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Socio-Economic Factors Influencing the Use of Information and Communication Technology for Accessing Agricultural Information among Cowpea Farmers in Alkaleri Local Government Area of Bauchi State, Nigeria

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ABSTRACT: The objective of the study was to determine socio-economic factors influencing the use of information and communication technology (ICT) for accessing agricultural information among cowpea farmers in Alkaleri Local Government Area of Bauchi State, Nigeria using using structured questionnaire. The result of the study showed that 83.33% of the respondents were males and about 77.50% of the cowpea farmers were married. Findings from the study also revealed that the mean age of the respondents was 39 year while the mean farming experience of the cowpea farmers was 18.60 years. Findings on educational status show that majority of the farmers had one form of formal education or another. The result also reveals that 70% of the cowpea farmers had no contact with an extension services. The co-efficient of gender and education were both positive and significant at 1% level and the co-efficient of farming experience was significant at 5%. Some of the major problems identified include unstable power supply, unaffordable cost of ICT tools, and lack of technical know-how and lack of confidence to operate ICTs. It was concluded that education, gender and farming experience were the socioeconomic variables that determine the use of ICTs for agricultural information on cowpea production among small holder farmers in the study area. It was recommended that trainings should be organized to help small holders cowpea farmers acquire the skills needed to operate ICTs tools, help them gain confidence on how to use ICTs, thereby facilitating adoption and use of ICTs for agricultural information.

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Today's world is widely information-driven where Information and Communication Technologies (ICT) are increasingly becoming the underlying drivers of social and economic development including agriculture, not only in developed countries but across the globe (Sennuga, 2019). The progress of farmers in their work largely depends on awareness, access, use and communication with accurate and reliable information (Nenna, 2016). It has therefore become necessary for agricultural sector to evolve towards modern technology and ICT to facilitate knowledge management process to reach the goals of sustainable development. Information and communication technologies (ICTs) are any device, tools that permit

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the exchange or collection of data through interaction or transmission. An increasing combination of technologies that are used to control information and back up communication can be referred to as information and communication technologies (Chikaire *et al.,* 2017). Examples of such technologies are software, hardware, CD-ROMs, e-mail, telephone, radio, television, and media for collection, storage, processing, digital cameras, and presentation of transmission in any format such as voice, data, text and image (Hassan *et al.,* 2019). Cowpea (*Vigna unguiculata*) can grow under harsh environmental conditions where other major crops fail to grow, Daryanto *et al.* (2015). In addition, one of the significant importances of cowpea to the ecology is the ability to fix atmospheric nitrogen in marginal soils where farmers have no access to agricultural inputs such as fertilizers or manure (Sennuga *et al.,* 2020). Its foliage is regarded as an important source of high-quality livestock feed. In addition, cowpea has the ability to restore soil fertility through nitrogen fixation, making it a good crop to use in crop rotation with major cereal crops (Daryanto *et al.,* 2015). cowpea provides feed, forage, hay, and silage for livestock, and green manure and cover crop which maintain the productivity of soils (Alemu 2016). Northern Nigeria produces about 1.7 million tons from about 4 million hectares, which represents over 60% of total national production (FAO, 2014). Katsina, Kano, Jigawa and Borno are notable States in cowpea production in northern Nigeria. Cowpea is one of the most preferred crops and a valuable component in the farming systems of majority of resource poor rural households in sub-saharan Africa for its various attributes (Molosiwa, 2016). Northern Nigeria produces about 1.7 million tons from about 4 million hectares, which represents over 60% of total national production (FAO, 2014). However the yield of cowpea have generally remained below the potential of the crop and consistently remained below the world average (6.2 million metric tons). Lack of information on sustained production is indicative of the fact that the production of cowpea in the study area is dominated by small holder farmers. The production and productivity of cowpea in the study area is hindered by the lack of access to modern technologies such as improved varieties and the accompanying crop pest management practices, inputs such as fertilizers, and poor input and output market access. The cowpea small holder farmers in Alkaleri Local government Area of Bauchi State can take advantage of the potentials of ICTs tools for optimum agricultural information for cowpea production. ICT tools are used to gather information regarding agricultural production in Nigeria. Small holder cowpea farmers need to source for a wide variety of information to increase their knowledge of cowpea production. It is believed that, when farmers are adequately informed and are aware of available ICT tools by which information can be accessed and utilized; it would help to improve productivity in their production (Abdulmuthallib *et al.,* 2022). In spite of the importance of ICT tools in providing information on various agricultural production practices, little is known about use of ICT tools by small holder cowpea farmers for sourcing information in Alkaleri Local government Area of Bauchi State. This has resulted in a knowledge gap which needs to be filled. The urgent need for current agricultural knowledge and information system by farmers calls for the adoption of information and communication technologies (ICTs) by farmers in a most efficient way. The objective of this study is to examine socio-economic factors influencing the use of information and communication technology (ICT) in the production of cowpea in alkaleri local government area of Bauchi state, Nigeria. The specific objectives were to; describe the socio-economic characteristics of cowpea farmers in the study area, assess the level of use of ICT facilities by cowpea farmers, determine the factors influencing the use of ICTs by cowpea farmers and identify the constraints to the use of ICT by cowpea farmers.

MATERIALS AND METHODS

Study Area: The study was conducted in Alkaleri Local Government of Bauchi state, which is among the thirteen (13) Local Government Areas in the state. Alkaleri Local Government Area is located on latitude 10°15′N and longitude10°20′E. The mean annual rainfall ranges between 1000-1200mm. The raining season starts April/May. The maximum humidity may increase drastically during the middle of raining season to about 96% in August and drop sharply to about 10% during harmattan around December. The major occupation of the inhabitants of Alkaleri LGA is farming (crop and animal production) and it forms the bedrock of their livelihood.

Sampling Techniques and Sample Size: Multi-stage random sampling method was used for the selection of respondents. In first stage, the three communities of the study area were purposively selected for high cowpea production. These communities were; Yashi, Badara and Dagudi. Thereafter, 25 respondents from each of the 3 communities were selected at random from the study area in order ensure fair representation and a total of 75 respondents were chosen.

Method of Data Collection and Analysis: Primary Data was collected using structured questionnaire. Data collected were subjected to both descriptive and inferential statistics. Descriptive statistical tools such

as frequency distribution, percentages, mean score, four point Likert type scale were used while the inferential statistical tool used was binary logit regression.

Model Specification: Five Point Likert Scale: Respondents' level of use of ICT was determined using five point Likert scale. The Likert scale is a measure of attitudes, preferences and subjective reactions by eliciting a response along the lines of strength of agreement with the scale items (Likert, 1932). To determine the level of use of ICT, responses were rated on a 5-point Likert'scale thus: highly used (5), used (4), undecided (3), highly not used (2), and not used (1) for each of the ICT facilities. The responses were counted with respect to the weights. The score for each variable was multiplied by the corresponding weight to obtain a weighted score. The weighted scores were then summed to obtain a weighted sum. The weighted sum was further divided by the number of respondents to obtain a weighted mean for each technology. Finally, the weighted means were sorted in descending order against the decision rule. The mid-point values of the scale were summed up and further divided by 5 to obtain a mean of 3.0.

The decision rule is that any technology with weighted mean value equal to or above the cut-off mean of 3.0 was considered to have high usage, while any technology with weighted mean of less than 3.0 was considered to have low usage. These weighted means were used to determine the relationship between the dependent variable (level of use of ICT) and the independent variables. The weighted score was used as the dependent (Y) variable in the regression. For this study; level of ICT use is denoted thus;

i. High use (1=Used).
ii. Low use (0 = not used)

Logit Regression: Factors influencing the use of information and communication technology (ICT) by cowpea farmers was measured using a binary logistic regression model.
The implicit form of the Logit model is specified as:

$$Y = f\ (X1, X2, X3, X4, X5, X6, X7) \quad (1)$$

The Logit model in its explicit form is expressed as:

$$Y = \beta o + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + \beta 6X6 + \beta 7X7 + e$$

Where; Y = ICT use by the small-holder farmers of cowpea (measured as dummy: 1 if farmers use ICT, 0 if otherwise); X_1 = Age (years); X_2 = Sex (male = 1, female = 0); X_3 = Marital status (married = 1, otherwise = 0)
X_4 = Household size (number): X_5 = Education (years): X_6=Farming experience (years): X_7=Extension Visit: βo = constant: β1 – β7= coefficients of the independent variables: e= error term

RESULTS AND DISCUSSION

Socio-economic Characteristics of Respondents in the Study Area are presented in Table 1 Sex: The distribution of cowpea farmers based on gender indicates that 88% of the respondents were male and 12% were female. The implication of this finding to the study area shows that majority of the people involved in cowpea production were male.

Age: The distribution of cowpea farmers based on age shows that 44% of the respondents were aged 41 years and above, 33% were aged between 31 and 40 years, and 23% were aged between 20 and 30 years with the mean age of the respondents been 39 years in the study area.

The implication of this finding is that a larger number of the farmers were strong able-bodied males and females capable of doing farm work. This should facilitate the adoption of ICTs by the farmers since age is a determinant factor for technology adoption. The finding agrees with the findings by Egwu and Igwe (2013) who asserted that young people participated in the use of ICT in agriculture.

Marital Status: The distribution of cowpea farmers based on marital status indicates that 77% of the respondents are married, 19% are single and 4% are widowed.

Household Size: Results further show that 52% of the cowpea farmers had a household size of 1-10 persons, followed by 28% with a household size of 12-20 persons. Furthermore, 20% had a household size 21 household members and above. A mean household size of 14 persons was obtained.

This implies that the farmers had a fairly large household size which could probably serve as an insurance against short falls in supply of farm labour. Household size has a great role to play in family labour provision in the agricultural sector.

Level of Education: Finding on educational status of the respondents shows that majority of the farmers had one form of formal education or another. About 55% had primary education, 32% had secondary education and 8% has tertiary education while 5% had no formal education.

With this educational level, the cowpea farmers should be able to operate simple ICT tools with ease. However, low educational attainment of the majority might limit the ability of the cowpea farmers to use different information and communication technologies optimally.

Table 1: Socio-economic Characteristics of the Respondents

Variable	Frequency	Percentage	Mean
Sex			
Male	66	88.0	
Female	9	12.0	
Age (years)			
20-30	17	23.0	
31-40	25	33.0	
41 and above	33	44.0	39
Marital status			
Married	58	77.0	
Single	14	19.0	
Widowed	3	4.0	
Household size			
1-10	39	52.0	
11-20	21	28.0	
21 and above	15	20.0	14
Level of education			
Primary education	41	55.0	
Secondary education	24	32.0	
Tertiary education	6	8.0	
Non-formal education	4	5.0	
Farming experience			
1-10	16	21.0	
11-20	24	32.0	
21 and above	35	47.0	19
Extension contact			
Yes	22	29.0	
No	53	71.0	

Source: field survey, 2024

Farming Experience: The years of farming experience revealed that 21% of the respondents had farming experience of between 1 and 10years, 32% had 11-20 years of farming experience, while 47% had farming experience of 21 years and above. The mean farming experience is 19 years.

Extension Visits: Result on extension visits reveals that majority (71%) of the cowpea farmers had no contacts with extension agents while the remaining 29% had extension visits. The probable reason might be due to shortage of man power that characterizes public extension system in Nigeria.

Level of Use of ICT Facilities: The result in Table 2 shows the level of ICT use by cowpea farmers. The result shows that three (3) out of seven (7) listed ICT facilities had mean values above the cut-off mean of 3.0 and thus were considered the ICT facilities that were highly used by the cowpea farmers. The radio had the highest mean value of 3.76. This was followed by GSM (phone) and TV with mean values of 3.10 and 3.08 respectively. The ICTs whose mean scores were below the cut-oof point of 3.0 included newspaper/bulletins (1.86), internet (1.84), computer (1.81), digital camera (1.81) and video player (1.70). This result indicates that use of ICT facilities by cowpea farmers was low. This collaborates with Ogunjimi *et al.* (2020) that the accessibility of media sources does not necessarily mean its use. Use of radio might be as result of the fact that radio was relatively cheap and readily available as a means of communication.

Table 2: Mean Rating of ICT Use by Cowpea Farmers

ICT	Level of Use of Technology						
	HU(5)	U(4)	N(3)	HNU(2)	NU(1)	Sum	Mean
Radio	105	156	-	12	9	282	3.76*
Television	55	132	9	14	21	231	3.08*
GSM (Phone)	45	124	21	30	13	233	3.10*
Newspaper/Bulletins	-	-	45	70	25	140	1.86
Internet	-	-	33	82	23	138	1.84
Computer	-	-	45	64	27	136	1.81
Digital camera	-	-	24	90	22	136	1.81
Video player	-	-	18	82	28	128	1.70

HU= highly used, U= Used, N= Neutral, HNU= highly not used, NU= not used

Determinant Factors Affecting the Use of ICTs in the Production of Cowpea: The results of the logit regression analysis revealed that the coefficient of determination (R^2) was 0.672. Implying 67.2% of the total variations in the use of ICTs for agricultural information (Y) was explained by the socioeconomic variables (X) included in the model. The regression results further show that 3 socioeconomic characteristics (education, gender, and farming experience) of the farmers were significant at different probability levels. The coefficient of education (0.318) and gender (0.318) were both positive and significant at 1% level of probability respectively. This implies that an increase in educational status of the cowpea farmers will lead to a corresponding increase in probability of ICTs usage for agricultural information on cowpea production. The positive influence of education on the use of ICTs is that education creates a favourable mental attitude for the acceptance of new technology such as ICTs. It can therefore be inferred

that the more educated the farmers, the more likely they will chose ICTs for their agricultural information needs. Gender of the cowpea farmers was positive.

Table 3: Socio-economic Factors Influencing the Use of ICT by the Respondents

Variables	SE	Coefficient	T-value
Constant	3.799	16.143	4.249
Education	0.178	0.318	3.803***
Gender	0.529	0.318	3.809***
Farming experience	0.551	-0.175	-2.295**
Age	0.538	-0.141	-1.971
Marital status	0.126	0.103	1.279
Household size	0.993	-0.018	-0.233
Extension visits	0.672	0.116	1.640
R^2	0.505		
Adjusted R^2	0.472		

*Note: ***1% and **5%*

The positive sign means that there was no gender discrimination in the level of ICTs usage for agricultural information. It therefore implies that both male and female cowpea farmers utilize ICTs for agricultural information, converse to Egwu and Igwe, (2013) found a negative relationship in the level of access and use of ICT as a source of agricultural technology delivery in their study area. The coefficient of farming experience (-0.175) was negative and significant at 5% level of probability. The negative sign implies that as farmers get older and increases in years of farming, they tend to adhere strictly to farming practices that they are used to.

Constraints Faced by the Cowpea Farmers in Using ICTs for Information in the Study Area: The distribution of the cowpea farmers based on constraints faced in the use of ICTs for agricultural information is presented in Table 4.3. These includes unstable power supply, unaffordable cost of ICT tools, lack of technical know-how and lack of confidence to operate ICTs. These problems were ranked 1st, 2nd, 3rd and 4th respectively. Finding is supported by Chikaire *et al.,* (2017) who reported similar findings on constrained faced by farmers in the use of ICTs in Imo State. Lack of government control on call charges and problem of connectivity were ranked 5th and 6th respectively. Problem of call charges and poor connectivity of ICTs might discourage cowpea farmer's use of ICTs for agricultural information channel. This probably accounts for limited use of more of the ICTs accessible to the cowpea farmers in the study area.

Table 4: Distribution of Cowpea farmers based on the constraints faced in using ICT

Constraints	*Frequency	Percentage	Rank
Unstable power supply	70	93.0	1st
Unaffordable cost of ICTs tools	63	84.0	2nd
Lack of technical know-how in operating ICT	60	80.0	3rd
Lack of confidence in operate ICTs	59	79.0	4th
Lack of government regulations call charges	32	43.0	5th
Problem of connectivity	24	32.0	6th

Source: Field Survey 2023

Conclusion: The study established that education, gender and farming experience were the socioeconomic variables that determine the use of ICTs for agricultural information at different probability levels. Four main constraints that hinder the use of ICTs for agricultural information source were reported by the farmers. It is recommended that extension agents should embark on awareness and training program on ICTs for cowpea farmers in the study area. Training will impart skills needed to operate ICTs tools, help them gain confidence on how to use ICTs, thereby facilitating adoption and use of ICTs for agricultural information by both the young and old farmers.

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