 5%, indicating a statistically significant positive relationship, meaning family size "has a significant impact on the dependent variable." The positive association between family size and profit suggests that larger families may contribute to higher labor availability and increased purchasing power, ultimately enhancing farm productivity and income. That is, larger families might contribute more labor to farming, increasing output. This is consistent with research by Mwalupaso et al. (2019), which indicates that family labor is essential to subsistence farming because it enables more effective use of resources. Larger families can spread risk and improve income stability by participating in a variety of agricultural activities. Families with more members are more likely to diversify their sources of income, which can lessen the effects of agricultural shocks, according to a study by Adebayo (2021). Higher overall profitability is frequently the result of this diversification. Families with larger families may also have more money to spend on improved practices, technologies, and inputs.Larger households may benefit from economies of scale, purchasing in bulk and reducing per-unit costs of seeds, fertilizers, and equipment. As highlighted by Thompson (2022), families that can invest in improved agricultural technologies often see significant increases in productivity and profit margins. Though larger families can provide more labor, some researchers suggest that this can lead to overcrowding and diminishing returns. For instance, Green and Foster (2019) argue that when family sizes exceed a certain threshold, the marginal productivity of additional labor decreases.

4.5.4 Land Size

Land size is positive but not statistically significant as indicate by the table 7 above (B = 2443.473, p = 0.098) indicating a marginally significant positive relationship with a significant level of more than 5%. Land size has a somewhat significant impact, but it is not as strong as variables with p-values < 0.05. Land size is often cited as a critical factor influencing agricultural profitability, with many studies affirming its positive correlation with increased income. However, there are also scholarly perspectives that suggest the relationship is more complex and can vary based on several contextual factors. The relationship may also depend on the type of crops grown and the farming techniques employed. Larger land sizes generally allow for greater production capacity. Studies by Jones and Clark (2019) indicate that farms with more land can cultivate a higher volume of crops and support larger herds of livestock, leading to increased overall profitability. Some researchers argue that beyond a certain point, increasing land size can lead to diminishing returns. Green and Foster (2019) suggest that the marginal productivity of land decreases as farms become larger, particularly if the additional

land is of lower quality or if management practices do not scale effectively. Chen and Liu (2021) highlight that larger farms may face challenges related to resource allocation, such as labor and capital.

4.5.5 Tractors

The use of tractors in agriculture is often associated with increased efficiency and productivity. However, Table 7 does not universally indicate the relationship between tractor usage and maize profitability. There is a significant negative relationship (B = -12212.265, p = 0.006) between the use of tractors for agriculture production activities and maize profitability with a significant level of less than 5%. Tractor usage has a strong significant impact, but the negative coefficient suggests it might not be beneficial in this context. Green and Foster (2019) argue that "the cost of purchasing and maintaining tractors can be prohibitive for small-scale farmers, potentially leading to financial strain rather than increased profitability." In addition to the purchase price, tractors incur ongoing maintenance and operational costs. Martinez (2020) found that these expenses could sometimes outweigh the benefits, particularly if the tractor is underutilized or if fuel prices fluctuate. Moreover, the introduction of tractors can lead to labor displacement, as fewer workers may be needed for tasks. Chen and Liu (2021) suggest that this can create economic challenges for rural communities where agricultural jobs are a primary source of income. The socio-economic implications of reduced labor demand can negatively affect overall profitability at the community level. However, the results contradict Lee (2021), who notes that mechanization allows for faster land preparation, planting, and harvesting, which can lead to higher yields and reduced labor costs. This efficiency can translate to increased profit margins for farmers. According to Adebayo (2021), this increased capacity can lead to greater overall production, thereby enhancing profitability. In addition, Thompson (2022) emphasizes that proper soil management through mechanization can improve crop health and yields, contributing to higher profits.

4.5.6 Livestock (Cattle)

The results from table 7 indicated a significant positive relationship (B = 239.632, p = 0.046) between maize profitability and ownership of cattle with a significant level less than 5%. This implies that cattle ownership substantially influences the outcome variable. The positive relationship suggests that integrating livestock into farming systems can diversify income sources and improve resilience. Cattle contribute to nutrient cycling on farms through manure, thereby improving soil health and decreasing reliance on synthetic fertilizers. Adebayo (2021) emphasizes that integrating cattle into farming systems can lead to improved soil health, thereby increasing crop yields and overall profitability. Cattle can act as a financial buffer for farming families. Brooks (2021) argues that livestock ownership provides a form of insurance against crop failures, allowing families to sustain their income during adverse conditions. However, these results contradict with Chen and Liu (2021), they highlighted that increased cattle numbers can exacerbate resource scarcity, leading to environmental degradation and potentially reducing overall farm profitability.

4.5.7 Types of Mobile Phone

The connection between farmers' mobile phone choices and maize profitability often shows no significant correlation (B = -2396.940, p = 0.728) as indicated by table 7 above with a significant level of more than 5%.15 % of communal farmers in Mashonaland East still use basic mobile phones, which offer limited functionalities. Green and Foster (2019) argue that while smartphones can provide access to valuable agricultural information, basic phones primarily facilitate communication. This limitation may hinder profitability, regardless of the phone type. The effectiveness of mobile technology is heavily influenced by farmers' digital literacy. Chen and Liu (2021) emphasize that even with smartphones; those lacking the skills to navigate applications may not see improved profitability. This suggests that access to advanced technology alone does not ensure better outcomes in maize farming. Maize profitability is affected by various external factors, such as market prices, climate conditions, and input costs. Martinez (2020) points out that these factors often overshadow the impact of the type of phone used, indicating that market dynamics play a more critical role in determining profitability. Some scholars argued that smartphones could significantly enhance profitability by enhancing their ability to access relevant data and connect with markets. Kumar and Singh (2020) assert that farmers using smartphones are better positioned to respond to market changes and optimize their farming practices, potentially leading to higher profits. Smartphones facilitate networking among farmers, which can lead to collaborative efforts that enhance profitability. Thompson (2022) emphasizes that farmers who can communicate and share resources are likely to achieve better economic outcomes, suggesting that the type of phone can be a factor in profitability.

4.5.8 Oxy-drawn Carts

The use of ox drawn carts shows no significant relationship (B = -2095.198, p = 0.553) with maize profitability with a significant level of more than 0.05.The lack of significance indicates that ox drawn carts do not provide substantial advantages in terms of efficiency or productivity to communal farmers. Green and Foster (2019) argue that the slower speed and lower capacity of ox drawn carts hinders productivity, making them less effective for transporting large quantities of maize quickly. The effectiveness of ox drawn carts is limited by the availability of resources such as labor and animal power in Mashonaland East. Adebayo (2021) notes that in regions where labor is scarce or costly, relying on ox drawn carts may not significantly enhance profitability compared to more modern transport methods. Some scholars argue that ox drawn carts can be a cost-effective solution for smallholder farmers in low-income settings. Chen and Liu (2021) highlight that in areas where capital for mechanization is scarce; ox drawn carts provide a viable alternative that allows farmers to transport goods without high initial investments. Ox drawn carts are more environmentally sustainable compared to mechanized transport. Adebayo (2021) emphasizes that using animal power can reduce reliance on fossil fuels and may appeal to environmentally conscious consumers, potentially enhancing market opportunities for maize producers. In some contexts, ox drawn carts may provide flexibility in navigating rural and less accessible areas where roads may not support larger vehicles.

4.5.9 Ploughs

The relationship between the use of ploughs in agriculture and maize profitability often shows no significant correlation relationship (B = 769.765, p = 0.259) as indicated by table 7 with a significant level of more than 0.05.Similar to ox drawn carts, the lack of significance for ploughs may suggest that traditional tools do not significantly enhance productivity in certain contexts. Several factors contribute to this lack of connection; traditional ploughs may not significantly enhance crop yields compared to modern farming techniques.Green and Foster (2019) hold the view that although ploughing is certainly necessary for soil preparation, its efficiency may be affected by the type of soil and climatic conditions resulting in varying effects on profit. The application of ploughs can be quite labor-intensive and may consume a lot of time, especially when compared to machine-operated options. Adebayo (2021) points out that the manual ploughing of fields is time-consuming and thus can cause delays in the planting and decrease the productivity, which in turn will result in the profitability being affected. There are some scholars who are of the opinion that the ploughs can positively influence the soil structure as well as the aeration, hence, improving the plant growth. Lee (2021) is of the opinion that the roots can be better developed and the nutrient absorption can be done more efficiently if the fields are ploughed in a correct manner, thus maize yields can be increased. The practice of using ploughs might be very much associated with the traditional agricultural methods. Brooks (2021) reveals that, in their opinion, the upholding of such practices can be very significant in terms of community identity and cohesion which can thus indirectly lead to profitability through a better cooperation and a more efficient sharing of the resources

4.6 Chapter Summary

The research findings and discussions pertaining to the effects of mobile phone usage on the profitability of maize among communal farmers in Mashonaland East have been presented in this chapter. The results show the significance of various mobile phone services, the key demographic traits of the respondents, and the challenges farmers face when utilizing mobile technology for farming.The demographic analysis revealed that women were more common, indicating a glaring gender imbalance and reflecting broader trends in sub-Saharan agriculture where women's roles are increasingly recognized. According to the age distribution, younger farmers were participating more, which is in line with research demonstrating their technological adaptability.Additionally, the respondents' educational backgrounds highlight the urgent need for focused training to advance digital literacy and advance agricultural practices. Weather updates, market information, and extension services were ranked as the most crucial mobile phone services for farmers. These services are crucial for directing choices and enhancing output.However, there are still many obstacles that prevent farmers from accessing vital information, such as inadequate network coverage and expensive data and mobile service fees. The statistical analysis showed a weak relationship between maize profitability and mobile phone use, indicating that although mobile technology may have advantages, it is not a magic bullet for enhancing agricultural results.The profitability of farms was found to be significantly predicted by family size and livestock ownership, highlighting the importance of labor availability and resource management. Although mobile phones have the potential to enhance farming methods and increase access to information, their impact on profitability is constrained by a number of barriers and external factors.The findings underscore

the need for a comprehensive approach to support communal farmers, which should provide affordable data solutions, increase training opportunities, and modernize infrastructure.Encouraging environmentally friendly farming practices and enhancing farmers' well-being are essential to advancing sustainable agriculture and improving their standard of living in Mashonaland East and beyond.Future research should continue to explore the intricate connection between technology adoption and agricultural productivity, accounting for additional variables that may influence outcomes.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter provides a thorough synopsis of the research process from chapter one to chapter four, combining the main conclusions of the study. There are three main goals of the chapter. In the first place, it makes inferences from the research that connect the results to the goals of the study. Second, it provides practical suggestions for pertinent parties, such as legislators, farmers, and business professionals, based on the data acquired. Finally, it points to areas that need more research in order to expand on the study's findings. This chapter attempts to conclude the study by combining these components, offering insightful analysis and useful recommendations for interested parties.

5.1 Conclusion

The study found that most respondents engaged in maize farming were female, constituting 55% of the sample. The age distribution showed a significant number of younger farmers, with 53.13% aged between 20 and 40 years. Educational backgrounds varied, with 30.33% attaining tertiary education. The average household size was small, with 88.33% having five or fewer members. All farmers reported having access to mobile phones, with 85% using smartphones.

Mobile phone usage was prevalent, with 78.33% of farmers utilizing their devices for agricultural purposes. However, challenges such as poor network coverage (96.7%) and high data costs (80%) hindered access to essential information. The study highlighted important mobile services, including weather updates, market information, and mobile money services, which farmers rated as very important for improving productivity.

Regression analysis indicated a modest relationship between mobile phone usage and maize profitability, explaining about 24.4% of the variance in profit. Significant predictors included family size and cattle ownership, while mobile phone usage and land size did not show statistically significant relationships.

Overall, while mobile phones have the potential to enhance agricultural practices, their impact on profitability is limited by factors like digital literacy and infrastructure challenges. Addressing these issues is crucial for maximizing the advantages of leveraging mobile technology for agricultural development and enhancing the well-being of smallholder farmers in Mashonaland East. The findings emphasize the need for strategies to promote mobile phone adoption and effective use in the region's agricultural development.

5.2 Recommendation

To increase maize production in Mashonaland East Province by using mobile phones this study recommends the following:

The demographic analysis reveals a substantial number of young farmers who are participating in maize farming. Agricultural organizations must encourage youth involvement in maize production so that the sector can gain from innovative and sustainable practices.

Findings suggest that phone use is common among farmers; however, issues such as bad network coverage obstruct them from getting important information. The government has to put money in telecoms infrastructure in the countryside so that all farmers can have a good signal and be able to work without problems.

- The survey highlights that high data costs significantly affect mobile phone usage for agricultural purposes. Stakeholders should work together to offer subsidies on data expenses for farmers, thereby increasing their access to vital agricultural resources and services.
- Training initiatives on mobile technology are crucial for boosting farmers' digital skills among farmers. The government and NGOs should implement training initiatives that teach farmers how to effectively use mobile technology for agricultural practices.
- Significance of mobile-based agricultural services, including weather forecasts and market data, was emphasized in the study. The government should support the creation and distribution of intuitive mobile apps offering current and pertinent agricultural insights.
- The regression analysis indicates that family size positively influences maize profitability. Therefore, programs that support larger families in agricultural activities, such as labor-sharing initiatives, should be encouraged to enhance productivity.
- Financial inclusion is vital for farmers. The government should promote mobile money services and microfinance options to improve financial inclusion and enable farmers to invest in their maize production.
- The findings indicate that community support networks can enhance knowledge sharing. Establishing local farmer groups that utilize mobile technology for collaboration can foster a sense of community and improve agricultural outcomes.

5.3 Areas of further study

- Further research should explore the specific impacts of mobile phone usage on farm output across various agricultural products in Zimbabwe, as current studies predominantly focus on maize.
- Studies examining the relationship between mobile phone access and economic choices in agriculture would be valuable to understand how technology influences farmers' financial outcomes.
- Research focusing on the effectiveness of agricultural mobile services, such as weather updates and market information, could help identify gaps and areas for improvement in service delivery.
- Analyzing the social and economic influences that affect mobile phone usage among various farmer demographics could lead to tailored interventions to increase technology adoption.

By pursuing these areas of further study, researchers can contribute to a more comprehensive insight into the impact of mobile technology in agriculture and its potential to enhance the well-being of agricultural communities in Zimbabwe.

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APPENDICES

Appendix 1: Multiple linear regression

Coefficients	B (Unstandardized Coefficients)	t-value	p-value
Intercept	-12112.461	-1.335	0.188
Family size	4073.786	2.079	0.043
Land size	2443.473	1.687	0.098
Tractors	-12212.265	-2.849	0.006
Ploughs	769.765	1.142	0.259
Cattle	239.632	2.049	0.046
Mobile phone usage	4676.362	0.729	0.469
Types of mobile phone	-2396.940	-0.350	0.728
Ox drawn carts	-2095.198	-0.597	0.553

Appendix 2: Multiple linear regression output

Output =-12112.461+4676.362 mobile phone usage +4073.786 family size +2443.473 land size-12212.265 tractors+769.765 ploughs+239.632 cattle-2396.940 types of mobile phone-2095.198 Ox drawn carts.

Appendix 3: Survey questionnaire

QUESTIONAIRE FOR AN ASSESSMENT OF MOBILE PHONE USAGE ON MAIZE PROFITABILITY AMONG COMMUNAL FARMERS IN MASHONALAND EAST.

My name is Tinotenda Kawonza, an undergraduate student pursuing a degree in Agricultural Economics and Management at Bindura University of Science Education. As a requirement for my academic program, I am undertaking a research project to assess the effects of mobile phone usage on maize profitability among communal farmers in Mashonaland East. The study seeks to examine the relationship between mobile phone use and maize profitability among communal farmers in the region. Your involvement in this research is greatly appreciated, and I respectfully request that you provide accurate responses to the questions below. Rest assured that the data collected will be treated with utmost confidentiality and utilized solely for scholarly purposes.

SECTION A: FARMER'S PROFILE OR HOUSEHOLD DETAILS

Select the appropriate answer or fill in the blank space provided.

1. Farmer's district.....

2. Farmer's ward.....

3. Respondent's gender: □ Male □ Female.

4. Age group: □under 20 years □21-30 years □31-40 years □41-50 years □50 and above.

5. Age of each family member.....

6. Respondent's marital status □ Single □ Married □ Divorced.

7. Respondent's highest level of education □ No formal schooling □ Primary schooling □ Secondary schooling □ Vocational training □ Higher education (college/university)

8. Type of farm □ Communal area □ Resettlement area □ Small-scale commercial farm □ Large-scale commercial farm

Farmers Assets

Fill in the required information below

Assets	Quantity	Estimated Value
Land and Infrastructure 1. Land (hectares)		
2. Grain storage facilities		
Equipment and Machinery 1. Tractors		
2. Plows		
3. Ox-drawn carts		
4.Irrigation equipment 5.Vehicle		
Technology and Communication 1. Mobile phone		
Livestock 1. Cattle		
2. Goats		
3. Chickens		
5. Other assets (specify)		
Total Estimated Value		

SECTION B

Please rate the importance of the following services offered by mobile phones to farmers.

Tick the appropriate response

1. Market Information □☐Not Important at All □ Minor service ☐□Moderate services □Significant service□ Essential service □Major

2. Weather updates □☐Not Important at All □ Minor service ☐□Moderate services □Significant service□ Essential service □Major

3. Mobile banking □☐Not Important at All □ Minor service ☐□Moderate services □Significant service□ Essential service □Major

4. Mobile Insurance □☐Not Important at All □ Minor service ☐□Moderate services □Significant service□ Essential service □Major

5. E-marketing □☐Not Important at All □ Minor service ☐□Moderate services □Significant service□ Essential service □Major

6. Production Information □☐Not Important at All □ Minor service ☐□Moderate services □Significant service□ Essential service □Major

Section C

Please fill in the information below to calculate the gross margin from your maize production.

Item	Amount $
Revenue	
Total maize output in tones	
Price per tones	
Total Revenue	
Costs	
Seeds	
Fertilizers	
Pesticides	

Labor	
Other cost (please specify)	
Total cost	
Gross margin	

Section D

Please rate the level of the following challenges encountered by farmers when using mobile phones.

Tick the appropriate response

1. Poor network coverage: □ not a challenge at all □ minor challenge □ moderate challenge □ major challenge

2. Restricted internet connectivity: □ not a challenge at all□ minor challenge □ moderate challenge □ major challenge

3. High cost of mobile phones: □ not a challenge at all□ minor challenge □ moderate challenge □ major challenge

4. Expensive data bundles: □ not a challenge at all□ minor challenge □ moderate challenge □ major challenge

5. High transaction fees: □ not a challenge at all□ minor challenge □ moderate challenge □ major challenge

6. Inaccessibility to mobile agricultural guidance: □ not a challenge at all□ minor challenge □ moderate challenge □ major challenge

7. Scarcity of farmer groups sharing knowledge via mobile: □not a challenge at all□ minor challenge □ moderate challenge □ major challenge

8. Language barrier: □ not a challenge at all□ minor challenge □ moderate challenge □ major challenge

9. Lack of experience with agricultural tools: □ not a challenge at all□ minor challenge □ moderate challenge □ major challenge

10. Limited availability of online forums for farmers on mobile phones: □ not a challenge at all□ minor challenge □ moderate challenge □ major challenge

11. Limited training opportunities for farmers on mobile use: □ not a challenge at all□ minor challenge □ moderate challenge □ major challenge

12. Limited mobile platforms for farmers to connect with markets: □ not a challenge at all□ minor challenge □ moderate challenge □ major challenge

13. Limited access to mobile phone-based agricultural communities: □ not a challenge at all□ minor challenge □ moderate challenge □ major challenge

14. Difficulty participating in online forums or social media groups related to agriculture: □ not a challenge at all□ minor challenge □ moderate challenge □ major challenge

15. Short battery life: □ not a challenge at all□ minor challenge □ moderate challenge □ major challenge

THANK YOU