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RESEARCH ARTICLE

An Appraisal of Farmers' Knowledge Level on Information and Communication Technologies Utilization in Niger State, Nigeria

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ABSTRACT

The use of Information and Communication Technologies (ICTs) in sharing information is very important in disseminating of agricultural information in Nigeria. Therefore, this study examined farmer's knowledge level on utilization of ICT tools for farming in Niger state, Nigeria. A ordered logit model and descriptive statistics were used to examine the data that were gathered from 135 respondents. The findings showed that the majority of respondents (86.7%) had a good level of education, had an average age of 30, and had an average of 11 years of experience producing food crops. However data analysis reveals that mobile phone (97.8%) ranked first in terms of types of ICTs equipment used by the farmers while, fixed telephone (32.6%) was the least. Farmers also had moderate (61.5%) knowledge level on ICTs equipment. The ordered Logit regression analysis indicates that the following variables were found to be important determinants of farmers' knowledge level about the use of ICTs equipment in crop production: age, gender, marital status, compatibility, relative advantage, educational level, and farming experience. Therefore, it was suggested that an ICT training program be set up or arranged to educate farmers about the benefits of utilizing ICT technology in their farming operations.

1. Introduction

Information and communication technologies, or ICTs, are the fusion of communication and computation for the gathering and retrieval of information. In general, it refers to the ever-growing array of technologies that are being utilized to support communication and information processing in a variety of economic sectors. According to [1-6] and [2], these technologies include computer hardware and software, CD-ROMs, radios, phones, email, the internet, and television. These platforms facilitate the collection, processing, storage, sharing, and distribution of information between computers and individuals, both locally and globally. The agriculture industry can gain from a more cost-effective flow of information to its stakeholders because of the numerous ICTs [6].

Agriculture is currently dealing with many problems that ICT has the potential to alleviate. This is especially true due to the increasing and increasing use of personal ICT devices such as computers, mobile phones and tablets. The integration of ICT in the agricultural sector has the potential to enhance economic growth and development by combining vast knowledge and providing many advantages, other technologies and related knowledge. The technology is one of the most popular ICTs and has become a leader in the provision of agriculture-related ICT services and solutions [7-13]. The [24] shows that most farmers earn less than $1 a day and the majority of Africans, 73%, live in rural areas. That is why farmers' agribusinesses, which

should be at the forefront of the permaculture movement, suffer from inadequate management and business potential. Moreover, most farmers are rural people living in rural areas who have little access to information, communication technology and know-how that can improve the efficiency of production, marketing, distribution and storage of agricultural products and are unable to use ICT to solve local problems. Help users. Rural people may not understand the advantages of ICT or lack the necessary knowledge or experience to use ICT effectively, leading to a lack of knowledge on how to use ICT to disseminate knowledge in agriculture [7]. The [24] reports that 73% of Africans are farmers working in rural areas, often earning less than $1 a day. Therefore, poor management and marketing strategies affect farmers' agribusinesses, which are supposed to set the standards for permaculture.

i. describe the socio-economic characteristics of the rural farmers in the study area;
ii. identify the various ICTs equipments used by rural Farmers in the study area;
iii. examine rural farmers knowledge level on utilization of ICTs in the study area;
iv. determine factors influencing farmers' knowledge level on utilization of ICTs;
v. identify constraints associated with the utilization of ICTs equipment in the study area.

The goal of this project is to maximize the use of information and communication technologies (ICTs) by providing farmers and communities with information and aiding decision-making for the government and other stakeholders. Policy makers will be able to assess existing rules and develop workable policies that will promote the use of ICTs in agricultural information transmission with the aid of the data that will be generated. Farmers' knowledge and understanding of the concept of utilizing ICT tools in agricultural production will grow as a result of the initiative. This study will also assist in identifying the areas where farmers' ICT equipment usage is deficient and has to be improved in order to achieve the intended outcomes.

The findings of this study will act as a foundation for future research in this field by other investigators

2. Materials and Methods

2.1 The Study Area

Niger State, Nigeria. 3.20° east latitude, 8° and 11.3° north longitudes are the location of Niger. According to the Nigerian Census (18), the state has 25 local government areas (LGAs) with a total land area of 76,363 square kilometers (29,484 square miles) and an estimated population of 5.4 million. The state's three agricultural regions are Regions I, II, and III; Bida, Kuta and Kontagora host the center. Approximately 85% of the workforce is engaged in agriculture, which is the country's main occupation. There are two different seasons in the province: The dry season lasting seven to eight months in the south, and the dry season lasting five to six months in the north. Annual rainfall varies between 1,100 mm in the north and 1,600 mm in the south (Office for National Statistics, 2012). Use multistage sampling to select samples to create a sample for this survey. The first step is to select one (1) local government from each agricultural area. In the second stage, three villages from each district administration, i.e. thirty percent of the total, were selected. The Niger State Agriculture and Mechanization Development Agency (NAMDA) provided the model for each village, and in the third stage, the model size was determined using the Yamane formula. Therefore, 135 registered farmers were selected as participants of this study. [15] used the Yamane equation (1967) to calculate the fitted model.

Yamanne's formula is mathematically expressed as: $n = \frac{N}{1+N(e)^2}$ (1)

Where; n = samples size
N = finite population
e = limit of tolerable error (level of precision at 0.08 probability)
l = constant

The data of this study were evaluated with the ordered logit regression model as well as statistics. such as frequencies, percentages and averages. A three-point Likert scoring system was used to evaluate the different ICT tools used by farmers in crop production: frequently used (FU) = 3, frequently used (SU) = 2, and not frequently used (NU) = 1. Divide 3 by 3 and add 3 + 2 + 1 = 6 to get an average of 2 points. Therefore, a mean score of 2 or higher is classified as indicating regular use of ICT frequency, but a mean score of 2 or lower is not classified as such. . Farmers' knowledge of using ICT tools was evaluated on a 4-point Likert scale: high knowledge (HK) = 4, medium knowledge (MK) = 3, low knowledge (LK) = 2, no knowledge (NK) = 1. 10 divided by 4 plus 4 + 3 + 2 + 1 = 10 gives an average of 2.5 points. Therefore, mean scores above 2.5 were excluded. A knowledge level below 2.5 is considered a low knowledge level, a knowledge level below 2.5 is considered a medium knowledge level, and a knowledge level below 2.5 is considered a high knowledge level. A three-point Likert scale was used to determine restrictions on the use of ICT in agriculture: severe restrictions (SC) = 3, not very strict (NSC) = 2, not limited (NC) = 1. 3 divided by Al 3 followed by 3 + 2 + 1 = When we add up 6, we get an average of 2 points. Thus, it was decided that ICT equipment could not be used when the average score was 2 or higher. On the contrary, it means <2: Proving that it does not hinder the use of ICT tools.

2.2 Model specification

To achieve objective (4), ordered logit regression model is used because the variable is divided into more than two levels. The formulas are as follows: Yi = bo+ b1X1 + b2X2 + b3X3 + b4X4 + b5X5 b6X6 + b7X7 + b8X8 + b9X9 + b10X10 + B11X11 + b12X12 +b13X13 ..... (2)

Where : Y1 = Factors affecting farmers' knowledge of using ICT tools (high knowledge, medium knowledge,
X1 = Female or female),
X2 = farmer's age (years),
X3 = education level (time spent in school),
X4 = occupation size (agricultural or other),
X5 = farm purpose (family or other),
X6 = annual net income (NGN),
X7 = complexity of ICT devices (yes or no),
X8 = relative quality of ICT devices (yes or no).
bo = constant,
b1 + b8 = estimated coefficient,
e = error.

3. Results and Discussion

3.1 Socio-economic Characteristics of the Respondents

Age

According to Table 1's data, the bulk of respondents (60.0%) were under 30 years old. The responders' average age was thirty years old. This suggests that the respondents were young people in their middle years with the ability to look up pertinent information about their agriculture venture. This result is in line with study conducted in 2015 by (8) which revealed that the majority of farmers (80%) who use ICT tools are still young and productive.

3.2 Family size of respondents

The total number of individuals residing in the family at the time of the survey is referred to as "household size". Table 1's findings indicate that, while the average household size was determined to be seven (7), a significant portion of respondents more than half, or 49.6% lived in households with six to 10 individuals. Due to the high expense of using modern ICT equipment and the fact that most of them focus their resources on consumption, families with larger household sizes typically, employ older ICT equipment. This claim is consistent with (9), who found that respondents' average household size was eight people, which may deter people from using ICT equipment.

Table 1: Socio-economic characteristics of respondents in the study area (n=135)

Variable	Frequency	Percentage	Mean
Age			
Below 25 years	50	37.0	30
26-30 years	31	23.0	
31-35 years	24	17.8	
36-40 years	18	13.3	
above 41 years	12	8.9	
Household size			
below 5 members	52	38.5	7
6-10 members	67	49.6	
above 11 members	16	11.9	
Level of education			
No formal	18	13.3	10
primary (1- 6 years)	26	19.3	
Secondary (7-12 years)	46	34.1	
Tertiary (above 13 years)	45	33.3	
Farming experience			
below 10 years	83	61.5	11
11-20 years	38	28.1	
above 21years	14	10.4	

Source: Field Survey, 2019.

Table 2: Various ICTs equipment used by crop farmers

ICTs Equipment	Frequency	Percentage (%)
Mobile phone	132	97.8
Television	115	85.2
Radio	123	91.1
Computer	76	56.3

Fixed telephone	44	32.6
Projector	53	39.2
Tablet	72	53.3
Microphone	66	48.9
Digital camera	72	53.4
E-mail	50	37.0
Facebook	99	73.4
Satellite	71	52.6
Video recorder	51	37.8

Source: Field survey, 2019.

3.3 Level of education

People's educational status is the position they have attained in terms of knowledge, abilities, and experience via the process of teaching and learning. According to Table 1's findings, 86.7% of respondents in the study area were formally educated. This suggests that most respondents have received enough knowledge to be aware of the challenges associated with using ICT. The findings are consistent with research conducted by (11), who discovered that farmers with greater levels of education had better access to ICT tools and information.

3.4 Farming experience

The years spent farming are the measure of farming experience. With a mean of 11 years, Table 1's result displays the respondents' agricultural experience. This suggests that farmers have been involved in the field for a considerable amount of time, and that as their experience grows, they are typically exposed to a wider range of concepts, techniques, and knowledge related to farming. Consequently, this makes it easier to potentially use new ICT equipment. This finding is consistent with (5) research, which found that most farmers in the study area had six to ten years of experience.

3.5 Various ICT equipment used by rural crop farmers

The majority of respondents (97.8%) use Facebook (73.4%), radio (91.1%), television (85.2%), and mobile phones (97.8%). The least number of respondents (37.0%) and fixed telephones (32.6%) use email. The results of (16) and (22), as well as this study, indicate that radio and television have become the main providers of agricultural information for farmers. The study supported the conclusions of (1) and (10), who discovered that cell phones are another ICT that farmers employ for communication and information gathering.

3.6 Level of knowledge on the utilization of ICTs equipment in crop production

The respondents' level of comprehension on the use of ICT equipment in the research area is shown in Table 3. The findings showed that 97.8% of the respondents knew the most about ICTs and the least about radios (x = 3.76), televisions (x = 3.44), fixed phones (x = 1.84), projectors (x = 1.96), and video recorders (x = 1.83).

Table 3: Level of knowledge on the utilization of ICTs equipment in crop production.

ICT EQUIPMENT	HK	MK	LK	NK	WM	Rank
Mobile phone	113(83.7)	15(11.1)	4(3.0)	3(22)	3.76*	**1st**
Radio	70(51.9)	43(31.9)	15(11.1)	7(5.2)	3.30*	**3rd**
Television	88(65.2)	27(20.0)	12(8.9)	8(5.9)	3.44*	**2nd**
Computer	37(27.4)	31(23.0)	28(20.7)	39(28.9)	2.49	**6th**
Fixed telephone	19(14.1)	13(9.6)	31(23.0)	72(53.3)	1.84	**12th**
Projector	17(12.6)	23(17.0)	33(24.4)	62(45.9)	1.96	**11th**
Tablet	27(20.0)	23(17.0)	29(21.5)	56(41.5)	2.16	**8th**
Microphone	18(13.3)	34(25.2)	31(23.0)	52(38.5)	2.13	**10th**
Digital camera	29(21.5)	26(19.3)	28(20.7)	52(38.5)	2.24	**7th**
E-mail	49(36.3)	29(21.5)	20(14.8)	37(2.74)	2.67	**5th**
Facebook	54(40.0)	29(21.5)	22(16.3)	30(22.2)	2.79	**4th**
Satellite	16(11.9)	35(25.9)	37(27.4)	47(34.8)	2.15	**9th**
Video recorder	16(11.9)	16(11.9)	34(25.2)	69(51.1)	1.83	**13th**

Source: Field survey, 2019.

Note: High knowledge (HK); Moderate knowledge (MK); Low knowledge (LK); No knowledge (NK); WM=Weighted Mean.

Table 4: Summary on level of knowledge on Utilization of ICTs equipment.

knowledge level	Frequency	Percentage
No knowledge (0)	0	00.0
Low knowledge (1-4)	42	30.8
Moderate knowledge (5-8)	83	61.5
High knowledge (9-13)	10	7.70
Total	135	100.0

Source: Field survey, 2019

This implies that most of the respondents have high knowledge on old ICTs equipment like mobile, radio and television rather than new ICTs equipment like cable television.

The outcome supports the claim made by (5) that the two main ICTs utilized in Nigeria to deliver agricultural extension have been radio and television. This is because the respondents are more knowledgeable about older ICT equipment and are therefore more accustomed to using it. In conclusion, Table 4's summary of respondents' knowledge levels about the use of ICT equipment in the research region indicates that most of them (61.5%) had a moderate degree of understanding. Their ability to obtain and use some ICT devices effectively may have contributed to this outcome. As a result, respondents depend on using outdated ICT equipment.

3.7 **Factors influencing farmers' knowledge level on the utilization of ICT equipment**

Situations where a person acquires knowledge, skills and experience through the process of teaching are called education. As can be seen in Table 1, the majority of participants in the study area (86.7%) have technical education. This shows that most participants have sufficient knowledge to understand the issues associated with the use of ICT technologies. It is known that agricultural training can improve the farmer's ability to use equipment. This means that a farmer's level of education increases his ability to acquire and use the knowledge needed to purchase modern ICT tools. These results are consistent with the study of (21) and (20) suggest that increasing the education of farmers will improve their understanding of the use of ICT tools and help them understand, use and work better.

Importantly, farmers' knowledge increases in tandem with their knowledge because farmers tend to learn more about certain techniques during the time and knowledge they learn from more experienced and real farmers. This statement is consistent with the findings of (15) found that older farmers were perceived to have greater skills and knowledge than younger farmers, making them more suitable for evaluating ICT tools. Additionally, as new technologies continue to complement older technologies, the value of ICT tools increases positively with farmers' skill levels. In other words, as the relative value of an ICT product increases, the number of farmers who know how to use the technology also increases. In this way, farmers can access better information using new technology.

The results also show negative regression coefficients for relationship (X12), age (X1), gender (X2), marital status (X3) and compatibility (X12); Negative relationship with farmers' skill level regarding ICT tools. Therefore, farmers' ability to use ICT tools decreases with age. This may be because young farmers need to use new technologies, while older people are less likely to take risks. This result is consistent with the results of (14) found that as farmers get older, they become less interested in long-term farming and take more risks.

Table 5: factors influencing farmers' knowledge level on the utilization of ICTs equipment

Variables	Coefficient	Standard error	Z	p>|z|
Age	-0.0398349	0.0184727	-2.16**	0.031
Gender	-0.3888624	0.2337429	-1.66*	0.096
Marital status	-0.5554129	0.2901956	-1.91**	0.056
Household size	-0.0051672	0.0292669	-0.18	0.860
Educational level	0.5429084	0.2782017	1.95**	0.051
Cooperative organization	-0.0244837	0.017905	-1.37	0.171
Source of labour	0.0889886	0.2467762	0.36	0.718
Farming experience	0.028461	0.0169226	1.68*	0.093
Access to extension agent	-0.025659	0.0436151	-0.59	0.556
Annual farm income	3.33e-07	5.96e-07	0.56	0.576

Complexity	-0.777729	0.345673	-2.25**	0.024
Compatibility	-0.0694408	0.2272541	-0.31	0.760
Relative advantage	1.656552	0.4372026	3.79***	0.000
Number	135			
LR chi2(8)	39.40***			
Prob> chi2	0.0006			
Pseudo R2	0.2386			

Source: Field survey, 2019
Note: ***= Significant at (1%), **= Significant at (5%), *= Significant at (10%)

Table 6 constraint faced by crop farmers.

Constraints	SC	NSC	NS	WS	WM	Rank
Accessibility of ICT equipment	53(39.3)	47(34.8)	35(25.9)	100	2.12	**9th**
Poor infrastructure to support ICT use	51(37.8)	74(54.8)	10(7.4)	125	2.30	**5th**
Lack of training skills to operate ICT	39(28.9)	74(58.4)	22(16.3)	113	2.13	**8th**
Lack of farmers' interest	33(24.4)	76(56.3)	26(19.3)	109	2.05	**10th**
Cost of ICT equipment	68(50.4)	52(38.5)	15(11.1)	120	2.39	**3rd**
Illiteracy level	58(43.0)	49(36.3)	28(20.7)	107	2.22	**7th**
Lack of awareness on ICT initiatives	28(20.7)	60(44.4)	47(34.8)	88	1.86	**11th**
language barrier	64(47.4)	39(28.9)	32(23.7)	103	2.24	**6th**
Service failure	60(44.4)	57(42.2)	18(13.3)	117	2.31	**4th**
Lack of electricity	76(56.3)	38(28.1)	21(15.6)	114	2.45	**1st**
Lack of maintenance ability	73(54.1)	45(33.3)	17(12.6)	118	2.41	**2nd**
Lack of updated agric. Information offered by ICT	31(23.0)	48(35.6)	56(41.5)	79	1.81	**12th**

Source: Field survey, 2019; WM≥ 2.0 = Serious constraint
Note: SC-Serious constraint; NSC-Not a serious constraint; NC-Not a constraint; WS: Weighted Sum; WM=Weighted Mean

Similarly, gender has an impact on some ICT products. Because men are the real decision makers and leaders of the family. This result is consistent with (12) research showing that male farmers are more willing to use modern ICT tools compared to female farmers. Marital status affects one's professional skills in using ICT tools. This is because married people have more family responsibilities than single people. This means that married farmers make less use of ICT tools due to time constraints resulting from increased responsibilities. Moreover, the complexity coefficient is negative and significant up to 5%, indicating that farmers who do not know how to use ICT often face serious operational problems. These results are consistent with those of (3) found that marriage is a responsibility and 76% of the participants were married. With a pseudo R2 of 0.2386, the independent variables of this model explain only 24% of the variance in farmers' ICT knowledge. The remaining 76% of the variance is due to external variables that the researchers cannot explain. The chi-square value is 39.40, indicating that the overall model fit is good to good and significant at the 1% level. The standard error (S.E.) of all independent variables does not exceed 5.0, indicating that the independent variables do not suffer from computational problems such as multicollinearity.

3.8 Constraints associated with the utilization of ICTs equipment by crop farmers

However, despite recent developments, the use of ICT is hampered by many problems. Table 6 lists the limitations of using ICT tools. According to the results, the main problems in this research are as follows: Farmers' reluctance to use ICT tools (x = 2.69), insufficient infrastructure to support ICT use (x = 2.75), lack of training on ICT. Technical skills (x = 2.71) and accessibility to ICT tools (x = 2.81). However, lack of information about ICT projects (x = 1.94) and lack of access to up-to-date agricultural information provided by ICT (x = 1.81) are not significant problems. This finding shows that one of the biggest barriers to ICT use is the accessibility of ICT tools and the lack of resources to support it. A possible explanation for this is that in rural areas there are problems such as maintenance, service failure, lack of energy and lack of access to large stores to purchase ICT equipment. This is consistent with the findings of (23), who found that lack of infrastructure, such as power outages and service outages, affects the use of ICT days in agricultural information, purchasing and advertising. This is consistent with the low literacy rate, inadequate ICT policies, problems in development, and the preference for development

projects as interventions showing the full impact of ICT (4; 16).

The majority of farmers in the research region believed that there was little training available for using these technologies and that using some of the equipment was tiresome. Similarly, farmers in the area encountered significant challenges due to a lack of interest in using ICT equipment and a lack of training to operate it. This is in line with the research done by (22), who discovered that rural farmers had unique obstacles when it came to using ICTs. These obstacles included the high price of personal computers, insufficient power sources, unreliable internet connectivity, and a lack of training and technological know-how. This result generally corresponds with the findings of (5), who found that low capacity of gateways to international networks or satellite systems, coupled with irregular, limited, and unstable power supplies, affect both few and poor telephone line users.

4. Conclusion

The research work's conclusions show that crop farmers in Niger State, Nigeria's Katcha, Bosso, and Wushishi Local Government Area of Agricultural zones i, ii, and iii, respectively, were aware of and used some of the various ICTs equipment that was available for information on production, marketing, and distribution. Although farmers' understanding of using ICTs to operate their farms was deemed moderate, they favored mobile phones, radios, and televisions over other sources of agricultural information because they were easily accessible. The main barriers to crop farmers in Niger State's Katcha, Bosso, and Wushishi Local Government Areas using ICT equipment were lack of access to ICT equipment and inadequate infrastructure to facilitate ICT use.

5. Recommendation

The study's conclusions led to the formulation of the following recommendations, which aim to raise rural farmers' awareness of how to use ICT technology for agricultural production.

i. The government should improve infrastructure—such as electricity—to allow agricultural growers to use information and communication technology.
ii. Government agencies and policy makers should establish and implement laws that will lower the cost of information and communication technology equipment so that the typical farmer may easily afford it.
iii. To facilitate farmers' constant access to ICT equipment, rural television watching centers and cybercafés should be built in various parts of Nigeria's states.
iv. To educate farmers about the numerous potential for utilizing ICT equipment in their farming operations, an ICT training program had to be set up or arranged. ICT training can be included into the provision of extension services to accomplish this.
v. Farmers should be provided with material and financial support to enable them to access and utilize ICT equipment.

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