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# INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTs) USAGE AND HOUSEHOLD FOOD SECURITY STATUS OF MAIZE CROP FARMERS IN ONDO STATE, NIGERIA: IMPLICATION FOR SUSTAINABLE DEVELOPMENT.

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# **INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTs) USAGE AND HOUSEHOLD FOOD SECURITY STATUS OF MAIZE CROP FARMERS IN ONDO STATE, NIGERIA: IMPLICATION FOR SUSTAINABLE DEVELOPMENT.**

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## **Abstract:**

The poor performance of agricultural sector as a result of insufficient information has led to food availability, access and utilization problems at the household and national levels. However, farming households have not maximally explored the full potential of ICT for accessing information related to food security. This study therefore, assessed ICT usage and household food security status of Maize crop farmers in Ondo State, Nigeria. Multi-stage sampling technique was employed in selecting 212 maize farmers who were household heads. Structured interview schedule was used as data collection instrument. Descriptive statistics (frequency counts, percentages, Mean) and inferential statistics (binary logit regression) were used for data analysis. The finding revealed that cell phone (92.5%), radio (86.3%) and television (67.9%) were the most available ICT tools for accessing information on food security dimensions. More than half (52.4%) of the respondents were food insecure in the study area. Mean while, the estimates of Binary logit regression analysis showed that household size, membership of social organization, farm size, cell phone usage and perception towards contribution of ICT usage were found to have significant effect on household food security status. The study therefore recommended that extension institutions should concentrate on the identified ICT tools especially cell phones in disseminating relevant and timely information to farming households for sustainable food security.

**Keywords:** Communication, Development, Food security, Information, Technology, Nigeria

## **Introduction**

Agriculture is a major source of livelihood in Nigeria, supporting 70% of the total population and accounting for 17.8 % of Nigeria's gross domestic product in 2015. Although, agriculture is a growing sector in Nigeria's economy with a mean annual growth rate of approximately 6.3% (NBS, 2015). Despite the performance of the sector, the issue of food insecurity remains a great challenge. The first Millennium Development Goals (MDGs) target was to eradicate extreme poverty and hunger in many nations of the world. This target was to be achieved by reducing the

proportion of people who suffer from extreme hunger and those whose income was less than one US dollar per day (FAO, 2005). In this regards, improved agricultural productivity is the key player in order to achieve food security. Currently, the MGS had since terminated in 2015 for the current Sustainable Development Goals(SDGs). However, the available statistical data on the first Millennium Development Goal shows that the target was not been fully achieved. In many African countries, Nigeria inclusive, there is high prevalence of under nutrition and food insecurity at both the national and household (FAO, 2003).

Food is the basic need and necessity of life that must be satisfied before any other developmental issue. Inadequate nutrition is considered as measure of poverty in many societies or synonymous to poverty (Datt *et al.*, 2000). According to Helen (2002), food security is known to maintain political stability and ensures peaceful coexistence among people while food insecurity on the other hand results into poor health and reduces performance of both children and adults. Food security is therefore defined “as a situation when all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for a healthy and active life” (World Food Summit, 2003). According to World Bank report, three pillars underpinning food security has been identified. These are: food availability, food accessibility and food utilization. This means that any country whose food production level is unable to satisfy these three dimensions criteria is termed to be food insecure.

Nigeria is being faced with the challenge of food insecurity and the, farming households are the most affected in terms of food insecurity and poverty. According to Awoke and Okorji (2004), smallholder farmers are those farmers who produce on subsistence level and cultivate less than five hectares of land annually on the average. Majority, more than 80 percent of the smallholder farmers in the developing countries are food insecure and depend largely on land as their primary

source of livelihoods and three out of every four poor people that lives in the rural areas depend on agriculture either directly or indirectly for their livelihood (Cruz, 2010). Food security of farming households is of serious concern because farmers who are vulnerable to food and nutritional insecurity have limited capacity to respond to agricultural development.

A critical factor in meeting the challenge of ensuring food security among rural households in developing countries is human resource development through knowledge building and information sharing (Murithii, 2009). According to Rafea (2009), there is a general lack of relevant and accurate information on production practices, farm management, prices of agricultural produce, food security dimensions and markets for agricultural products that can better the lots of farmers.

The use of Information and Communication Technologies (ICTs) therefore takes the lead of all the strategies for ensuring household food security among rural populace through the dissemination of relevant information (Batchelor et al., 2005). ICT consists of various collections of resources and technical tools that are used for connecting, spreading, storing and managing information (Pigato, 2004). However, Chowdhury (2001) enumerated the importance of ICTs in relation to food security and poverty reduction. This is achieved by making information available on food security dimensions, marketing of produce and in overall helping farmers in making rational decisions. In general, the capacities of ICTs on food security are related to improving communication between research systems, farmers and extension, improving accessibility to information regarding inputs, introducing technologies, providing more rapid accessibility to high quality information, ensuring information about the appropriate times and places for optimized sales of agricultural products, increasing agricultural products and decreasing agricultural product losses (Temu and Msya, 2004).

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. ICT could be used to meet the information needs of the local people by sharing the acquired knowledge and information. This will abate the challenges faced at ensuring food security and lead to increased agricultural production, increased awareness and sharing of information that will eventually increase the chances of food security for all at all levels.

### **Problem Statement**

It has been observed that traditional approach of providing agricultural information through extension services has had several shortcomings, one of which is its failure to allow much interaction with users. New approach for promoting access to relevant agricultural information and food security is through the use of information and communication technologies (Van Crowder and Fortier, 2000). However, the potential of these ICT tools is under-utilized especially among the farming households. This has contributed to many problems militating against Nigerian agriculture and food security in the nation. Danaan (2006) relates this to high level of illiteracy and lack of technical know-how among farming population. The low level of education and literacy among rural farmers in the developing countries including Nigeria had resulted into great scarcity of skills and expertise essential in exploring the potentials of ICT in promoting agricultural productivity and food security. Illiteracy as viewed by Technical Center for Agriculture (CTA, 2004) hampers versatility in the use of ICTs making the number of

farmers who are hooked to these technologies few and far below expectation. Mboho (2007) stressed this as one of the challenges facing farming households in using the modern technologies effectively to promote food security dimensions. As a result, farming households which constitute the productive workforce in agriculture face challenges of achieving increased food production, food accessibility and food utilization leading to low life expectancy, high infant mortality rate and malnutrition (McNmara, 2003).

According to International Telecommunication Union (ITU) (2009), ICTs do not directly ensure household food security, but rather play an important role in uplifting the livelihood activities of the rural populace by keeping them abreast of up to date information which empowers their productive and logical decisions. It is on this background that the International Telecommunication Union (ITU) is working hard on promoting the use of ICT to address agricultural problems including food security. 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 of best practices in IT usage as well as IT-related skill deficiencies in the workforce which constrain the benefits from ICT to increase agricultural productivity as posited by Kaushik and Singh (2004). This digital divide is not merely a problem of access to ICT, it is part of a larger developmental problem in which vast sections of the farming population are deprived of the capabilities necessary to use ICTs to acquire information and convert it into useful knowledge. Without adequate knowledge and skills on the use of ICTs among the farming population, ICT will remain restricted to only the urban centers of the country while agricultural productivity will remain low leading to food insecurity. Invariably, knowledge and skills are crucial to acquire information on food security dimensions to better the

lot of farming households because it is through this that farmers can maximize the benefits of ICT and information needs are to be met. 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 farming population in Nigeria. This gap therefore necessitated this study which ascertained the contributions of ICT to household food security among maize crop farmers in Ondo State, Nigeria. Specifically, the study described the socio-economic characteristics of maize crop farmers in the study area; identified various ICT tools available for use by the respondents ; ascertained the information received through ICT on household food security dimensions; determined the food security status of the respondents and determined the perception of the respondents towards contributions of ICT usage on household food

## **Methodology**

The study was carried out in Ondo North Agricultural Zone of Ondo State, Nigeria. Ondo State popularly known as sunshine state is in the Southwest of Nigeria. It has interstate boundaries with Ekiti and Kogi States to the north, Edo State to the east, Delta State to the southeast, Osun State to the northwest and Ogun State to the southwest. The Gulf of Guinea lies to its south. Ondo State covers an area of 15,195.2 square kilometers and lies at latitude  $7^{\circ}55'$  north and longitude  $5^{\circ}25'$  east. It comprises of 18 local government areas with its capital in Akure. The State has a population of 3,460,877.

Ondo North Agricultural Zone is predominantly tropical rainforest except for the extreme Northern part where derived savanna climate is experienced . Ondo North Agricultural Zone is predominantly agrarian with a significant percentage of its labour force engaging in farming. The

climate experienced in this part of Ondo state is favorable for the cultivation of arable crops such as maize, Yam, cocoyam, cassava, plantain/banana among others.

Multistage sampling technique was adopted in the selection of two hundred and twelve (212) respondents for the study. There are six Local government areas that make up the agricultural zone. Firstly, four out of six Local Government areas in the zone were randomly selected this is followed by random selection of villages in each selected local government areas as shown in Table 1. From the list of registered farmers, forty percent (40%) of the total registered maize crop farmers who are household heads in each of the selected villages were randomly sampled, in all a total of two hundred and twelve (212) formed the sample size for the study.

**Table 1: Sampling procedure for selection of respondents from Ondo North Agricultural Zone**

<b>Agricultural zone</b>	<b>Selected LGAs</b>	<b>Number of villages</b>	<b>Selected villages (15%)</b>	<b>Registered maize-crop farmers</b>	<b>Selected Maize-crop farmers (40%)</b>
Ondo north	Owo	10	Iyere	68	27
			Isuada	55	22
	Akoko North East	12	Iboropa	78	31
			Auga	67	27
	Akoko South West	13	Iye	66	26
			Ese	75	30
	Ose	11	Elegbeka	58	23
			Omi-alafa	65	26
<b>Grand Total</b>	<b>4</b>	<b>44</b>	<b>8</b>	<b>527</b>	<b>212</b>

A well structured interview schedule was used to as data collection instrument in order to elicit relevant information from the respondents.



## Measurement of Variables

The dependent variable of the study is household food security status. Household food security status of the respondents was measured using nine generic questions on food access developed by FANTA (FANTA, 2003). This was measured on 4 points rating scale of often = 3, sometimes = 2, rarely = 1 and not at all = 0. The scores were computed and used to categorize the households into food secure and food insecure status. The maximum score for each respondent on FANTA scale was 27 while the minimum score was 0. The mean score on the food security scale was used to categorize the respondents into food secure and food insecure. The lower the score, the more food secure an individual is and vice versa. Data collected were analyzed using descriptive statistical tools such as frequency counts, percentages, means, and Binary logit regression. To assess the effect of selected independent variables on household food security, and the probability of a household being food secure, data were collected on socio economic characteristics of the respondents and ICT tools used for accessing information.

## Analytical Model

Binary logistic model was used to determine the factors associated with household food security of the respondents. Following Bogale and Shimelis (2009), the cumulative probit model could be stated as:

$$P_i = f(Z_i) = \frac{1}{1 + e^{-(\alpha + \sum \beta_i X_i)}} \dots\dots\dots (1)$$

Where:

$P_i$  = the probability that an individual is being food secure given  $X_i$

$X_i$  = a cumulative of all the independent variables (explanatory)

$\alpha$  &  $\beta$  = regression parameters to be estimated

e = the base of the natural logarithm.

For ease of interpretation of the coefficients, a logistic model could be written in terms of the odds. The odd ratio is the probability that a household would be food secure ( $P_i$ ) to the probability of a household not being food secure ( $1 - P_i$ )

That is:

$$\frac{P_i}{1 - P_i} = e^{z_i} \dots\dots\dots (2)$$

Taking the natural logarithm of the equation yields:

$$\ln\left(\frac{P_i}{1 - P_i}\right) = z_i = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots\dots\dots \beta_m X_m \dots\dots\dots (3)$$

If the error term,  $\Sigma_i$  is taken into account, the equation becomes:

$$z_i = \alpha + \Sigma_i^m = 0 \beta_1 X_1 + \varepsilon_i \dots\dots\dots (4)$$

In this study, the explanatory variables used in the model included:

Age ( $X_1$ ) - age of household head (Actual age in years)

Sex ( $X_2$ ) - Gender of household head (Dummy  $D = 1$ , if Male, otherwise  $D = 0$ )

Marital Status ( $X_3$ ) – Dummy  $D = 1$  for married, otherwise = 0)

Household Size ( $X_4$ ) – Number of people eating in the same pot (Actual)

Years of Schooling ( $X_5$ )- Actual Number of years spent in schooling

Farming Experience ( $X_6$ ) – Actual years

Membership of Social Organization ( $X_7$ ) - Dummy ( $D = 1$  for Members, otherwise  $D = 0$ )

Cell Phone ( $X_8$ )- (Dummy ( $D = 1$  if used for accessing information on household food security dimensions, otherwise  $D = 0$ ))

Radio ( $X_9$ ) - (Dummy ( $D = 1$  if used for accessing information on household food security dimensions, otherwise  $D = 0$ ))

Television ( $X_{10}$ ) (Dummy ( $D = 1$  if used for accessing information on household food security dimensions, otherwise  $D = 0$ ))

Bulletin ( $X_{11}$ ) - (Dummy ( $D = 1$  if used for accessing information on household food security dimensions, otherwise  $D = 0$ ))

Perception score ( $X_{12}$ ) – Actual score

The parameters of the probit model were estimated using maximum likelihood approach.

## **Results and Discussion**

### **Respondents' personal Profile**

Respondents' personal characteristics are presented in Table 2. The mean age of the sampled respondents was 52.2 years with modal class between 41 and 60 years. This indicates that majority of the respondents are still in their economically active years in the productive enterprises. Majority (84%) of the sampled respondents were males and married respectively. The mean household size of the sampled respondents was 6 with modal class between 4 and 6 members. This implies that majority of the respondents had a large household size. Furthermore, the distribution of the household heads by education revealed that more than half (59%) had a formal education. This implies that a sizeable number of the respondents are literate. The mean years of farming experience of the respondents was 21.2 years. About 47% of the sampled respondents were members of social organization.

**Table 2: Distribution of Respondents according to personal profile**

Variable	Mean	Modal Class
Age	52.2 years	41-60
Sex	-	84% Male
Marital Status	-	84% Married
Household size	6 members	4-6 members
Years of schooling	5.4 years	59% with formal education
Farming experience	21.2 years	75% 10 and above
Farm size	1.94 hectares	1 and 2.99hectares
Membership of social organization	-	47% members

### **Available ICT Tools for accessing information on food security dimensions**

Table 3 shows the result on the available ICT tools for use in accessing information on food security dimensions. It was revealed that the most available ICT tools for use are cell phone (92.5%), radio (86.3%), television (67.9%). Others are newspapers (22.2%), Bulletins (9.6%), Internet (4.1%) and the least was E-mail (1.4%). This finding shows that cell phone, radio and television are the major ICT tools for accessing information. Meanwhile, newspaper, bulletin, internet and E-mail are relatively low in terms of its availability for use in accessing information on food security dimensions by the respondents. 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); Lashgarara and Mohammadi (2011) 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. In the same vein, Arokoyo (2005) enumerated that these classes of ICT facilities (radio, television and mobile phones) remained the major ICTs

used for extension delivery service especially in the rural areas. Preference for these ICT tools among the respondents could be related to many factors one of which is economic friendliness. Adejo and Haruna (2009) had earlier stated that old ICT tools are ideal for rural areas, it is cheap to set up, easy to use and filling vital needs. Beside, the use of these technologies requires little or no literacy compared to new ICT tools such as internet, e-mail and printed materials.

**Table 3: Distribution of respondents according to Available ICT Tools for Use**

<b>ICT Tools</b>	<b>Frequency</b>	<b>Percentage</b>
Cell phone	196*	92.5
Radio	183	86.3
Television	144	67.9
Newspaper	47	22.2
Bulletin	20	9.4
Internet	9	4.2
E-mail	3	1.4

**Field survey 2015**

**\* Multiple response**

### **Food Security status**

Table 4 shows the categorization of respondents based on food security status. The Table revealed that among the respondents' household heads considered for this study, more than half (52.4%) of the respondents were found to be food insecure while the remaining (47.6%) were food secure. This implies that most of the households surveyed were found to be food insecure.

**Table 4: Categorization of Respondents Based on Food Security Status**

<b>Score (Points)</b>	<b>Category</b>	<b>Frequency</b>	<b>Percentage</b>
≤ 10	Food secure	101	47.6
11 and above	Food insecure	111	52.4
<b>Total</b>		<b>212</b>	<b>100</b>

**Source: Field Survey, 2015**

**Mean Score= 10.0 point.**

## Determinants of Food Security

Table 5 provides the parameters estimates for the binary logit model for the determinants of household food security. The significance of -2Log likelihood ratio (129.059) and chi-square (54.290) shows that logit model is fit for the analysis. In this model, the coefficients of five out of twelve explanatory variables are statistically significant at 5% level. It is evident from the table that household size, membership of social organization, cell phone usage, farm size and perception score. With the exception of perception score, all the explanatory variables had the expected signs.

Household size had a negative and significant relationship with household food security at 1% significant level. This implies that the probability of food secured decreases with increase in household size. The odds ratio in form of food secured decreases by the factor 0.457 as the household size increased by one member. This finding is consistent with the assertion of Mequanent *et al* (2014) that an increase in household size indicates more people to be fed and indirectly reduces income per capital head, expenditure per head and per capital food expenditure.

Membership of social organization is statistically significant at 1% level. This indicates that the probability of food secured increases with belonging to social organizations. This implies that membership of social organization creates opportunities and access to resources for household heads that can be of benefit to them to be food secure. This finding tallies with that of Oyedele and Akintola (2012) and Omonona *et al*,(2008). They reported that belonging to local level organizations increases access to credit. The result shows that the odds ratio in form of food secure increases by the factor 6.099.

The coefficient of farm size of the household head is positive and significant at 5% level. This implies that farm size is positively related to the probability of a household being food secure. The odds ratio in form of food security increases by factor 2.277 when the area under cultivation is increased by 1hectare. This finding is in consistent with the finding of Bogale (2009). Also, food production can be increased extensively through expansion of areas under cultivation. With large farm size, the households can produce more food for the family.

The coefficient of cell phone usage is positive and statistically significant at 5% level. The probability of food secure increases with cell phone usage for information acquisition on agricultural production. The odds ratio in form of food secure increases by the factor 4.799. According to Van Crowder and Fortier (2000), Chowdhury (2001) enumerated that ICT have the potential to improve the ability of individuals to acquire information needed for promoting food security. Access to information through cell phone makes the farming households to be connected with others for agricultural related information.

The coefficient of perception of contributions of ICT usage to food security is negative and significant at 5% level. This implies that the probability of food secure decreases with perception of contribution of ICT usage. The odds ratio in term of food secure decreases by the factor 0.950. perception of the role of ICT in promoting food security information depends on individuals' farming households and information received. Yaghoobi and Sarani (2011) had earlier reported that knowledge and information are important elements that could improve household food security.

**Table 5: Binary Logit estimate for the determinants of household food security**

Variable	B	S.E	Wald	Df	Sig	Exp(B)	Remark
Age	0.008	0.039	0.041	1	0.940	1.008	NS
Sex	-0.588	0.710	0.685	1	0.408	0.556	NS
Household	-0.796	0.161**	24.544	1	0.000	0.451	S
Education	0.049	0.052	0.889	1	0.346	1.050	NS
Farming experience	0.024	0.033	0.523	1	0.469	1.024	NS
Membership of social organization	1.808	0.549**	10.836	1	0.001	6.099	S
Cell phone usage	1.588	0.806**	3.784	1	0.050	4.799	S
Radio usage	0.575	0.719	0.639	1	0.424	1.777	NS
Television usage	0.579	0.515	1.272	1	0.259	1.784	NS

Perception score	-0.053	0.025**	4.366	1	0.037	0.950	S
Bulletin usage	0.076	0.933	0.007	1	0.935	0.905	NS
Farm size	0.823	0.278	8.740	1	0.003	2.277	S
Constant	6.138	2.751	4.979	1	0.026	463.232	

-2 Log Likelihood Ratio = 129.059      Chi square = 54.290\*\*    R<sup>2</sup> (Nagelkerke) = 0.390

NS- Not Significant @ 5%

N- Significant @ 5%

### **Conclusion and Recommendations**

The study assessed the use of ICT for accessing food security information among maize crop farmers in Ondo State. From the findings of this study, it could be concluded that cell phone, radio and television were the major ICT tools used by the respondents in accessing food security information in the study area. Meanwhile, most of the respondents were food insecure. Household size, membership of social organization, farm size and cell phone usage for accessing information significantly influenced food security status of the respondents. Sequel to the findings of this study, it was recommended that extension institutions should concentrate on the identified ICT tools in disseminating food security information to farmers in order to bring about a sustainable food production. Adult literacy programme should be revitalized for the purpose of the uneducated farm families by both the government and non governmental agencies. Finally, farmers should be encouraged to have affiliation with social organizations in their communities for social network to access information and resources for farming and both government and Non Governmental organizations should intensify the empowerment programme that would improve the capacity of farmers in the study area.

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