# Determinants of Digital Financial Service Usage Among Smallholder Farmers in North Central Nigeria

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**ABSTRACT**

This study investigates the usage and determinants of Digital Financial Services (DFS) among smallholder farmers in North Central Nigeria. A multistage sampling technique was used to select 813 respondents across Niger, Kogi, and Kwara States. Binary logistic regression analysis revealed that education positively and significantly influences DFS adoption, while age, marital status, household size, income, and land ownership negatively influence it. However, variables like sex, mobile phone ownership, internet access, farm size, and farming experience showed no significant impact. Despite high mobile (97.4%) and internet-enabled phone ownership (72.4%), adoption gaps remain. The findings emphasize the importance of education and digital literacy in promoting DFS uptake. Addressing barriers like trust, usability, and perceived relevance is essential to deepen digital financial inclusion for rural farmers.

**Keywords**- Digital Financial Services, Smallholder Farmers, Financial Inclusion, Adoption

## INTRODUCTION

Agriculture serves as a cornerstone of Nigeria's economy, contributing 21% to its Gross Domestic Product (CGAP, 2017). It is estimated that 70 percent of the food utilised in Nigeria (as a country in Sub-Saharan Africa) is grown by smallholder farmers. However, agriculture receives less than 5% of net bank lending in the majority of African nations, which disproportionately underserves smallholder farmers. These farmers could save, borrow, and transfer money more readily, securely, and affordably if they had easier, better access to financial products and services (Ordu et al, 2021).

Solutions driven by technology have the potential to remove the obstacles smallholder farmers encounter. Due to the rise in mobile wallet usage, mobile money penetration, and agency banking to satisfy their financial needs, digital finance solutions have pushed financial inclusion in many Sub-Saharan African regions. But in spite of these achievements, smallholder farmers still ignored or underutilised since they don't provide Financial Service Providers (FSPs), particularly banks, MNOs, and fintechs, with commercial viability. The cost of developing, implementing, and providing these solutions to rural areas is significantly higher than that of other industries like retail and e-commerce. The costs of onboarding smallholder farmers are also increased by the fact that many of them lack the skills and knowledge necessary to use financial products (GSMA, 2017).

Despite these obstacles, the number of digital finance solutions aimed at smallholder farmers in Africa is still growing significantly. However, these solutions, which are primarily driven by the private sector with assistance from donors, are aimed at providing low-cost or zero-rated financial services in order to temporarily alleviate common pain points. In the short term, donors assist in the design and development of solutions and may provide financial subsidies; however, over time, these solutions become unsustainable for the FSPs, who are unable to continuously provide farmers with concessional rates.

The result is an unprofitable mismatch between the needs of smallholder farmers and FSP's capacity to offer workable solutions. Innovations and technology are among the biggest facilitators of financial inclusion. Interoperability between industry participants, such as banks, MNOs, agriculture organisations, information hubs, donor organisations, grant-aided institutions, and third-party industry partners, is essential to promoting lower costs for smallholder businesses. Government, FSPs, and industry players must work together to provide shared solutions, platforms, networks, and infrastructure that can lower barriers to financial inclusion and, in turn, lower the cost of doing business for smallholder farmers, including the costs of sending and receiving money, in the midst of the global COVID-19 pandemic, which has seen the proliferation of cashless services.

Comprehending the role of electronic banking services in the agricultural sector is of importance for several reasons, reflecting the potential for change of these services for improving efficiency, sustainability, and economic growth within the agricultural sector (GSMA, 2017)

## MATERIAL AND METHODS

The study was conducted in North Central Nigeria. North Central Nigeria is made up of six states (Benue, Kogi, Kwara, Nasarawa, Niger and Plateau) and the Federal Capital Territory (FCT), Abuja. While the states have 114 Local Government Areas with a total population of over 20million, the FCT has 6 council areas with a population of about 1.41 million. The zone is agrarian as the main employer of labour is agriculture with few commercial centers in form of modern and local markets (Bolarinwa, Ogunkanmi &. Ogundipe, 2021).

### Sampling Technique and Sample Size

This study adopted a multistage sampling technique to select a representative sample of smallholder farmers in North Central Nigeria. The multistage approach was chosen to allow for systematic, unbiased selection from the population and to ensure adequate representation of the diverse agro-ecological and administrative units within the region. North Central Nigeria comprises six states; Benue, Kogi, Kwara, Nasarawa, Niger, and Plateau - and the Federal Capital Territory (FCT). From this region, a total of three (3) states were selected using simple random sampling at the first stage. The selected states were Niger, Kwara, and Kogi, chosen from the pool of seven (6 states and FCT) to represent varying socioeconomic and agricultural conditions within the North Central zone.

Based on this sampling procedure, as shown in Table 1, the total sampling frame was 2,410 registered smallholder farmers across 28 selected cells in the three states. From this, a final sample size of 813 respondents was drawn. Specifically, 318 respondents were selected from Niger State, 237 from Kwara State, and 258 from Kogi State. However, after data collection and cleaning, 812 out of 813 was suitable for data analysis. The selection process was rigorously executed to ensure that every registered smallholder farmer in the sample frame had an equal and known chance of being selected, thereby improving the representativeness of the study findings.

**Table 1: Sampling Procedure for the study**

| SN | Selected states | 50% of zones from each state | 20% of blocks from selected zone | 20% of cells from selected block | Total number of registered farmers in selected cell (Sample frame) | Sample size $(n=N/1+N(e^2))$ |
|---|---|---|---|---|---|---|
| 1 | Niger | Zone A | Mokwa | Bokani | 80 | 23 |
| | | | | Mokwa | 75 | 21 |
| | | | Kacha | Badegi | 79 | 23 |
| | | | | Kacha | 80 | 23 |
| | | | Lavun | Kutigi | 75 | 21 |
| | | | | Lanle | 83 | 24 |
| | | Zone C | Ibbi | Ibbi | 81 | 23 |
| | | | | Zugurma | 77 | 22 |
| | | | Kontagora | Kontagora | 80 | 23 |
| | | | | Tungan Wawa | 79 | 23 |
| | | | Wushishi | Wushishi | 76 | 22 |
| | | | | Kodo | 78 | 22 |
| | | | Zungeru | Zungeru | 85 | 24 |
| | | | | Kaliko | 85 | 24 |
| | | | | | **Total= 1,113** | **= 318** |
| 2 | Kwara | Zone B | Lafiaji | Lafiaji | 97 | 41 |
| | | | Lade | Lade | 83 | 35 |
| | | Zone C | Iporin | Oke Oyi | 98 | 41 |
| | | | | Oke Ose | 87 | 37 |
| | | | | Agbeyangi | 96 | 40 |
| | | | Shao | Sobi | 103 | 43 |
| | | | | | **Total= 564** | **= 237** |
| 3 | Kogi | Zone B | Egume | Anyigba | 85 | 30 |
| | | | | Egume | 108 | 38 |
| | | | Ankpa | Ojapata | 80 | 28 |
| | | | | Ankpa | 110 | 39 |
| | | Zone D | Alloma | Ejule | 90 | 32 |
| | | | | Umomi | 85 | 30 |
| | | | Okpo | Imane | 95 | 33 |
| | | | | Okpo | 80 | 27 |
| | | | | | **Total=733** | **=257** |
| **TOTAL** | **3** | **6** | **15** | **28** | **2410** | **812** |

## RESULTS

**Socio-Economic Characteristics of Respondents**

The study collected data on the socio-economic characteristics of respondents, including sex, age, marital status, level of education, farm size, household size, income, farming experience, land ownership, major crops grown, and bank account ownership.

### Social Characteristics of Respondents

Sex, age, marital status, level of education and household size were variables grouped as social characteristics of the respondents. Results of data analysis regarding these variables are presented in Table 2.

**Table 2 :        Social Characteristics of Farmers**

| Variables | Frequency (n=812) | Percentage | Mean (Std Dev.) |
|---|---|---|---|
| **Sex** | | | |
| Male | 587 | 72.3 | |
| Female | 225 | 27.7 | |
| **Age (years)** | | | 46.4 (10.89) |

| | | | |
|---|---|---|---|
| 20 – 40 | 283 | 34.9 | |
| 41 – 60 | 450 | 55.4 | |
| 61 and above | 79 | 9.7 | |
| Min.= 20 | | | |
| Max.= 80 | | | |
| | | | |
| **Marital Status** | | | |
| Single | 80 | 9.9 | |
| Married | 643 | 79.2 | |
| Widow | 45 | 5.5 | |
| Divorced | 26 | 3.2 | |
| Separated | 18 | 2.2 | |
| | | | |
| **Level of Education** | | | |
| 0 year (No formal education) | 102 | 12.6 | |
| 1-6years (Primary education) | 99 | 12.2 | |
| 7-12years (Secondary education) | 286 | 35.2 | |
| Above 12years (Tertiary education) | 325 | 40.0 | |
| | | | |
| **Household size (persons)** | | | 8.13 (3.45) |
| 1 – 4 | 95 | 11.7 | |
| 5 – 7 | 278 | 34.2 | |
| 8 – 12 | 353 | 43.5 | |
| 13 and above | 86 | 10.6 | |
| Min.= 2 | | | |
| Max.= 20 | | | |

*Source: Field Survey, 2024*

### Sex

The results presented in Table 4.1 show that majority (72.3%) of the respondents were male while few (27.7%) were female. This finding implies that smallholder farming in North Central Nigeria is male dominated and reflects the patriarchal nature of many Nigerian societies (Kolawole et al, 2017). This finding corroborates an assertion that many women in Nigerian societies are not involved in farm operations requiring heavy labour such as land clearing, tilling and harvesting but are mainly involved in post-harvest operations like threshing and winnowing (Rahman 2008; Mohammed, Dzidzienyo**,** Umar**,** Mohammad**,** Tongoona & Gracen, 2021). This contradicts the findings of Mafimisebi (2008) that most farmers are women.

### Age

Results on age of the farmers in Table 2 indicate that most of the respondents (55.4%) were within the age bracket of 41 to 60 years. The average age of the respondents was 46.4 years. This finding is an indication that smallholder farmers in North Central Nigeria are in the active age group. This aligns with the findings of Akintobi (2020) that most of the smallholder farmers in North Central Nigeria are in their active age and have potential drive to sustain agricultural production. The implication is that the farmers are much likely to be agile and capable to perform several tasks involved in crop production, thereby contributing greatly to the production of crops in the selected states for this study and Nigeria as a whole.

### Marital Status

Another finding in Table 2 pointed that majority of the respondents were married (79.2%). This aligns with the findings Adesina and Yusuf (2023) that majority of the farmers are married. Only 9.9% were single, 3.2% were divorced and 2.2% had separated from their spouses. By implication, being married is an indication of availability of spouse or partner that could help in performing gender related tasks such as husband involvement in the tedious work like land clearing and wife involvement in harvesting, processing, and storage of crops. This is a form of partnership that is expected to boost the production of crops in North Central Nigeria. The finding corresponds with the view of Omolehin *et al.,* (2007) who reported that married farmers were more mindful of the importance of getting better yields so as to meet their family food obligations. The need for marketable surplus to produce income for family financial needs was also high among married farmers.

### Education

On the level of education of the respondents, Table 2 show that 12.6% had no formal education, 12.2% had primary education, 35.2% had secondary education, and 35.2% had tertiary education. Based on these results, it could be deduced that most of the farmers in the study area had formal education ranging from primary to tertiary

education. This corroborates the findings of Kolawole et al. (2017) and Hassan et al. (2023) that majority of the farmers are able to read and write inscription and instruction to appropriately use improved technologies that may be introduced to them.

### Household Size

On the population of people in their households, Table 2 further shows that 11.7% had 1 to 4 persons, 34.2% had 5 to 7 persons, 43.5% had 8 to 12 persons while 10.6% had 13 persons and above. The average number of persons in their households was approximately 8 persons. Eight persons as members a household is relatively high considering the present economic reality in Nigeria. This corroborates the findings of Hassan and Knight (2023) that higher household size may translate to high responsibility that is expected to favourably trigger higher commitment to crop production among farmers in the study area.

### Economic Characteristics of Respondents

Farm size and monthly income were variables grouped as economic characteristics of the respondents. Results of data analysis regarding these variables are presented in Table 3

### Farm Size

Results presented in Table 3 show that majority (61.1%) of the respondents cultivated less than one hectare of land. The average land area cultivated by the respondents was 1.6 hectare. This study supports the claim that majority of farmers in North Central Nigeria have a farm size of less than 2 hectares (UNCTAD,2015; Apata, 2016, Chiaka et al, 2022).

### Income

As regards income, Table 4.2 indicated that respondents earned between ₦5,000 to ₦600,000 naira monthly with average monthly income of ₦203,817.71. The estimated average daily income was ₦6,793.92. This is equivalent to $4.37 per day considering CBN exchange rate as at the time of the analysis (March, 2025). This is higher than the World Bank International poverty line of US$1.9 a day reported for Sub-Saharan African countries. This implies that the smallholder farmers in the study area are not poor. This is to show that involvement in crop production as a business is capable of bringing more farmers out of poverty when government efforts is intensified on empowering farmers on the use of improved technologies. This study therefore supports the claim that crop production has the potential to lift smallholder farmers out of poverty (Alene &Manyong, 2007; Manda, Alene, Tufa, Abdoulaye, Wossen, Chikoye &Manyong, 2019, Alabi et al., 2024).

**Table 3: Economic Characteristics of Respondents**

| Variables | Frequency (n=812) | Percentage | Mean (Std Dev.) |
|---|---|---|---|
| **Farm size (Hectares)** | | | 1.6   (1.71) |
| Less than 1.0 | 496 | 61.1 | |
| 1.1 – 2.0 | 214 | 15.3 | |
| 2.1 – 3.0 | 45 | 5.5 | |
| 3.1 – 4.0 | 19 | 2.3 | |
| 4.1 – 5.0 | 128 | 15.8 | |
| Min.= 0.1; Max.= 5.0 | | | |
| **Monthly Income (Naira)** | | | 203,817.7 (167,857.08) |
| 5,000 – 50,000 | 224 | 27.9 | |

| | | |
|---|---|---|
| 51,000 - 150,000 | 155 | 19.1 |
| 151,000 – 300,000 | 127 | 15.6 |
| 301,000 – 500,000 | 281 | 34.6 |
| 501,000 – 600,000 | 25 | 3.1 |
| Min.= 5,000; Max.= 600,000 | | |

*Source: Field Survey, 2024*

### Experience, Land Ownership and Major Crops Grown

This sub-section is concern with years of experience, land ownership and types of crop grown by respondents. Results of data analysis regarding these variables are presented in Table 4.

**Years of farming Experience**
As presented in Table 4, years of respondents' experience in crop farming ranges from 1 to 30 years with average of 17.4±10.08years. Seventeen years of experience is considered long years through which the farmers must have gained a lot of knowledge crop production and farm management. Farmers in North Central Nigeria are experienced and capable of implementing and sustaining innovations (Kolawole *et al*, 2017; Akintobi, 2020). Afolami, Obayelu, & Vaughan, (2015) maintain that farming experience exerts a significant influence on adoption and utilization of improved technologies by farming households.

**Land ownership**
Results of analysis on Table 4 reveals that most of the respondents (82.6%) own the land that they use for their farming activities. Ownership of land can improve land use and management. This corroborates the findings of Mdoda and Gidi (2023), Deininger et al. (2017) and Besley and Ghatak (2010) that majority of farmers own land and land ownership is one of the crucial ways towards sustainable development for productivity-enhancing investment, land management, and eventually improving access to credit markets and financial institutions through using of land as security.

**Major Crop Grown**
The result of the analysis in Table 4 shows that cassava emerged as the major crop grown among the surveyed farming households, accounting for 33.9% of the respondents. This makes cassava the most dominant crop cultivated in the study area, surpassing other staple crops such as maize (27.0%) and rice (17.9%). This finding is in consonance with Abah and Petja (2016) and Chiaka et al (2022). The prominence of cassava in this context may be attributed to its adaptability to a wide range of soils and climatic conditions, relatively low input requirements, and resilience to drought, which makes it particularly suitable for smallholder farmers operating under resource constraints. Moreso, cassava plays a significant role in household food security and income generation. It is a staple in many Nigerian diets and is also processed into various products such as garri, fufu, and starch, creating multiple avenues for value addition and market opportunities. The widespread cultivation of cassava could also reflect government and development partner interventions aimed at boosting root and tuber crop production for food security and rural livelihoods.In contrast, other crops such as cowpea (6.0%), millet (4.6%), yam (5.5%), and vegetables (1.7%) were grown by fewer households, indicating that while diversification exists, the focus remains on crops with high consumption and commercial value. The relatively lower figures for crops like potatoes (1.2%) and vegetables may point to limitations in input availability, market access, or agronomic knowledge related to their production.
Cassava dominates the cropping pattern among the studied households, underscoring its critical role in rural agricultural systems and its potential as a key entry point for interventions aimed at improving food security and promoting digital financial service (DFS) adoption in the agriculture sector.

### Mobile Phone Ownership

Based on the data provided in Table 4, mobile phone ownership among the respondents is overwhelmingly high. Out of 812 respondents, 791 (97.4%) reported owning a mobile phone, while only 21 (2.6%) did not. This corroborates the findings of Akinyemi (2020) that majority of farmers own a mobile phone

This high rate of mobile phone ownership suggests that most farming households are equipped with at least basic communication tools (Ifeanyi-Obi and Iferobia, 2024). This is particularly significant when considering the potential for digital financial services (DFS) and agricultural information dissemination. The widespread access to mobile phones provides a solid foundation for scaling mobile-based innovations in agriculture, such as mobile banking, weather alerts, market information, extension services, and DFS platforms.

Moreover, this access boosts the likelihood of successful adoption and usage of DFS, especially when supported by user-friendly interfaces and local language integration. It also indicates a promising level of connectivity, which can improve the overall efficiency, productivity, and financial inclusion of farming households.

**Internet-Enabled Device Ownership**
The data in Table 4 reveals that a significant proportion of respondents, 72.4% own internet-enabled phones, while 27.6% do not. This high level of ownership indicates a substantial potential for leveraging digital platforms for agricultural communication, financial services, market access, and extension delivery (NITDA, 2020). The prevalence of internet-enabled phones suggests that many farmers are already positioned to access Digital Financial Services (DFS), mobile-based agricultural innovations, and online learning or advisory content. This also reflects growing digital inclusion in rural farming communities (NITDA, 2020). However, the 27.6% who lack such devices remain digitally excluded, potentially limiting their access to modern tools and resources.

**Bank Account Ownership**
The result from Table 4 reveals that of the respondents, 94.2%, reported having a bank or wallet account, indicating a high level of access to financial services. This suggests that a large majority of smallholder farmers are potentially ready for or already engaged in digital financial services, as these accounts form the foundation for accessing various DFS offerings.
However, 47 farmers, representing 5.8% of the sample, reported not having a bank or wallet account. This group could face challenges in adopting DFS, as the lack of a financial account may hinder their ability to participate in mobile money, digital payments, or other electronic financial services. The relatively small proportion of non-owners suggests that while DFS adoption is widely possible among this group, there remains a need to address barriers to financial inclusion for the small segment without access to formal financial accounts (Omenihu, 2024). This could involve examining issues such as access to banking infrastructure, awareness, or the affordability of digital financial services for smallholder farmers.

**Table 4: Experience, Land Ownership and Major Crop Grown**

| Variables | Frequency (n=812) | Percentage | Mean (Std Dev.) |
|---|---|---|---|
| **Experience in Farming (years)** | | | 17.4   (10.08) |
| 1 – 10 | 270 | 33.3 | |
| 11 – 20 | 312 | 38.4 | |
| 21 – 30 | 146 | 18.0 | |
| Above 30 | 84 | 10.3 | |
| Min.= 1; Max.= 50 | | | |
| **Land Ownership for Farming** | | | |
| Yes | 671 | 82.6 | |
| No | 141 | 17.4 | |
| **Major Crop grown** | | | |
| Cassava | 275 | 33.9 | |
| Cowpea | 49 | 6.0 | |
| Maize | 219 | 27.0 | |
| Millet | 37 | 4.6 | |
| Rice | 145 | 17.9 | |
| Potatoes | 10 | 1.2 | |
| Yam | 31 | 5.5 | |
| Vegetables | 14 | 1.7 | |
| Other crops | 32 | 3.9 | |

**Mobile Phone Ownership**

| | | |
|---|---|---|
| Yes | 791 | 97.4 |
| No | 21 | 2.6 |

**Internet-enabled phone**

| | | |
|---|---|---|
| Yes | 588 | 72.4 |
| No | 224 | 27.6 |

**Bank Account / Wallet Ownership**

| | | |
|---|---|---|
| Yes | 765 | 94.2 |
| No | 47 | 5.8 |

*Source: Field Survey, 2024*

**Binary Logit Regression Results for Socioeconomic Characteristics Influencing DFS Adoption**

Tabel 5 presents the results of the analysis on the influence of selected socioeconomic characteristics on DFS Adoption ($H_{01}$: There is no significant relationship between selected socioeconomic characteristics of the smallholder farmers and their adoption of DFS). The binary logistic regression model was statistically significant (LR chi² (11) = 148.59, p < 0.0001), indicating that the model as a whole fit significantly better than a model without predictors. The Pseudo R² of 0.1386 suggests that approximately 13.9% of the variation in DFS adoption among the farmers is explained by the selected socioeconomic variables included in the model.

The coefficient for age is negative and statistically significant at the 1% level ($\beta$ = -0.025; p = 0.009), indicating that as age increases, the probability of adopting DFS decreases. This suggests that older farmers may be less inclined to adopt new digital technologies, possibly due to technological apathy, risk aversion, or lower digital literacy. This finding is consistent with previous studies that report younger farmers are more adaptable to innovations, especially technology-based services (Akinyemi, 2020).

The sex of the respondent was not statistically significant ($\beta$ = -0.260; p = 0.180), suggesting that gender does not independently influence DFS adoption in the study area. This may reflect increased digital inclusion or that both male and female farmers face similar enabling or inhibiting conditions in DFS usage.

Marital status ($\beta$ = -0.530, p = 0.013) showed a significant negative relationship at the 5% level. Married farmers were less likely to adopt DFS compared to unmarried farmers. Household Size ($\beta$ = -0.104, p = 0.000) was negatively and significantly associated with DFS adoption at the 1% level. Larger household size decreases the likelihood of adopting DFS.

Education was found to be positively and significantly associated with DFS adoption ($\beta$ = 0.042; p = 0.029), implying that more educated farmers are more likely to adopt DFS. This reinforces the role of education in increasing financial literacy and digital competencies, which are essential for navigating DFS platforms. This corroborates the study of Peprah *et al* (2020) and Abdul-Rahaman & Abdulai (2021) that the probability of adoption of DFS increases with higher levels of education. This is not surprising because educated farmers are more likely to be financially informed compared with the non-educated and being educated has a higher probability of exposing an individual to knowledge, availability, and usage of financial products and services (Sekabira & Qaim, 2016)

(Land ownership (($\beta$ = -1.168; p = 0.000) was significantly negative at the 1% level. Those who owned land were less likely to adopt DFS than non-owners, possibly reflecting the self-sufficiency or reduced need for formal financial services among landowners.

Neither farm size nor farming experience had statistically significant effects on DFS adoption. While one might expect larger farm holdings or extensive experience to influence financial behavior, their lack of significance could be due to uniform access to DFS platforms regardless of scale, or possibly the effect of other overriding constraints such as institutional or infrastructural factors.

The coefficient for income was negative and statistically significant ($\beta$ = -0.00000250; p = 0.000), indicating that higher income is associated with a lower likelihood of DFS adoption. This result may reflect a preference among higher-income farmers for traditional banking services or a greater targeting of lower-income farmers by mobile

money agents and DFS providers. This corroborates the finding of Akinpelu (2023) that some DFS providers, such as target low-income earners.

The result further reveals that both mobile phone ownership ($\beta = 0.258$; $p = 0.629$) and access to the internet ($\beta = -0.381$; $p = 0.104$) were not statistically significant. This implies that the mere availability of enabling infrastructure does not guarantee adoption. It may be that access is not the limiting factor, but rather issues of trust, usability, literacy, or perceived relevance.

**Tabel 5: Binary Logit Regression Results for Socioeconomic Characteristics Influencing DFS Adoption**

| Variables | Coef. (β) | Std. Error | t-value | P>|t| | Decision Ho |
|---|---|---|---|---|---|
| Age | -.0253422 | .0096613 | -2.62 | 0.009* | Reject Null |
| Sex | -.2600029 | .1940256 | -1.34 | 0.180 | Accept Null |
| Marital Status | -.5299942 | .2130878 | -2.49 | 0.013** | Reject Null |
| Household Size | -.1043857 | .0277105 | -3.77 | 0.000* | Reject Null |
| Education | .0415634 | .0190644 | 2.18 | 0.029** | Reject Null |
| Land Ownership | -1.168311 | .2154151 | -5.42 | 0.000* | Reject Null |
| Farm Size | -.047306 | .0533726 | -0.89 | 0.375 | Accept Null |
| Farming Experience | .007651 | .0104613 | 0.73 | 0.465 | Accept Null |
| Income | -2.50e-06 | 5.63e-07 | -4.44 | 0.000* | Reject Null |
| Mobile phone Ownership | -.2577983 | .5329924 | -0.48 | 0.629 | Accept Null |
| Internet Access on Device | -.3812451 | .2346512 | -1.62 | 0.104 | Accept Null |
| (Constant) | 3.644099 | .7936508 | 4.59 | 0.000 | |

Model Summary
Number of observations = 812
LR chi2(11)      =      148.59
Prob > chi2      =      0.0000
Pseudo R2       =      0.1386
Log  likelihood  =  -461.6006
Significant *at p≤0.01\*, p≤0.05\*\*, p < 0.10\*\*\**
Source: Field Survey, 2024

**CONCLUSION**

Smallholder farmers in North Central Nigeria have access to mobile technology and banking infrastructure, the adoption of DFS is significantly influenced by their socio-economic characteristics, particularly education, age, and household dynamics. Higher education enhances DFS uptake, while older age and larger household size reduce adoption likelihood. Access alone does not guarantee usage, underscoring the need for interventions beyond infrastructure. To promote DFS adoption among smallholder farmers, stakeholders should prioritize digital literacy training, especially for older and less educated farmers. Tailored awareness campaigns, simplification of digital platforms, and targeted incentives for underserved groups (e.g., landowners and married individuals) are also recommended. Collaborative efforts among government, financial institutions, and agri-tech firms are needed to build inclusive, farmer-friendly digital ecosystems.

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**CONFLICT OF INTEREST**

**FUNDING**