



EFFECT OF ACCESS TO INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) ON FOOD SECURITY STATUS AMONG FARMING HOUSEHOLDS IN BEKWARRA LOCAL GOVERNMENT AREA OF CROSS RIVER STATE, NIGERIA

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ABSTRACT

ICTs do not directly ensure household food security but play a vital role in enhancing rural livelihoods by providing timely information that empowers productive decisions. This study examined the effect of access to ICTs on food security among farming households in Bekwarra Local Government Area, Cross River State, Nigeria. A multi-stage sampling technique was used in selecting 151 respondents. Descriptive statistics, food security index, and Binary Logit regression model were used for data analysis. The result shows that 69.5% of the respondents had a household size of between 1-10 members and 60.3% of the respondents were male. The mean age of respondents was 41.27 years, with 64.2% married. The mean per capita monthly food expenditure was ₦12,314.29, with a food security line of ₦8,209.53, it was further revealed that 66.2% of households were food insecure, while 33.8% were food secure. The relationship between access to ICT and food security among farming household revealed that Access to Radio, Access to television, Access to mobile phone and years spent in school were positively significant to the respondents food security status; while age and household size were negatively significant to the farming household food security status. The study concluded that access to ICT affects food security, with respondents adopting various coping strategies. It was recommended that ICT devices such as Radio, Television, mobile phones and internet services should be made accessible for farmers to improve their information sources on production in order to improve food security.

Keywords: *Information and Communication Technology (ICT), Food Security, Farming, Households*

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INTRODUCTION

Information and Communication Technology (ICT) has emerged as a pivotal driver of economic and social development globally. In Nigeria, the adoption and utilization of ICT have experienced significant growth over the past two decades, catalyzed by policy reforms and investments in telecommunication infrastructure (Apulu, 2012). The expansion of mobile phone networks, internet access, and digital literacy initiatives has transformed various sectors, including agriculture, health, and education (West, 2015). The significance of ICT extends beyond connectivity and communication; it encompasses a wide range of applications that enhance efficiency, productivity, and innovation across various sectors. In agriculture, ICT facilitates access to market information, weather forecasts, and extension services, thereby improving decision-making and productivity among farmers (Aker, 2011).

Food security, as defined by the Food and Agriculture Organization (FAO), exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO, 2006). The dynamics of food security encompass four main dimensions: availability (sufficient quantities of food), access (adequate resources to obtain food), utilization (appropriate use based on knowledge and health), and stability (consistent access over time) (Barrett, 2010). Achieving food security is multifaceted, involving agricultural productivity, market dynamics, socio-economic factors, and policy frameworks. ICT has a transformative potential in enhancing food security by addressing various challenges across the food value chain. By providing farmers with timely access to information on market prices, weather conditions, and pest management, ICT can improve agricultural productivity and reduce losses (Nakasone *et al.*, 2014). Furthermore, ICT facilitates efficient supply chain management, reducing transaction costs and enhancing market linkages (Mittal and Mehar, 2016). Digital platforms also enable the dissemination of agricultural knowledge and best practices, empowering farmers to adopt innovative and sustainable farming techniques (Baumüller, 2018). The principal purpose of this study is to empirically assess the effect of access to Information and Communication Technology (ICT) on the food security status of farming households in Bekwarra Local Government Area of Cross River State, Nigeria. The major argument of this study is that enhanced access to ICT significantly improves food security among farming households by facilitating better access to agricultural information, market opportunities, and resources. This study aims to contribute to the existing body of knowledge by providing empirical evidence on the impact of ICT on food security in a specific rural context, thereby informing policy and interventions aimed at leveraging ICT for agricultural and food security improvements.

Some studies have been carried out in relation to the role of ICTs in improving the food security of rural households. For instance, Van Crowder and Fortier (2000), Lashgarara *et al.* (2010) reported that ICTs have the potential to improve the ability of individuals to acquire information needed for promoting food security. Nigeria as well can benefit from this knowledge and information simply by acquiring existing knowledge, produce new knowledge and apply this knowledge to foster development especially in agriculture. However, rural communities have not explored the full potential of these facilities to better their living conditions because these tools have not been uniform or sufficiently widespread as poor, marginalized and illiterate farmers are often excluded due to lack of knowledge. Without adequate knowledge and skills on the use of ICTs among farming household, recent literature search on utilization of ICT in agriculture, food and nutritional security has shown that little or no effort has been tailored towards investigating the contributions of ICT usage to household food security among farmers in Nigeria. This gap therefore necessitated this study which ascertained the contributions of ICT to household food security among farmers in Bekwarra Local Government Area of Cross River State, Nigeria. The broad objective of this study is to examine the effect of access to information and communication technology (ICT) on food security among household farmers in the study area. The specific objectives were to:

- i. describe the socio-economic characteristics of the respondents in the study area;
- ii. analyze the food security status of the respondents in the study area;
- iii. identify the rank type of ICT device used by the respondents in the study area;
- iv. identify the relationship between access to ICT and food security among farming household in the study area;
- v. identify the coping strategies adopted towards food insecurity in the study.

Methodology

Study Area

The study area is Bekwarra Local Government area of Cross River State, which is located within the south-south of Nigeria. Bekwarra Local Government falls under the northern senatorial district of Cross River State otherwise known as cross river north senatorial district alongside Obanliku, Obudu, ogoja, yala. Bekwarra has a population as of the 2006 national population census of 105,822 with 54,585 and 51,237 and 127,445 in 2011 and 173,907 by 2015 (base on growth rate of 2.8% per annum) male and female. Bekwarra lies between latitude $6^{\circ} 37'$ and $6^{\circ} 45'$ North and longitude $9^{\circ} 48'$ East of the equator with an estimated land area of about 400 square

meter. The annual mean temperature of Bekwarra ranges from 29⁰C – 32⁰C. The average rainfall varies from about 2286.00mm to 2285.00mm. The rainy season lasts from April through October with a slight break in July/August. Dry season starts from November to March. This climate condition is considered quite conducive for cultivation of fruit trees, cereals, and tubers.

Sampling Procedure

A multi-stage sampling technique was used to arrive at the selection of one hundred and fifty one (151) respondents using primary data with the aid of well-structured questionnaires which were administered to the respondents in the study area. Firstly, Five (5) wards were selected using even number counts, which gave the following wards; (Nyanya, Ukpah, Ibiaragidi, Afrike Ochagbe and Ugboro). Secondly, Sixteen (16) villages were randomly selected. Lastly, involved random selection of respondents in proportionate to the size of the households in each sampled villages which gave rise to one hundred and fifty one (151) respondents.

Data Analysis

Data obtained was analyzed using descriptive statistics such as frequency, percentage and mean to achieve objective i, iii and v. Food security index (per capita food expenditure) were used to analyzed objective ii and Binary logit regression model were used to analyze objective iv.

Model Specification

Food Security Index

The households were classified into food secured and food insecure households using the food security index as earlier used by Titus and Adetokunbo (2007). These were used to establish the food security status of various households. It is given by:

$F_i = \frac{\text{Per capita food expenditure for the each household}}{\frac{2}{3} \text{ mean per capita food expenditure of all households}}$(1)

Where, F_i = food security index, when $F_i > 1$ = household is food secured and $F_i < 1$ = household is food insecure. A food secured household is therefore those with a per capita monthly food expenditure falling above or equal to two-third of the mean per capita food expenditure. On the other hand, a food insecure household is that whose per capita food expenditure falls below two-third of the mean monthly per capita food expenditure.

Binary Logit Regression Model

The logit model was also used to estimate the determinants of food security among households. The relationship between food security status variable Y_i and its determinants X_i is given as, $Y_i = \text{logit}(\mu_i) = \ln \left(\frac{\mu_i}{1 - \mu_i} \right) = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \dots + \beta_k X_{ik} + \mu_i$ (2)

Where $Y_i = 1$ for $X_i > 0$ otherwise and $i = 1, 2, 3, \dots, n$ X_i is a vector of explanatory variables and $\hat{\alpha}$ is the vector of parameters. The logit model computes a maximum likelihood estimator of β given the non-linear variable, which is one when the household is food secured and zero if otherwise. The explanatory variables X_i are;

X_1 = Access to Radio (Yes = 1, No = 0)

X_2 = Access to Television (Yes = 1, No = 0)

X_3 = Access to Personal Computer (Yes = 1, No = 0)

X_4 = Access to Mobile Phone (Yes = 1, No = 0)

X_5 = Age (years)

X_6 = Access to Internet (Yes = 1, No = 0)

X_7 = Marital Status (Married = 1, Single = 0)

X_8 = Household Size (Numbers)

X_9 = Years spent in School (years)

μ_i = error term.

Results and Discussion

Socio-Economic Characteristics of the Respondents

The distribution of respondents by sex shows that 60.3% are male and 39.7% are female, reflecting traditional gender roles in agriculture, where men tend to dominate (Agwu *et al.*, 2011). However, the significant female presence highlights the critical role women play in agricultural productivity and food security (Enete *et al.*, 2011). This underscores the need to consider both genders in ICT-based agricultural interventions. Age, the majority of farmers (60.9%) is between 41-60 years old, followed by 26.5% aged 61-80, and 12.6% aged 21-40. The prominence of middle-aged farmers, who combine experience with physical capacity, is crucial for agricultural productivity. This age group is also more likely to adopt innovative farming practices, including ICT, to maintain or enhance productivity (FAO, 2017). Educationally, 54.3% of respondents have tertiary education, 25.2% have secondary education, 13.2% have no formal education, and 7.3% have primary education. The high proportion of educated respondents indicates a potential for ICT adoption, as educated

farmers are more likely to understand and use these tools to access agricultural information, market prices, and weather forecasts, which can improve decision-making and productivity (Aker, 2011). Marital status, 64.2% of respondents are married, while 13.2% are single and widowed/widowers, with 9.3% separated. The predominance of married respondents reflects traditional rural structures, where marriage is common. Married farmers, with greater family responsibilities, are more likely to adopt ICT to enhance productivity and food security (Adepoju and Obayelu, 2013).

Household size data shows that 69.5% of respondents have 1-10 members, while 30.5% have 11-20. Smaller households may face labor shortages, potentially affecting agricultural productivity, but they also have lower food consumption needs, which influence their food security (Ellis, 2000). Such households often rely on external labor or community cooperation to meet farming needs. Cooperative membership, 59.6% of respondents do not belong to any cooperatives, while 40.4% are members. Cooperatives provide access to resources, credit, inputs, and market information, which enhances productivity and food security (Bernard and Spielman, 2009). Membership also facilitates access to ICT through shared resources and training, promoting the adoption of improved agricultural practices (Shiferaw *et al.*, 2011). Credit access is available to 54.3% of respondents, while 45.7% lack such access. Credit is crucial for enhancing agricultural productivity and food security by enabling farmers to invest in improved technologies, purchase quality inputs, and manage farms more efficiently. Credit access also supports ICT adoption, which can enhance productivity (Khandker and Koolwal, 2016). Occupation, 37.7% of respondents are civil or public servants, 33.8% are farmers, 27.2% are traders, and 1.3% are entrepreneurs. The high percentage of civil servants suggests that many respondents have stable employment and potentially higher incomes, which gives them better access to resources, including ICT, for supporting agricultural activities (Aker, 2011). Farming remains a significant livelihood for 33.8% of respondents, and these farmers are poised to benefit from ICT interventions that improve market access, agricultural information, and weather updates (Asenso-Okyere and Mekonnen, 2012).

Most respondents (72.2%) have additional income sources beyond their primary occupation, while 27.8% do not. The high percentage of income diversification reflects households' efforts to mitigate risks and enhance economic stability and food security (Ellis, 2000). Households without additional income sources may be more financially vulnerable, relying solely on primary occupations, which can expose them to risks like poor harvests and market fluctuations. Finally, 58.9% of respondents have 21-40 years of farming experience, 25.2% have 1-20 years, and 15.9% have 41-60 years of experience. The significant number of experienced farmers indicates a deep understanding of agricultural practices in the area. These farmers are more likely to adopt improved practices and technologies, including ICT, to enhance productivity and food security (Doss and Morris, 2001). Moreover, younger farmers with less experience are often more open to adopting innovative technologies, supporting ICT adoption in agriculture (Moran, 2005).

Table 1: Socio-Economic Characteristics of the Respondents

	Frequency	Percentage
Age		
21-40	19	12.6
41-60	92	60.9
61-80	40	26.5
Educational Level		
no formal education	20	13.2
primary school	11	7.3
secondary school	38	25.2
tertiary school	82	54.3
Marital Status		
Single	20	13.2
Married	97	64.2
widow / widower	20	13.2
Separated	14	9.3
Household size		
1-10	105	69.5
11-20	46	30.5
Member of Cooperative		
No	90	59.6
Yes	61	40.4
Access to Credit		
No	69	45.7
Yes	82	54.3
Occupation		

Farming	51	33.8
Trading	41	27.2
civil / public service	57	37.7
Entrepreneur	2	1.3
Other source of income		
No	42	27.8
Yes	109	72.2
Farming Experience		
1-20	38	25.2
21-40	89	58.9
41-60	24	15.9
Total	151	100.0

Source: Author's compilation

Food Security Status of Respondents

Food security index which is per capita food expenditure for the i^{th} household divided by $2/3$ mean per capital food expenditure of all households was used to determine the food security status (Olayiwola *et al.*, 2017). The result of the food security status of respondents was revealed in Table 2. The mean per capita expenditure of households was ₦12,314.29, this value were used as the food security indices. This implies that, all respondent whose per capita monthly food expenditure falls less ₦12,314.29 were regarded as being food insecure. This is because, it is an indication that these households were unable to meet their expected food expenditure. The finding on table 2 indicates that 66.2% of respondent were food insecure while 33.8% were food secured.

Table 2: Food Security Status of Respondents

Food Security Status	Frequency	Percentage
Food insecure	100	66.2
Food Secured	51	33.8
Total	151	100.0
Mean per capita household for expenditure (MPCHHFE) is ₦12,314.29		
Food security line ($2/3$ of MPCHHFE) is ₦8,209.53		

Source: Author's compilation

Distribution of Respondents Access to ICT

This section indicates respondents' access to information and communication technology (ICT) components in the study area. Table 3 revealed the mean and rank of various ICT components mostly used by the respondents. GSM phones ranked 1st, with mean score (4.70). Radio ranked 2nd with mean score (4.44), Television set ranked 3rd with mean score (4.33). CD/DVD player ranked 4th with mean score (4.32), VHS video player ranked 5th with mean score (4.07). Internet ranked 6th with mean score (3.44), Cassette recorder ranked 7th with mean score (3.37), Computer ranked 8th with mean score (3.28). Camera ranked 9th with mean score (3.12), Land line phones ranked 10th with mean score (2.86). PDAs ranked 11th with mean score (2.83), Cinema ranked 12th with mean score (2.31), Overhead projector ranked 13th with mean score (2.27). GIS ranked 14th with mean score (2.21) and FAX ranked 15th with mean score (1.82). This result confirms the finding of Owen (2008) who reported that the most available ICT tools used by farmers are cell phone, radio and television. This implies that conventional ICTs (radio, television and telephones) still remain the most available ICTs to farmers in the study area. Nevertheless, Lashgarara *et al.* (2010) reported that old ICT tools (radio, television and cell phones) are the major ICT facilities for acquiring information related to household food security dimensions among rural households in Iran.

Table 3: Distribution of Respondents Access to ICT

ICT Components	Mean	Rank
Do you have access to GSM phones	4.70	1
Do you have access to land line phones	2.86	10
Do you have access to television set	4.33	3
Do you have access to cinema	2.31	12
Do you have access to camera	3.12	9
Do you have access to internet	3.44	6
Do you have access to computer	3.28	8
Do you have access to overhead projector	2.27	13
Do you have access to Fax	1.82	15

Do you have access to cassette recorder	3.37	7
Do you have access to pocket devices (PDAs)	2.83	11
Do you have access to Radio	4.44	2
Do you have access to GIS (Geographic Information System)	2.21	14
Do you have access to CD/DVD player	4.32	4
Do you have access to VHS video player	4.07	5

Source: Author's compilation

Relationship between Access to ICT and Food Security among Farming Households

The relationship between access to ICT and food security among farming household in the study area were analyzed using binary logit regression model. The Pseudo R-square of 0.7553 implies that all the explanatory variables included in the model were able to explain 75.53% of the variation in the relationship between access to ICT and food security status of the respondents. The log-likelihood ratio (LR) test was significant at one percent (1%) meaning that the model was adequate in explaining the probability of the effect of the explanatory variables on farmers' food security status. The result of the model is given in the Table below and it was revealed that Access to Radio, Access to television, Access to mobile phone and years spent in school were positively significant to the respondents food security status; while age and household size were negatively significant to the farming household food security status.

Access to Radio (X_1) is statistically significant at 5% and had a positive relationship with food security. This signifies that for a unit increase in access to radio, the level of food security will increase by 1.897689. This implies that, an increase in access to radio by the farmers increases the possibility of a household becoming food secure. This is because the farmers might have acquired a lot of knowledge and experience about farming practices through listening to some innovation or farm training through radio, which will increase his productivity and in turn increases his food security status. This finding aligns with that of Isaac and Ayodeji (2019). Access to Television (X_2), the variable was significant at 1% and had positive relationship with farmers' food security status, which indicated that the probability of household food security increases as farmers have access to television. Specifically, access to television by the farmer increased the probability of being food secure by 835.5125.

Access to mobile phone (X_4) is significant at 5% and had a positive with the food security status of the farmer. This implies that a unit increase in access to mobile phone of the respondent will probably increase food security status by 16.80763. With the help of a phone, the farmer will be able to access vital information and innovation to increase his productivity, which will translate to increase his/her food security status. This result is in agreement with Isaac and Ayodeji (2019). The result shows that age (X_5) variable had negative relationship on farmers' food security and was significant at 1%. The negative sign implies that a unit increase in age of the farmers will lead to 0.0193198 decreases in the food security status of the farmers; this thus suggests that as farmers grow older, they tend to be less productive and thus less food secured. This is in agreement with Babatunde *et al.* (2007), who reported that the older the household heads, the lower the probability that the household would be food secure.

Household size (X_8) of the respondents was statistically significant at 5% and exhibited a negative relationship with food security status. Which implies for every unit increase in the households size leads to probability of decrease in food security by 0.0221325. As the number of the household member increases so also the quantity of food consumed by an individual in the house decrease there by leading to a decrease in the food security status of the farmers. Years spent in school (X_9) of household was statistically significant at 5% and exhibited a positive relationship with food security status. This implies that, increase in the number of years spent in school increases the possibility of a household becoming food secure by 85.91254. Educated farmers have the ability to adopt innovation, which will lead to an increase in production and translate to improving the food security status of the farmer. This result is in agreement with Tari *et al.* (2016).

Table 4: Relationship between access to ICT and food security among farming household

Variables	Odds Ratio	Standard Error	Z	P>z
Access to Radio (X_1)	1.897689	0.6052396	2.01	0.045**
Access to Television (X_2)	835.5125	1659.389	3.39	0.001***
Access to Personal Computer (X_3)	2.116079	2.10246	0.75	0.451
Access to Mobile Phone (X_4)	16.80763	19.62467	2.42	0.016**
Age (X_5)	0.0193198	.0266042	-2.87	0.004***
Access to Internet (X_6)	3.591505	3.965563	1.16	0.247
Marital Status(X_7)	0.301742	0.4428127	-0.82	0.414
Household Size (X_8)	0.0221325	0.0339782	-2.48	0.013**
Years spent in School (X_9)	85.91254	154.5012	2.48	0.013**
Constant	0.0014315	0.003159	-2.97	0.003***

Pseudo R ²	0.7553
Prob > chi2	0.0000***

Source: Author's compilation *** sign at 1%, ** sig at 5% and * sig at 10%

Coping strategies adopted towards food Insecurity

FAO (2013) defined coping strategies as what people are willing to embark on for sustainability where they are food insecure. Households actively try to protect their livelihoods, adopting several actions and mechanisms when faced with shocks and stresses that affect their livelihood or livelihood outcomes, one of which is food insecurity. These behavioral responses are termed coping strategies and encompass a wide range of economic, social, political and behavioral responses to declining food security or perceived threats to food insecurity (Hadley and Crooks, 2012). Table 6 showed the coping strategies employed by the respondents toward food insecurity. According to Adebayo and Abegunrin (2013), these strategies are effective in coping with the problem associated with food security. The result revealed that; allowing children eat first had the highest percentage (72.2) in always column, reliance on less preferred food had the highest percentage (68.9) in occasionally and withdrawal of children from school had the highest frequency in never column. This implies that the household^{heads} priority is to see to the welfare of the entire household by providing food even if it is less preferred; children are always allowed to eat first no matter quantity of food.

Table 5: Coping Strategies Adopted by the Respondents

	Always		Occasionally		Never	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Reliance on less preferred food	23	(15.2)	104	(68.9)	24	(15.9)
Reduced food quantity served at meal time	20	(13.2)	91	(60.3)	40	(26.5)
Eating once a day			52	(34.4)	99	(65.6)
Letting children eat first			109	(72.2)	42	(27.8)
Buy food on credit	3	(2.0)	80	(53.0)	68	(45.0)
Buying of less expensive food	24	(15.9)	89	(58.9)	38	(25.2)
Selling livestock to buy food	20	(13.2)	86	(57.0)	45	(29.8)
Rationing money	97	(64.2)	51	(33.8)	3	(2.0)
Eating wild fruit	70	(46.4)	72	(47.7)	9	(6.0)
Begging for food	2	(1.3)	11	(7.3)	138	(91.4)
Borrowing money	6	(4.0)	81	(53.6)	64	(42.4)
Selling durable assets	7	(4.6)	82	(54.3)	62	(41.1)
Migrating to search for job	28	(18.5)	68	(45.0)	55	(36.4)
Withdrawal of children from school	6	(4.0)	15	(9.9)	130	(86.1)
Eating crops reserved for next planting season	15	(9.9)	77	(51.0)	59	(39.1)

Source: Author's compilation

Conclusion

The findings in this study revealed the effect of access to information and communication technology on food security status among farming household, is a problem in the study area. In addition, different coping strategies have been employed by respondents to reduce the effects of household food insecurity and with the use of some ICT devices to get information of which some appear to be more effective than others. The result revealed that Access to Radio, Access to television, Access to mobile phone and years spent in school were positively significant to the respondents food security status; while age and household size were negatively significant to the farming household food security status. However, all aiming at having a food secured household in the study area. Based on the findings of this study, the following recommendations were made;

- ICT devices such as Radio, Television, mobile phones and internet services should be made accessible for farmers to improve their information sources on production in order to improve food security.
- Farmers should be educated on family planning in order to curtail large number of household size to increase food security seeing that large household size decreases food security status.
- Farmers with higher level of education should be encouraged to venture into farming due to the fact that numbers of years significantly increase food security.

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