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# ASSESSMENT OF ADOPTION OF ELECTRONIC PAYMENT SYSTEMS AMONG SMALLHOLDER FARMERS IN KOGI STATE, NIGERIA

**Achem, O.L, Ejembi, E. P. and Umar, H.S.**

**Department Of Agricultural Economics and Extension, Faculty Of Agriculture, Nasarawa State University, Keffi.**
achemleonard@gmail.com **+2347035954349**

***Abstract***
*This study assessed adoption of electronic payment systems (EPS) among smallholder farmers in Kogi State, Nigeria. A multi-stage sampling technique was used to select 165 respondents from four agricultural zones. Primary data were collected using structured questionnaire and analyzed using descriptive statistics (frequency, percentage, mean) and inferential statistics (Logit regression model).*
*The results revealed a high level of awareness and adoption of EPS, with 81.8% of respondents familiar with Automated Teller Machines (ATMs), 80.4% with Point of Sale (POS) systems, and 56.8% with mobile banking. The adoption of EPS was significantly influenced by marital status ($\beta = 2.454$, $p < 0.05$), household size ($\beta = 2.002$, $p < 0.05$), and estimated annual income ($\beta = 2.199$, $p < 0.05$). The major agricultural inputs and services paid for via EPS were agro-chemicals (68.9%), animal feeds (58.1%), improved seeds (53.4%), and farm labor (45.3%). However, the study identified frequent power interruption (x= 2.35), network failure (x= 2.05), and high rate of illiteracy (x= 2.03) as major constraints to the adoption of EPS. The study's findings have implications for policymakers, financial institutions, and stakeholders seeking to promote technological adoption in the agricultural sector. It also recommends infrastructure development, partnerships, incentives, and training to promote adoption and effective use of EPS among smallholder farmers.*
***Keywards:*** *Assessment, adoption, Electronic, payment, System.*

## 1.0 Introduction

Electronic payment systems have revolutionized the way financial transactions are conducted, offering numerous benefits, including increased efficiency, reduced transaction costs, and improved financial inclusion. In Nigeria, smallholder farmers face challenges in accessing formal financial services, hindering their productivity and competitiveness.

Electronic payment system otherwise called e-payment is a payment system consisting of electronic mechanisms, which make the exchange of payments possible. It can simply be defined as payment or monetary transactions made over the internet or a network of computers (Uduji *et al.,* 2018). In other words, it involves the provision of payment for services and transfers through devices such as telephones, computers, internet, Automated Teller Machine (ATM) and smartcards. It is a paperless system of payments that offers an alternative to the traditional system of payment, which involves the use of cash and cheques. E-payment system has the advantage of facilitating transactions more conveniently and is available round the clock independent of the customer's location.

Electronic payment system can be broadly classified into two groups namely, wholesale and retail payment systems. Wholesale payment system exists for non-consumers among and between banks, governments and other financial service firms. Examples include transactions handled by the Society for Worldwide Interbank Financial Telecommunications (SWIFT) and Nigerian Interbank Settlement Systems (NIBSS). Retail payment systems include those low volume transactions involving consumers through the use of such payment mechanisms like Smartcards, ATMs, electronic money transfer and e-banking. This is also applicable to wholesale payments (Margret, 2005).
Electronic payment system is an operational network governed by laws, rules and standards that links bank accounts and provides the functionality of monetary exchange using bank deposits (Okifo and Igbunu, 2015). The payment system is the infrastructure consisting of institutions, instruments, rules, procedures, standards and technical means established to affect the transfer of monetary value between parties discharging mutual obligations. What makes it a “system” is that it employs cash substitutes with the use of

electronic money and other ICT related equipment in its operations. Traditional payment systems are negotiable instruments such as draft cheque and documentary credits such as letter of credits. With the advent of computers and electronic communications a large number of alternative electronic payment systems have emerged. These include debit cards, credit cards, electronic funds transfers, direct credits, direct debits, internet banking and e-commerce payment systems. Some payments include credit mechanisms, but that is essentially a different aspect of payment. Payment systems are used in lieu of tendering cash in domestic and international transactions and consist of a major service provided by banks and other financial institutions (Uduji *et al.,* 2018).

According to Ehiriudu *et al.* (2016), e-payment system is an automated process of exchanging monetary values, among parties in a business transaction and transmitting this value over the information and communication technology network. However, technological advancement keeps broadening the frontier of possibilities in all human endeavours and thus more e-banking services are being developed and introduced. As at today, all the deposit money banks in Nigeria offer e-banking services. Technological breakthroughs and product designs have led to the emergence of e-banking services which in recent time have become globally popular except in developing countries including Nigeria (Nwankwo and Eze, 2013).

Small holder farmers are small-scale farmers, pastoralists, forest keepers, fishers etc; who manage areas varying from less than one (1) hectare to ten (10) hectares. Smallholders are characterized by family focused motives such as favour the stability of the farm household system, using mainly family labour for production and using part of the produce for family

consumption (FAO, 2013).

Wikipedia estimated 500 million smallholder farms in developing countries of the world, supporting almost two billion people. Smallholder farmers are usually valued for providing supplemental sustenance, recreation and general rural lifestyle appreciation.

Smallholder farmers in Kogi State are individuals who cultivate small plots of land, typically less than 2hectares, and rely heavily on farm labour. These farmers are crucial to the state's food security and economic architecture, producing a variety of crops such as cassava, yam, maize, rice. Despite their importance, smallholder farmers in Kogi State face numerous challenges, including limited access to modern farming technologies, inadequate infrastructure, and insufficient support services.

The nexus between electronic payment systems (EPS) and smallholder farmers explores the digital financial services and agricultural practices evident among small-scale farmers. The adoption of EPS by smallholder farmers has several benefits such as: -

1. Increased efficiency: EPS reduces transaction costs and time, enabling farmers to make timely payments for inputs, labor, and services.
2. Improved access to finance: EPS can provide smallholder farmers with access to formal financial services, enabling them to access credit, savings, and other financial products.
3. Enhanced market access: EPS can facilitate transactions between farmers and buyers, reducing the need for physical cash and enabling farmers to access wider markets.
4. Reduced risk: EPS can reduce the risk of theft, loss, or damage associated with cash transactions.
5. Increased transparency: EPS provides a digital record of transactions, enhancing

transparency and accountability in agricultural transactions.

6. Increased income: EPS can help farmers receive payments directly and efficiently, reducing transaction costs and increasing income.

7. Improved productivity: By facilitating access to inputs, services, and finance, EPS can contribute to improved agricultural productivity.

8. Enhanced financial inclusion: EPS can provide smallholder farmers with access to formal financial services, enabling them to manage risks, invest in their farms, and improve their livelihoods. (FAO, 2019; CGAP, 2019; Uduji, Okolo-Obasi et all (2019).

**2.0 Objectives of the Study**

This study attempts to investigate adoption of EPS by smallholder farmers in Kogi State, Nigeria; and their potential to transform the way they conduct financial transactions, and manage their farms.

The broad objective of the study was to assess adoption of electronic payment systems among smallholder farmers in Kogi State, Nigeria. The specific objectives were to:

i. describe the socio-economic characteristics of smallholder farmers in the study area;
ii. ascertain the level of adoption of electronic payment systems among respondents in the study area; and
iii. identify the major constraints to adoption of electronic payment systems in the study area.

**3.0 Methodology**

The study used a survey design, collecting data from smallholder farmers in Kogi State. The population of the study comprised of all registered smallholder farmers in the selected

agricultural zones of Kogi State (Zone A, B, C and D). A multi-stage sampling technique was used to select respondents from the population.

The first stage employed a purposive selection of one (1) Local Government Area (LGA) in each Agricultural zone based on high farming activities in the LGAs. Four (4) LGAs were selected (Kabba Bunu in Zone A, Dekina in Zone B, Koton Karfe in Zone C, and Idah in Zone D).

In the second stage, two villages/towns were purposively sampled from each of the four LGAs. This was based on their level of agricultural production. A total of eight (8) villages were selected (Bunu village and Kabba town from Kabba Bunu LGA, Anyigba town and Egume village from Dekina LGA, Koton Karfe town and Kpareke village from Koton Karfe LGA, Idah town and Ofu village from Idah LGA).

In stage three, a random selection of 60% out of the list of 274 registered smallholder farmers gotten from the office of Kogi State Agricultural Development Programme (KADP) was carried out. This gave a total of about 164 respondents that were used for the study.

Descriptive statistics and logit regression analysis was used to analyze the data.

**Method of Data Collection**

Primary data were used in this study. The primary data were obtained by the use of structured questionnaire which were administered to smallholder farmers in the study area. The primary data were collected on socio-economic characteristics of respondents in the study area; verified electronic payment systems among respondents in the study area; effectiveness in the use of electronic payment systems among respondents; major agricultural inputs, and services paid for via electronic payment systems; level of adoption

of and electronic payment systems among respondents in the study area; selected socio-economic factors influencing the electronic payment systems among respondents in the study area; and the major constraints of electronic payment systems among respondents in the study area.

**Method of Data Analysis**

Analysis of data means categorizing, ordering, manipulating and summarizing of data that answers the research questions. The data obtained were analysed using both descriptive and inferential statistics. Descriptive statistics such as percentage, frequency, mean and ranking order were used to analyse objectives i, ii, iii, iv, v and vii; while Inferential statistics such as Logit regression model was used to analyse objective vi.

**Model Specification**

**The Logit regression model to be used is expressed as:**

The Logistic model = Ln (Pi/ (1-Pj)) = Zi = o+ iXi +e ……. (1) The model is a cumulative logistic probability function. The significance of each factor is influenced by the coefficient of probabilities within a (1, 0) range interval to the problem of predicting odds of events occurring within the range of a real line. The estimated model was specified as follows.

$Li = In (P/(1-P)) = o + 1X_1 + ..+ 10X_{10} + e$…….. (2)

Where;

Li + Logit

Z will be binary (1 or 0). 1 denoted adoption of electronic payment system and 0 for otherwise.

$X_1$ to $X_{10}$ are the socio-economic characteristics of respondents of adoption of electronic payment system among small-scale farmers.

$X_1$ = Education Level (years of formal schooling)

$X_2$ = Annual farm Income (in N)

$X_3$ = Age (in years)

$X_4$ = Marital status

$X_5$ = Farming Experience (in years)

$X_6$ = Membership of social group (yes =1, no =0)

$X_7$ = Access to extension agents (yes =1, no =0)

$X_8$ = Assessed perceived benefits of e-payment systems (yes =1, no =0)

$X_9$ = individual perceptions of the advantages of e-payment solutions

(yes =1, no =0)

$X_{10}$ = Ease of use of e-payment systems (yes =1, no =0)

$b_1 - b_{12}$ = Regression coefficients

## 4.0 Results and Discussion

### 4.1 Socio-economic characteristics of respondents

Sex, a socio-economic variable in the Tables below shows that a higher proportion of the respondents (54.7%) were male, while 45.3% were female. This gender distribution from the findings suggests that male farmers were more involved in utilizing electronic payment systems than their female counterparts. This may stem from the socio-cultural norm where men are typically recognized as household heads and primary income earners. As such, they may have more decision-making authority over financial matters, which include accessing and adopting new payment technologies. Additionally, men may have better exposure to financial tools and greater control over resources, thus increasing their likelihood of using digital platforms for transactions. This finding is consistent with

Gyata (2019) who conducted a study titled “comparative assessment of adoption determinants of electronic wallet system by rice farmers” in Benue and Taraba States, Nigeria and reported that majority (i.e. 73%) of the respondents were male, while 27% were female in Benue State.

The age distribution as shown in the table (a) revealed that 50% of respondents were 40 years and above, followed by 31.1% aged between 31–40 years, 17.6% between 21–30 years, and only 1.4% under 20 years. The average age of respondents in the study area was calculated at 43.9 years. This reflects a farming population that is predominantly in its middle age, a group often considered active, experienced, and capable of adapting to innovation. Middle-aged farmers are likely to possess the energy and resilience required for farming, while also being open to embracing technologies like electronic payment systems especially as digital tools become increasingly integrated into agricultural value chains. Their relative digital literacy and willingness to improve their productivity could facilitate quicker adoption. This finding is in line with Gyata (2019), who conducted a study titled “comparative assessment of adoption determinants of electronic wallet system by rice farmers” in Benue and Taraba States, Nigeria; and reported that majority (i.e. 73%) of the respondents were male, while 27% were female in Benue State. This revealed that the pool mean age was 44.12 years.

The marital status of a significant proportion of the respondents (58.8%), as seen in the table were married, while 32.4% were single, 7.4% widowed, and 1.4% divorced. Married farmers often have broader financial responsibilities, such as covering household expenses, children's education, and healthcare. To meet these needs efficiently, married individuals may be more inclined to use electronic payment systems, which offer quick,

traceable, and secure means of conducting financial transactions. Additionally, the need to efficiently manage inflows and outflows of funds especially for multi-purpose spending can encourage the adoption of digital financial services.

The household size distribution as seen in the table showed that 47.3% of farmers had between 1–5 household members, 40.5% had 6–10, and 12.2% had 11–15 members, with the average household size being 6. This indicates relatively large household sizes, a common feature in rural Nigerian communities. Larger households often have more financial responsibilities and a broader range of needs. Electronic payment systems can assist in effectively managing these needs through organized record-keeping, easier fund transfers, and access to digital financial products. They also offer a practical means to distribute resources, receive remittances, or pay for services such as education, health, and farm inputs.

The table also revealed the educational level of majority of the respondents (57.4%) had attained tertiary education, while 12.8% had secondary education, 5.4% primary, and 24.3% had no formal education. This relatively high level of education among smallholder farmers is a positive indicator for technology adoption. Education enhances awareness, comprehension, and confidence in using digital tools. Farmers with formal education are more likely to explore new methods of conducting financial transactions and may better understand the benefits of electronic payment systems. They can also navigate mobile banking apps and digital platforms more easily, thereby reducing resistance to change. This agrees with research carried out by Oladejo and Yinus (2015); analysing data from Nigerian deposit banks and revealed a strong correlation between educational level, and e-payment adoption.

In terms of farm experience as captured in the table, 39.9% of farmers had been farming for over 20 years, 32.4% for 1–10 years, and 27.7% for 11–20 years. The average farming experience was 19.3 years. While seasoned farmers may initially exhibit skepticism towards unfamiliar technologies, their extensive experience often brings financial acumen and a willingness to embrace tools that promise efficiency. Once convinced of their reliability, experienced farmers may integrate electronic payment systems into their operations to streamline payment for inputs, labour, and produce sales. However, training and sensitization may be required to overcome initial hesitations.

The result on access to loan from the table revealed that 59.5% of farmers lacked access to loans, while only 40.5% had accessed credit through various informal and formal sources such as friends, cooperatives, produce buyers, and banks. Access to loans is a critical enabler for technological adoption. Farmers who can secure financing are better positioned to invest in smartphones, internet data, or point-of-sale (POS) devices necessary for digital payments. On the contrary, lack of access to financial support may inhibit farmers from participating in the digital economy, thereby limiting their financial inclusion and ability to invest in scalable farming practices. The result agrees with Gyata (2019) who reported that the pooled result shows that 69.77% of the respondents did not have access to credit while only 30.23% had access to credit.

Only 16.2% of respondents were members of cooperative societies, while the majority (83.8%) were not. Cooperative societies serve as essential platforms for collective resource pooling, information sharing, and access to financial services. Members often benefit from group financing, shared infrastructure, and training opportunities. Farmers outside of these networks may lack awareness or access to digital financial tools. Limited

cooperative membership may thus translate into slower adoption of electronic payment systems, since collective influence and institutional backing are important motivators in technology adoption, especially in rural areas.

A majority (73%) of respondents had contact with extension workers, with most receiving 1–3 visits during the last cropping season. The average number of visits was two. Regular interaction with extension agents plays a critical role in introducing and promoting agricultural innovations. These agents can provide hands-on guidance on using digital payment platforms, help resolve concerns about security and usability, and generally build farmers' confidence in new technologies. Where such contact is consistent and informative, the adoption rate of electronic payment system is likely to be higher.

The table revealed that the average farm size was 2.8 hectares, with most farmers operating on 1–3 hectares, indicating their classification as small-scale farmers. Land was primarily acquired through inheritance (46.6%), with others using rented, leased, or shared cropping arrangements. Small farm sizes often limit farmers' capital and profit margins, making them cautious in adopting costly innovations. While upfront costs for digital tools may be a barrier, smallholders can benefit significantly from electronic payments by gaining access to broader markets, avoiding cash-handling risks, and utilizing financial services like microloans and savings schemes.

The income distribution showed that 39.2% of farmers earned over ₦1.5 million annually, while 15.5% earned less than ₦500,000. The average annual income was ₦5,860,810.81, indicating a relatively high-income potential among respondents. Higher income levels are associated with greater financial flexibility, which can enable investment in digital tools and faster adoption of electronic payment systems. Wealthier farmers may also be

more integrated into formal value chains and digital marketplaces, making them more likely to receive and send payments electronically. The finding is not consistent with Gyata (2019) who reported the mean income of Benue farmers was N121, 264.00.

The results show that the adoption rate of electronic payment systems among smallholder farmers is influenced by socio-economic factors such as age, educational level, and extension contacts. The study also highlights the potential benefits of electronic payment systems, including increased efficiency and reduced transaction costs.

The Table below shows the distributions according to the socio-economic characteristics of the respondents.

**Table 1 Showing Socio-economic Characteristics of Respondents in the Study Area (n=165)**

| Socio-economic variables | Frequency | Percentage (%) | Mean |
|---|---|---|---|
| **Sex** | | | |
| Male | 81 | 54.7 | |
| Female | 67 | 45.3 | |
| **Age (years)** | | | |
| Less than 21 | 2 | 1.4 | 43.9 years |
| 21-30 | 26 | 17.6 | |
| 31-40 | 46 | 31.1 | |
| Above 40 | 74 | 50.0 | |
| **Marital status** | | | |
| Single | 48 | 32.4 | |
| Married | 87 | 58.8 | |
| Divorced | 2 | 1.4 | |
| Widowed | 11 | 7.4 | |
| **Household size (number of persons)** | | | |
| 1-5 | 70 | 47.3 | 6 persons |
| 6-10 | 60 | 40.5 | |
| 11-15 | 18 | 12.2 | |
| **Level of education** | | | |
| Non formal education | 36 | 24.3 | |
| Primary education | 8 | 5.4 | |
| Secondary education | 19 | 12.8 | |
| Tertiary education | 85 | 57.4 | |
| **Farming experience (years)** | | | |
| 1-10 | 48 | 32.4 | 19.3 years |
| 11-20 | 41 | 27.7 | |
| Above 20 | 59 | 39.9 | |
| **Access to loan** | | | |
| Yes | 60 | 40.5 | |
| No | 88 | 59.5 | |
| **Source of loan** | | | |
| No access to loan | 88 | 59.5 | |
| Neighbours | 2 | 1.4 | |
| Friends | 25 | 16.9 | |
| Cooperative society | 13 | 8.8 | |
| Bank | 8 | 5.4 | |
| Produce buyer | 12 | 8.1 | |
| **Amount of loan accessed (₦)** | | | |
| No access to loan | 88 | 59.5 | ₦ 273, 310.81 |
| 1,000-200,000 | 2 | 9.5 | |
| 201, 000-400,000 | 14 | 1.3 | |
| Above 400,000 | 44 | 29.7 | |
| **Cooperative membership** | | | |
| Yes | 23 | 16.2 | |
| No | 124 | 83.8 | |
| **Years of cooperative membership (years)** | | | 1 year |
| Non-members | 124 | 83.8 | |
| 1-5 | 10 | 6.7 | |
| 6-10 | 10 | 6.7 | |
| Above 10 | 4 | 2.8 | |
| **Extension contact** | | | |
| Yes | 108 | 73.0 | |
| No | 40 | 27.0 | |
| **Number of extension contacts (number of visits)** | | | |
| Had no access | | | |
| 1-3 | 40 | 27.0 | 2 visits |
| 4-6 | 92 | 62.2 | |
| | 16 | 10.8 | |

| | | | |
|---|---|---|---|
| **Access to land** | | | |
| Yes | 148 | 100.0 | |
| No | 0 | 0.0 | |
| **Methods of land acquisition** | | | |
| Inheritance | 69 | 46.6 | |
| Lease | 19 | 12.8 | |
| Purchased | 2 | 1.4 | |
| Shared cropping | 12 | 8.1 | |
| Rented | 43 | 29.1 | |
| Farm freely on family land | 3 | 2.0 | |
| **Farm size (hectares)** | | | 2.8 hectares |
| 1-3 | 107 | 72.3 | |
| 4-6 | 29 | 19.6 | |
| Above 6 | 12 | 8.1 | |
| **Estimated annual income (₦)** | | | ₦ 5,860,810.81 |
| 1,000-500,000 | 23 | 15.5 | |
| 501,000-1,000,000 | 39 | 26.4 | |
| 1,001,000-1,500,000 | 28 | 18.9 | |
| Above 1,500,000 | 58 | 39.2 | |
| **Total** | **148** | **100.0** | |

## 4.2 Electronic Payment Systems: Level of adoption

The result from the table (B), showing the level of adoption of electronic payment systems among respondents shows that there was high adoption rate of electronic payment systems, with ATM (91.9%), POS (86.5%), mobile banking (79.7%), internet banking (45.9%) and the least Unstructured Supplementary Data service

**Table 2: Level of Adoption of Electronic Payment Systems among Respondents**

| Electronic Payment Systems | | Percentage (%) |
|---|---|---|
| Automated Teller Machine | 2 | 91.9* |
| Point of Sale | | 86.5* |
| Mobile banking | | 79.7* |
| Internet banking | | 45.9 |
| Unstructured Supplementary Service Data | | 36.5 |

Decision rule: Any score of at least 50% and above will be considered as having high level of adoption. Any score that is less than 50% will be considered as having low level of adoption.

***** = High level of adoption

## 4.3 Constraints to Adoption of EPS

The result shown in Table highlights the key challenges facing small holder farmers. Some of these challenges include frequent power interruptions ($x$=2.35), network failures ($x=2.05$), high illiteracy etc

See below distribution showing constraint to adoption of Electronic Payment Systems.

**Table 3: Constraint to Adoption of Electronic Payment Systems among Respondents (n=165)**

| Variables | Mean (*x*) |
|---|---|
| Frequent power interruption | 2.35* |
| Network failure | 2.05* |
| High rate of illiteracy | 2.03* |
| Insufficient infrastructure | 1.67 |
| Fraud | 1.58 |
| Refusal to accept payment | 1.43 |
| Regulatory framework | 1.31 |
| Difficulty in payment between different platforms | 1.31 |

Decision rule: A mean of ≥ 2.0 = serious constraint, while any mean of < 2.0 will = not a serious constraint.* Serious constraint

## 5.0 Conclusion and Recommendations

### 5.1 Conclusion

The study concludes that policymakers and stakeholders should prioritize awareness creation and capacity building to enhance the adoption of electronic payment systems among smallholder farmers. This can improve their productivity, competitiveness, and overall well-being.

### 5.2 Recommendations

Based on the findings, the study recommends that:

1. Policymakers should develop targeted interventions to promote the adoption of electronic payment systems among smallholder farmers.
2. Stakeholders should provide training and capacity-building programs to enhance the skills of smallholder farmers in using electronic payment systems.
3. Financial institutions should develop user-friendly and accessible electronic payment systems tailored to the needs of smallholder farmers.

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