

**DETERMINANTS, PERCEPTION AND IMPACT OF MAIZE FARMERS FINANCIAL
INCLUSION VIA MOBILE MONEY: A CASE STUDY OF THE DORMAA-AHENKRO
MUNICIPALITY, GHANA**

THESIS

By:

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**MASTER OF AGRIBUSINESS STUDY PROGRAM
FACULTY OF ANIMAL AND AGRICULTURAL SCIENCES
UNIVERSITAS DIPONEGORO**

2023

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As one of the Requirements for Obtaining an agricultural master's degree
in Master Program in Agribusiness Faculty of Animal and Agricultural Sciences
Universitas Diponegoro

**MASTER PROGRAM IN AGRIBUSINESS
FACULTY OF ANIMAL AND AGRICULTURAL SCIENCES
UNIVERSITAS DIPONEGORO**

2023

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Study program/Department : MASTER PROGRAM IN AGRIBUSINESS

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STATEMENT

I declare truthfully that the thesis I have compiled as a requirement for obtaining a Master's degree from the Master Program in Agribusiness is entirely my work and has never been submitted as a fulfilment of the requirements for obtaining a Master's degree from Universities Diponegoro or other universities. As for certain parts of the thesis writing that I quoted from the work of others, the source has been written by the norms, rules and ethics of scientific writing. Hereby declare as follows:

1. Titled Thesis: ... Determinant, Perception and Impact of Maize Farmers Financial Inclusion Via Mobile Money: A Case Study of Dormaa-Ahenkro Municipality, Ghana.....
2. I also admit that this final project can be completed because of the full guidance and support of my supervisor: Prof. Agus Setiadi, S.Pt. M.Si., Ph.D. and Dr. Ir. Wiludjeng Roessali, M. Si

If in the future it is found that all or part of this thesis is not my work or there is plagiarism in certain parts, I am willing to accept the revocation of my academic degree and other sanctions by the applicable laws and regulations.

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PREFACE

This research proposal is submitted as one of the requirements for obtaining an agricultural master's degree in the Master Program in Agribusiness at Universitas Diponegoro. The research proposal with the topic “**Determinants, Perception and Impact of Maize Farmers Financial Inclusion via Mobile Money, Ghana**” was done under the critical supervision of. as the main guide, Prof Agus Setiadi, PhD and as a member of advisor Dr Ir. Wiludjeng Roessali, M. Si.

Mobile money has been a significant mainstream in the Sub-Saharan and Eastern parts of Africa which has given much notice to infer the impact on the economy with other research papers it has been seen as Mobile money is one of the financial instruments that has an impact. But significantly the important to the farmers “maize farmers” which this research is about.

First of all, I thank God for being grateful to me for being accepted into the Agribusiness program at Universitas Diponegoro.

I also express my esteem and pleasure to Universitas Diponegoro for granting me the opportunity with the scholarship.

To finally conclude I would like to express my thanks to these people as follows:

My primary research supervisor Dr Ir. Wiludjeng Roessali, M.Si, and member advisor, Agus Setiadi, PhD as well as the head of the Master of Agribusiness study program and the head of the department for the support and guidance.

Last but not least, I thank my mum Comfort Asante, and my dad, Thomas Blay, for their unwavering support, especially my sisters. I thank them for their support in all aspects of educational support.

I, therefore, thank God in this office for graduating with my master's degree in Agribusiness at Universitas Diponegoro

SUMMARY

Mr. Emmanuel Mensah under the careful supervision of Dr Ir. Wiludjeng Roessali and Prof. Agus Setiadi, PhD provided their in-depth knowledge of this project titled **“Determinants, Perception and Impact of Maize Farmers Financial Inclusion via Mobile Money, Ghana”**

The study was conducted in the Dormaa Central with the main focus of maize farmers as my primary source for this project. The objective of the study was to access the determinant, Perception and impact of maize farmers’ financial inclusion via mobile money.

The study employed the use of descriptive statistics to describe the characteristics of the respondents, perception index and Propensity Score matching to evaluate the data surveyed from the sample size. Well-designed questionnaires will be used to collect the data in the study area stated in this study. After the validation of the data collected. There was a further process to analyse the data for a proper decision on the results through the SPSS and STATA. This research is a clear reflection of an economic assessment of the economy of Ghana. The study examined the perception of maize farmers regarding their financial inclusion through the utilization of mobile money services. The available data collected was analysed through the perception index by the SPSS. Data were collected through the primary data which 150 questionnaires were used and respondents’ responses were collected on the questionnaire administration. perception of the maize farmers was analysed and based on the series of questions through frequency, mean and percentages from the perception index, which came out that 47.3% were very familiar and 36.7% were familiar with mobile money as a financial inclusion which shows mobile money has become very important in the system and as financial inclusion in some African countries and Ghana as a whole. However, respondents stated the fact that they use mobile money for saving and paying bills with a percentage of 96%. To further conclude on the farmers' perception, it came out that 30.7% of respondents saw that using mobile money was very convenient. 52% said it was convenient. 9.3% were neutral. 4.7% said it was inconvenient and 3.3% said it was very inconvenient. The factors that influence maize farmers’ financial inclusion were also assessed through Binary logistic regression and it was seen that gender, marital status and farmers association was a factor in farmers using mobile money technology as a financial inclusion which was significant at 10%, 5% and 1%. Lastly, the impact of maize farmer’s financial inclusion through mobile money was also done by the propensity score matching with the treated and untreated groups which showed that maize farmers who adopted the use of mobile money were to save more compared to those who were not using it.

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CHAPTER I

INTRODUCTION

1.1 Background

Agriculture being the world's relied-upon sector has been a significant contributor to the economy of several developing countries. In Ghana, agriculture has remained a significant area of the country's economy, contributing to 22 % and 32% of the national GDP with an annual growth rate ranging between 1.7 and 7.4% (Ghana Statistical Service, 2015a). Maize is considered to be the most abundant staple crop in Ghana and other African countries and contributes significantly to consumer diets and has occupied a planted area of about one million hectares and accounts for 50–60% of total cereal production

Maize grains are a major staple for many households, an ingredient for poultry feed and an important industrial commodity in Ghana which is therefore considered an important crop for Ghana's agricultural sector and food security. It is a versatile crop grown in all the agroecological zones of Ghana by predominantly smallholder farmers under rain-fed conditions (MOFA, 2018). Sustaining and improving maize productivity would reduce smallholder farmers' food insecurity and poverty. Despite the economic importance of maize in Ghana, its production is scarce partly

due to the high demand. The scarcity in production is attributable to low yields caused by many problems including the use of unimproved varieties and declining soil fertility. The average maize yield in Ghana is estimated to be $2.26 \text{ Mt}\cdot\text{ha}^{-1}$ as against a potential yield of $5.5 \text{ Mt}\cdot\text{ha}^{-1}$ (MOFA, 2018). This is far lower than yields achieved in similar lowland rain-fed, tropical environments in Thailand ($4.5 \text{ Mt}\cdot\text{ha}^{-1}$) and southern Mexico ($3.2 \text{ Mt}\cdot\text{ha}^{-1}$) (Faostat, 2020). Due to the shortfall between production and demand, an average of 78,000 Mt of maize was imported yearly between 2015 and 2018 to augment the shortfall. Again, low soil fertility is among the most important problems limiting crop productivity in South Saharan Arica (Kihara et al., 2017). In smallholder farms, soil fertility decline has been recognized as one of the major biophysical problems affecting agriculture, particularly nitrogen (N) and phosphorus (P) deficiencies (Verde et al., 2014). In Ghana, the soil nutrient depletion rates are estimated at $35 \text{ kg}\cdot\text{N}\cdot\text{ha}^{-1}$, $4 \text{ kg}\cdot\text{P}\cdot\text{ha}^{-1}$ and $20 \text{ kg}\cdot\text{K}\cdot\text{ha}^{-1}$ annually (Bationo et al.2018). The soil nutrients in the natural resource base are therefore dwindling faster than they are being replaced. Increasing population pressure has resulted in an intensification of land use with several smallholder farmers practicing continuous cropping with little or no soil amendments, an indication that nutrient-depleting cultivation practices are still used extensively. Apart from declining soil fertility, the use of unimproved varieties and uncertified seeds is also among the major problems influencing maize production in smallholder farms. Most smallholder farmers have resorted to the use of local varieties, and even where they use improved varieties, the seeds have been recycled for several years. These practices could contribute to the low yields that are being recorded (MOFA, 2018). Elsewhere, yield reductions ranging from 45 to 67% have been recorded for local varieties compared to improved open-pollinated varieties (Lobulu et al., 2019). The use of soil

amendments and improved maize varieties are therefore crucial in achieving increased and sustained maize productivity.

Ghana, situated in West Africa boasts a flourishing sector that plays a role, in the country's economy (Ghana Statistical Service, 2019). Maize is a crop in Ghana widely grown across regions (Amanor, 2013). The country benefits from ecological conditions like suitable rainfall patterns and fertile soils, which support the production of maize (Food and Agriculture Organization, 2018).

In terms of financial accessibility according to Wang et al. (2014) in Latin America, particularly in countries like Brazil and Argentina, there has been more significant investment in agricultural infrastructure, technology, and access to credit, which has helped farmers adopt modern farming practices and improve productivity. Again, in some Asian countries, such as China and India, agriculture has been a major focus of government policies, and financial accessibility has improved through various subsidies, loans, and support programs for farmers (Chichava et al 2016). Also, In Latin American countries, the governments have implemented policies to promote agriculture, including research and development programs, extension services, and market-oriented policies, for instance, according to OECD-Fao, (2019) Mexico's *Alianza para el Campo*, for example, has offered support to farmers under a wide array of instruments, including on-farm investment subsidies, income support, natural resource conservation programs, risk management and marketing support. The Mexican government has also implemented special strategic programs such as PROMAF, which supports the maize and

bean value chains, being these two products are traditional staple foods of the Mexican diet and also Brazil has similarly implemented comprehensive agricultural policies addressing specific target farmer populations, such as PRONAF (National Program to Strengthen Family Farming). Mid-size farmers have had access to special lines of credit through PRONAMP (National Program to Support Medium Agricultural Producers) and larger producers have benefitted from price support and subsidized credit and insurance programs.

The Ghanaian government has implemented policies and initiatives to bolster development, such as providing inputs, extension services and support for market access (Ministry of Food and Agriculture 2019). Which makes it significant to consider financial inclusion via mobile in this sector. However, the existence of financial exclusion has been acknowledged by many developed and developing nations as one of the socio-economic challenges (Wentzel et al., 2016). As such, financial inclusion has attracted the attention of financial institutions, governments and policymakers as their modus operandi to curtail the menace (Wang and Guan, 2017). Financial inclusion plays a critical role in promoting economic growth and reducing poverty in rural areas, where access to formal financial services is often limited (Demirguc-Kunt & Klapper, 2015). Mobile money services have emerged as a transformative solution, allowing individuals to access basic financial services through their mobile phones (Jack & Suri, 2014). In the specific context of maize farmers in Ghana, financial inclusion through mobile money holds great potential to improve their livelihoods, enhance productivity, and contribute to overall economic well-being (Harelimana, Chiang, & Zulu-Mbata, 2018).

Generally, the World Bank (2014) defined financial inclusion as the share of individuals and firms that use financial services. While the concept of mobile money can be likened to the platform of Google pay where people having access to phone can make payment and also transfer money through the platform to other fellow without scanning like the google pay. In detail, Ngong et al., (2022) revealed that financial inclusion is all initiatives that make formal financial services accessible and affordable to all general population. However, financial inclusion growth owes to the rise of some people being excluded from financial services in most parts of the developing world. These excluded populaces are often farmers, with little to no educational background. Hence with numbers being slated, globally it has been estimated that about 80% of the people living on less than \$2 a day are marginalized (World Bank 2015) and in sub-Saharan Africa, almost 66% of adults lack access to financial services (European Investment Bank 2017). This has become a wake-up call with financial inclusion being identified as an enabler of the 2030 global development agenda, enhancing the elimination of extreme poverty, reduction of hunger, good health and wellbeing, quality education, gender equality and promoting shared economic growth (Klapper et al., 2016). According to the World Bank's Global Findex Database (2017), only 40% of adults in Ghana had access to formal financial services. Adults' account ownership increased from 29% in 2011 to 59% in 2017 (Demirgüç-kunt et al., 2018), but inclusion in rural areas remained very low, especially among rural farmers. This is mainly due to location disadvantage of financial institutions, low level of education for the rural farmers, lack of savings due to insecure income of the rural farmers, lack of collateral to qualify for loans and individual risks (Okello *et al.*, 2018). However, with the introduction of mobile financial services, such as mobile money, the landscape has transformed significantly, providing greater access to financial services for the previously unbanked population.

This has created room for mobile money services that provide accessible and affordable financial and payment services to previously unbanked, low-income segments of society (Munyegera and Matsumoto, 2016). As of 2016, the number of people with mobile accounts has grown to half a billion globally, out of which 277 million were found in Sub-Saharan Africa (GSMA, 2016)

Financial inclusion encompasses various dimensions, including access, usage, and the quality of financial services (World Bank, 2014). Mobile money, with its convenience and accessibility, has gained popularity as a means of financial inclusion, particularly in regions with limited banking infrastructure (Mbiti et al., 2015). By utilizing mobile technology, maize farmers can conduct transactions, make payments, save money, and access credit, thereby overcoming traditional financial system barriers (Baptista et al., 2015).

The determinants of maize farmers' financial inclusion through mobile money in Ghana may include factors such as age, education level, income, proximity to mobile network coverage, and prior experience with technology (Sanni, 2017). Understanding these determinants can help identify the key barriers and facilitators that influence farmers' adoption and utilization of mobile money services.

with recent research being conducted on agriculture finance through the banked, it was been revealed by (Benami and Carter, 2021) that the provision of agricultural finance in developing countries is often complicated by poor transportation and communication infrastructure, relatively small sizes of financial transactions, and considerable risk inherently associated with smallholder farm production. These complications leave most farmers with very limited access to adequate financial services (Ouma et al., 2017).

Furthermore, with a lot of studies conducted it was widely seen that African farmers find it difficult to save. First, they are typically poverty-ridden smallholder farmers (FAO,2022). Second, they are usually unbanked (world Bank, 2017). Yet, the last two decades have brought forth an increasing range of different digital financial services that can be accessed through mobile phones. Such mobile financial services (MFS) include mobile money (AFI, 2016). Several studies have shown that farmers in Africa use the so-called mobile money or in the nutshell called MFS “mobile financial services” and that these innovations are associated with higher input intensity, farming productivity, market orientation, and household incomes (Kikulwe et al., 2014; Munyegera and Matsumoto, 2016; Sekabira and Qaim, 2017; Krone and Dannenberg, 2018; Aggarwal et al., 2020; Batista and Vicente, 2020; Gopane, 2020; Hartmann et al., 2020; Abdul-Rahaman and Abdulai, 2021). However, with the few usages of this Mobile money platform in Ghana. A study was conducted by Aboagye and Anong 2020 on the perception of customers on the usage of mobile money. Due to their experience, it was revealed that Mobile money appears to have addressed the many challenges of financial inclusion relating to proximity, cost, and documentation requirements, and thus provides a convenient alternative to bank accounts for some groups of consumers. As one participant indicates “I do not have enough money to open a bank account and since I have a mobile money account, I can send and receive money everywhere without having to wait in long lines or fill out any complicated paper forms so I do not need a bank account (Makola group participant, personal communication, July 2017). Perceptions held by maize farmers regarding mobile money are crucial in shaping their willingness to adopt and engage with the technology (Saka & Mahmud, 2019). Positive attitudes towards mobile money can be driven by perceived benefits such as convenience, security, cost-effectiveness, and increased financial

control (Saeed & Abdollahi, 2016). On the other hand, concerns related to trust, reliability, network connectivity, and familiarity with technology may hinder adoption (Gakpetor, 2019). Exploring these perceptions can provide insights into the factors that influence maize farmers' acceptance and usage of mobile money services in Ghana.

In addition, according to the survey, some also had their perception of mobile money in a different view which consumers had low confidence in the efficiency and security of the system due to the frequent network failures and increasing rate of fraud. One participant stated that “Mobile money is a very good service but some of the agents are thieves [even some of the service providers (MNOs)]. I don't leave any money in my account anymore because I don't trust them” (Makola group participant, personal communication, July 2017). Hence maize farmers were chosen for this project because maize farmers account for 50–60% of the total cereal production in Ghana and maize represents the second largest crop commodity in the country after cocoa (Millennium Development Authority [MiDA], 2010). The impact of maize farmers' financial inclusion via mobile money can be far-reaching. Improved access to financial services can enhance farmers' financial management capabilities, enabling them to save, budget effectively, and plan for the future (Gelaw, 2020). Access to credit through mobile money can facilitate investment in farming inputs, equipment, and technology, leading to increased productivity and profitability (Senn, 2016). Furthermore, mobile money can empower farmers to engage in formal markets, access market information, and make timely payments, reducing transaction costs and improving market efficiency (Ghana Statistical Service, 2019).

1.2 Problem Statement

Mobile money technology has been receiving attention and gradually becoming the most appropriate source of carrying financial transactions among people in developing countries including Ghana especially the farmers, the unbanked and the underserved (Akomea-Frimpong et al., 2019). Aside from everything recent studies have also revealed that the use of mobile money has a generally positive impact on household welfare (Suri and Jack, 2016). Empirical studies conducted by Demirgüç-Kunt et al., (2017) showed that a greater number of the population in developing countries like Ghana do not have access to banks and other financial services. Starting at 29% in the year 2011 (two years after the introduction of mobile money in Ghana) the percentage of adults who own accounts increased to 41% in 2014. Over the years formal financial institutions have shown a lack of interest in agriculture finance in some ways according to Ibrahim et al., (2020). First big swaths of the agricultural population were subject to the same weather and climate risks making it hard for providers of financial services to hedge risks or operate profitable insurance pools and agricultural households were located in remote parts of the country and were often widely dispersed that, financial institutions found it challenging to provide cost-effective and affordable services. Due to these factors, many farmers in Ghana face many issues including limited access to financial services. as a result of these economic hardships such as low produce, poverty and low standard of living have become part of them. Without access to financial services, these farmers easily fall victim to the pressure of their families and neighbours. Importantly, saving seems crucial to breaking the cycle of low investment and low agricultural productivity. Providing an enabling

environment for savings may be part of the solution to this developmental challenge of which mobile money plays key importance. Despite the introduction of mobile money by the network operators in Ghana as a means of bridging the gap of the marginalised by the financial mainstream. The recent economic decision by the government of Ghana has led the populace in redrawing their money from their mobile money wallet which served as a source of savings account for the people including the poor farmers. With regards to the 2022 budget which was read by the finance minister to tax individuals on the money which they receive through their mobile money wallet. Although due to the low consumer adoption rate of this mobile money, the economic hardship has created doubt in the minds of the people with the use of mobile money due to the tax placed on this technology.

To this effect, there are various studies on mobile money such as Vicente and Batista 2020 on the improving success of savings through mobile money and experimental evidence from African smallholder farmers, Nkegbe et al.,2017 on how mobile phones used by smallholder maize farmers affect productivity in Ghana. Also, a handful of mobile money research such as Peprah et al., 2020 on how mobile money adoption increases output and welfare of smallholder farmers in Ghana. Kikulwe et al.,2014 on their study of improvement in household welfare resulting from the adoption of mobile money and lastly, Aboagye and Anong 2020 on the provider and consumer perceptions on mobile money and microfinance integration in Ghana. These studies tend to look at the adoption, welfare and perception of either the general public or the smallholder farmers. But there has not been single evidential research on the perception and impact of maize farmers' financial inclusion through mobile money. This research tends to find out since there is a research gap

1.3 Research Questions

1. What is maize farmers' perception of financial inclusion via mobile money adoption?
2. What are the factors that influence maize farmers' financial inclusion through mobile money adoption?
3. What is the impact of maize farmers' financial inclusion through mobile money on farmers' income?

1.4 Research Objects

1. To determine the perception of maize farmers' financial inclusion via mobile money adoption
2. To analyse factors that influence maize farmers' financial inclusion through mobile money adoption.
3. To examine the impact of maize farmers' financial inclusion through mobile money on farmers' savings.

1.5 Research Benefits

Understanding the determinants, perceptions, and impact of maize farmers' financial inclusion through mobile money in Ghana is crucial for designing effective policies and interventions to promote inclusive agricultural development. By leveraging the potential of mobile money services, policymakers and stakeholders can empower maize farmers, enhance their resilience, and contribute to sustainable rural development

CHAPTER II

LITERATURE REVIEW

2.1 Mobile Money as Financial Inclusion in Africa

Upadhyay and Jahanyan (2015) threw more light on mobile money which they said is money transfer services that use information and communication technology tools and none banking channels to give and extend financial services to subscribers who are not profitable to be reached by formal and traditional services providers like the banks. Despite everything, mobile money provides basic financial services such as deposit, withdrawal, remittance delivery and payment of bills which are being done by the banks. Thus, the launch of mobile money services by telecommunication companies in many countries, especially in the sub-Saharan Africa setting has boosted the provision of financial services among low-income earners.

Asongu (2013) stated that the introduction and revolution of mobile phones have transformed many lives, especially the rural poor (including farmers) which has not only provided communication but also access to basic financial services through phone-based money transfer and storage (Ahmad et al.,2020) in addition, Okello et al., 2018 argued that mobile money is relatively cost-effective and efficient compared to cash-based payment channels. Thus, Chauhan (2015) referenced Kumar, Martin and O'Neil paper in 2011 that mobile money, which enables person-to-person and person-to-merchant payments using mobile phones without the need to have bank accounts and costly equipment is convenient and key in promoting financial inclusion among the poor. Many scholars like Asravor et al., (2020) and Abdul-Rahaman et al., (2022) also observed

that as a large number of poor people in developing countries migrate from rural settings to urban areas to earn a livelihood, through this they need to send money back to their families on regular basis. however, money transfer services can be very difficult and expensive. Thus, in such circumstances, mobile money becomes the most suitable medium for transferring money.

2.2 Mobile Money and Financial Services

The very best of the use of mobile phones in developing settings is being, viewed with some consideration is the introduction of mobile financial services and transactions (Hasan et al.,2021) in addition several services have been introduced into Ghana over the past years, namely mobile financial services. This has primarily focused on mobile money and mobile phone operators offering some type of mobile money services in Ghana. This can help the unbanked such as farmers to overcome such barriers and also have some benefits from financial services. The growth of mobile financial services in developing systems has been embraced which is been drawing the curtains down by eliminating the accessibility issues presented by traditional banking.

In the rural area of sub-Saharan Africa, it is been estimated that about 20% which farmers are inclusive of the population have access to any type of formal financial institution (Aker and Wilson, 2013). With that access to financial services is a key aspect of the development as credit and savings allow individuals and households (i.e., farmers) to invest, save and respond to shocks (Aker and Wilson., 2013).

The creation of mobile money in the economy of Ghana has brought financial services closer to the doorsteps of the poor, particularly the farmers and the rural areas. This Avenue has created a system for people to use text messages to the value in an account accessible by the mobile phone and also transfer value or cash between users (Asongu et al., 2018) Through the study conducted by Jack and Suri 2014 released that mobile money is more cost-effective than the traditional methods of money transactions (e.g., the postal service or delivery by family or friends). However, it has not only allowed households to send or receive money when it is needed to improve households' ability to share risk (Jack and Suri 2014).

2.3 Impact of Mobile Money

The study of mobile money and just impact has been researched in a few studies which is the impact assessment of mobile money since many such innovations were still at their adolescent stages of implementation as noted by Thulani et al., (2014). In 2016, Oni et al, also identified important indicators which can be applied in the assessment of alternative banking services as means of financial inclusion. However, these indicators were categorised as qualitative, quantitative and impact indicators, where impact indicators included change in income, change in living standards change in savings the level of indebtedness and lastly the level of banking habits. Furthermore, empirical studies reviewed the positive savings, information exchange, increased income and reduced costs (Thulani et al., 2014).

2.4 Mobile Money as Savings

Mobile money has generally been touted to be a phone cum savings account, hence enabling people without a formal banking account to engage in a safer and more efficient savings mechanism. (Nandhi, 2018) wrote that mobile money usage has significantly improved efficiency and regularity savings. However, its service system has a transformational benefit by offering something new that is new ways of accessing services and supporting livelihood such as loans (Aron 2018). Allen (2013) also referenced those incomes for rural mobile money patronizes increased due to remittances which also led to higher savings. In addition, the possibility of mobile money increasing savings was demonstrated by Kass-Hanna et al 2022 while Jack and Suri 2014 also asserted that mobile money users saved to store funds safe from the danger of theft and inaccessibility to other family members. To further up, they further postulated that savings have the potential of adding social value to those constrained by the cost of opening a bank account and the large distance between their households and the closest formal savings establishment.

2.5 Hypothesis

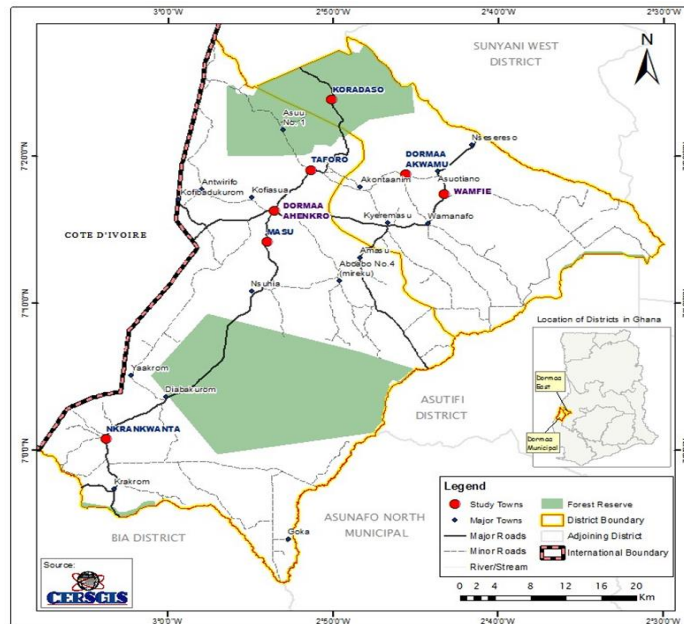
Financial inclusion via mobile money increases farmers' savings

CHAPTER III

METHODOLOGY

3.1 Study Area

The study area chosen for this research is Dormaa municipality which is located in the Bono region of Ghana. The desired purpose for choosing such a location as a study area is based on the purpose of the major occupation in the said area which is farming (which includes crops and livestock). The municipality is located in the western part of the Bono region of Ghana formerly known as the Brong Ahafo region. It is placed within the longitudinal of 30° west and 30°30' west and latitudinal of 7°North and 7°30' north. The municipality has a total land area of 917 Square kilometers. It has a tropical climate, with temperatures averaging 23.9°C and a double maxima rainfall pattern. Rainfall ranges from an average of 1000 mm in the northern parts to 1400mm in the southern parts. It has 296 settlements in the municipality. The population of the study area according to GSS (2010) population census is 115,144. The urban population constitutes 31.3% of the municipalities of the total population which indicates that the study area is rural and has agriculture (Crops and Livestock) as stated earlier as the predominant economic activity.



Picture 1 Map of Ghana Showing Communities of Dormaa Municipal and Dormaa East

Source: Centre for Remote Sensing and Geographic Information Services (CESGIS), Legon, Accra, Ghana (with data supplied from the author's field research, March 2012).

3.2 Research Design

The descriptive and causal research design will be used in the study since the impact and other objectives will be needed in the study.

3.3 Sample size and Sampling Technique and Procedure

Maize farmers in the Dormaa Central Municipal of Ghana form the study's target population. Due to the difficulty of obtaining the total number of maize farmers in the Dormaa Central Municipal,

the standard formula for computing sample size was not used in this study. For the purpose of this study, 150 maize farmers were considered appropriate.

A multi-stage sampling procedure was used for the selection of maize farmers in the Dormaa Central Municipal. To begin with, purposive sampling technique was used to select Dormaa Central Municipal. This is because the district has significant number of maize farming. Second, Purposive sampling was used utilized to choose six different communities that is Antrifu, Agapet, Suromani, Ahantrase, Kofiasua and New Dormaa in the Municipality because of their intensive maize production. Thirdly, Simple random sampling technique was used to select 150 maize farmers for the interview in the six communities found in the Municipality. The communities here is in the context that as considering Province of Indonesia with its towns like Semarang and others. The communities listed is in the same bracket as Semarang with the Municipal in Ghana as the Province per Indonesian point of view

3.4 Data Collection

With the objective of my study the research will be conducted through primary and secondary data. As such, the data will focus on the objectives. Primary data and secondary data will be collected using semi-structured questionnaires. Both cloth and open-ended questionnaires. The secondary data will be combined along with the primary data through a desktop review that is through Books, internet searches and journals.

3.5 Method of Data Analysis

Data was analyzed using the SPSS and STATA 15 tool in analyzing the objectives

Objectives 1

To determine the perception of financial inclusion via mobile money adoption. Perception index analysis was employed to achieve this.

Perception index analysis

The perception index was used to measure the perception of financial inclusion via mobile money adoption. Respondents will be required choose from a five-point Likert scale ranging from (1= strongly disagree, 2= disagree, 3= Neutral, 4 =agree and 5= strongly agree) Then the Likert scale questions will be represented with (strongly disagree (-1), disagree= (-0.5), Neutral= (0), agree = (0.5) and strongly agree (1). Their level of agreement or disagreement with some provided statements. The average of the statements is added and divided by the number of statements to form the perception index (PI). Mathematically, the average score for each perception statement is expressed as:

$$(1)$$

Where X= Ranked value of a perception statement and V by respondent j

Where Q =Total number of j 's assigning value X to a pre-defined statement.

Where n = Total number of respondents

$$(2)$$

Objectives 2

Objective two was analyzed using the binary logistic regression model.

In this study, binary logistic regression model was used to investigate the factors that influence maize farmer's financial inclusion through Mobile money adoption. The binary logistic regression model considers Z as a set of unobserved continuous variable. The relationship between Z and the probability that a maize farmer financial inclusion via mobile money increases farmer's savings or financial inclusion via mobile money does not increases farmer's savings is given by the function specified in equation below.

$$P_i (Y_i = 1) \quad (3)$$

Where P_i = probability that the i^{th} farmer financial inclusion via mobile money increases farmers savings; e = an exponential function; z_i = value of the unobserved continuous variable for the i^{th} maize farmer. The latent variable, Z , from equation [2] is derived as follows:

$$Z_i = \text{Log} \quad (4)$$

The latent variable, Z is linearly related to the observed explanatory variables by:

$$Z_i = \hat{\alpha}_0 + \hat{\alpha}_1 X_{1i} + \hat{\alpha}_2 X_{2i} + \hat{\alpha}_3 X_{3i} + \dots + \hat{\alpha}_k X_{ki} + \epsilon_i \quad (5)$$

Where; X_{kj} = k^{th} predictor of the i^{th} farmer; β_k = is the k^{th} coefficient; k = number of explanatory variables. The latent variable, Z is a binary variable where:

$$Z = \left\{ \begin{array}{l} 1 \text{ financial inclusion via mobile money increases farmers savings} \\ \end{array} \right\}$$

0 financial inclusion via mobile money does not increases farmer's savings

By substituting equation [5] into equation [3], the relationship between the explanatory variables and latent variable gives the probability that a maize farmer financial inclusion via mobile money increases farmer's savings is represented as follows:

$$P_i \quad (6)$$

Empirically (econometrically), the factors that determine whether or not a financial inclusion via mobile money increases farmer's savings become:

$$Z_i = \hat{\alpha}_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \dots + \beta_n X_{in} + \epsilon_i ; i = 1, 2, 3, \dots, n \quad (7)$$

where Z_i is whether or not a maize farmers financial inclusion via mobile money increases farmers savings and it is considered as the response variable, β_0 is the intercept (constant term), the remaining beta values, $\beta_1 - \beta_n$ are values to be estimated, and ϵ_i is the error term (random disturbance term) representing the unpredicted or unexplained variation in the response variable. The empirical binary logistic regression model for analyzing factors influencing whether or not a maize farmer financial inclusion via mobile increases farmers savings is specified in equation (7).

Mobile money for savings = $\beta_0 + \beta_1 \text{Age} + \beta_2 \text{Gender} + \beta_3 \text{Education} + \beta_4 \text{Experience} + \beta_5 \text{Main economic activity} + \beta_6 \text{Association} + \beta_7 \text{Distance to Agent} + \beta_8 \text{Bank Account} + \beta_9 \text{Distance to Bank} + \epsilon_i$

(6)

Definition of variables used in the binary logistic regression model and their a priori expectations are presented in Table 3.1.

Table 1 Description of the variable used in the Binary Logistic Regression Model

Variable	Measurement/Description	Expected Sign
<i>Response/Dependent Variable</i>		
Usage of mobile money for savings	1=yes, 0=no	Not applicable
<i>Explanatory/Independent Variable</i>		
Age	Years	+/-
Gender	1=male, 0=female	+/-
Level of education	Years of formal education	+
Main economic activity	1=maize trading, 0=otherwise	+/-
Traders' association membership	1=yes, 0=no	+
Distance to nearest mobile money agent	Kilometres	-
Ownership of bank account	1=yes, 0=no	-
Distance to nearest bank	Kilometres	+

Source: Author, 2023

Objective 3

To investigate the impact of maize farmer's financial inclusion through Mobile money on farmer's savings propensity score matching (PSM) was used.

PSM was used to investigate the impact of maize farmer's financial inclusion through Mobile money on farmer's savings by comparing variations in performance between the financially included (treatment) and not financially included (control). Average treatment effect (ATE) and average treatment effect on the treated (ATT) compare the average performance of participants and non-participants of a program (Becker and Ichino, 2002; Rosenbaum and Rubin, 1983). Participation in an intervention is voluntary, leading to probable selection bias. Hence, PSM matches participants and non-participants identically in features (StataCorp, 2015; Rosenbaum and Rubin, 1983). To estimate propensity scores, a probit model will be used, where 1= financially included via mobile money increases savings (treated group), and 0= financially included via mobile money does not increases savings (untreated/control/comparison group). ATT will be used to estimate the nearest neighbor matching, radius/caliper matching, and kernel matching and stratification methods, so that propensity scores are used to match treated and control groups. Following StataCorp (2015), Becker and Ichino (2002), and Rosenbaum and Rubin (1983), the impact of maize farmer's financial inclusion through Mobile money on farmer's savings will be estimated by computing differences in performance between financially included and not financially included

$$\delta_i = Y_{1i} - Y_{0i} \quad (8)$$

Where δ_i denotes financially included via mobile money (treatment) on maize farmers savings, Y_{1i} and Y_{0i} denote potential savings in the absence and presence of mobile money respectively. ATE is expressed as:

$$ATE = E(\delta) = E(Y_1 - Y_0) \quad (9)$$

Where E denotes the expected value (or the average). Also, ATT is as follows:

$$ATT = E(Y_1 - Y_0 \mid D = 1) \quad (10)$$

$$ATT = E(Y_1 \mid D = 1) - E(Y_0 \mid D = 1) \quad (11)$$

$$ATT = E(Y \mid D = 1) - E(Y \mid D = 0) \quad (12)$$

CHAPTER IV

RESULTS AND DISCUSSION

4.2 SOCIO-ECONOMIC CHARACTERISTICS OF MAIZE TRADERS

Socio-economic characteristics are significant in assessing entrepreneurial abilities of farmers in agricultural enterprise (Falola et al., 2013). The socio-economic characteristics of maize farmers are presented in Table 4.1. The table below shows that 40.7% of the sampled respondents were males and 59.3% were females. This is not consistent with the results of Aneani et al. (2012) who found 80% of sampled farmers being males and 20% being females in the Ghanaian farming sector. This shows a positive sign of females engaging in farming in the region of study. Also, the ages of respondents were recorded and it was seen that 5.3% were 20-30 years. 15.3% were 31-40 years. 26.0% were also between the ages of 41-50 years. 18.7 were between 51-60 years. While 27.3% were between 61-70 and 7.3% were above 70 years which is consistent with Oteng (2019). According to (Oliveira et al., 2020; Suh & Lee, 2021) younger individuals tend to have higher levels of digital literacy and greater technological aptitude, which can facilitate their understanding and adoption of mobile money services which can be seen in the above table that a section of individual fall in the younger age bracket which is even important for a household to use the mobile money technology. This showed that maize farmers in the study area were not older farmers with fewer older ones getting into maize production. In terms of residence status from the data collected,

it was seen from the above table that 2.7% were migrants who just settled in the study area and 97.3 were natives. In the above, it was seen that 34.7% had no education. Also, 40% had basic education. In addition, 30% had secondary/vocational education and lastly, 5.3% also had tertiary education. This is in line with Oteng (2019) who reported that 36.7% of smallholder farmers had no formal education. Studies have shown that individuals with higher levels of education are more likely to possess the knowledge and skills required to understand financial concepts, manage their finances, and utilize mobile money services effectively (Chen & Volpe, 2017)

Table 2 Socio-economic characteristics of maize farmers

Variables	Frequency 150	Percentage (%)
Gender		
Male	61	40.7
Female	89	59.3
Age		
20-30	8	5.3
31-40	23	15.3
41-50	39	26.0
51-60	28	18.7
61-70	41	27.3
Above 70	11	7.3
Residence status		
Migrant	4	2.7
Native	146	97.3
Education		
None	52	34.7
Basic	60	40.0
Secondary/vocational	30	20.0
Tertiary	8	5.3

(training/polytechnic/university)

Marital status		
Single	44	29.3
Married	106	70.7
Household head		
No	68	45.3
Yes	82	54.7
Number of households		
1-5	38	25.3
6-10	64	42.7
11-20	40	26.7
Above 20	8	5.3
Year of maize farming		
1-10	35	23.3
11-20	58	38.7
21-30	15	10.0
Above 30	42	28.0
Main economic activity		
Farming	137	91.3
Teaching	7	4.7
Trading	5	3.3
Fishing	1	0.7
Off-farm job		
No	124	82.7
Yes	26	17.3
Trader Association		
No	98	65.3
Yes	52	34.7
Who do you sell your maize to		
Wholesalers	49	32.7
Retailers	38	25.3
Aggregators	11	7.3
Schools	11	7.3
Processors	9	6.0
Household	10	6.7
Others	22	14.7

Source: survey data 2023

Moreover, the table also shows that 29.3% were single and 70.7% were married. This finding suggests that maize farming was a means of providing for the family in the study area. In terms of

the being household head. Those who responded yes to being household head were 54.7% and No was 45.3% which is consistent with GSS (2013) who reported male-headed households as the majority in Ghana. In Ghana, males are usually household heads relative to females. Again, it was also revealed that the number of households between 1-5 was 25.3% and 6-10 was 42.7%. Also, between 11-20 to be 26.7% and lastly 5.3% above 20. Per the family settlement in Ghana people leave in large group as families not necessary being two separate family. But it happens when the dependency rate is high with children born sometimes leave with their grandmothers and not their nuclear homes. Which contributes to the large number of of household size. According to the table above, years in maize farming were taken and it was revealed that 23.3% were between the years of 1-10. 38.7% were between the years 11-20. Also, 10.0% were between 21-30 and 28.0 were above 30 years. Respondents who considered farming as their main activity were 91.3%. 4.7% were into teaching. 0.7% were into Fishing and 3.3% were into trading. Also, respondents who were not into off-farm jobs were 82.7% and those who were into an off-farm job were 17.3%. Also, it was revealed from the above table that respondents who were not in traders' associations were 65.3% and those in traders' associations were 34.7%. Lastly, it was shown in the table based on whom farmers sell their produce. The table revealed that maize sold to retailers was 32.7%. Wholesalers were 25.3%. Also, it was seen that those sold to aggregators were 7.3%, and schools also represented 7.3%. Also, processors were sold to in the percentage of 6.0%. Household sales were 6.7% and others at 14.7%.

4.3 THE PERCEPTION OF MAIZE FARMER FINANCIAL INCLUSION VIA MOBILE

MONEY

This section talks about the Perception of understanding of mobile and its role. Based on the perception questions asked by the respondents seeking their understanding of mobile money and its role in financial inclusion. From the table below, it revealed that 0.7% said they use it for buying credit. Also, 3.3% approved of the fact that they use the mobile for just saving and transferring money to others and lastly 96% chose that their understanding of mobile money is to help them save and also pay bills. The larger percentage confirms the results of Tariq et al. (2021) who found that found that mobile money has significantly increased financial inclusion, especially in rural areas and among low-income populations, by offering a secure and accessible way to save and transact

Table 3 Perception of understanding of mobile money and its role

Variable	Frequency N = (150)	Percentages %
Understanding of mobile money and its role in financial inclusion		
Buying credit	1	0.7
Helps in saving and transferring	5	3.3
Saving and paying bills	144	96

Source: survey data 2023

The table below is based on the perception questions asked to respondents to know how familiar they are with mobile money. With the results generated from the analysis. It shows that 47.3% said they are very familiar with the mobile money concept. Also, 36.7% said they are familiar. Then 8.7% were neither familiar nor unfamiliar. 4.7% also said they are unfamiliar with mobile money and lastly 2.7% were very unfamiliar with mobile money. With the usage of mobile phones has paved the way for people to be familiar with the usage of mobile money which confirm the study by (Amankwah-Amoah et al., 2018; Suh & Lee, 2021) who said the widespread availability and adoption of mobile phones have contributed to people's familiarity with mobile money. With the increasing penetration of mobile devices, individuals have access to mobile money services, leading to greater familiarity and usage

Table 4 Perception of mobile money familiarity

Variables	Frequency N = (150)	Percentages %
Familiar with mobile money		
Very familiar		
Familiar	71	47.3
Neutral	55	36.7
Unfamiliar	13	8.7
Very unfamiliar	7	4.7
	4	2.7

Source: survey data 2023

Through the questionnaire, respondents were asked how they feel about using mobile money for financial transactions. It was seen that 36% were very comfortable. Also, 52% were comfortable.

7.3% were neither comfortable nor uncomfortable. Also, 3.3% were uncomfortable and 1.3% were very uncomfortable.

Table 5 Perception of how they feel using mobile money

Variables	Frequency N = (150)	Percentages %
How do they feel about using mobile money		
Very comfortable	54	36
comfortable	78	52
Neutral	11	7.3
Uncomfortable	5	3.3
Very uncomfortable	2	1.3

Source: survey data 2023

From the table below it was also seen that respondents were asked to rate the convenience of using mobile money for financial transactions. From the results tables, it shows that 30.7% saw that it was very convenient. 52% said it was convenient. 9.3% were neutral with the rate of how convenient mobile money is. 4.7% also said it was inconvenient and lastly 3.3% also said it was very inconvenient. With mobile money being convenient it is consistent with Obar, J. A., & Wildman, S. S. (2015) which according to their paper stated that the convenience of mobile technologies, including mobile money, has transformed the way individuals' access and manage their finances. It was further seen by the research of Chigada, A., & Hajir, B. (2017) who also said the convenience of mobile money contributes to financial inclusion by allowing individuals to perform financial transactions easily and securely.

Table 6 Perception of the Convenience of Mobile Money

Variables	Frequency N = (150)	Percentages %
Rate the convenience of using mobile money		
Very convenient	46	30.7
Convenient	78	52
Neutral	14	9.3
Inconvenient	7	4.7
Very inconvenient	5	3.3

Source: survey data 2023

From the table below, it was seen that respondents were asked if they feel mobile money has helped in increasing access to financial services. Then the results were seen that 28.0% strongly agreed. 33.3% agreed. 28.7 were neutral. Also, 6.7% disagreed and 3.3% strongly disagreed.

Table 7 Perception of Feel that mobile money increases access to financial services

Variables	Frequency N= (150)	Percentages %
Do they feel that mobile money helps increase access to financial services		
Strongly agree	42	28.0
agree	50	33.3
Neutral	43	28.7
disagree	10	6.7
strongly disagree	5	3.3

Source: survey data 2023

From the table, respondents were again asked if mobile has increased financial inclusion among maize farmers. With the response and analysis from the table show that 47.3% strongly

agreed. 36.7% also agreed. 8.7% were neutral. 4.7% disagreed and 1.3% strongly disagreed that fact mobile money has not increased the financial inclusion among maize farmers.

Table 8 Perception of Feeling that mobile money has increased financial inclusion among Farmers

Variables	Frequency N	Percentages %
Do they feel that mobile money has increased financial inclusion among maize farmers		
Strongly agree	59	47.3
agree	54	36.7
Neutral	24	8.7
disagree	11	4.7
strongly disagree	2	1.3

Source: survey data 2023

From the table below questions were asked if respondents were satisfied with the mobile money services they have used. Of the responses, 38.7% were very satisfied. 47.3 were satisfied or somewhat satisfied. 7.3% were neutral. 6% were unsatisfied with the services used and 0.7 were very unsatisfied with the services used.

Table 9 Perception of Satisfaction with mobile money use

Variables	Frequency N = (150)	Percentages %
How satisfied are they with the mobile services they have used		
Very satisfied	58	38.7
Somewhat satisfied	71	47.3
Neutral	11	7.3
Unsatisfied	9	6.0
Very Unsatisfied	1	0.7

Source: survey data 2023

4.4 Factors that influence maize farmer's financial inclusion through Mobile money adoption

Table 4.9 below shows the factors that influence maize farmers' financial inclusion through Mobile money adoption. The probability chi-squared reveals that the likelihood ratio (LR) chi-squared is significant (at 1%). This implies that the explanatory variables contribute to variations in maize farmers' financial inclusion through mobile money adoption. Specifically, the pseudo-R-squared suggests that the explanatory variables contributed 16% of variations in maize farmers' financial inclusion of mobile money. The remaining variations were caused by other unobserved characteristics captured by the error term.

The gender coefficient is positively signed and is statistically significant at 5 % which shows a positive relationship between gender and the usage of mobile money for savings. The marginal effect reveals that gender increases the probability of saving mobile money by 12.5%, with other factors held constant. This means that Gender differences in access to mobile phones can affect the usage of mobile money. In many societies, women may have less control over mobile phones compared to men, limiting their ability to utilize mobile money services. However, this study per

survey saw that females were more than the males and hence it's possible the use of mobile phones in the current society is not in line with what Kifle et al. (2015) and Shittu et al. (2017) have found that women are generally less likely to adopt and utilize mobile money services compared to men. Various socio-economic, cultural, and technological factors contribute to these gender-based differences. Also, per the analysis, it disagrees with Aker and Fafchamps (2015) and Amankwah-Amoah et al. (2020) suggest that women are often less likely to own and have regular access to mobile phones, which acts as a barrier to their engagement with mobile money services

Again, the coefficient of marital status is positively signed and is statistically significant at 10% which shows a positive relationship between marital status and the usage of mobile money for savings and is consistent with (Akinyemi et al. 2020). The marginal effect reveals that marital status increases the probability of saving mobile money by 10.6%, with other factors held constant. This means that maize farmers that are married are more likely to use mobile money to save than those that are single because married farmers have the responsibility of reducing their household's vulnerability to risks and the resulting negative impacts and are therefore more likely to save. Farmers who are single are also likely to use mobile money to save, which could be due to the fact that with limited responsibility of catering for other individuals, these farmers are more likely to set aside money to save for future purposes.

The coefficient of farmers' association membership is positively signed and is statistically significant at 1% which shows a positive relationship between farmers' association membership and the usage of mobile money for savings and is in line with Awal et al., (2021) who found out that FBO membership also exerts a significant positive effect on mobile money technology

adoption. The marginal effect reveals that belonging to a farmers' association increases the probability of saving mobile money by 24.9 %, other factors held constant. This suggests that farmer associations often promote financial discipline and goal-setting among their members. By joining an association, farmers can benefit from financial management training and support that help them develop the habit of saving through mobile money and set achievable savings goals, contributing to their long-term financial well-being. The coefficient of Age (0.0435) is positively signed and is not statistically significant which shows that there is no relationship between age and the usage of mobile money for savings. This implies that no matter the age of the farmer he/she can use the mobile money for saving and is not consistent with Afawubo et al. (2020) who observed a relationship between age and usage of mobile money. Again, the coefficient of formal education (0.1034) is positively signed and is not statistically significant which shows that there is no relationship between formal education and the usage of mobile money for savings which is not in line with Mulu-Mutuku et al. (2018), who reported a relationship between formal education on the usage of mobile money. Furthermore, the coefficient of maize farming experience (-0.2202) is negatively signed and is not statistically significant which shows that there is no relationship between maize farming experience and the usage of mobile money for savings and the coefficient of main economic activity (0.2121) is positively signed and is not statistically significant which shows that there is no relationship between main economic activity and the usage of mobile money for savings.

Ownership of a bank account (0.6976) is positively signed and is not statistically significant which shows that there is no relationship between Ownership of a bank account and the usage of mobile money for savings and it does not corroborate with Akinyem et al. (2020) and lastly the

number of households (-0.1921) is negatively signed and is not statistically significant which shows that there is no relationship between a number of households and the usage of mobile money for savings.

There we accept the hypothesis= Financial inclusion via mobile money increases farmers' savings

Table 10 Factors that influence maize farmers' financial inclusion through Mobile money adoption.

Independent variables	Coefficient	Standard Error	Z	P> Z 	Marginal Effect
Gender(1=male)	1.0200	0.5316	1.92	0.055*	0.1251
Age (years)	0.0435	0.1923	0.23	0.821	0.0053
Formal education(years)	0.1034	0.2850	0.36	0.717	0.0126
Marital status(1=married)	0.8666	0.4958	1.75	0.080*	0.1063
Maize farming experience(years)	-0.2202	0.2370	-0.93	0.353	-0.0270
Main economic activity (1=maize farming)	0.2121	0.3649	0.58	0.561	0.0260
Farmers association membership(1=yes)	2.0370	0.7818	2.61	0.009***	0.2499
Ownership of bank account(1=yes) household(number)	0.6976	0.5042	1.38	0.167	0.856
Constant	-0.1921	0.3088	-0.62	0.534	-0.0235
Log-likelihood (LR)	0.9357	1.3678	0.03	0.979	
Number of observations	-58.0712				
LR chi-square (9)	150				
Probability chi-squared	22.20				
Pseudo R-squared	0.0083*				
	0.1605				

*, **, *** represent significant levels at 10% 5% and 1% respectively

Source: Author's Computation from Field Data, 2023

4.5 IMPACT OF MAIZE FARMER'S FINANCIAL INCLUSION THROUGH MOBILE MONEY ON FARMER'S SAVINGS

The table below gives details on the impact of mobile money on maize farmers' savings. Consider this not all maize farmers chose to use mobile money as savings. But those who used the mobile money were able to save more as compared to those who didn't use it. From the four algorithms, it shows that maize farmers who adopted the use of mobile money as financial significantly impacted their savings as compared to other maize farmers who didn't.

Table 11 Matching estimates for average treatment effects on the treated-on farmer's mobile money usage over non users

Matching algorithm	Savings	SE	T-test	No. of treated	No. of control
ATT nearest neighbour matching	83.264	394.405	0.211	121	25
ATT radius matching	272.448	748.475	0.364	121	25
ATT stratification	392.332	373.896	1.049	121	25
ATT kernel matching	342.518	265.083	1.292	121	25

ATT: average treatment effects on the treated

Source: Author's computation based on field data, 2023

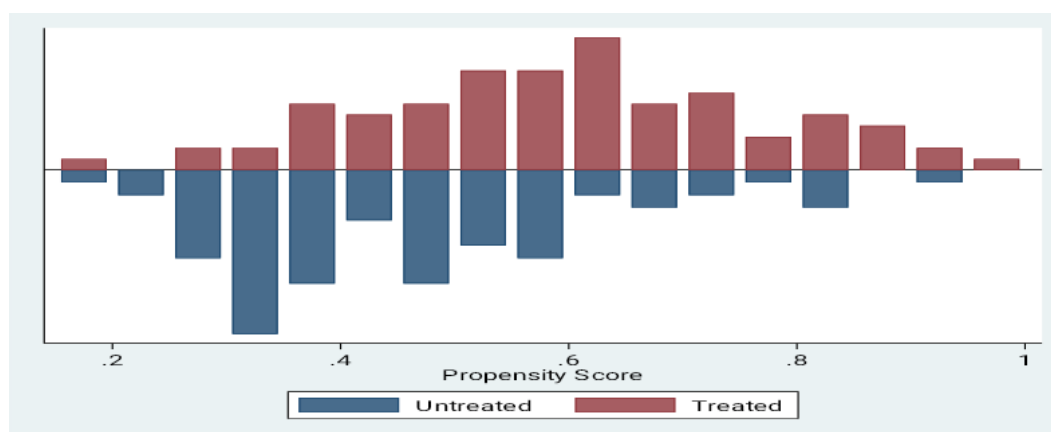
Hence the nearest neighbour matching results indicated that farmers who adopted mobile money increased their savings that are GH¢ 83.264, while the second saving was GH¢ 272.448 by the radius matching estimation, followed by stratification and kernel was recorded with savings of GH¢392.332 and GH¢342.518 respectively. The results suggest that savings by maize farmers for all matching algorithms is significant and has a positive effect on maize farmers' savings. This is consistent with the study of Jack, W., & Suri, T. (2014) who observed from their findings that

introduction to mobile money has increased the savings of an individual in Kenya. In addition, Suri, T., & Jack, W. (2016) again added further studies in 2016 after the 2014 findings further agreed with the fact that the individual with access to mobile money experience a significant increase in savings, particularly among women which also agreed to the research more with females or women being more than males in this regard. This means the ability to have access to or have mobile money has an impact on farmers' savings. The results also agree with the studies by Demirguc-Kunt et al., (2015) which findings elaborated that individuals who have access to mobile money services are more likely to have a bank account and engage in formal savings compared to those without such access. Moreover, the ability to make small, frequent transactions through mobile money has facilitated incremental savings, making it more feasible for low-income earners to build savings over time. Studies by Jack and Suri (2017) and Aker, et al., (2019) have found a significant positive association between mobile money usage and increased savings among individuals in Africa. Also, Mobile money platforms often provide additional digital tools and features that encourage savings behaviour. Features like automated savings, goal-setting options, and transaction history tracking can assist individuals in managing and monitoring their savings. Research by Cull et al. (2017) and Sarpong and Musingafi (2019) suggests that individuals who use mobile money and engage with these tools tend to have higher savings rates compared to those who do not. Mobile money can help individuals save by reducing transaction costs associated with traditional financial services. Research by Jack and Suri (2019) and Sani et al. (2020) has shown that individuals who use mobile money experience lower transaction costs compared to those who rely solely on cash or traditional banking services. The reduced costs encourage individuals to save more of their income and engage in regular savings behaviour. Studies by Ahmed et al. (2018) and

Sanni and Matimati (2019) indicate that individuals who use mobile money tend to have improved financial discipline, leading to increased savings behaviour. The results of this study is consistent with Mas and Ng'weno in 2016 who examined the impact of mobile money on the savings behaviour of small-scale farmers in Kenya. The researchers found that farmers who used mobile money services saved more frequently and in larger amounts compared to those who did not use mobile money. This further shows that there is a great and significant impact of maize farmers' mobile money savings as financial inclusion.

There we accept the = Financial inclusion via mobile money increases farmers' savings

Because maize farmers who saved using the mobile money platform had an increase in savings than those who didn't



Picture 2 Histogram of Propensity Score after matching for treated and untreated groups

Source: Author's computation, 2023 (STATA 15 SOFTWARE)

After matching, the Pseudo R2 and mean absolute bias distribution results are low, and the p-value ($p > \chi^2$ of 0.086 for unmatched and matched samples) are statistically different from zero. This indicates a reasonable, high-quality matching procedure.

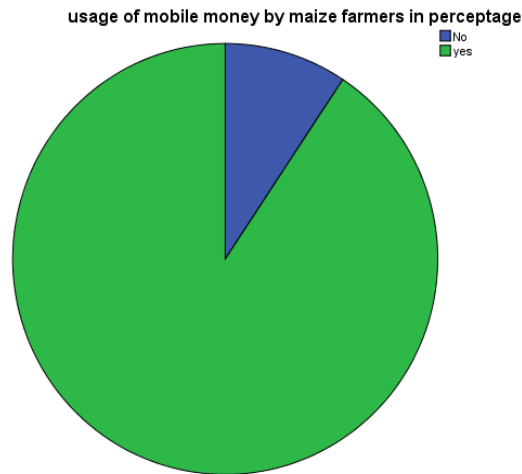
Table 12 Indicators for matching quality before and after matching

Sample	Ps R2	LR chi2	$p > \chi^2$	MeanBias	MedBias	B	R	%Var
Unmatched	0.066	9.65	0.086	25.5	24.4	63.4*	0.74	50
Matched	0.045	14.96	0.005	15.8	8.8	49.4*	3.49*	50

* If B > 25%, R outside [0.5; 2]

Source: Author's computation 2023 (STATA 15 SOFTWARE)

Picture 3 Pie chart of the usage of mobile money by maize farmers



Considering the analysis of the respondents' responses with regard to the usage of mobile money a larger percentage were extracted against those who were not using the mobile money platform as a farmer. Although education and awareness are needed, farmers find the app and platform useful with a frequency of 134 responding yes to the use of mobile money and 14 as No on the frequency table. Which represented a percentage of 90.7% as Yes and 9.3% as NO. with the picture above shows the pie chart view of the usage

CHAPTER V

CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

The study has revealed through the analysis and perception of the survey from the farmers and it has significantly shown how important mobile money has shown in the past decade which has proved a lot in helping them to do transactions and also save based on convenience without standing and waiting in long queues and also going through a lot of documentation which was revealed in other studies. Asiedu et al. (2017) have found that farmers who perceive mobile money platforms as secure and reliable are more likely to embrace these services and utilize them for their financial transactions. Dzansi et al. (2019) also indicated that farmers who perceive mobile money as offering advantages such as convenience, accessibility, and cost-effectiveness are more inclined to adopt and use these services. This was revealed in the analysis by which farmers confirmed that the use of mobile money is convenient. The study was used based on the socio-economic characteristics of 150 maize farmers and also used the perception index, Propensity score matching “PSM” and Binary logistic regression to understand the factors that influence maize farmers' financial inclusion through mobile money adoption and the impact of maize farmers financial inclusion through mobile on their saving. This significantly showed that those who used the mobile money had an increase in their savings as compared to those who

didn't with the money in this respective manner GH¢ 83.264=\$7.31, GH¢ 272.448=\$23.91, GH¢ 392.332= \$34.44 and GH¢ 342.518 =\$30.06 and the factors that influence the adoption of mobile money as financial was noticed that Gender, Marital status and Farmers association were significant to contribute to their choice of usage. Through this there three objectives have influenced the understanding of the perception, determinant and impact of maize farmers' financial inclusion via mobile money through the frequencies, mean and percentages, Binary Logistics and Propensity score matching.

The financial inclusion of maize farmers through mobile money has the potential to revolutionize their access to formal financial services and improve their overall livelihoods. By implementing the above recommendations, stakeholders can create an enabling environment for maize farmers to adopt mobile money and reap its benefits. Increased awareness, improved accessibility, tailored solutions, user-friendly interfaces, and robust security measures will collectively contribute to enhanced financial inclusion, increased productivity, and improved resilience among maize farmers. Ultimately, this will drive sustainable agricultural growth, poverty reduction, and economic development in maize farming communities.

5.2 RECOMMENDATION

Financial inclusion plays a vital role in empowering farmers and facilitating their access to formal financial services. Mobile money has emerged as a game-changer, revolutionizing the way financial transactions are conducted in various sectors, including agriculture. This recommendation paper focuses on the determinants, perception, and impact of maize farmers' financial inclusion through the utilization of mobile money.

Due to the importance of the use of mobile money. It's very important to consider a great measure and these are the recommendations which will ensure great utilization of mobile money as a financial inclusion by maize farmers. Collaboration and Partnerships are very key to ensuring the proper utilization of mobile money by maize farmers. Hence there is a need to foster collaboration between financial service providers, agricultural organizations, and mobile network operators to create tailored mobile money solutions that cater to the specific needs of maize farmers. This collaboration can help develop innovative features such as crop insurance, savings plans, and access to credit, which will enhance the overall financial inclusion experience for farmers. Also, there must be an awareness campaign. That is there can be a Launch of targeted awareness campaigns to educate maize farmers about the benefits and usage of money services. These campaigns should highlight the convenience, security, and potential financial gains associated with mobile money adoption. Agricultural extension officers and mobile money agents should be actively involved in disseminating information and conducting training programs to ensure effective awareness and understanding. Furthermore, the introduction of Infrastructure Development. The network operators or telecommunication in Ghana for example MTN, VODAFONE, AIRTEL and TIGO can Improve access to mobile money services by expanding network coverage and establishing a robust agent network in rural areas. This would involve

working closely with mobile network operators to ensure reliable connectivity and establishing mobile money agent points that are easily accessible to maize farmers. Enhancing infrastructure will facilitate seamless transactions and boost the adoption of mobile money services. In spite of all the recommendations above the mobile money interface should have user-friendly Interfaces that is mobile money platforms should be designed with user-friendly interfaces, taking into account the literacy levels and technological familiarity of maize farmers. Simplified menus, local language support, and intuitive navigation can significantly enhance the usability and uptake of mobile money services among farmers. Lastly, there must be a solid software update to strengthen security Measures. The Mobile money service providers must prioritize the implementation of robust security measures to address farmers' concerns about fraud and unauthorized access. Utilize secure authentication methods, encryption techniques, and regular system audits to instill confidence in farmers regarding the safety of their transactions and funds.

REFERENCES

- Abdollahi, M., & Farvardin, M. T. (2016). Demystifying the effect of narrow reading on EFL learners' vocabulary recall and retention. *Education Research International, 2016*.
- A. Bationo, J. O. Fening, and A. Kwaw, "Assessment of soil fertility status and integrated soil fertility management in Ghana," in *Improving the Profitability, Sustainability and Efficiency of Nutrients through Site Specific Fertilizer Recommendations in West Africa Agro-Ecosystems*, pp. 93–138, Springer, Berlin, Germany, 2018.
- Abdulai, S., Nkegbe, P. K., & Donkor, S. A. (2017). Assessing the economic efficiency of maize production in Northern Ghana. *Ghana Journal of Development Studies, 14*(1), 123-145.
- Abdullahi, S., Ya'u, A., Abubakar, A. H., Kubra, H., & Shuaib, Y. U. (2018). Profit Margin Assessment of Sheep Marketing: A Panacea for Sustainable Small-Scale Livestock Enterprise in Gombe State, Nigeria. *Jurnal Ekonomi dan Studi Pembangunan, 10*, 1.
- Abdul-Rahaman, A., & Abdulai, A. (2022). Mobile money adoption, input use, and farm output among smallholder rice farmers in Ghana. *Agribusiness, 38*(1), 236-255.
- Aboagye, J., & Anong, S. (2020). Provider and consumer perceptions on mobile money and microfinance integrations in Ghana: A financial inclusion approach. *International Journal of Business and Economics Research. Special Issue: Microfinance and Local Development, 9*(4), 276-297.

- AFI, 2016. Digital Financial Services: Basic Terminology. Guideline Note 19. Alliance for Financial Inclusion, Kuala Lumpur, Malaysia, p. 12.
- Afawubo, K., Couchoro, M. K., Agbaglah, M., & Gbandi, T. (2020). Mobile money adoption and households' vulnerability to shocks: Evidence from Togo. *Applied Economics*, 52(10), 1141–1162. <https://doi.org/10.1080/00036846.2019.1659496>
- Aggarwal, G., Cheruiyot, I., Aggarwal, S., Wong, J., Lippi, G., Lavie, C. J., ... & Sanchis-Gomar, F. (2020). Association of cardiovascular disease with coronavirus disease 2019 (COVID-19) severity: a meta-analysis. *Current problems in cardiology*, 45(8), 100617.
- Ahmed, H. S., Isah, A. O., & Bakri, N. S. (2018). Mobile money, financial behavior and saving habits in Nigeria. *Journal of Internet Banking and Commerce*, 23(3), 1-14.
- Ahmad, A. H., Green, C., & Jiang, F. (2020). Mobile money, financial inclusion and development: A review with reference to African experience. *Journal of economic surveys*, 34(4), 753-792.
- Aker, J. C., & Wilson, K. (2013). Can mobile money be used to promote savings? Evidence from Northern Ghana.
- Aker, J. C., & Fafchamps, M. (2015). Mobile Phone Coverage and Producer Markets: Evidence from West Africa. *World Bank Economic Review*, 29(Supplement_1), S124-S134

- Aker, J. C., Ghosh, I., & Burrell, J. (2019). The promise (and pitfalls) of digital credit in emerging markets. *Annual Review of Economics*, 11, 497-518.
- Akinyemi, B. E., & Mushunje, A. (2020). Determinants of mobile money technology adoption in rural areas of Africa. *Cogent Social Sciences*, 6(1), 1815963.
- Akomea-Frimpong, I., Andoh, C., Akomea-Frimpong, A., & Dwomoh-Okudzeto, Y. (2019). Control of fraud on mobile money services in Ghana: an exploratory study. *Journal of Money Laundering Control*, 22(2), 300-317.
- Allen, K. (2013). On the new frontier of mobile and money in the developing world: mobile phones, M-PESA, and Kenya.
- Allen, F., Demirguc-Kunt, A., Klapper, L., & Peria, M. S. M. (2016). The foundations of financial inclusion: Understanding ownership and use of formal accounts. *Journal of financial Intermediation*, 27, 1-30.
- Amankwah-Amoah, J., Wang, X., & Sun, P. (2018). An exploratory study of the factors influencing the adoption of mobile money services: Evidence from Ghana. *Technological Forecasting and Social Change*, 129, 1-12
- Amanor, K. (2013). Dynamics of maize seed production systems in the Brong Ahafo region of Ghana: agricultural modernisation, farmer adaptive experimentation and domestic food markets. *Future Agricultures Consortium Working Paper*, 61.
- Amanor, K. S., & Chichava, S. (2016). South–south cooperation, agribusiness, and African agricultural development: Brazil and China in Ghana and Mozambique. *World Development*, 81, 13-23.

- Aron, J. (2018). Mobile money and the economy: A review of the evidence. *The World Bank Research Observer*, 33(2), 135-188.
- Asiedu, E. O., Antwi, S. K., & Donyina, A. K. (2017). Factors influencing farmers' adoption of mobile money services in Ghana. *Agriculture & Food Security*, 6(1), 47
- Asongu, S. A. (2013). How has mobile phone penetration stimulated financial development in Africa?. *Journal of African Business*, 14(1), 7-18.
- Asravor, R. K., Boakye, A. N., & Essuman, J. (2022). Adoption and intensity of use of mobile money among smallholder farmers in rural Ghana. *Information Development*, 38(2), 204-217.
- Baptista, Gonçalo, and Tiago Oliveira. "Understanding mobile banking: The unified theory of acceptance and use of technology combined with cultural moderators." *Computers in Human Behavior* 50 (2015): 418-430.
- Batista, C., & Vicente, P. C. (2020). Improving access to savings through mobile money: Experimental evidence from African smallholder farmers. *World Development*, 129, 104905.
- Batista, C., & Vicente, P. C. (2020, May). Adopting mobile money: Evidence from an experiment in rural Africa. In *AEA Papers and Proceedings* (Vol. 110, pp. 594-98).
- Benami, E., Jin, Z., Carter, M. R., Ghosh, A., Hijmans, R. J., Hobbs, A., ... & Lobell, D. B. (2021). Uniting remote sensing, crop modelling and economics for agricultural risk management. *Nature Reviews Earth & Environment*, 2(2), 140-159.
- Cabral, L., & Amanor, K. S. (2022). Tractors, states, markets and agrarian change in Africa. *The Journal of Peasant Studies*, 49(1), 129-136.

- Chauhan, S. (2015). Acceptance of mobile money by poor citizens of India: Integrating trust into the technology acceptance model. *info*, 17(3), 58-68.
- Chen, H., & Volpe, R. P. (2017). An analysis of personal financial literacy among college students. *Financial Services Review*, 26(2), 201-220
- Chisanga, B., & Zulu-Mbata, O. (2018). The changing food expenditure patterns and trends in Zambia: implications for agricultural policies. *Food Security*, 10(3), 721-740.
- Claessens, S., Glaessner, T. C., & Klingebiel, D. (2002). *Electronic Finance: a new approach to financial sector development?* (Vol. 431). World Bank Publications.
- Cobla, G. M., & Osei-Assibey, E. (2018). Mobile money adoption and spending behaviour: The case of students in Ghana. *International Journal of Social Economics*, 45(1), 29–42. <https://doi.org/10.1108/IJSE-11-2016-0302>
- Cull, R., Demircuc-Kunt, A., & Makhoulouf, F. (2017). What determines the savings and borrowing behavior of individuals in developing countries? *The World Bank Economic Review*, 31(3), 563-589.
- Demirgüç-Kunt, A., & Singer, D. (2017). Financial inclusion and inclusive growth: A review of recent empirical evidence. *World Bank Policy Research Working Paper*, (8040).
- Demirgüç-Kunt, A., Klapper, L. F., Singer, D., & Van Oudheusden, P. (2015). The global finindex database 2014: Measuring financial inclusion around the world. *World Bank Policy Research Working Paper*, (7255).

- Demirguc-Kunt, A., Klapper, L., Singer, D., & Ansar, S. (2018). *The Global Findex Database 2017: Measuring financial inclusion and the fintech revolution*. World Bank Publications.
- Dwivedi, Y. K., Rana, N. P., Jeyaraj, A., Clement, M., & Williams, M. D. (2019). Re-examining the unified theory of acceptance and use of technology (UTAUT): Towards a revised theoretical model. *Information Systems Frontiers*, 21(3), 719-734
- Dzansi, Y. Y., Osei, V. K., & Awunyo-Vitor, D. (2019). Determinants of farmers' adoption of mobile money services in Ghana. *Cogent Economics & Finance*, 7(1), 1670983
- Esponda, G. M., Hartman, S., Qureshi, O., Sadler, E., Cohen, A., & Kakuma, R. (2020). Barriers and facilitators of mental health programmes in primary care in low-income and middle-income countries. *The Lancet Psychiatry*, 7(1), 78-92.
- Falola, A., Ayinde, O. E., & Agboola, B. O. (2013). Willingness to take agricultural insurance by cocoa farmers in Nigeria. *International Journal of Food and Agricultural Economics (IJFAEC)*, 1(1128-2016-92004), 97-107
- Faostat, "Statistical databases and data-sets of the food and agriculture organization of the united nations," 2010, <https://www.fao.org/statistics/en/>
- Food and Agriculture Organization. (2018). Ghana country profile. Retrieved from <http://www.fao.org/ghana/fao-in-ghana/ghana-country-profile/en/>
- Gakpetor, K. (2019). Mobile money adoption among smallholder farmers in Ghana: An empirical analysis. *Journal of African Business*, 20(4), 485-505
- Gelaw, F. (2020). The role of mobile money in agricultural financial inclusion: Evidence from smallholder maize farmers in Ethiopia. *Journal of Rural Studies*, 80, 199-207

- Gopane, T. J. (2020). Digitalisation, Productivity, and Measurability of Digital Economy: Evidence from BRICS. In *Digital Economy. Emerging Technologies and Business Innovation: 5th International Conference on Digital Economy, ICDEc 2020, Bucharest, Romania, June 11–13, 2020, Proceedings 5* (pp. 27-37). Springer International Publishing.
- Ghana Statistical Service (2013): Revised Gross Domestic Product. Retrieved June 2013 from http://pdf.usaid.gov/pdf_docs/PNABK614.pdf
- Ghana Statistical Service (2015a), Annual Gross Domestic Product, Ghana Statistical Service: Statistics for Development and Progress.
- Ghana Statistical Service. (2019). Ghana Agriculture Sector Report 2019. Retrieved from <https://statsghana.gov.gh/gssmain/fileUpload/agricultural%20report%202019.pdf>
- Gichuki, C. N., Mulu-Mutuku, M. (2018). Determinants of awareness and adoption of mobile money technologies: Evidence from women micro entrepreneurs in Kenya. *Women's Studies International Forum*, 67, 18–22 doi:10.1016/j.wsif.2017.11.013
- GSMA, 2016. Mobile Money Development Tracker. Retrieved from <http://www.gsma>.
- Harelimana, J. D., Chiang, C. F., & Zulu-Mbata, O. (2018). The impact of mobile money on financial inclusion: Evidence from Sub-Saharan Africa. *Journal of African Business*, 19(3), 372-394.

- Ibrahim, A. J., & Billah, M. M. S. (2020). Poverty alleviation through Islamic social finance in agro-sectors—an experience of northern Ghana. *Awqaf-led Islamic Social Finance: Innovative Solutions to Modern Applications*, 137-154.
- Jack, W., & Suri, T. (2014). Risk sharing and transactions costs: Evidence from Kenya's mobile money revolution. *American Economic Review*, 104(1), 183-223.
- Jack, W., & Suri, T. (2017). Mobile money: The economics of M-PESA. *Journal of Economic Perspectives*, 27(2), 103-122.
- Jack, W., & Suri, T. (2019). Mobile money: The effects of M-PESA in Kenya. *American Economic Review*, 109(1), 429-471.
- Kass-Hanna, J., Lyons, A. C., & Liu, F. (2022). Building financial resilience through financial and digital literacy in South Asia and Sub-Saharan Africa. *Emerging Markets Review*, 51, 100846.
- Kihara, J., Sileshi, G. W., Nziguheba, G., Kinyua, M., Zingore, S., & Sommer, R. (2017). Application of secondary nutrients and micronutrients increases crop yields in sub-Saharan Africa. *Agronomy for Sustainable Development*, 37, 1-14.
- Kikulwe, E. M., Fischer, E., & Qaim, M. (2014). Mobile money, smallholder farmers, and household welfare in Kenya. *PloS one*, 9(10), e109804.
- Krone, M., & Dannenberg, P. (2018). Analysing the effects of information and communication technologies (ICTs) on the integration of East African farmers in a value chain context. *Zeitschrift für Wirtschaftsgeographie*, 62(1), 65-81.

- Kumar, D., Martin, D., & O'Neill, J. (2011, May). The times they are a-changin' mobile payments in india. In *Proceedings of the SIGCHI conference on human factors in computing systems* (pp. 1413-1422).
- Lobulu, J., Shimelis, H., Laing, M., & Mushongi, A. A. (2019). Maize production constraints, traits preference and current Striga control options in western Tanzania: farmers' consultation and implications for breeding. *Acta Agriculturae Scandinavica, Section B—Soil & Plant Science*, 69(8), 734-746.
- Mas, I., & Ng'weno, G. (2016). Do mobile money services improve the quality of the traditional banking system? Evidence from Kenya. *World Development*, 80, 91-107
- Mbiti, Isaac, and David N. Weil. "Mobile banking: The impact of M-Pesa in Kenya." In *African successes, Volume III: Modernization and development*, pp. 247-293. University of Chicago Press, 2015
- Ministry of Food and Agriculture. (2019). Agricultural Sector Policy 2019-2023. Retrieved from <https://www.mofa.gov.gh/site/wp-content/uploads/2019/06/ASPD-2019-2023.pdf>
- Mochiah, E. E. A., Osei, R. D., & Akoto, I. O. (2014). Deciding to Urban-Migrate and Agricultural Development: Evidence from the Millennium Challenge Account (MCC)-Millennium Development Authority (MiDA) Intervention Zones, Ghana. *Modern Economy*, 5(13), 1187.
- MoFA, Agriculture In Ghana: Facts And Figures 2018, Ministry of Food and Agriculture. Statistics Research and Information Directorate, Accra, Ghana, 2018

- Munyegera, G. K., & Matsumoto, T. (2016). Mobile money, remittances, and household welfare: Panel evidence from rural Uganda. *World Development*, 79, 127-137.
- Must, B., & Ludewig, K. (2010). Mobile money: cell phone banking in developing countries. *Policy Matters Journal*, 7(2), 27-33.
- Nakai, J. (2018). Food and Agriculture Organization of the United Nations and the sustainable development goals. *Sustainable development*, 22, 1-450.
- Nandhi, Mani (2018). Effects of Mobile banking on the savings practices of low-income users – The Indian experience. In Bill Maurer; Smoki Musaraj; and Ivan Small (eds): *Money at the Margins: Global Perspectives on Technology, Financial Inclusion, and Design*. New York: Berghahn Books, pp. 266–286.
- Ngong, C. A., Onyejiaku, C., Fonchamnyo, D. C., & Onwumere, J. U. J. (2022). Has bank credit really impacted agricultural productivity in the Central African Economic and Monetary Community? *Asian Journal of Economics and Banking*.
- Obar, J. A., & Wildman, S. S. (2015). Social media definition and the governance challenge—an introduction to the special issue. *Obar, JA and Wildman, S.(2015). Social media definition and the governance challenge: An introduction to the special issue. Telecommunications policy*, 39(9), 745-750.
- Oecd, F. A. O. (2022). OECD-FAO Agricultural Outlook 2022-2031.
- Okello Candiya Bongomin, G., Ntayi, J. M., Munene, J. C., & Malinga, C. A. (2018). Mobile money and financial inclusion in sub-Saharan Africa: the moderating role of social networks. *Journal of African Business*, 19(3), 361-384.

- Okpeyo, E. T., Musah, A., & Gakpetor, E. D. (2019). Determinants of tax compliance in Ghana. *Journal of Applied Accounting and Taxation*, 4(1), 1-14.
- Oliveira, T., Alhinho, M., Rita, P., & Dhillon, G. (2020). The role of age, gender, income and intention to use mobile payment apps: Insights from Portugal. *Telematics and Informatics*, 54, 101444
- Organisation for Economic Co-operation and Development (OECD), FAO. (2019). Latin American agriculture: prospects and challenges. *OECD-FAO agricultural outlook 2019–2028*, 70-124.
- Oteng, C. (2019). *Mobile Money, Income and Welfare of Smallholder Farmers in Selected Districts in Ghana* (Doctoral dissertation, University of Cape Coast).
- Ouma, S. A., Odongo, T. M., & Were, M. (2017). Mobile financial services and financial inclusion: Is it a boon for savings mobilization? *Review of development finance*, 7(1), 29-35.
- Peprah, J. A., Oteng, C., & Sebu, J. (2020). Mobile money, output and welfare among smallholder farmers in Ghana. *Sage Open*, 10(2), 2158244020931114.
- Pope, M., Pantages, R., Enachescu, N., Dinshaw, R., Joshlin, C., Stone, R., ... & Seal, K. (2011). Mobile payments: The reality on the ground in selected Asian countries and the United States. *International Journal of Mobile Marketing*, 6(2).
- Poulton, C., Kydd, J., & Dorward, A. (2006). Overcoming market constraints on pro-poor agricultural growth in Sub-Saharan Africa. *Development policy review*, 24(3), 243-277.

- Radcliffe, D., & Voorhies, R. (2012). A digital pathway to financial inclusion. *Available at SSRN 2186926*.
- Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70(1), 41-55.
- Rutten, M., & Mwangi, M. (2012). 5 Mobile cash for nomadic livestock keepers: The impact of the mobile phone innovation (M-Pesa) on Maasai pastoralists in Kenya. In *Transforming innovations in Africa* (pp. 79-101). Brill.
- Saeed, S., & Abdollahi, A. (2016). Factors influencing farmers' adoption of mobile money transfer services: The case of Pakistan. *Computers in Human Behavior*, 65, 559-568
- Saka, N., & Mahmud, I. (2019). Examining the determinants of mobile money adoption among maize farmers in Ghana. *Cogent Business & Management*, 6(1), 1631179.
- Sanni, M., & Matimati, R. (2019). Mobile money usage and savings behavior: Evidence from Zimbabwe. *Journal of African Business*, 20(3), 367-384.
- Sani, I., Ahmad, M. H., & Chandio, F. H. (2020). Mobile money usage and savings behavior: A case study of Pakistan. *Journal of Internet Banking and Commerce*, 25(2), 1-23.
- Sarpong, D., & Musingafi, M. C. (2019). Mobile money usage and savings: Empirical evidence from sub-Saharan Africa. *Journal of African Business*, 20(3), 323-343.
- Sekabira, H., & Qaim, M. (2017). Can mobile phones improve gender equality and nutrition? Panel data evidence from farm households in Uganda. *Food Policy*, 73, 95-103.
- Suh, B., & Lee, C. (2021). Factors affecting mobile payment use: A focus on age differences. *Information Systems Frontiers*, 1-15

- Suri, T., & Jack, W. (2016). The long-run poverty and gender impacts of mobile money. *Science*, 354(6317), 1288-1292.
- Tariq, A., Tariq, R., Rana, R. A., & Arshad, H. (2021). The role of mobile money in financial inclusion: Evidence from developing countries. *International Journal of Finance & Economics*, 1-18
- Thulani, M., Chitakunye, P., & Chummun, B. Z. (2014). Mobile money as a strategy for financial inclusion in rural communities. *Mediterranean Journal of Social Sciences*, 5(25), 216.
- Upadhyay, P., & Jahanyan, S. (2016). Analyzing user perspective on the factors affecting use intention of mobile based transfer payment. *Internet Research*.
- Verde, B., & Matusso, J. (2014). Phosphorus in sub-Saharan African soils-strategies and options for improving available soil phosphorus in smallholder farming systems: A review. *Academic Research Journal of Agricultural Science and Research*, 2(1), 1-5.
- Wang, H. H., Wang, Y., & Delgado, M. S. (2014). The transition to modern agriculture: Contract farming in developing economies. *American Journal of Agricultural Economics*, 96(5), 1257-1271.
- Wang, X., & Guan, J. (2017). Financial inclusion: Measurement, spatial effects and influencing factors. *Applied Economics*, 49(18), 1751–176

Wentzel, J. P., Diatha, K. S. & Yadavalli, V. S. S. (2016). An investigation into factors impacting financial exclusion at the bottom of the pyramid in South Africa. *Development Southern Africa*, 33, 203- 214

World Bank 2017 “The Global Findex Database.” <http://www.worldbank.org/globalfindex>

World Bank Group, 2013. *Global financial development report 2014: Financial inclusion* (Vol. 2). World Bank Publications. World Bank, 2015. *Sub-Saharan Africa*.

World Bank Group. (2013). *Global financial development report 2014: Financial inclusion* (Vol. 2). World Bank Publications.

World Bank. (2014). *Global financial development report 2014: Financial inclusion*. Washington, DC: World Bank.

World Health Organization. (2019). *Trends in maternal mortality 2000 to 2017: estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division*.

Zhang, J. (2013). *A Comparison of Propensity Score Matching Methods in R with the MatchIt Package: A Simulation Study* (Doctoral dissertation, University of Cincinnati).

Zins, A., and Weill, L. (2016). The determinants of financial inclusion in Africa. *Review of development finance*, 6(1), 46-57.

APPENDIX

TITLE: Determinants, perceptions, and impact of maize farmer's financial inclusion via mobile money

A. PERSONAL AND HOUSEHOLD CHARACTERISTICS

Code	Personal Characteristics	Response
A.1	Community/town	
A.2	Gender 0= Female 1= Male	
A.3	Age of respondent	
A.4	Residence status	

	1= Indigene/native) 0=Migrant	
A.5	Highest level of formal education of farmer 1 = None 2= Basic 3 = Secondary/ Vocational 4 = Tertiary (Training college/Polytechnic/university)	
A.6	How many years have you spend in formal education	
A.7	Marital status 0= Single 1= Married	
A.8	Are you the head of the household? 1= Yes 0= No	
A.9	Including yourself, how many people live in your household?	
A.10	How many years of experience do you have in maize farming?	
A.11	What is your main economic activity? 1= Farming 2 = Fishing 3 = Teaching 4 = Trading 5= Handicraft 6 = Other (specify)	
A.12	Are you in any off-farm job 1= Yes 0 = No If yes, please state it	
A.13	Do you belong to any traders association? 1= Yes 0 = No	
A.14	Who do you sell maize to? (<i>multiple answer are allowed</i>) 1=retailers 2=wholesalers 3=aggregators 4=schools 5=processors 6=households 7=food vendors 7=others	

B. The perception of maize farmer's financial inclusion via mobile money

1. How familiar are you with mobile money as a financial inclusion tool?
 - a. Very familiar
 - b. Familiar
 - c. Neutral
 - d. Unfamiliar
 - e. Very unfamiliar
2. How do you feel about using mobile money for financial transactions?
 - a. Very comfortable
 - b. Comfortable
 - c. Neutral
 - d. Uncomfortable
 - e. Very uncomfortable
3. How do you rate the convenience of using mobile money for financial transactions?

a. Very convenient

b. Convenient

c. Neutral

d. Inconvenient

e. Very inconvenient

4. Do you feel that mobile money helps to increase access to financial services in your area?

a. Strongly agree

b. Agree

c. Neutral

d. Disagree

e. Strongly disagree

5. Do you feel that mobile money helps to increase financial inclusion among maize farmers?

a. Strongly agree

b. Agree

c. Neutral

d. Disagree

e. Strongly disagree

6. How satisfied are you with the mobile money services you have used?

a. Very satisfied

b. Somewhat satisfied

c. Neutral

d. Unsatisfied

e. Very unsatisfied.

7. Can you describe your understanding of mobile money and its role in financial inclusion?

.....

C. The factors that influence maize farmer's financial inclusion through Mobile money adoption.

1. What factors influenced your decision to adopt mobile money for financial transactions?

a. Convenience

b. Security

c. Cost

d. Accessibility

e. Recommendation from others

f. Other (please specify)

2. How important was each of the following factors in your decision to adopt mobile money?

a. Convenience

b. Security

c. Cost

d. Accessibility

e. Recommendation from others

f. Other (please specify)

3. How much knowledge did you have about mobile money before using it?

a. A lot

b. Some

c. A little

d. None

4. How important was ease of use in your decision to adopt mobile money?

a. Very important

b. Important

c. Neutral

d. Unimportant

e. Not important at all

5. How easy was it to set up a mobile money account?

a. Very easy

b. Easy

c. Neutral

d. Difficult

e. Very difficult

6. How much training did you receive on how to use mobile money?

a. A lot

b. Some

c. A little

d. None

7. How satisfied are you with the customer service provided by your mobile money provider?

a. Very satisfied

b. Satisfied

c. Neutral

d. Unsatisfied

e. Very unsatisfied

8. How much trust do you have in your mobile money provider?

a. A lot

b. Some

c. A little

d. None

9. How much impact did the availability of mobile money agents in your area have on your decision to adopt mobile money?

a. A lot

b. Some

c. A little

d. None

10. How much impact did the availability of mobile money services at your local market have on your decision to adopt mobile money?

a. A lot

- b. Some
- c. A little
- d. None

11. How much impact did your previous experience with financial services have on your decision to adopt mobile money?

- a. A lot
- b. Some
- c. A little
- d. None

12. How much impact did your age have on your decision to adopt mobile money?

- a. A lot
- b. Some
- c. A little
- d. None

13. How much impact did your education level have on your decision to adopt mobile money?

- a. A lot
- b. Some
- c. A little
- d. None

14. How much impact did your income level have on your decision to adopt mobile money?

- a. A lot
- b. Some
- c. A little
- d. None

15. How much impact did your access to other financial services have on your decision to adopt mobile money?

- a. A lot
- b. Some

c. A little

d. None

16. Can you explain what factors influenced your decision to adopt mobile money for financial transactions?

D. The impact of maize farmer's financial inclusion through Mobile money on farmer's savings.

1 Do you use a mobile phone?

A. Yes =1

B. No=0

2. Which kind of network do use

1= MTN 2= Vodafone 3= Airtel/Tigo 4= Glo

3. Have you registered for mobile money with your mobile network?

A. Yes = 1

B. No = 0

4. Do you use the Mobile Money Service?

A. Yes = 1

B. No = 0

5. Why did you choose to sign up to use Mobile Money service?

6. Which of the following services do you use mobile money for?

1= Buy Airtime 2= Pay bills (DSTV, Utility) 3=Transfer money 4= Receive money 5=Savings
6=business/trading 7= Others

7. Do you use mobile money for business transactions (payment for maize you buy from farmers and receipt of money from your buyers)?

A. Yes = 1

B. No = 0

8. What is the source of money you use to save on your mobile money account?

1=income from farm harvest 2=remittance 3=household contribution 4 = loan 5=income from trading of maize 6=other (specify)

9. Do you have a bank account?

A. Yes = 1

B. No = 0

10. Have you ever used mobile money to save money?

A. Yes = 1

B. No = 0

11. Do you feel that using mobile money has helped you to save more money?

a. Strongly agree

b. Agree

c. Neutral

d. Disagree

e. Strongly disagree

12. How much money do you currently have saved in your mobile money account?

a. Less than 1000¢

b. 1000¢-2000¢

c. ¢3000- ¢4000

d. More than 5000¢

13. How often do you make deposits into your mobile money account?

a. Daily

b. Weekly

c. Monthly

d. Rarely

e. Never

14. Have you ever used the savings in your mobile money account to make a large purchase?

a. Yes

b. No

15. How satisfied are you with the ability to save money using mobile money?

a. Very satisfied

b. Satisfied

c. Neutral

d. Unsatisfied

e. Very unsatisfied

16. Can you describe how using mobile money has affected your ability to save money and make large purchases?

BIOGRAPHY



Emmanuel Mensah is a dedicated individual with a passion for agribusiness and a strong commitment to making a positive impact in the agricultural sector. Born on June 6th, 1992, in Ghana, Emmanuel embarked on his educational journey in pursuit of his passion.

In 2018, I successfully completed my Bachelor of Science (BSc) in Agribusiness at the University of Energy and Natural Resources in Ghana, obtaining valuable knowledge and skills in various aspects of agricultural management, economics, and entrepreneurship. My educational background laid a solid foundation for my future endeavours in the agricultural industry.

Following my graduation, I sought practical experience and joined Okuafofa Agribusiness Training Centre in Ghana in 2019. There, I served as an Assistant Facilitator, supporting the training programs and providing guidance to aspiring agribusiness professionals. My time at Okuafofa allowed me to gain hands-on experience, further honing my skills in agribusiness operations and training facilitation.

My dedication to continuous learning and professional growth led me to pursue a Master of Agribusiness degree. Currently, in the final year of my program at Universitas Diponegoro in Indonesia, scheduled to complete my studies in July 2023. This advanced degree is equipping me with a deeper understanding of agribusiness principles, advanced management strategies, and global agricultural trends, empowering me to contribute significantly to the development of the agricultural sector.