



ANALYSIS OF AWARENESS AND ACCESSIBILITY OF INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTs) AMONG CROP FARMERS IN KANO STATE, NIGERIA

¹Daneji, M. I., ²Dahiru, A., ³Attahir, M. and ⁴Saidu, A.,

¹Department of Agricultural Economics and Extension,
Faculty of agriculture, Bayero University, Kano.

²Department of Agricultural Economics and Extension, Faculty of Agriculture and Agricultural Technology, Aliko Dangote University of Science and Technology, Wudil, Kano State

³Department of Agricultural Extension and Management,
Audu Bako College of Agriculture Dambatta, Kano State

⁴Department of Horticultural Technology, Audu Bako College of Agriculture, Dambatta, Kano.

Corresponding Authors` Email: muhammadattahir56@gmail.com, **GSM:** 07067078888

ABSTRACT

The study examined the awareness and accessibility of information and communication technologies (ICTs) among crop farmers in Kano State, Nigeria. A multi-stage sampling procedure was used to select (162) respondents. Data were collected using a well-structured questionnaire and analyzed with descriptive and inferential statistics. The results showed that (56.2%) of respondents were rice farmers, while (15.4%), (14.8%), and (13.6%) were millet, sorghum, and maize farmers, respectively. The findings revealed that (35.8%) of respondents were aged (41–50) years, with the majority (90.7%) being male and married (92.6%), and having an average household size of 11 members. Additionally, (30.3%) had completed secondary education, and 63.6% belonged to cooperative societies, with an average income of (₦72,143.84). Regarding awareness, mobile phones (100%) and radios (96.3%) were the most recognized ICT components, indicating widespread awareness among crop farmers. In terms of accessibility, mobile phones (96.3%), radios (92.6%), and televisions (67.9%) were highly accessible. Furthermore, in utilization, farmers predominantly used mobile phones (93.8%), radios (88.3%), and televisions (61.7%). Logistic regression analysis indicated that household size, education level, farming experience, and cooperative membership significantly influenced ICT awareness and accessibility at $p \leq 0.05$, $p \leq 0.01$, $p \leq 0.05$, and $p \leq 0.05$ levels, respectively. The major constraint identified was inadequate skills in using ICTs (98.8%). Despite this limitation, most respondents reported utilizing ICT tools and acknowledged their potential to improve access to agricultural information. The study concludes that mobile phones, radios, and televisions are the most recognized, accessible, and utilized ICT components among crop farmers, with mobile phones leading in all three categories (100% awareness, 96.3% accessibility, 93.8% utilization). It recommends that farmers actively participate in cooperative societies to leverage shared resources, strengthen support networks, and advocate for policies promoting ICT acceptance.

Keywords: Awareness, Accessibility, Information, Communication, Technologies, Farmers

INTRODUCTION

Agriculture supports about 25–30% of the global population (FAO, 2020), yet its progress is often hindered by limited awareness, accessibility, and utilization of modern technologies among farmers. Information and Communication Technologies (ICTs) have emerged as powerful tools to bridge this gap, enhancing access to timely information on farm practices, markets, and weather forecasts (Aker, 2017; Jensen, 2020). In Nigeria, and particularly Kano State, agriculture remains central to livelihoods, but inadequate ICT adoption constrains productivity. Many studies highlight that, ICT-based agricultural extension can significantly improve efficiency and decision-making (Adera *et al.*, 2016; IFAD, 2019). However, farmers' awareness, accessibility, and utilization of ICTs remain inconsistent due to infrastructural, socio-economic, and cultural barriers. Despite government recognition of extension's importance, ICT adoption among Kano crop farmers is low. Farmers face inadequate awareness, limited accessibility, skepticism about ICT effectiveness, and demographic



disparities in adoption. Traditional reliance on face-to-face extension is further weakened by declining extension worker numbers. These challenges restrict farmers' ability to access vital agricultural information, limiting productivity and sustainability (Aker, 2017; Oyekele *et al.*, 2018). The objectives are to:

- i. Describe farmers' socio-economic characteristics;
- ii. Assess awareness, accessibility, and utilization of ICTs;
- iii. Identify factors influencing ICT awareness and utilization.
- iv. Determine factors the utilization of ICT and;
- v. Identify constraints to ICT utilization.

METHODOLOGY

Study Area

The study was conducted in Kano State, Nigeria, which was created in 1967. The state lies between latitudes 10°33' N and 12°37' N and longitudes 7°43' E and 9°35' E. According 2006 census the total population of Kano state was 9401,288 With a projected population of approximately 16253,549 in 2024 (KNSG Subdivision,2024), it falls within the tropical wet and dry climatic zone of northwestern Nigeria. The state comprised of 44 Local Government Areas (LGAs) and shares boundaries with Jigawa State to the northeast, Kaduna State to the southwest, Bauchi State to the southeast, and Katsina State to the northwest. The climate is characterized by a rainy season from April to October, followed by the Harmattan season (November to February). Mean annual rainfall varies across the state: about 1,000 mm in the south, 800 mm around Kano urban, and 600 mm in the northeast (KNARDA 2019). Agriculture is the backbone of the state's economy, involving both crop and livestock production. Kano is renowned for producing millet, sorghum, maize, rice, wheat, groundnuts, and vegetables. Livestock production, particularly cattle, goats, and sheep, is widespread, with the Kano cattle market being one of the largest in West Africa (KNARDA, 2019).

Sampling Technique and Sample Size

A multi-stage sampling technique was adopted: Stage 1: Six LGAs were purposively selected based on high concentrations of crop farming (rice, millet, sorghum, maize). Stage 2: From each LGA, three wards were randomly selected using a ballot method, giving 18 wards. Stage 3: One village was randomly selected from each ward, totaling 18 villages. Stage 4: A 10% sample of the farming population was drawn from each village, yielding a total of 162 respondents out of a sampling frame of 1,620.



Table 1: Sampling Frame and Sample Size

S/NO	LGAs	WARDS	VILLAGES	S/ FRAME	S/size 10%
1	Dambatta	Dambatta	Gwarabjawa	117	12
		Ajumawa	Masallaci	111	11
		Fagwalawa	Katsarjuwa	63	6
2	Makoda	Jibga	Bare-Bari	98	10
		Koguna	Chidari	81	8
		Matsidau	Yantsere	102	10
3	Kunchi	Matan fada	Falle	62	6
		Shuwaki	Galadanchi	48	5
		Kunchi	Hugungumai	76	8
4	Kura	Danhassan	Gamadan	113	11
		Karfi	Gundutse	110	11
		Kura	Makera	101	10
5	Garun-Mallam	Garun malam	Funkurun	113	11
		Chiromawa	Kadawa/Gari	115	12
		Yadakwari	Dakasoye	103	10
6	Bunkure	Kulluwa	UnguwarRabo	69	7
		Gafan	Yar Tasha	61	6
		Gurjiya	U/ Maigari	77	8
		18	18	1620	162

Source: preliminary survey 2023

Data Collection and Analysis

Primary data were collected using structured questionnaires and interview schedules, administered with the help of trained enumerators fluent in English and Hausa. The descriptive Statistics such as frequencies, percentages, means, and ranges were used to describe farmers' socio-economic characteristics, ICT awareness, and constraints.

Percentage: This was employed to establish the population of the respondents to a particular response. Percentage is written mathematically as

$$\text{Percentage (\%)} = \frac{X}{N} \times 100 \text{-----(1)}$$

Where

% = percentage

X = individual observation

N = number of observation

ii. Frequency: This is a table in which numbers in a data are arrange in sequential order with frequency of each number recorded.

$$Fr = \sum f/Nr \text{----- (2)}$$

Where

\sum = summation

Fr=frequency

Nr = number of observations

Logistic Regression Analysis: The logistic regression model, as used by Giorgio *et al.* (2023), can be implicitly expressed as:

$$Y = F(X_1, X_2, X_3, X_4, X_5) \text{-----(3)}$$

The equation 3 can further be simplified explicitly as follows

$$Y = \alpha + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + U \text{----- (4)}$$

Where:

Y = ICT Awareness (1 = aware, 0 = not aware)

X1 = Age (years), X2= Gender (Male = 1, Female = 2), X3 = Education level (years), X3 = Farming experience (years) and X5 = Estimated on-farm income (₦).

Pearson correlation was employed to measure the relationship between socio-economic characteristics and ICT utilization. The coefficient () was computed as:



RESULTS AND DISCUSSION

Socioeconomics Characteristics of the Respondents

Table 2 presents the socio-economic characteristics of crop farmers in Kano State. The results revealed that 35.8% of the respondents were within the age bracket of 41–50 years. This is consistent with the finding of Adebayo *et al.* (2017), who reported that the majority of crop farmers with access to ICTs in Nigeria were between 30–59 years old, aligning with the economically active age range with a mean farming experience of 23 years. This indicates that most farmers are in their economically active years, with substantial farming experience to potentially enhance technology adoption. The average household size was 11 members, reflecting the extended family system common in northern Nigeria. The results also showed a dominance of males (90.7%), while females accounted for only 9.3%. This imbalance is consistent with earlier findings that male farmers have greater access to productive resources and information compared to female counterparts (Ali *et al.*, 2016). Furthermore, 92.6% of the respondents were married, indicating farming as a family-oriented activity. In terms of education, 30.3% had completed secondary education, suggesting moderate literacy levels among respondents, which could enhance ICT adoption. Additionally, 63.6% were members of cooperative societies, providing opportunities for knowledge sharing and collective access to ICT resources.

Table 2: Distribution of Respondents according to Quantitative Socioeconomics Variables

Variable	Frequency	Percentage	Min	Max	Mean	SD
Age (years)						
20 -30	14	8.64	20	70	47	9.98
31- 40	28	17.28				
41-50	58	35.8				
51-60	54	33.34				
61-70	8	4.94				
Household size						
1 – 8	75	46.3	1	40	11	7.88
9 –16	55	33.9				
17 -24	22	13.6				
25-32	6	3.7				
33-40	4	2.5				
Farming experience(years)						
2-11	34	20.9	2	51	23	12.12
12-21	40	24.7				
22-31	41	25.3				
32-41	41	25.3				
42-51	6	3.7				
Estimate on farm income (#)						
100000 - 200,000	144	88.9	100,0	600,0	72,143	97013.84
200,001 - 300,000	4	2.5	00	00		
300,001 - 400,000	6	3.7				
400,001 - 500,000	5	3.1				
500,001 - 600,000	3	1.9				

Source: Field Survey, 2023



Table 3: Distribution of Respondents according to Qualitative Socioeconomic Variables

Gender	Frequency	Percentage
Male	147	90.7
Female	15	9.3
Marital Status		
Single	10	6.2
Married	150	92.6
Widow	1	.6
Divorced	1	.6
Education level		
Non formal	43	26.5
Primary	48	29.6
Secondary	49	30.3
Tertiary	22	13.6
Membership of cooperative societies		
Member	103	63.6
Non member	59	36.4
Total	162	100.0

Source: Field Survey 2023.

Awareness, Accessibility and Utilization of ICTs

Findings revealed ICT Tools Awareness, Mobile phones (100%) and radio (96.3%) are the most recognized ICT components, indicating widespread awareness. This implies that, Mobile phones and radios are pivotal for information dissemination given their high awareness, accessibility, and utilization rates and expand agricultural extension programs using mobile applications, SMS alerts, and radio broadcasts to reach more farmers effectively. Accessibility, Mobile phones (96.3%), radios (92.6%), and television (67.9%) is highly accessible. furthermore, Utilization, Farmers predominantly utilize mobile phones (93.8%), radios (88.3%), and television (61.7%). This is consistent with findings by Adebayo *et al.* (2017), who reported the widespread use of mobile phones among Nigerian farmers for agricultural purposes. Furthermore, Low awareness is observed for media vans (22.8%), internet (24.7%), and pamphlets (16.0%). Low accessibility is reported for pamphlets (13.0%), media vans (6.2%), and computers (17.9%). This suggests that media vans are less common and less utilized for agricultural extension services in the study area. This is consistent with findings from Levi (2015), who noted limited use of media van units in rural farming communities

Table 4: Awareness, Accessibility and Utilization of Various ICTs among Crop Farmers.

ICT component	Awareness Freq (%)	Notaware Freq (%)	Accessible Freq (%)	Not access Freq (%)	Utilization Freq (%)	Not Utilize Freq (%)
Computer/Tel						
Mobile phone	162 (100)	0 (0.0)	156 (96.3)	6 (3.7)	152 (93.8)	10 (6.2)
Email	81 (50.00)	81 (50.00)	51 (31.5)	111 (68.5)	50 (30.9)	112 (69.1)
Internet	40 (24.7)	122 (75.3)	63 (38.9)	99 (61.1)	57 (35.2)	105 (64.8)
Computer	90 (55.6)	72 (44.4)	29 (17.9)	133 (82.1)	30 (18.5)	132 (81.5)
Broadcast/audio						
visual						
Television	137 (84.6)	25 (15.4)	110 (67.9)	52 (32.1)	100 (61.7)	62 (38.3)
Radio	156 (96.3)	6 (3.7)	150 (92.6)	12 (7.4)	143 (88.3)	19 (11.7)
Media van	37 (22.8)	125 (77.2)	10 (6.2)	152 (93.8)	8 (4.9)	154 (95.1)
Print techno.						
Leaflet	49 (30.2)	136 (84.0)	37 (22.8)	125 (77.2)	34 (21.0)	128 (79.0)
Pamphlet	26 (16.0)	64 (39.5)	21 (13.0)	141 (87.0)	17 (10.5)	145 (89.5)
News paper	98 (60.5)	74 (45.7)	65 (40.1)	97 (59.9)	60 (37.0)	102 (63.0)
Magazines	88 (54.3)	41 (25.3)	55 (34.0)	107 (66.0)	59 (36.4)	103 (63.6)
Poster	121 (74.7)	79 (48.8)	96 (59.3)	66 (40.7)	87 (53.7)	75 (46.3)
Journal	83 (51.2)	79 (48.8)	65 (40.1)	97 (59.9)	65 (40.1)	97 (59.9)

Source: Field Survey 2023. Figures in parentheses is percentages

Factors Influencing ICT Awareness and Accessibility

The logistic regression model (Table 3) examined the determinants of ICT awareness among crop farmers. The -2 Log Likelihood of 88.680 ($p = 0.001^{**}$) indicated a moderately good model fit. The Cox and Snell R^2 value of 0.298 showed that 29.8% of the variance in ICT awareness was explained by the independent variables, while the Nagelkerke R^2 value of 0.502 suggested that 50.2% of the maximum possible variance was explained.

Table 5: Factors Influencing the Awareness Utilization of ICT among Crop Farmers in the Study Area

VARIABLES	B	STD ERROR	WALD	SIG.	EXP(B)
Marital Status	.597	.575	.144	.705	1.817
Household size	-.126	.052	5.925	.015*	.882
Education Level	.803	.317	6.425	.011**	2.232
Farming experience	.136	.049	7.815	.005*	1.146
Estimated on-farm income	.0001	.0001	2.214	.137	1.000
Membership of cooperati.	.262	.676	11.181	.001*	.104
Constant	-.634	.256	.383	.536	.220
-2Log likelihood	88.680	001**			
Cox and Snell R Square	.298				
Nagelkerke R square	.502				
Chi Square	57.302	(df=8, $p \leq .001$)			

Source: Field Survey 2023. *, and * * variables significant at 5 % and 1% respectively.

The results indicated that household size (.015*, $p < 0.05$), The negative coefficient ($B = -.126$) indicated that for every one-unit increase in household size, the likelihood of utilizing Information and communication technology for agricultural information decreases by 12.6% (exp(B)). This is similar findings have been reported by Adekunle *et al.* (2017), who found that household size was significantly negatively related to the adoption of Information and communication technology in agricultural extension services in Nigeria. Education level (.011**, $p < 0.01$), this implies that for every one-unit increase in education level, the odds of using ICT in accessing agricultural information increase by 123.2%. This is consistent with findings by Adebayo *et al.*, (2017) and Adekunle *et al.*, (2017), who found that education level was a significant factor in information and communication technology adoption in agricultural extension services in Nigeria. Farming experience (.005*, p



<0.05), The exponentiated coefficient $\text{Exp}(\beta)$ is 1.146, suggesting that for each additional unit of farming experience, the odds of utilizing Information and communication technology in accessing agricultural information increase by a factor of 1.146, holding all other variables constant. This finding contrasts with studies by Mango *et al.* (2015) and Diiro (2013), which found that farming experience had a negative and significant impact on information and communication technology adoption and cooperative membership (.001*, $p < 0.05$) The exponentiated coefficient $\text{Exp}(\beta)$ is 1.146, implies that for each additional unit of farming experience, the odds of utilizing Information and communication technology in accessing agricultural information increase by a factor of 1.146, holding all other variables constant. This finding contrasts with studies by Mango *et al.* (2015) and Diiro (2013), which found that farming experience had a negative and significant impact on information and communication technology adoption.

Constraints to ICT Utilization

The most critical constraint identified was inadequate skills in using ICTs (98.8%), followed by poor network connectivity, high costs of devices, and limited electricity supply. These challenges echo the findings of IFAD (2019), which highlighted infrastructural and literacy barriers as major impediments to rural ICT adoption. The results demonstrate that while crop farmers in Kano State are generally aware of ICTs, actual access and utilization remain constrained by socio-economic and infrastructural factors. Education, farming experience, and cooperative membership emerged as significant enablers, underscoring the need for capacity-building initiatives and collective action approaches. Similar to Aker (2017), the study confirms that ICT tools such as mobile phones and radios remain the most practical entry points for rural farmers. However, advanced ICT platforms require stronger policy support, training, and rural infrastructure development.

Table 6: Constraints Associated with Utilization of ICTs in the Study Area

Constraints	Frequency	Percentage	Ranking
Inadequate of skill in using ICTs	160	98.8	1 st
Inadequate supply of electricity	159	98.1	2 nd
High cost of internet access	154	95.1	3 rd
poor wide network coverage	152	93.8	4 th
limited network connectivity	149	92.0	5 th
Illiteracy	144	88.9	6 th
High cost of maintenance	143	88.3	7 th
Electric/Mechanical fault	142	87.7	8 th
High cost of print materials	141	87.0	9 th
High cost of ICTs tools	119	73.5	10 th
Poor quality of print materials	114	70.4	11 th
human attitudes	105	64.8	12 th
inadequate of information and retrieval	105	64.8	12 th
Noise during the program	70	43.2	13 th

Source: field survey 2023. Multiple responses existed.

CONCLUSION AND RECOMMENDATION

The study concludes that ICTs have strong potential to improve agricultural extension services and farmers' income in Kano State; The study found that socioeconomic factors like age, marital status, education, farming experience, household size, and income significantly influence the awareness and accessibility of ICTs among crop farmers in Kano State, Nigeria, with radio and mobile phones being the most effective tools due to their availability despite unreliable electricity.

Based on the findings in the study area, the following recommendations are proffered:

- Stakeholders, should collaborate to improve education levels among crop farmers in Kano State, Nigeria, to enhance ICT adoption and unlock its socioeconomic benefits.



- Radio and mobile phones are effective ICT tools, and the government should develop more agricultural radio programs accessible via mobile phones while encouraging cooperative societies to improve access to information, resources, and policy advocacy.
- To address barriers like high internet costs, inadequate skills, and poor electricity supply, the government should subsidize costs, establish monitoring mechanisms, and NGOs should strengthen institutional linkages for effective extension service delivery.

REFERENCES

- Adebayo, K., Idowu, A. A., and Yusuf, O. T. (2017). "Adoption of Information and Communication technologies (ICTs) by agricultural extension workers in Nigeria: Implication for extension service delivery. *Journal of agricultural extension*, **21**(2): 26-38.
- Adera, J., Onumah, G., and Weidner, G. (2016). "Agricultural extension services and innovations in Kano State. " *Journal of Agricultural Extension*, **19**(2); 11-20.
- Adebayo, K., Idowu, A. A., and Yusuf, O. T. (2017). "Adoption of Information and Communication technologies (ICTs) by agricultural" extension workers in Nigeria: Implication for extension service delivery. *Journal of agricultural extension*, **21**(2): 26-38.
- Adekunle, O. A., Adekoya, A. E., and Oladeji, J. O. (2017). "Factors Influencing the Adoption of ICT among Rural Farmers in Oyo State, Nigeria." *Journal of Agricultural Extension*, **20**(1): 1 10.
- Ali, S., Mohammed, H., & Suleiman, H. (2016). Application of mobile phones in disseminating agricultural information to farmers by agricultural extension workers in Giwa Local Government Area, Kaduna State, Nigeria. [Unpublished manuscript/document]. Ahmadu Bello University, Zaria.
- Aker, J. C., and Mbiti. (2017). "Mobile phone and economic development in Africa. *Journal of Economic Perspectives*, **24**(3): 207-232.
- Diirro G. M (2013). Impact of off farm income on agricultural technology adoption intensity and Productivity – evidence from rural maize farmers in Uganda `` Uganda strategic program IFRI; Working paper 11
- Food and Agricultural Organization of the United Nations (2020). The state of food security and nutrition in the world 2020. Rome: FAO.
- Georgios Friligkos, Evi Papaioannou, Christos Kaklamanis (2023). A framework for applying the Logistic Regression model to obtain predictive analytics for tennis matches, Vol. (15), pp.60-74
- IFAD. (2019) .The rural development report 2019: Creating opportunities for rural youth. International Fund for Agricultural development.
- Jensene, H. R. (2020). Contract farming and smallholder farmers: A systematic review. *Agricultural systems*, **184**: 102901.doi:10.1016 /agsy.2020102901.
- Kano State Agricultural and Rural Development Authority (2019). Headquarters, Kano State, Nigeria 2019 bulleting, Kano, Nigeria.
- Kano State subdivision (2024). www.citypopulation.de retrieved, 7 February, 2024.
- Mango, N., Makate, C., Mlambo, B., Siziba, S., and Lundy, M. (2015). A Stochastic Frontier Analysis of Technical Efficiency in Smallholder Maize production in Zimbabwe: The post-fast track land reform.
- Oyekele, R. S., Gana, F. S., Umar, I. S., Ndanisa, M. A. and Peter, E. W. (2018). Effectiveness of Radio in the Dissemination of Agricultural Information among Farmers in Edu Local Government Area of Kwara State, Nigeria. *Continental Journal of Agricultural Science*, **3**: 1–6.