



**Analysis of Socio-Economic Determinants of Adoption of Information and
Communication Technologies (ICT) Among Farmers in Ushongo Local Government
Area of Benue State Nigeria**

Akor, Akaayar Apollos¹ and Tarnongo, Tom Jacob²

¹Department of Cooperative Economics and Management. Federal Polytechnic Wannune, Benue State, Phone
Number: 08035934677 G-mail: apollos4u@gmail.com

²Department of Accountancy, Federal Polytechnic Wannune, Benue State, tarnongojacob@gmail.com

Abstract

This study was undertaken to analyze the socio-economic determinants of adoption of information and Communication Technologies (ICTs) among farmers in Ushongo Local Government area of Benue State Nigeria. Purposive and random sampling techniques were adopted to select a sample size of 113 respondents across the six selected town for the study. Data were collected using a well-structured questionnaire. Data analysis went through descriptive and inferential statistics, hypothesis one was tested using logit regression model while hypothesis two was tested using kruskal-wallis analysis. Result shown that mobile phones (89.383) were the most available ICT in the study respondents apply ICT in the area of adoption of improved agricultural practices ($X = 4.47$) major challenge faced by the respondents was erratic and unstable power supply ($X = -4.47$) the level education (X_5), ($w = 1.302$) and household size (X_4) (w) 4.124 significantly affected respondents' level of access to ICTs. The finding also revealed that the selected towns were similar in their access to ICTs. Furthermore, coefficient of determinant (R^2) was 0.416 at 10% level of probability indicates that socio-economic characteristics of the respondents tested significantly affected their level of access to ICT. Based on the findings, the study recommends that agricultural information should be conveyed to the farmers through their mobile phones for effective communication of new technologies. Extension agents and ICT experts should pay more attention to teaching the farmers in the study area to use other ICT besides mobile phones and preference should not be given to any town

Keyword: Development, Economics, Assessment, Impact and ICT

Introduction

Agricultural development is a multi-dimensional process involving the reorganization and reorientation of the entire agricultural system to accelerate economic growth, reduce inequality, and alleviate absolute poverty (Onyeaghalachiya, Chukwunonso, & Laetia, 2024). Development represents a movement from unsatisfactory conditions to materially and spiritually improved circumstances, requiring coordinated utilization of available resources within a political unit (Nelson, 2002).

Information and communication have always been fundamental to agriculture, which serves as the engine for economic growth and improved livelihoods in Africa (Maiga, 2024). The majority of Sub-Saharan Africa's population resides in rural areas and depends directly or indirectly on agriculture (Diao, Hazell, Resnick & Thurlow, 2007), yet approximately 26% of Africa's population remains malnourished (World Bank, 2008). Agricultural development in rural areas faces numerous constraints including inadequate market access, unfair market conditions, limited access to advanced technologies, weak infrastructure, high production and transport costs, conflicts, HIV/AIDS, natural disasters, deforestation, environmental degradation, biodiversity loss, and dependency on foreign aid (Njoku, 1998; Anonguku, 2014).

Farmers have historically sought information from one another, and providing access to accessible, affordable, relevant, and reliable information sources is the ultimate aim of agricultural information services (Bheenick & Brizmohun, 1999). Information and Communication Technology (ICT) serves as a powerful tool for farmers to access and organize knowledge, facilitating technology implementation and transforming learning and interaction patterns among producers. Modern agricultural development requires alternative information sources beyond face-to-face, donor-promoted services. According to Alenoghena, Ohize, Adejo, Onumanyi, Ohihoin, Balarabe, & Alenoghena (2023), substantial opportunities exist for information dissemination through mobile telecommunication systems. As agricultural development challenges grow, ICT continues advancing, offering correspondingly improved tools for combating underdevelopment in the sector. While positive impacts are evident, questions remain regarding replicability, scalability, and sustainability for larger and more diverse populations, hence this research on the economic assessment of ICTs on agricultural development in Ushongo LGA. Agricultural development is as complex as human nature, and ICT is not an end in itself. The excitement surrounding ICT diffusion in developing countries has often obscured the fact that their contributions to agricultural development are rapidly evolving yet poorly understood. Limited access to worldwide databases on CD-ROMs or DVDs persists, partly due to foreign exchange constraints (Gautam, 2024). While previous agricultural development policy targets focused on self-sufficiency, equity, stability, and conservation (Amogu, 2012), systematic generation, classification, and manipulation of data to solve agricultural development problems have not received due consideration. Despite phenomenal growth in phone line availability, extension services in Nigeria have not taken commensurate advantage of this opportunity, possibly due to poorly developed legal, institutional, and regulatory frameworks. Furthermore, limited access to computers and internet connectivity among farmers in Ushongo LGA makes even basic networking for information exchange nearly impossible.

Basic education and ICT knowledge among rural farmers in the study area remain severely limited amid high rural poverty and illiteracy. ICT infrastructural development barely addresses rural farmers' needs and is hardly compatible with their circumstances. Participatory needs assessment regarding farmers' ICT requirements and appropriate information content is often poorly established. Thus, while everyday ICTs such as cellphones are more widely diffused, underdevelopment in the agricultural sector (including Ushongo LGA) continues unabated. The main objective of this study is to assess the economic impact of ICTs on farmers in Ushongo LGA of Benue State, Nigeria. Specific objectives are to: (1) describe the socio-economic characteristics of farmers; (2) determine the range of ICT available for use; (3) evaluate the effect of ICT use on agricultural output; and (4) determine problems militating against ICT use. Two hypotheses were tested: H_{01} (socio-economic characteristics do not significantly affect farmers' access to ICTs) and H_{02} (no significant difference exists among rural farmers across selected towns regarding ICT accessibility).

Methodology

The study was conducted in Ushongo Local Government Area of Benue State, covering 412,940 km² and sharing boundaries with Gboko, Buruku, Vandeikya, Kwande, Konshisha, and Katsina-Ala LGAs. It lies between longitudes 8°–9° East and latitudes 6°–7° North (Wikipedia, 2014), with a population of 123,951 people (National Population Commission, 2006) across ten council wards. The population is predominantly farmers. Purposive and random sampling techniques were employed. Six towns—Ushongo, Lessel, Kyobo, Igboor, Lobi, and Ghatse—were purposively selected based on relatively high involvement in arable/non-arable crops (cassava, yam, potatoes, oranges). Using BNARDA's registered farmers' list as the sampling frame, 20% proportional allocation yielded 113 respondents selected through simple random sampling. Data were collected via structured questionnaire and personal observation. Descriptive statistics, Logit regression, and Kruskal-Wallis (1) test were used for hypothesis testing.

Model Specification

Legit Model for Hypotheses 1

The formula for the logit regression model that was used for testing hypotheses I is stated below:

$$Z = \ln Y = b_0 + b_1x_1 + b_2x_2$$

Where

Z- probability of level of access to ICTs (1-high access, 0=low access)

bs-coefficient of explanatory changes in z caused by changes in the independent variables.

$X_1 = \text{Age}$

$x_2 = \text{Sex}$

$x_3 = \text{Marital status}$

$x_4 = \text{Heasehold size}$

$x_5 = \text{Education}$

$x_6 = \text{Farming experience}$

Kruskal-Wallis test for Hypotheses 2

$$H = \frac{12}{W(N+1)} \times \sum \frac{R_i^2}{n_i} + \frac{R_2^2}{n_2} + \frac{R_3^2}{n_3} + \frac{R_4^2}{n_4} + \frac{R_5^2}{n_5} - 3(N+1)$$

Where H = Kruskal-Wallis

N = Total number of observations over all samples

$\sum R_i^2$ = Sum of square of the sum of ranks for samples

N_i = sample size of the sample

Results and Discussion

Socio-economic Characteristics of farmers in Ushongo Local Government Area

Table 1 shows that 113 respondents were selected proportionally across six towns in Ushongo LGA, with Ushongo contributing the largest sample (24 respondents) and Igboor the smallest (14), based on 20% of each town's sampling frame.

Table 1: A Sample Plan

Selected Town	Sample Frame	Sample Size (20%)
Lessel	106	21
Ikyobo	97	19
Igboor	68	14
Gbatse	81	16
Lobi	96	19
Ushongo	120	24
Total	568	113

Source: Field data, 2026

Table 2 Shows distribution of respondents according to their socio-economic characteristics. Respondents within the age bracket of 20-30 years were only 6.19%, majority of the respondents (73.45%) were within the age of 41-50 years, while 11.50% were within the age range of 31-40 years and those above 50years were 8.85%, this shows that 91.14% of the farmers in the area were below age of 50 years. This implies that farmers in the study area are energetic and are still in their active years.

Table 2: frequency distribution of respondents according to socio economic characteristics

Characteristics	Frequency	Percentage (%)
Age (years)		
20–30	7	6.19
31–40	13	11.50

Characteristics	Frequency	Percentage (%)
41–50	83	73.45
Above 50	10	8.85
Gender		
Male	90	79.65
Female	23	20.35
Education Level		
No formal education	5	4.42
Primary education	6	5.81
Secondary education	92	81.42
Tertiary education	10	8.85
Marital Status		
Single	22	19.47
Married	88	77.86
Widowed/Divorced	3	2.65
Farming Experience (years)		
<10	9	7.96
11–20	70	61.95
Above 20	34	30.09

Source: Field data, 2026

The findings also indicate that most of the respondents (77.86%) were married, 19.47% were single while 2.651% were widowed/divorced, wild most of the respondents were married. Analysis clearly wed that 79.65% of the respondents were male while 20.35% were females. This implies that farming in the study area is dominated by males. Data analysis showed that 81.42% of the respondents had secondary education 8.85% had tertiary and 5.31% had primary education while 4.42% had non-formal education. Altogether 95.58% Of the respondents had formal education in the study area This means that farmers in the study area are literate and can read and write. Result further showed that majority of the respondent 61.94% had farming experience of 11-20 years and 30.09% had farming experience of over 20 years while 7.96% had been farming for less than 10 years. This implies that most of the farmers must have acquired experience, relevant skills and other resources for effective farming. This is in line with Atagher, et al (2014) and Inoni (2008) that as the farmer get older and more experience, the more resources he commands to generate more come

Range of information and Communication Technologies Available in the Study Area

Table 3 reveals that GSM phones (89.38%) and internet connectivity (63.72%) were the most widely available ICTs among farmers, while personal computers (10.61%), laptops (15.04%), and photocopiers (12.38%) had low availability, and scanners, fax machines, telephones, and printers were completely unavailable (0.00%).

Table 3: Range of ICTs available in the study area

Available ICTs	Frequency	Percentage (%)
Personal computer	12	10.61
Laptop	17	15.04
Scanner	0	0.00
Fax	0	0.00
Internet connectivity	72	63.72
Photocopier	14	12.38
Telephone	0	0.00
GSM	101	89.38
Colour printer	0	0.00
Monochrome printer	0	0.00

Source: Field Data, 2026

Research findings reveal that mobile phones are most available in the study area, as 89.38% of the respondents indicated that GSM service was available to them. Also available with a relative high percentage is photocopiers (12.38%) and Laptops (15.04%). Agricultural information, if conveyed to the farmers through their mobile phones will therefore be easily accessed the respondents. Awareness of such information precedes adoption, and is therefore very important. Surabhi and Mamta (2012) also found mobile phones to be a veritable tool of communication among farmers in India. Results father indicate that 69.03% representing 72 respondents agreed that the area is internet connectivity while 46.90% had personal computers in the selected towns within the study area

Access of Information and Communication Technologies on Agricultural Development

Results showed that the respondents also applied ICTs a most areas of agricultural production such as improvement in agricultural products value chain (mean= 4.05), provision of information to farmers with a mean value of (mean =4.05) and increase efficiency in agricultural marketing with a mean value of (mean=3.94) respectively. The various aspects of agriculture where respondents applied use of ICTs are presented in Table 4. it was found out that the respondent applied ICTs in most areas of agricultural production, but are applied more in the areas of adoption of improved agricultural practices (Mean =4 19) and providing farmers with access to financial services (Mean= 4.10). ICTs are therefore crucial to agricultural development, as farmers will need to be aware of state-of-the-art methods of production, and adopt these production methods to enhance their production efficiency. This is a role that ICT's play in the study area. This finding is similar to that of Hopestone (2014), who found ICTs to play a prominent role in the adoption of improved agricultural practices and agricultural development in Ethiopia

Problems militating against the use of Information and Communication

Technologies by Farmers

Farmers in the study area are faced with many problems with regards to the use of ICTs, and some of the problems they grapple with are presented in Table 4.

Table 4: Access of Information and Communication Technologies in agricultural development (n -113)

Item	SA F(%)	A F(%)	U F(%)	D F(%)	SD F(%)	Mean ($\bar{X}$)
Improvement in agricultural products value chain(A)	34 (30.1)	56 (49.6)	19 (11.8)	3 (2.7)	1 (0.9)	4.05
Improved access to financial services(B)	28 (24.8)	70 (61.9)	13 (11.5)	2 (1.0)	0 (0.0)	4.10
Adoption of improved agricultural practices(C)	44 (38.9)	50 (44.2)	16 (14.2)	3 (2.7)	0 (0.0)	4.19
Provision of information to farmers(D)	32 (28.3)	60 (53.1)	16 (14.2)	5 (4.4)	0 (0.0)	4.05
Increased efficiency in agricultural marketing(E)	35 (31.0)	50 (44.2)	14 (12.4)	14 (12.4)	0 (0.0)	3.94
Enhancement of farmers' pricing power(F)	36 (31.9)	49 (43.4)	21 (18.6)	5 (4.4)	2 (1.8)	3.99

Source: Field data, 2026

Key: SA – Strongly agree, A – Agree, U-Undecided, SD- Strongly disagree, F- Frequency, %-Percentage and X –Mean

Based on the findings of this research, the major challenges face by the respondents' circle around power supply These include erratic and unstable power supply (Mean =4:47) and high cost of alternate power supply (Mean= 4.42). It. therefore, implies that provision of stable electricity will greatly improve the use of ICTs in the study area, and this will transmit to enhancement of agricultural production and other allied activities This finding in congruent with that of Showole and Bissallah (2014), who also found erratic electricity to be a major constraint to the use of ICTs for agricultural development in Nigeria.

Table 5: Problems Militating Against the Use of ICTs by farmers (N =113)

Problems Militating Against ICT Use	SA	A	U	D	SD	Mean
Low level of ICT compliance by agricultural development organisations(A)	42 (37.2)	54 (47.8)	13 (11.5)	4 (3.5)	0 (0.0)	4.19
Erratic and unstable power supply(B)	61 (54.0)	45 (39.8)	6 (5.3)	1 (0.9)	0 (0.0)	4.47
High cost of alternative power supply(C)	55 (47.3)	52 (46.0)	5 (4.4)	1 (0.9)	0 (0.0)	4.42
Limited access to internet connectivity(D)	27 (23.9)	60 (53.1)	13 (11.5)	12 (10.6)	1 (0.9)	3.89
High level of rural poverty(E)	33 (29.2)	62 (54.8)	8 (7.1)	10 (8.8)	0 (0.0)	4.04
High level of illiteracy among farmers(F)	45 (39.8)	44 (38.9)	9 (8.0)	14 (12.4)	1 (0.9)	4.04
Difficulty finding sites with relevant information(G)	41 (36.3)	46 (40.7)	19 (16.8)	7 (6.2)	0 (0.0)	4.07
Lack of relevant information resources(H)	34 (30.1)	52 (46.0)	22 (19.5)	4 (3.5)	1 (0.9)	4.01

Source: Field data, 2026

Key: SA – Strongly agree, A – Agree, U-Undecided, SD- Strongly disagree, F- Frequency, %-Percentage and X –Mean

Effects of Socio-economic characteristics of farmers access to Information and Communication Technologies

The result of the logistic regression carried out to analyze the effect of the socio-economic characteristics of farmers in Ushongo Local Government of Benue state on their level of access to information and communicate technologies is presented in table 6.

Table 6: result of logit regression of the effect of socio-economic characteristics of farmers on access to information and communication technology

Socio-Economic Characteristics	B	S.E.	Wald	Sig.	Exp(B)
Age	-0.009	0.025	0.130	0.718	0.991
Sex	0.627	0.483	1.687	0.194	1.872
Education	0.658	0.576	1.302	0.254	1.930
Marital Status	0.775	0.515	2.259	0.133	2.170
Household Size	0.125	0.062	4.124	0.042*	0.882
Farming Experience	-0.022	0.025	0.764	0.382	0.978
Constant	0.345	0.892	0.150	0.699	1.413

Significant at 5%**; 2 log likelihood = 135.9998; Nagelkerke R^2 = 0.416; exp.(B) = 1.173; sig = 0.098

Table 7 presents the Kruskal-Wallis test results comparing ICT accessibility across the six selected towns, showing that Lessel had the highest frequency of farmers with high ICT access (16, rank 6.0), followed by Ikyobo (15, rank 5.0), while Igboor and Gbatse had the lowest (5 each, rank 1.5 each); however, the test statistic ($X^2 = 5.00$, $df = 5$, $p = 0.416$) indicates no statistically significant difference in ICT accessibility among the towns at the 5% significance level.

Table 7: Kruskal-Wallis analysis result of comparison of the accessibility of farmers to information and communication technologies across the selected towns of the study area

Selected Town	Frequency Based on High Access to ICT	Rank
Lessel	16	6.0

Selected Town		Frequency Based on High Access to ICT	Rank
Ikyobo	15		5.0
Igboor	5		1.5
Gbatse	5		1.5
Lobi	11		4.0
Ushongo	9		3.0

Source: Field data, 2026, $X^2=5.00$, sig = 0.416; df = 5

Research findings reveal that the level of education of the responders significantly affected their level of access to ICTs ($W=1.302$) at 10% level of education in increases the probability that the respondents will have a high level of access to ICTs by a factor of 1.930($\exp(B)=1.930$) Education exposes individuals, to the use of ICT. Finding is similar to those of Jabir (2013) and sabolaje and Adigun (2013), who found level of education of significantly affect the level of access of farmers to ICTs.

This research further Identified household size of the respondents to significantly affect their level of access to ICTs ($W=4.124$) at 5% level of probability. The relationship between household size of the respondents and their level of access to ICTs is negative, indicating that the probability that the respondents have high level of access to ICTs decrease with increase in their household size by a factor of 0.882 ($\exp(B)=0.882$). farmers with large households to carter for have great responsibilities, and may not be able to save their financial resources to purchase ICTs, or may not have the luxury of time to them as a result of family pressures, Ogutu, Okello and Otieno (2013) also and the household size of farmers to significantly affect their level of access ICT.

The Nagelkerke R^2 for the regression is 0.416, implying that the variables in the equation affected the probability of the level of access of the respondents by 41 6%. The overall regression equation was also found to be at 10% probability, indicating that the socio-economic characteristics of the respondents tested significantly affected their level of access to ICTs. The null hypothesis, which states that the socio-economic characteristics of the respondents do not have significant effect on their level of access in ICTs is therefore rejected.

Comparison of the accessibility of farmers to information and Communication Technologies across the selected towns of the study area

A Kruskal-Wallis test was conducted to compare the accessibility of the respondents to ICTs across the six selected towns of the study areas, and the result is presented ($Sig=0.416$). The towns are similar in their access to ICTs, and should be treated with regard to provision of ICT facilities. The null hypothesis, which state that there is no significant difference among rural farmers in terms of availability of ICT facilities across the selected towns of the study area, is therefore accepted.

Conclusion and Recommendations

The result of this research revealed that the information and communication technology (ICT) most popular among to the respondents is the mobile phone or GSM. the respondents are also more proficient in the use of mobile phones, compared to other available ICTs. It was also found that ICTs have greatly influenced the adoption of improved agricultural practices by the respondents. the major constraints to the use of ICTs by the respondents are erratic power supply and high cost of alternatives sources of power. The socio-economic characteristics of the respondents that significantly affected accesses to ICTs are their level of education and their household size. The six selected towns do not differ significantly in their level of access to information and communication Technologies. Based on the findings, the following recommendations are made:

- i. Agricultural information should be conveyed to farmers through their mobile phones for affected communication of new technologies. This is because it is the most available ICT in the study area
- ii. Efforts should be made by electricity generators and distributors to stabilize electricity supply to the study area, as this can enhances the use of ICTs by the respondent
- iii. Farmers should be more encourage by government, non-governmental organizations and educational authorities to embrace formal education as this will increase their likelihood to use ICTs

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