

From Awareness to Financial Inclusion: Examining the Adoption Pathway of Digital Payment Systems and Mobile Money Among Farmers in Cross River State

¹Asuquo, Innocent Asuquo and ²Eyong, Innocent Arikpo

¹Department of Agricultural Economics, University of Calabar, Nigeria

²Department of Agricultural Extension and Management, Federal Polytechnic, Ugep, Nigeria

*Corresponding authors' email: innocent_asuquo@yahoo.com

ABSTRACT

Financial inclusion remains a pressing challenge in rural Africa, where many smallholder farmers are still excluded from formal financial systems. This paper examined how digital payment systems influence financial inclusion among farmers in Cross River State, Nigeria, focusing on awareness, usage, and the impact of digital payment systems on inclusion. Survey data from 121 farmers were analyzed using descriptive statistics and a Propensity Score Matching (PSM) model. Result revealed that Awareness was relatively high (75%), though understanding differed with level of education attained. Adoption was uneven: 28 farmers reported moderate use, 25 frequent, 21 occasional, 13 very frequent, and 1 rare use. Logistic regression results, which preceded the PSM, showed that education, income, and loan access encouraged adoption, while farming experience and male gender reduced it. Propensity score matching estimated a 27% increase in financial inclusion among users of the payment systems. The findings also showed that digital payment systems are already expanding access to financial services among farmers, but their impact is uneven. Without improvements in infrastructure and literacy, existing inequalities may widen, leaving poorer and less educated farmers behind. Policymakers and financial providers can use this evidence to design targeted strategies that make digital finance more inclusive and responsive to rural realities. This study offers empirical evidence on the role of digital payment systems in expanding financial access for rural farmers, while drawing attention to the uneven benefits across socio-economic groups.

Received: 17 Aug. 2026

Accepted: 14 Sept. 2026

Published: 28 Sept. 2026

Keywords:

Financial inclusion, Digital payment systems, Mobile money, smallholder farmers, Cross River State, Nigeria

INTRODUCTION

In today's development debates, financial inclusion is increasingly recognized as a necessity rather than a privilege. The United Nations' Sustainable Development Goals (SDGs) give clear direction on this, particularly Goal 1 -No Poverty, Goal 2 - Zero Hunger, and Goal 8 - Decent Work and Economic Growth (United Nations (UN); 2015). For rural communities where agriculture dominates, the ability to save securely, access credit on time, and make affordable transactions can mean the difference between stagnation and progress. Without such access, farmers are unable to invest productively, cushion against shocks, or move beyond subsistence (Beck *et al.*, 2015).

Across Africa, digital payment systems have opened new vistas. Mobile money has redefined how individuals interact with financial issues even in areas where the conventional banking system has little presence (Jack & Suri, 2014; GSMA, 2023). Kenya's M-Pesa, often described as a benchmark, is celebrated for reducing transaction costs and lifting millions of households out of poverty (Suri & Jack, 2016), the Nigerian experience is, however, an aberration. Despite being the home to one of Africa's largest economies and fastest-growing fintech industries, Nigeria still struggles with deep financial exclusion, with about 26% (28.8 million) of adult Nigerians currently excluded (Central Bank of Nigeria (CBN), 2022; EFInA, 2023). While urban dwellers benefit from some level of inclusion principally through their activities with physical banks and partly through digital mobile banking, with only 17% of the dwellers excluded; rural dwellers (majority of whom are farmers), on the other

hand, remain on the fringes, with an exclusion rate as high as 37%, rising to 47% in Northern Nigeria. Weak infrastructure, unstable electricity, poor financial literacy levels, and limited access to financial agents all combine to slow inclusion and adoption of digital banking/payment systems (Oluwatayo, 2013; Siano *et al.*, 2020). These structural challenges weigh more heavily than transaction charges or fraud risks, leaving many farmers excluded from a financial system that could otherwise transform their livelihoods.

In Cross River State, the problem is particularly acute. More than 70% of the 4.4 million population are farmers, and farming is the main source of livelihood, yet many of these farmers are completely cut off and financially excluded from access to formal credit and savings services. Exclusion at this level is psychologically unsettling and very inconvenient, undermining productivity, restricting growth opportunities, and stifling farming households in a vicious cycle of poverty (Okeke & Eze, 2018; Adegbite & Machethe, 2021). Although platforms like *OPay*, *Moniepoint*, *Paga*, *PalmPay*, and *Kuda* have expanded across Nigeria (GSMA, 2023; CBN, 2024), their impact on rural farming communities in Cross River State is undocumented.

While the State possesses enormous economic potential with fertile agricultural landscapes, it is troubling that a significant portion of the population is financially excluded. This exclusion has far-reaching consequences: without access to savings, credit, insurance, and other essential financial services, farmers struggle to invest in their farms, manage risk, and improve their livelihoods. Although the digital revolution is transforming economies worldwide, it is, on the

other hand, grossly underutilized in the State, hindered principally by a complex mix of infrastructural, socio-cultural, and economic barriers. It is as a consequent of this, that this study was premised.

Existing studies on digital payment systems and/or mobile money and financial inclusion have largely focused on broad national trends, with none addressing specific experiences of rural farmers in the State. For instance, Otitoju *et al.* (2023) examined digital financial inclusion for smallholder farmers in Nigeria but did not explore the region-specific barriers in states like Cross River State. Similarly, Khatun *et al.* (2024) highlighted the low adoption of mobile banking in rural areas but did not focus on the distinct financial needs of farmers. Akinwale *et al.* (2023) investigated digital platforms that connect investors with farmers, with a focus on the Niger Delta region, leaving a gap in understanding the financial inclusion landscape in the State. On the whole, there is a shallow depth of similar localized studies in Nigeria. Outside Nigeria, but elsewhere in Africa, Aker & Mbiti (2010) also demonstrated the transformative power of mobile money in rural Kenya, but without specifics to farmers. Therefore, addressing this gap is crucial to understanding how digital financial/payment systems can better serve rural farmers, particularly in a state where agriculture is a primary source of livelihood. By examining the unique socio-cultural, economic, and infrastructural context of the state, this study sought to provide a deeper understanding of the factors influencing financial inclusion of rural farmers and attempts to fill this knowledge gap.

The question is, are these digital payment platforms genuinely expanding access, or are they reproducing inequalities by serving only those with education, income, or proximity to infrastructure? This unanswered question forms the heart of the problem addressed in this study. It is against this backdrop that this study is structured. It explores the level of awareness of digital payment systems, the extent to which farmers use them, and the effect of these digital payment systems on financial inclusion, particularly access to credit, savings, and account ownership. With a combination of descriptive and visualization as well as econometric techniques such as Propensity Score Matching (PSM), the study also adds to the methodological gaps in previous studies.

Theoretical Perspective

Explaining how farmers adopt and interact with digital payment systems requires a theoretical foundation that connects individual behavior to broader systems. The Diffusion of Innovation Theory (Rogers, 1962) shows how innovations spread gradually, with innovators and early adopters paving the way for wider acceptance. In Cross River State, Nigeria, a few forward-looking farmers can influence their peers by demonstrating the tangible benefits of digital financial services (DFS). Closely aligned to this theory is the Technology Acceptance Model by Davis (1989), which emphasizes that perceived usefulness and ease of use of technology determine whether people will embrace it or not. For farmers, usefulness often means quicker credit, safer savings, or reduced travel costs, while ease of use depends on whether the platforms are intuitive and reliable even in low-connectivity areas.

Equally relevant is the Financial Intermediation Theory (Gurley & Shaw, 1960s), which explains how intermediaries' lower transaction costs and bridge information gaps between savers and borrowers. Today, fintech platforms like OPay, Paga, and Moniepoint have taken on that role, connecting farmers directly with credit providers and markets without the overhead of physical banks. Finally, the Sustainable

Livelihoods Framework (Chambers & Conway, 1991) reminds us that true inclusion is not just about access but about resilience. For farmers, digital finance can act as a buffer against shocks, whether a poor harvest, sudden illness, or market fluctuation, by creating reliable channels for savings, micro-loans, and income diversification.

Awareness and Understanding

Awareness of mobile money in rural Nigeria is no longer negligible, but awareness does not always lead to deep understanding. Nationally, the EFINA (2023) survey reported that access to formal financial services rose from 30 percent in 2016 to 57 percent in 2023, while the World Bank's Global Findex (2021) found that account ownership climbed steadily over the past decade. However, several studies show that having the knowledge of mobile banking is not the same as being confident in its use. Ajah *et al.* (2024) discovered that many women agripreneurs were aware of digital financial tools but had little knowledge of products such as micro-insurance. Similarly, Olowa and Olowa (2022) observed that although farmers had heard about mobile banking, they often struggled to see its relevance for their day-to-day farming operations. This gap between familiarity and comprehension is particularly visible in Cross River, where literacy levels and education strongly influence whether awareness leads to active adoption.

Usage Patterns

Once awareness is established, usage patterns expose a patchwork of adoption levels. Evidence from Kenya has been striking, as Jack and Suri (2014) showed that regular use of M-Pesa enhanced household resilience and helped families weather income shocks. Nigeria, by contrast, reveals both promise and hesitation. Khatun *et al.* (2024) and Sodipo *et al.* (2021) found that although rural farmers expressed high levels of awareness, active usage lagged because of fraud concerns, transaction failures, and mistrust of hidden fees. At the same time, evidence suggests that Nigerian farmers already integrate mobile phones deeply into agricultural decision-making. Okeke & Eze (2018) reported that smallholders used phones for accessing prices, sourcing inputs, and connecting with buyers, indicating that the infrastructure for digital engagement exists, even if financial platforms are not yet fully embedded in everyday practice.

Financial Inclusion Impact

Across rural communities, access to financial services significantly affects farmers' livelihoods and resilience. Households that can save, borrow, or insure against risks are better able to invest in productive activities and manage shocks. In Nigeria, Fowowe (2020) found that farmers with access to credit and banking services were more likely to invest in quality seeds, fertilizers, and mechanized tools, resulting in higher yields and more stable incomes. Those excluded from formal systems often rely on informal borrowing or distress sales, limiting long-term growth.

Financial inclusion also enhances market participation and income strategies. In Uganda, farmers with banking access could delay sales, process crops before selling, and reach buyers beyond local markets, securing better prices and reducing dependence on intermediaries (Sekabira & Qaim, 2017). These opportunities also support off-farm income, helping households diversify earnings and reduce vulnerability to seasonal fluctuations.

The benefits of financial inclusion, however, depend on broader socio-economic and structural factors. Education, gender, and infrastructure access influence adoption, as

shown in Burundi (Atta-Aidoo *et al.*, 2022), while low literacy, unreliable networks, and inconsistent policies limit participation in Nigeria's Niger-Delta (Sodipo *et al.*, 2021). In Cross River State, evidence is limited, but farmers face similar challenges, including restricted bank access, seasonal incomes, and limited financial literacy. This study therefore examines how financial inclusion affects productivity, income stability, and resilience among these farmers, offering recommendations for targeted policies and interventions.

MATERIALS AND METHODS

Study Area and Data

The study was conducted in Cross River State, Nigeria, a state known for its rich cultural heritage, diverse geography, and vibrant agricultural activities. Spanning approximately 20,156 square kilometers, the state features tropical rainforest in the south and savanna in the north, both supporting crop, livestock, and fish farming. The population, estimated at over 4 million in 2023, is distributed across 18 Local Government Areas (LGAs) and three agricultural zones, with English as the official language alongside several indigenous languages such as Efik, Ejagham, Boki, Yala, and Becheve.

Agriculture dominates livelihoods, engaging a significant proportion of the population. Major crops include cassava, rice, cocoa, oil palm, maize, yams, and vegetables, while livestock and fishery contribute substantially to income and food security. The diversity of production systems and widespread mobile phone usage made the state an ideal setting for investigating awareness, usage, and impact of digital financial services among farmers.

Sample Size/Sampling Procedure/Data Collection

The study focused on farmers across rural and semi-urban areas who owned mobile phones. A sample size of 121 farmers was determined using Cochran's formula with a confidence level of 95% and a margin of error of 8.8%. A multi-stage sampling technique ensured proportional and representative selection of the respondents for the study, and the stages were;

1. Selection of Agricultural Zones: Two zones, Calabar and Ikom, were purposively chosen for high agricultural activity and mobile network coverage.
2. Selection of LGAs: Within each zone, LGAs were selected based on farming intensity and accessibility:
 - i. Calabar Zone: Calabar Municipal, Akamkpa, Akpabuyo, Odukpani
 - ii. Ikom Zone: Yakurr, Obubra, Etung
3. Sample Allocation: Respondents were distributed proportionally across selected LGAs based on the population of farmers as obtained from the Cross River State Agricultural Development Project.
 - i. Calabar Zone: 69 farmers
 - ii. Ikom Zone: 52 farmers
4. Selection of Communities: Random selection of communities ensured diversity of respondents.
5. Selection of Respondents: Within communities, farmers were selected systematically, using a calculated interval to cover eligible participants. This approach ensured a representative spread of farmers across geographic, socio-economic, and infrastructural content

Structure of Questionnaire

The questionnaire was structured in three parts; the first part addressed social characteristics concerning the respondents (age, education, household size, farm experience). Part two addressed issues related to awareness of digital financial services and extent of use; the third part/final part of the

questionnaire focused on the impact. The questionnaire combined closed-ended questions, suitable for statistical analysis, with open-ended items to target nuanced insights and personal experiences, creating a balanced mix of quantitative and qualitative data. Open Digital Kit (ODK) was used in collecting the data for analysis.

Method of Analysis

Visual Instruments: Bar Charts, Frequency Table, and Scatter Plot

Bar charts and frequency tables summarized patterns of awareness, understanding, and usage of mobile financial services among farmers. These instruments revealed which services were most recognized or used and provided a visual distribution of responses across different demographic groups. A scatter plot complemented this by examining relationships between variables. Visualizing correlations revealed trends and potential causes of engagement, offering immediate, intuitive insight into the data.

Measuring Impact of Digital Payment Systems on Financial Inclusion

To measure the impact of digital payment systems in improving farmers' financial inclusion, Propensity Score Matching (PSM) was used. PSM is a conditional probability of receiving a treatment given pre-treatment characteristics (Rosenbaum & Rubin, 1983). The PSM was computed using a binary logistic regression (Logit) model given as:

$$\ln(Y=1 | X) = \alpha + \beta_1 \text{LoanAcc} + \beta_2 \text{Hhsize} + \beta_3 \text{Income} + \beta_4 \text{Fexpr} + \beta_5 \text{Fsize} + \beta_6 \text{Edu} + \beta_7 \text{Mstat} + \beta_8 \text{Gend} + e$$

Dependent Variable: Use of mobile banking (binary: 1 for Use, 0 for Non-use).

Independent Variables:

X₁= LoanAcc = Access to Loans (Loan access = 1, No access = 0)

X₂= Hhsize = Household size (Number of persons in a household)

X₃= Income (Farm annual income in naira)

X₄= Fexpr = Farming experience (Years)

X₅= Fsize = Farm Size (Hectares for crop, Number of Animals for Livestock)

X₆= Edu = Education level (Years of schooling)

X₇=Mstat = Marital status (Married=1, Separated=2, Single=3, Widowed=4)

X₈= Gender (Male = 1, Female = 0)

The propensity score was calculated from the results of the Logistic regression, which indicated the likelihood that a farmer was financially included. To analyze the causal effect of digital payment systems on owning a bank account, two matching algorithms were employed: Nearest Neighbor Matching (NNM), which matched each treated farmer with the closest untreated farmer based on the propensity score. Average Treatment Effect (ATE) was estimated to evaluate the impact of digital payment systems on farmers' access to bank accounts. It was preferred for its ability to control selection bias, revealing the actual impact of service use on financial inclusion.

RESULTS AND DISCUSSION

Sample Characteristics and Data Notes

The analysis draws on data from 121 farmers selected using Cochran's formula and interviewed with a structured questionnaire on ODK. Respondents captured a wide socio-economic range, from younger, less experienced farmers to older household heads with decades in agriculture. The dataset included variables such as years of schooling, income, farm size, gender, marital status, and farming experience,

alongside outcomes like awareness, usage, barriers, impact, and access to formal financial services.

It is worth noting that some analyses used fewer than 121 observations due to item nonresponse. For example, usage frequencies added up to 88 instead of 121. Where sub-samples were applied, this is flagged in the discussion. Econometric models were estimated using the listed variables as predictors, with diagnostics (Pseudo R^2 , LR χ^2 , confidence intervals) reported accordingly.

Awareness and Understanding

A notable 75% of the respondents reported being aware of mobile money and digital payment systems. Within this, 17% described themselves as “somewhat aware,” 40% as “very aware,” and 18% as “extremely aware.” However, the analysed data also showed that awareness was not equally distributed: scatter plots revealed a strong positive correlation between education and depth of awareness. This means that

while three out of four farmers must have heard of mobile payments, the ability to understand and actually use them rests heavily on their levels of education. This is similar to broader evidence from Nigeria and Sub-Saharan Africa. EFINA (2023) reported that 57% of Nigerian adults used formal financial services compared to 30% in 2016, yet rural adoption still lags. Similarly, the World Bank’s Global Findex (2021) showed an increase in account ownership, but limited functional literacy constrained effective use. Okeke and Eze (2018) also found that even when rural workers in Anambra recognized mobile banking benefits, mistrust and uncertainty hindered uptake.

Theoretically, this supports the Technology Acceptance Model (Davis, 1989), where perceived usefulness and ease of use promote adoption. Farmers with more schooling likely find digital systems less intimidating, while those with little literacy remain cautious.

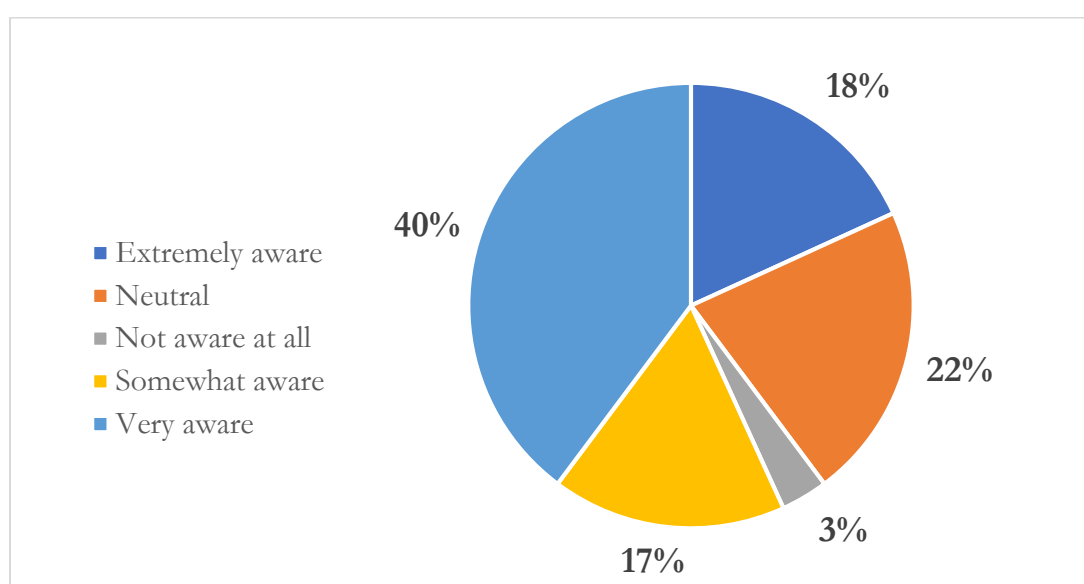


Figure 1: Respondents' Awareness of Digital Payment Systems

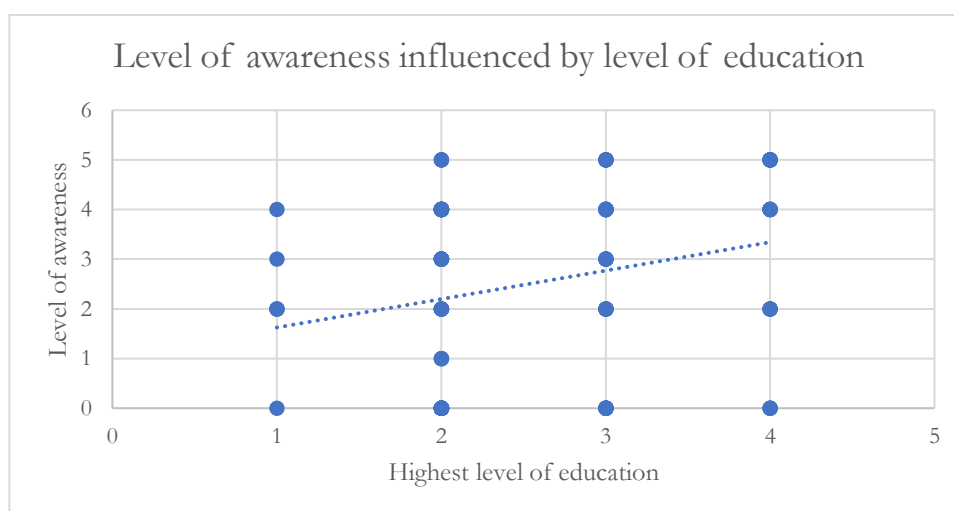


Figure 2: The Scatter Plot of Education against Level of Awareness

Extent of use Usage Pattern

Of the 88 respondents with valid usage data, 28 reported moderate use, 25 frequent use, 21 occasional use, 13 very frequent use, and only 1 rarely used. This indicates that, in

addition to cash payments, farmers also relied substantially on mobile payments through digital tools.

This partial adoption reflects a rational balancing act. Farmers used digital payment platforms to save time and for activities such as remittances or paying for input supplies, but resort to

cash when trust, reliability, or agent liquidity are uncertain. Olowa and Olowa (2022) described similar hesitation among farmers in Southwest Nigeria, noting that cultural preferences for tangible cash often remain strong. Sodipo *et al.* (2021) found that even when awareness was high (82%), only 40% of Niger Delta farmers used mobile money actively, citing fears of failed transactions.

Cross-country evidence strengthens this reading. In Kenya, Jack and Suri (2014) showed that M-Pesa's wide adoption was linked to its reliability in handling remittances and shocks. In contrast, Khatun *et al.* (2024) observed that Nigerian farmers often hesitated due to security concerns despite knowing about mobile banking. In other words, intensity of use depends less on knowing the service exists, and more on trust of workability.

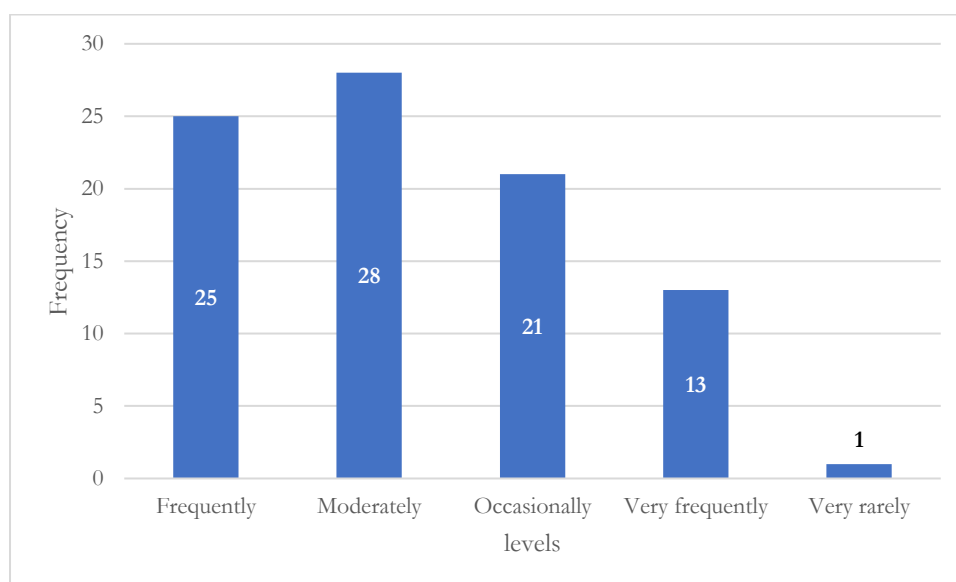


Figure 3: Frequency of Usage of Mobile Money and Digital Payment Systems

Impact of Digital Payment Systems on Financial Inclusion

The logit treatment model confirms that access to loans, household size, annual farm income education, and marital status (Separated/Divorced) increased adoption odds, while farming experience and male gender reduced them. The education effect was consistent with Olowa & Olowa (2022), who noted that better-educated farmers more readily embraced digital services, which also confirms the study's earlier findings using the visualizations. The coefficient for farming experience is negatively signed, which suggests conservatism among older farmers, confirming Ajah *et al.* (2024), who observed that older individuals have slower adoption rates in African rural settings.

Propensity Score Matching results in Table 1b further show that adoption increases financial inclusion by 27% (ATE =

0.27, $p < 0.001$). This shows that the use of digital payment systems in transacting businesses substantially increased inclusion by 27%. This supports the findings of Jack & Suri (2014), who showed that M-Pesa helped Kenyan households weather shocks and deepen financial ties, and Agada *et al.* (2023), who emphasized that financial inclusion boosts agricultural investment. Therefore, if digital payment systems increase financial inclusion by 27%, it implies that it will go a long way to improving their access to credit and savings through these platforms and, by extension, their productivity. One way this is achieved is by accessing all these from the comfort of their homes and reducing the burden of distance and bureaucracy of conventional banks.

Table 1a: Determinants of Digital Payment Systems on Financial Inclusion

Use of mobile banking		Coeff.	Std. Err	Z	P>Z	[95% Conf. Interval]
Transaction for Loans		0.761468	0.07954	9.57	0.000	0.605572 0.917363
Household size		0.03369	0.012060	2.79	0.093	0.01004 0.057317
Annual income		6.35E-09	3.77E-09	1.68	0.005	-1.05E-09 1.37E-08
Farming experience		-0.02397	0.004238	-5.66	0.000	-0.03227 -0.01566
Farm size		0.01208	0.008167	1.48	0.138	-0.00391 0.028105
Education		0.05619	0.007407	7.57	0.000	0.041673 0.070707
Marital status						
Married		0.049999	0.178532	0.28	0.779	-0.29992 0.399915
Separated/divorce		0.91545	0.261456	3.50	0.000	0.4030 1.427889
Single		-0.17634	0.18899	-0.93	0.351	-0.54676 0.194069
Widowed		-0.25154	0.239346	-1.05	0.293	-0.72065 0.217566
Gender		-0.57195	0.067221	-8.51	0.000	-0.7037 -0.4402
_Cons		2.25296	0.179759	12.53	0.000	1.900638 2.605281

Use of mobile banking	Coeff.	Std. Err	Z	P>Z	[95% Conf. Interval]
n	121				
LR Chi2 (8)	61.50				
Prob	0.000				
Pseudo R ²	0.3697				

Table 1b: Propensity Score Matching Results of Digital Payment System on Financial Inclusion

Access_to_bank_account	Coeff.	Std. Err.	Z	P > Z	[95% Conf	Interval
ATE	0.2727273	0.0450325	6.06	0.000	0.1844652	0.3069894

Implications, Limitations and Strengths

The results carry several implications for both scholarship and practice. First, they confirm that awareness alone is not sufficient for meaningful adoption. Farmers may have heard about digital finance, but unless services are designed to be simple, reliable, and supported with literacy programmes, adoption will remain partial. This aligns with findings from Olowa & Olowa (2022), who stressed that awareness without competence creates “passive users” rather than active participants. Secondly, the gender and experience results revealed that adoption is socially embedded, not just individually chosen. The fact that younger or female farmers may be more willing to adopt while older men transact more intensively shows household dynamics. This strengthens the importance of gender-sensitive financial products and programmes tailored to different farmer profiles.

Several limitations should be acknowledged. First, the sample size (n = 121) reduced statistical power and may have limited generalization. Moreover, the cross-sectional design implies that the study reflects adoption and inclusion at one point in time and not their evolution. A panel design would better show how adoption affects inclusion over time. While Propensity Score Matching helped to control for observable differences, unobserved confounders such as motivation, social networks, or trust in institutions may still have introduced some element of bias. Finally, the study focused on farmers in Cross River State; results may not fully represent the dynamics in other Nigerian regions with different cultural, infrastructural, or market contexts.

Despite these constraints, the study also has notable strengths. It combines descriptive and econometric methods to provide both breadth and causal insight. Few studies on Nigerian farmers have applied such a mixed-method econometric approach, making this contribution unique. The focus on rural farmers in Cross River adds local depth to a literature often dominated by urban samples.

CONCLUSION

The study demonstrates that digital payment systems offering digital financial services hold a big promise for advancing financial inclusion among farmers and particularly smallholder farmers in Cross River State. Awareness of mobile money and digital payment platforms is relatively high, yet the depth of understanding is uneven, influenced strongly by education levels. Usage patterns reveal that while many farmers incorporate these services into their lives, adoption remains partial, with cash transactions still dominating. Econometric evidence strengthens these observations, as adoption of mobile money raised financial inclusion by 27 percent, and users of these services were more likely to access credit and savings. However, the benefits remain uneven, disproportionately accruing to better-educated and resource-rich farmers.

From these findings emerge several clear policy recommendations. Improving rural infrastructure, particularly electricity and mobile network reliability, is a prerequisite for

digital finance to function as intended. Without dependable connectivity, even the most enthusiastic farmers cannot fully rely on mobile payments. Equally critical is addressing the cost barrier: transaction fees, though not always ranked as the most severe challenge, discourage frequent usage, especially for small transfers typical in rural settings. Policymakers and regulators should consider tiered or subsidized pricing models to make digital transactions more attractive.

Strengthening financial literacy must also move to the forefront of inclusion strategies. Awareness campaigns should be complemented with practical, farmer-centered training delivered in local languages and through cooperatives. Such programmes would transform awareness into confident use, reducing the knowledge gap that currently limits adoption. Beyond this, financial institutions and fintech providers should design products that fit the agricultural cycle and the realities of smallholder incomes, such as seasonal credit or micro-savings tailored to planting and harvest periods.

Finally, the findings show the importance of trust. Farmers will only adopt digital finance at scale when platforms guarantee consumer protection, transparent charges, and swift resolution of disputes. Expanding agent networks into underserved villages, ensuring agents have liquidity, and building mechanisms for accountability are steps that would reinforce confidence. Special attention is needed for vulnerable groups, particularly women, older farmers, and those with low literacy, who risk being left behind if solutions are not inclusive by design.

REFERENCES

- Adegbite, O. O., & Machethe, C. L. (2021). Revisiting the measurement of financial inclusion of rural smallholder farmers in Nigeria. *Agricultural Finance Review*, 81(4), 554-567. DOI: <https://doi.org/10.1108/AFR-02-2021-0015>
- Agada, G. O., Achike, A. I., Chukwuone, N. A., & Omeje, J. E. (2023). Analysis of Impact of Financial Inclusion on Rural Farming Households in Nigeria: A Review. *Nigerian Agricultural Policy Research Journal*, 10(1), 65-76.
- Ajah, E.A., Etowa, E.B., Effa, E.B., Ofem, U.I., Iso, H.E., Ettah, O.I., & Asuquo, I.A. (2024). Financial Inclusion of Agro-processors: Effect of Credit on Poverty Status of Roasted Plantain Vendors in Calabar, Nigeria. *African Journal of Food, Agriculture, Nutrition and Development*, 24(2): 25468-25488.
- Aker, J. C., & Mbiti, I. M. (2010). Mobile Phones and Economic Development in Africa. *Journal of Economic Perspectives*, 24(3): 207-232.
- Atta-Aidoo, J., Antwi-Agyei, P., Dougill, A.J., Ogbanje, C.E., Akoto-Danso, E.K., & Eze, S. (2022). Adoption of Climate-smart Agricultural Practices by Smallholder Farmers in Rural Ghana: An Application of the Theory of Planned. *PLOS Climate*, 1(10): 1-18.

- Beck, R., Jakubik, P., & Piloiu, A. (2015). Key Determinants of Non-Performing Loans: New Evidence from a Global Sample. *Open Economic Review*, 26: 525-550. DOI 10.1007/s11079-015-9358-8
- Central Bank of Nigeria- CBN (2024). Data and Statistics. Available online at <https://www.cbn.gov.ng>
- Central Bank of Nigeria. (2022). National Financial Inclusion Strategy 3.0(NFIS 3.0)| Policy.ng. Available online at <https://www.cbn.gov.ng/policy.ng>
- Cross River State Government. (2024). Official website of Cross River State Government.
- Demirgüç-Kunt, A., Klapper, L., Singer, D., & Ansar, S. (2022). The Global Findex Database 2021: Financial Inclusion, Digital Payments, and Resilience in the Age of COVID-19. World Bank.
- Enhancing Financial Innovation & Access (EFInA). (2023). Access to financial services in Nigeria 2023 survey – Key highlights.
- Enhancing Financial Innovation & Access EFInA). (2016). Access to Financial Services in Nigeria 2016 Survey
- Fowowe, B. (2020). The Impact of Financial Inclusion on Agricultural Productivity in Nigeria. *African Development Review*, 32(4), 496–508.
- Global System for Mobile Communications Association (GSMA). The Mobile Economy 2023. Available online at <https://www.gsmaintelligence.com>.
- Jack, W., & Suri, T. (2014). Risk Sharing and Transaction Costs: Evidence from Kenya's Mobile Money Revolution. *American Economic Review*, 104(1), 183–223.
- Jack, W., & Suri, T. (2016). The Economics of M-PESA. National Bureau of Economic Research Working Paper No. 16721.
- Khatun, M.N., Sarker, N.I. & Mitra, S. (2024). Adoption Of Mobile Banking to Promote Financial Inclusion Among Rural Farming Communities: Drivers and Satisfaction Level Perspective. *Journal of Agriculture and Food Research*, 18 (10):14-48.
- National Population Commission. (2023). Nigeria's Population Report 2023.
- Nigerian Bureau of Statistics. (2024). National Bureau of Statistics: Home.
- Okeke, T.C. & Eze, G.A. (2018). Exploring Mobile Money Adoption Among the Informal Sector in Anambra State, Nigeria. *International Journal of Development and Sustainability*, 7(12):2927-2942.
- Olowa, O. W., & Olowa, O. A. (2022). Determinants of Adoption of Mobile Financial Service in Rural Nigeria: Evidence from Ogun State. *Farm Economist*, 22(2), 100-110.
- Oluwatayo, I. B. (2013). Mobile Phones as a tool for Financial Inclusion Among Farming Households in Rural Southwest Nigeria. *Journal of Agricultural and Food Information*, 14(1), 90–101.
- Otitaju, M. A., Adelere, O. E., Akinbola, A. O., & Abah, E. G. (2023). Implications of Digital Financial Inclusion for Smallholder Farmers in Nigeria: A Review. *International Journal of Social Science and Humanities Research*, 11(3), 152-157.
- Sekabira, H., & Qaim, M. (2017). Mobile Money, Agricultural Marketing, and Off-farm Income in Uganda. *Agricultural Economics*, 48(5), 597-611.
- Siano, A., Raimi, L., Palazzo, M. & Panait, M.C. (2020). Mobile Banking: An Innovative Solution for Increasing Financial Inclusion in Sub-Saharan African Countries: Evidence from Nigeria. *Sustainability*, 12(23): 1-24
- Sodipo, J.A., Ikue, N.J., Zeb-Omoni, S., Uche, O.I., Enegesi, L.B., Taenyi, E.R., Ekuase, E.M., Simeon, M., Alalibo, B.G. (2021). Mobile Money Operations, Financial Inclusion, and Socioeconomic Factors in the Niger-Delta Region of Nigeria. *International Journal of Research in Business & Social Science*, 10(5), 224–234.
- Suri, T., Jack, W., & Stoker, T. M. (2012). Documenting the Birth of a Financial Economy. *Proceedings of the National Academy of Sciences USA*, 109(26), 10257-10262.
- United Nations -UN (2015). The 17 Goals- Sustainable Development Goals. Available online at <https://sdgs.un.org>
- World Bank. (2024). Financial inclusion overview.

