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FACTORS INFLUENCING THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTs) AMONG RICE FARMERS IN KANO STATE, NIGERIA

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ABSTRACT

The study analyzed the factors influencing rice farmers' use of Information and Communication Technologies in six selected Local Government Areas of Kano State. The study described the socio-economic characteristics, determined factors influencing the use of ICTs and identified the perceived constraints associated with the use of ICTs by rice farmers in the study area. Multistage sampling procedure was used to select 680 respondents for the study. Both primary and secondary data were used. The data were analyzed using descriptive statistics and multiple regression model. The result showed that the majority (70.59%) of rice farmers were male. Most (51.47%) of them were between 41-50 years of age, indicating that they were in their productive years. The majority were married (58.97%) and had large household size (61%) of between 6-10 people. Educationally, 61.76% of them were secondary certificate holders with farming experience (57.79%) between 6-10 years and 69.56% cultivated 1.1-2.0hectares of lands. The result also revealed that farmers belonged to one cooperative society and another (59.41%) with 6–10years of membership and a mean of 8years. Farmers equally had access to extension services (57.21%) and no credit facility (73.68%). The study revealed that age, sex, farming experience, household size, farm size, educational level, extension contact and membership of cooperatives significantly influenced rice farmers' use of ICTs with an R^2 value of 0.86. The perceived constraints of the farmers were high cost of ICTs, inadequate access to extension services and lack of credit facilities, epileptic network, power and electricity supplies and language barriers. It was concluded that socio-economic factors significantly influenced ICT usage among rice farmers. Farmers should make use of their membership of cooperatives to contribute money together in eradicating the problem of high cost of ICTs and also install alternative source of power to equally overcome the problem of irregular power supply.

Key words: Factors influencing; Rice farmers' use; ICTs; Kano State; Nigeria

INTRODUCTION

In African, agriculture is basically traditional and it is practiced by small-scale farmers and pastoralists. Thus, more effective extension services are needed to address agricultural challenges including meeting the information needs. The bottom line is that, most farmers are unaware of Information and Communication Technologies (ICTs). They simply use their handsets for receiving and making calls without exploring the importance of ICTs (Cornelisse et al., 2022). This is because, most farming activities in Africa have not matched the level of advancement in ICTs. This has, however, enhanced the criticism against the traditional practices of agriculture for labour intensiveness and low productivity. In many States of Nigeria including Kano State, farmers face a similar situation of inadequate access to better agricultural information. Consequently, farmers lack adequate knowledge of farm management practices like correct land preparation, timely planting, pests and disease control, timely weeding to bypass the critical period of weed competition, knowledge of nutrient deficiency symptoms and how to correct them and also, ensure proper record keeping (Asenso-Okyere and Mekonnen, 2023).

In response, agricultural extension experts and institutions around the world are promoting the use of Information and Communication Technologies among farmers (Anjali Verma et al., 2024). Information and Communication Technologies can expedite the process of agricultural technology transfer from research and development institutions to farmers. Information Communication Technologies (ICTs) improve the adoption of agricultural technology by supporting farmer learning, problem-solving and accessibility to profitable markets for crops.

These rapid development in ICTs have huge potential for improving farmers' information access, which is likely to increase productivity and profitability through the adoption of recommended practices. However, many studies about Information and Communication Technologies in agriculture have been conducted in Nigeria, but only few of them had attempted to provide a comprehensive study on the factors influencing farmers' use of ICTs components (Cornelisse, 2022). The study therefore, described the socio-economic characteristics of rice farmers in the

study area, investigated factors influencing rice farmers' use of ICTs and determined the perceived constraints faced by rice farmers' use of ICTs in the study area.

Methodology

Study area

The study was carried out in Kano State. Kano State is located in the north western part of Nigeria between latitudes 11°' 30'E and 11.500° and longitudes 8.500° E and 11.5000'N with over four million citizens living within 449km2 (173sq mi). Kano has developed a diverse economy, establishing itself as a center for industry, agriculture and Islamic banking. The Hausa and Fulani make up the majority of Kano state's population. Kano state is one of the 36 states of Nigeria, located in the northern region of the country. According to the National Population Census in 2006, Kano state is the most populous state in Nigeria having nine million, four hundred and one thousand, two hundred and eighty-eighty thousand (9.401, 288, 000) people. Also, the recent official estimates taken in 2016 by the National Bureau of statistics found that Kano state was still the largest state by population in Nigeria. It was projected to be twelve million, five hundred twenty three thousand, three hundred and twenty one (12, 523,321, 000) people in 2023. There are forty-four (44) local government areas in Kano state. Kano state borders on Katsina state to the northwest for about 201km (130 miles), Bauchi state to the southeast for 131km (82 miles) and Kaduna state to the southwest for about 255km. Kano consist of wooded savanna in the south and shrub vegetation in the north and is drained by Kano-chalawa-hadejia River system. The states' light sandy soil is excellent for growing peanuts which is a major export crop. Other crops include cotton, onions, tobacco, wheat, millet, rice, sorghum, beans, corn and gum Arabic. Cattle, horses, goats and sheep are grazed and hides and skins are exported. Based on reconnaissance survey conducted in the study area, multistage sampling procedure was used for the study. The first stage, involved the purposive selection of six (6) LGAs namely Bagwai (Gadanya and Gogori), Bunkure (Falingo and Gabo), Doguwa (Gama and Marggao), Dawakin kudu (Danbagina and Dosan Dosan), Dambatta (Ajumawa and Dambarta) and Garko (Gurjiya and Kafin Malamai) out of forty-four (44) LGAs for their predominance use of ICTs. In the second stage, two (2) communities were randomly selected from each of the chosen LGAs. Therefore, a total of twelve communities were chosen for the study. The third stage involved the compilation of a list of rice farmers who used ICTs from among other farmers who did not use ICTs in the selected communities with the help of the State Agricultural Development Programme (ADP) which gave a total of 3,400 sample frame.

Also, using simple random sampling technique, 20% of rice farmers who made used of ICTs were selected from the six (6) local government areas that amounted to a sample size of 680 respondents. Data were analyzed using descriptive statistics (frequency distribution, percentages and mean) and multiple regression model. The perceived constraints faced by farmers in the use of ICTs were analyzed using mean scores which were computed on seven (7) constraints using Likert three points rating scale of highly agreed, moderately agreed and not agreed with weights of 3, 2 and 1. By adding together as 3+2+1=6 which was divided by 3 to get a mean score of 2. Therefore, scores equal to or greater than (≥) 2.0 were regarded as "high" while, those less than 2.0 were regarded as "low" respectively.

Multiple regression is an extension of simple linear regression. It is used to predict the value of a variable based on the values of two or more of other variables. The variable to be predicted is called the dependent variable while variables used to predict the value of the dependent variable are called the independent variables. The implicit regression equation is given as:

$Y_i = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, U)$…… 1

Where;

Y = Dependent variable (use of ICTs by farmers).

X_1 = Age (in years)

X_2 = Educational level (primary = 1, secondary =2 and tertiary = 3)

X_3 = Farm size (in hectares)

X_4 = Farming experience (in years)

X_5 = Marital status (married =1, not married =2)

X_6= Sex (male 1, female 2)

X_7 = Household size (no of people in a household)

X_8 = Extension visits (no of visits)

X_9 = Access to credit (yes or no)

X_{10} = Membership of cooperative society (years spent)

U = error term

RESULTS AND DISCUSSION

Socio-economic characteristics of rice farmers in the study area

The findings of this study revealed that majority (51.47%) were between the age group of 41-50years. This implies that most of the rice farmers in the study area were still productive in rice production and active with enough strength that could be utilized in the production of rice. The result agreed with Bangkok

(2024) who stated that most respondents were energetic and productive in maize farming with the age range of 41-49years.

The result of educational level in Table 1 revealed that majority (61.76%) had secondary education. This implies that the farmers were educated enough to read instructions and use ICTs facilities effectively in the study area. This result agreed with Cornelisse (2022), who also stated in his study that respondents had secondary education.

The result further revealed that 69.56% of the rice farmers' farm size was between 1.1-2.0 hectares. This implies that the farmers had fairly large farm sizes and will be able to adequately use ICT components. This is in disagreement with Ettah and Kuye (2025) who discovered that most farmers (98%) had small sizes of farms. Invariably, many farmers who had small farm sizes could be as a result of shared inherited lands from their late parents due to large household sizes.
The result of farming experience revealed that the majority (57.79%) had between 6-10years of experience in rice production. This implies that the farmers' experience in rice farming was long enough to be able to make sound decisions as regards the use of ICTs. This result agreed with Anjali Verma et al. (2024) who discovered that farmers had between 5-10years of experience with a mean of 7years in rice farming. As a result, farmers would be enlightened enough in their decision to use ICTs in the study area.

The study also revealed that 58.97% of the rice farmers were married. This result underscores roles and responsibilities of farmers' use of ICTs in the study area. This result is in agreement with Anjali Verma et al. (2024) who found that most of the farmers in the study area were married. Married farmers are more brave and responsible to be able to use ICTs in the study area.
This implies that male farmers participated more in rice farming than females in the study area. The result of farmers' sex revealed that majority (70.59%) of respondents were males. Male farmers who are married could be more responsible to take positive decision to use ICTs in the study area. The study agrees with Anjali Verma et al. (2024), who reported that majority (49.5%) of the respondents were males. This could be because, male farmers are more energetic with well-developed muscles to carry out the tedious activities of rice farming.
The findings also revealed that majority (61.18%) of rice farmers had household size of between 6-10people. This implies that the largeness of the households could be used as family labour and thereby reserving enough money to invest in ICTs usage. According to Bangkok (2024), 63% of maize farmers had household size that ranged from 6-10 persons with a mean of 8.

The result in Table 1 revealed that majority (59.41%) of farmers were members of cooperative societies between 6-10 years with a mean of 8years. This implies that the farmers must have acquired enough experience in the organizations regarding the use of ICTs in rice farming system. The finding agrees with Syiem and Raj (2024), who reported that majority (48.18%) of respondents were members of social organization between 5-10years. Farmers' membership of organization influences the use of technologies resulting to higher productivity and poverty alleviation. This may be the reason why many of the rice farmers had opportunity of interacting with other farmers to enhance diffusion and use of ICTs in the study area. The results revealed that 57.21% of the farmers had access to extension visits of 1 time in a month. The farmers complained that the extension service delivery in the study area was inadequate. Similarly, in the study of Asenso-Okyere and Mekonnen (2023), they reported that majority (74%) of the farmers had low extension visits. The inadequate visits of extension agents to farmers could lead to insufficient training in ICTs and thereby resulting to non-usage and consequently reduction in productivity.

The result of access to credit by farmers revealed that 73.68% had no access. This implies that the unavailability of credit in the study area could deprive the farmers from using ICTs. This finding is similar to Anjali Verma et al. (2024), who found that most of the farmers had no access to credit.

Table 1: Socio-economic characteristics of rice farmers (n= 680)

Socio-Economic Characteristics	Frequency	Percentage	Mean
Age			
20-30	145	21.32	
31-40	109	16.03	
41-50	350	51.47	**45**
51-60	61	8.97	
61-70	15	2.21	
Educational level			
Primary	136	20.00	
Secondary	420	61.76	
Tertiary	124	18.24	
Household size			
1-5	74	10.88	
6-10	416	61.18	**8**
11-15	190	27.94	
Farm size			
0.1-1.0	181	2 6.62	
1.1-2.0	473	69.56	**1.5**
2.1-3.0	26	3.82	
Farming experience			
1-5	45	6.62	
6-10	393	57.79	**8**
11-15	210	30.88	
16-20	32	4.71	
Marital status			
Single	154	22.65	
Married	401	58.97	
Widowed	74	10.88	
Divorced	31	3.56	
Separated	20	2.94	
Sex			
Males	480	70.59	
Females	200	29.41	
Extension contacts (no of visits per month)			
No visit	214	31.47	
One time	389	57.21	
Two times	77	11.32	
Access to credit			
Access	179	26.32	

No access	501	73.68	
Membership of cooperative societies (years)			
1-5	65	9.56	
6-10	404	59.41	**8**
11-15	211	31.03	

Factors influencing the use of ICTs by Rice farmers

The result in Table 2 revealed that age had a positive coefficient of 0.033 and significant at 5% level of probability. This implies that the higher the age of rice farmers, the higher the predicted probability of ICT usage.

Educational level of farmers showed positive coefficient (3.944) and was significant at 5% level of probability. This implies that the higher the educational level, the more likely the use of ICTs by rice farmers in the study area. The result agrees with the finding of Michiel and Van Crowder (2022), who reported that education had a positive and significant influenced on farmers' use of technologies. The level of farmers' education determine their ability to read and understand instructions regarding the use of technologies in agriculture and also grab opportunities that would improve livelihood strategies, enhance food security and reduce poverty.

The result of farm size had a coefficient of 1.542 and was also significant at 1% level of probability. This implies that the larger the farms, the more the use of ICTs. This findings disagrees with Ghosh (2024), who reported that farm size of the respondents had positive coefficients but was not significant to the use of technologies.

Farming experience was significant at 10% level of probability with a coefficient of 6.987. This implies that the more the experience, the more they use ICTs. This is in agreement with Ettah and Kuye (2025) who reported that, farming experience had positive coefficient (1.972), which significantly influenced the use of improved practices at 5% level of probability.

Marital status had a negative coefficient of -0.271 and was not significant in the use of ICTs by rice farmers. This implies that, this variable though, not significant but contributed to the influence of rice farmers' use of ICTs.

Farmers' Sex revealed a positive influence with a coefficient of 1.186 at 1% significant level of probability. This implies that sex determines the use of ICTs. This is in consonant with Ghosh (2024), who reported that sex influenced the use of media accessibility and usage. Household size also influenced ICTs usage positively with a coefficient of 1.215 at 5% level of probability. This implies that the larger the household size, the more the use of ICTs to source agricultural information. This result is in support of Burke and Sewake (2024) who reported that large households of respondents positively and significantly influenced the adoption of recommended practices.

The number of extension visits to farmers had a positive coefficient of 3.551 and was significant at 10% level of probability. This implies that the more extension visits to farmers, the more they receive information on the use of ICTs. The result of extension visits was in variance to with Anjali Verma et al. (2024) who reported that extension visits was not significant to the adoption of technologies.

Access to credit had a coefficient of 4.285 which did not influence the use of ICTs but contributed to the total influence of ICTs usage by farmers.

Cooperative society had a positive coefficient of 1.240 and was significant at 5% level of probability. This implies that the more farmers belong to cooperative societies, the more they expose to ICTs knowledge.

Table 2: Result of factors influencing the use of ICTs by Rice farmers

Variables	Coefficient	Standard error	T-value
Constant	14.495	0.009	3.957
Age	0.033**	1.848	0.320
Sex	1.186***	0.342	3.461
Marital status	-0.271	1.608	-0.169
Farming experience	6.987*	4.081	1.712
Household size	1.215**	0.598	2.032
Farm size	1.542***	0.237	6.508
Educational level	3.944**	1.909	2.066
Extension contact	3.551*	1.822	2.005
Membership of cooperative society	1.240**	0.546	2.272
Access to credit	4.285	3.186	1.345
Prob > f	0.004**		
R-square	0.833		
Adjusted R-square	0.514		

*Note: ***, ** and * significant at 1%, 5% and 10% levels of significance*

Constraints faced by rice farmers' Use of ICTs in the Study Area

Table 2 shows the distribution of rice farmers' perceived constraints in the use of ICTs. Inadequate access to extension services was perceived as the highest constraint having mean score of 2.59 followed by language barriers as the next considered constraint with the mean value of 2.56. Inadequate credit facilities recorded mean score of 2.54. Also, epileptic network and power supply having mean scores of 2.52 while high cost of ICTs recorded mean score of 2.48 respectively. This findings agrees with Rolle and Satin (2024), who reported that, the problems of inadequate credit facilities and high cost of technologies were the major constraints to farmers' use of improved technologies. They blamed this on the collapse of frameworks of extension and credit institutions.

Table 3: Distribution of farmers' agreement with perceived constraints to farmers use of ICTs in the study area

S/N	ICTs components	HA	MA	NA	MS	Perceived constraints
1	High cost of ICTs	449	156	25	2.48	High
2	Inadequate access to extension services	451	182	47	2.59	High
3	Lack of credit facilities,	420	210	50	2.54	High
4	Epileptic network	410	215	55	2.52	High
5	Epileptic power supply	425	186	69	2.52	High
6.	Language barriers	424	215	41	2.56	High

CONCLUSION

Information and Communication Technology (ICT) is considered as a medium of disseminating agricultural information to farmers. The result of the study generally indicated that most of the socio-economic characteristics of farmers were significant and also contributed to the total variability of farmers' use of ICTs with 86% R^2 value. It can be concluded therefore, that, the use of ICTs in the study area should be adequately motivated. This can be done by ameliorating the observed constraints such as inadequate access to extension services followed by language barriers, lack of credit facilities, epileptic network and power supplies and high cost of ICTs respectively.

RECOMMENDATIONS

i. The result of the study indicated that farmers faced high cost of ICTs. It is recommended that farmers should make use of their membership of cooperatives to contribute money together in order to assist themselves financially. This of course will enable them to eradicate the problem of high cost of ICTs in the study area.
ii. The network providers should enhance internet services to eradicate epileptic network problem.
iii. The membership of cooperatives by farmers should also be utilized to put resources together and install alternative source of power such as solar energy in order to overcome the problem of irregular power supply.
iv. The management of farmers' cooperatives should higher resource persons to train farmers on different languages and interpretations skills so that they can translate other languages into local language of the farmers in the study area.

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