Perceived constraints in the use of ICT Tools by small holder rice farmers in Southeast, Nigeria

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Abstract
*The study examined Perceived constraints in the use of ICT Tools by small holder rice farmers in Southeast, Nigeria. Specifically, it described level of use of ICT, constraints to the use of ICT tools, influence of farmers' perceived challenges on the level of use of ICT and differences in the use of ICT across States. The finding on the level of use of ICT revealed that a greater proportion (49.79%) of the farmers are making a very low use of ICT tool. The findings on the constraints to the use of ICT tools by rice farmers revealed, factor one (connection factor) explained 30.20% variance of the factors challenging the use of ICT tools/format, factor two (economic factor) explained 10.95% variance of the factors challenging the use of ICT tools/format, factor three (attitude factor) explained 10.59% variance of the factors challenging the use of ICT tools/format, and factor four (location factor) explained 6.46% variance of the factors challenging the use of ICT tools/format in the study area. Furthermore, the 4 factors explained 58.21% of the total factors challenging the use of ICT tools/format in Southeast, Nigeria. The finding on the influence of farmer's perceived challenges on the level of use of ICT tolls/format had a sum square between group and within group of 20.757 and 265.882 respectively. This implies that the challenges do not influence the level of ICT use in the area. The study on significant difference in the level of use of ICT across States revealed that there was a significant difference in the level of use of ICT tool/format between Anambra and Enugu State (3.18)*** and Ebonyi and Enugu (2.39)**, but none exist between Anambra and Ebonyi. Government and other relevant bodies should ensure that ICT facilities are installed in rural communities and Information meant for rice farmers should be tailored to their specific need were recommended.*

Keywords: *Constraints, rice farmers, ICT use, Southeast*

INTRODUCTION

Agriculture has played a great role in Nigeria's independence since the colonial era and still remains strategic to the development of the economy of low income countries (Anumudu, Obianefo, Okafor and Onyekineso, 2020). Obianefo, Ng'ombe, Gbughemobi and Okoroji, (2021) opined that agricultural sector over the years remained the highest source of employment especially in the rural areas, farmer's involvement in the sector is very important for food

availability and supply. Agriculture is the engine of growth for most developing countries of the world and also one of the most effective ways to alleviate poverty and hunger (Amungwa and Baye, 2014). It can raise income and improve food security for 80% of the world's poor, who live in rural areas and work mainly in farms (World Bank, 2018). Agriculture in Africa has a massive social and economic footprint; more than 60% of the population of Sub-Saharan Africa are smallholder farmers, and about 23% of Sub-Saharan Gross Domestic Product (GDP) comes from agriculture (Goedde, Ombaka and Pais, 2019). Agriculture contributed about 22.86% of Nigeria's GDP in 2017 (National Bureau of Statistics (NBS), 2018). These smallholder farmers engage in different livestock and crops production including rice.

Globally, rice production has grown at an annual average of 10% over the past decades, reaching 486.7 million tons in 2017 (NBS, 2018). Most of this growth came from Asia, accounting for 89% of the global output. China and India are the largest producers, each with a share of 29.6% and 22.6% of the global production respectively. Africa accounts for about 4% of world production and the continent is the second-largest consuming and producing region (Abdul-Gafar and Yu 2016). Nigeria reached a peak of 3.7million tonnes in 2017 making them the second-largest producer in Africa (Daoui, 2017). Rice is the primary staple food for most of the populace in the region, especially the rural area, with about 6% of global rice consumption, Africa accounts for about 4% of the world production making the continent the second largest consuming and producing region (Abdul-Gafar and Yu 2016). About 70% of Nigeria feeds on rice, while 30% of their cereal-based diets are also from rice (Uba, 2003 And Gbughemobi, Nkamigbo and Meludu, 2021). Udemezue (2018) stated that Nigerians consume 8 million tonnes of rice and the figure rises by 6% annually. Programs, projects, and technologies like Value Addition, and Information Communication Technologies (ICTs) have been introduced in rice production and agricultural sector to enhance farmers' agricultural production.

ICTs are used to champion practical, cost-effective, and scalable solutions that impact lives, it have a high potential to transform agriculture. They are "means" rather than the "ends". Information and communication technologies (ICTs) could transform agricultural activities in many parts of the world. ICTs cannot solve every problem, but these tools do promote youth involvement in agriculture by enhancing their opportunities, motivation, and capacities. ICTs contribute to improving youth livelihoods, agricultural modernization and create benefits throughout value chains, especially through increased access to more effective information via many smartphone apps. ICTs also help strengthen and develop farmers' organizations, especially through social networks. Annamalcus and Rae, (2003) discovered that most farmers often have little influence on real market price trends and market conditions. As a result, traders are well-positioned to exploit both farmers and buyers through practices that sustain system-wide inefficiencies. This will to a great extent be addressed through the use of ICT platforms through which farmers will get real-time to all such information and therefore take care of exploitative tendencies in middlemen and ultimately improve farmers income levels. Information technology can help in bringing about transparency, increased access to information and rural transformation. Access to information holds the key to successful agricultural development. Information Communication Technologies (ICTs) in recent years have witnessed major changes and are diverging as a powerful tool for

accelerating agricultural growth in a developing country like Nigeria (Enwelu, Uramah, Asadu, and Chan 2014). The introduction of ICTs helps in agricultural farmer's access to market information and services, management of pest and diseases and rural development programs (Meera, Jhamtani and Roa, 2014). It will also help in broadening the orientation of farmers in production activities thereby causing a major turnaround in the agricultural sector as it is doing many in other sectors (Ajayi, Alabi and Akinsola, 2013).
Communication remains a major challenge in agricultural delivery systems and national development. This is needed to build/develop a communication revolution that could transform the lives of hundreds of millions of farmers. Innovative business development supply a substantial number of the technologies that farmers use and has transformed the knowledge structure of the agricultural sector.

The role of ICT to enhance food security and support rural livelihood is increasingly recognized and was officially endorsed at the World Summit on the Information Society (WSIS) in 2005. These include the use of computers, the internet, Geographical Information Systems (GIS), mobile phones, as well as traditional media such as radio and television. Although it is a relatively new phenomenon, evidence of the contribution of ICT to agricultural development and poverty alleviation is becoming increasingly available. The introduction of various relevant ICTs in agricultural information dissemination could help farmer's access market information; land resources and services; management of pests and diseases; rural development programs (Meera, Jhamtani and Rao, 2004). It will also help in broadening the orientation of farmers in production activities thereby causing a major turnaround in the agricultural sector as it is doing in many other sectors. In Nigeria, policy on the adoption of ICTs was initiated in the year 1999 when the civilian regime came into power (Posu, 2006). ICTs have a vital role to play in getting information to farmers but many rural communities still have little or no access to it. ICTs have a transformation influence on farming and food production in countries where governments and policymakers are committed to developing comprehensive e-agricultural strategies.

MATERIALS AND METHOD

The study was conducted in Southeast Nigeria. It is one of the six geopolitical zones of Nigeria. The zone comprises of Imo, Anambra, Abia, Enugu and Ebonyi States. The region is located between latitude $5^{o}45^{'}00^{"}$N and longitude $8^{o}30^{'}00^{"}$E. It is bordered by the Niger River in the west and has an administrative and cultural border with the Northern region of Nigeria. The eastern boundary lies between the border of Nigeria and Cameroon and the Southern coast is along the Gulf of Guinea. The total surface area of the region was approximately 76000 square kilometers (29,400sq m).The region has three types of vegetation. The coastal area in the south is dominated by mangrove swamps and tidal waterways. Further north of the swamps is the tropical rainforest, however, over a period of time, many of the leafy trees of the forest were cleared for planting palm trees. In the northernmost part of the region is the guinea savannah. Major rivers of the region include rivers of the Niger Delta system such as Qua Iboe, Cross River, Orashi River, and Imo River. Obudu Plateau in the northeastern area, the Oban and Ikom Hills, along the eastern boundary with Cameroon are a few of the highlands in the region.

Anambra State is located in the South-Eastern part of the country, and comprises 21 Local Government Areas which includes (Aguata, Awka North, AwkaSouth,Anambra West, Anaocha, Anyamelum, Dunukofia, Ekwusigo, Idemili North, Idemili South, Ihiala, Njikoka, Nnewi North, Nnewi South, Ogbaru, Onitsha North, Onitsha South, Orumba North, Orumba South and Oyi), which is sub-divided into four agricultural zones to aid planning and rural development. Its name is an Anglicized version of the original Oma-Mbala, the Igbo name of the Anambra River. The capital and seat of government is Awka. The state's theme is "Light of the nation". Boundaries are formed by Delta State to the west, Imo State and River State to the south, Enugu State to the east, and Kogi State to the north. The name was derived from the Anambra River (Omambala) which flows through the area and is a tributary of the River Niger. The indigenous ethnic groups in Anambra state are the Igbo (98% of the population) and a small population of Igala (2% of the population), who live mainly in the north-western part of the state.

Ebonyi State is made up of 13 L.G.As with 5533 km^2 as the total landmass and estimated population of 2198371 (NPC 2006). The occupation of the people is predominantly farming with over 80 percent of the population living in rural area and are involved in agricultural production. The vegetation lies between the Rain Forest and Guinea Savannah of Nigeria.

Enugu State is located between latitude 6.5 ($6^0$30'0N) and longitude of 7.5 ($7^0$30'0E). The state occupies an area of about 8,022,950KM^2 (Ezike, 1998) and has a population of about 3,257,278 (NPC, 2006). The state has seventeen (17) political Local Government Areas (LGA) and is divided into six (6) agricultural zones namely: Agbani,Awgu, Enugu, Enugu-Ezike, Udi and Nsukka.

Population of the study

The population of the study consists of all the rice farmers in Southeastern and a multi-stage sampling technique was adopted to select 480 respondents among States in Southeast, Nigeria. The first stage involved purposive selection of three states with a high concentration of rice farmers in Southeast, Nigeria; (Anambra, Enugu and Ebonyi States). The second stage also involved the purposive selection of two (2) agricultural zones from each State making it a total of six (6) zones. The third stage involved the purposive selection of two (2) Local governments from each of the agricultural zones based on high concentration of rice farmers making it a total of twelve (12) local governments. The fourth stage involved the random selection of two (2) communities from each local government making it a total of twenty-four (24) communities. Finally, twenty (20) rice farmers were selected from each community using the simple random sampling technique. This gave a total sample of four hundred and eighty (480) respondents. The data were analyzed using descriptive statistics which included chart, frequency, percentage and mean, mean threshold of 5 Point Likert Scale and Spearman bivariate correlation of non-parametric tools.

Instrument for data collection

Qualitative and quantitative methods were used to collect data from the respondents. Qualitative data were collected using focus group discussion (FGD), this is used to gather first-hand

observation of the process of individuals discussing issues. It captures real-life data in the social environment (Babbie, 2001). It brings out aspects of the topic that were not anticipated by the researcher. FGD helped generate interview topics, questionnaire items and can help the researcher judge the adequacy of the analysis and help in the interpretation of the situation (McQueen and Knussen, 2002). Quantitative data would also be collected using interview schedule which is also called questionnaire. The researcher employed the use of Survey CTO which is a powerful, reliable and easy to use survey platform that allows one to at least transport and process data for academic research. It is a fully integrated tool that includes a powerful and offline capable Android data collection application, a hosted server with user management and two way data sync and a desktop client for downloading and capacity data into multiple formats.

Measurement of variables

Independent variable: an independent variable is a variable whose variation does not depend on that of another, it is a value that is manipulated to determine the value of a dependent variable. The independent variables for the study include:

The personal and enterprise characteristics of the respondent measured as follows:

Sex: Sex was measured as male = 1 or female = 0

Age: Age was measured as the actual age (in years)

Marital status: single =1, married = 2, widow (er) = 3, separated = 4

Educational qualification: Years spent in school.

Years of farming experience: The respondents were asked to state the total number of years they have spent in farming.

The level of knowledge of ICT: farmers were asked to tick yes or no to assess their knowledge from the list of statements about ICT. The respondents were allowed multiple responses as they may have more than one knowledge of the subject under discussion. Based on the rule of thumb, level of knowledge is categorized into three as low knowledge with a value of 2, medium knowledge with a value of 4, and high knowledge with a value of 6. A ratio representation of these indicates that variables with percentage value less than 33.3% is low knowledge, while 33.3% to less than 50.0% is medium knowledge, and high knowledge ranges from 50.0% and above.

Attitude of the farmers. The farmers were asked to rate their feelings on ICT, on a 5-point Likert scale of strongly agree (5) agree (4) somewhat agree (3) disagree (2) strongly disagree (1)

Available ICT for use the respondents were asked to tick from the list of the available ICT provided. The respondents were allowed multiple responses as more than one ICT tools/format maybe available to them.

Challenges faced by farmers on the use of ICT the farmers were asked to rate their perceived constraints on a 5- point Likert scale, with options of very serious = 5; serious = 4; somewhat serious = 3; not serious = 2; not a problem = 1. The farmer's rating was subjected to a principal factor analysis (PFA) matrix to ascertain the factor loading.

Dependent variables: A dependent variable is a variable whose variation depends on that of another, it is gotten as a result of the manipulation of another variable. For the purpose of this study, the dependent variable is:

Level of usage of ICT by the farmers. The farmers were asked to rate their extent of use of ICT available to them on a 5-point Likert scale of very often = 5; often = 4; moderate = 3; rarely = 2

and never used = 1. The values were added to get 15 and divided by 5 to get the mean value of 3 Any variable with a mean score 3 and above was regarded as being used frequently by farmers while variable with a mean score of less than 2 was regarded as not being used frequently

RESULT AND DISCUSSION

The Level of Use of ICT

Level of ICT use was classified into low, medium and high, this approach was adopted to enable for policy/decision making process. The finding revealed that a greater proportion (49.79%) of the farmers are making a very low use of ICT tool. The other farmers make medium (17.23%) and high (32.98%) use of the ICT methods for farming. The implication is that the use of ICT tools for their farming is low and should be upgraded in this modern economy in the study area.

Table 1 Distribution of the Level of Use of ICT

Possible Scene	Observed	Classification	Frequency	%	Man	STD
0-15	1-15	Low (up to 5)	237	49.79		
		Medium (6-10)	82	17.23	10.92	3.66
		High (above 10)	157	32.98		
		Total	476			

Source: Field Survey Data, 2023.

Constraints to the use of ICT tools by rice farmers

The information about the constraints to the use of ICT tools/format by rice farmers in the study area is presented in Table 2. The challenges of ICT tools/format use by rice farmers in Southeast, Nigeria were operationalized with principal factor analysis. The result had a Kaiser Meyer-Olkm (KMO) value of 0.78 showing that the data is adequate enough. Based on the rule of thumb, variable with communalities value less than 0.5 (Appendix table 1p) was removed which assumes that such variable is not strong for construct or factor loading (Obianefo, Osuafor, Ezeano and Anumudu, 2020). The challenges to the use of ICT tools/format were rotated in 4 components and named as connection, economic, attitude and location factors which has a positive Eugin-values (Appendix table 2p). The researcher used a promax rotation method as a discriminant analysis to ensure no variable loaded in more than one component factors.

Therefore, factor one (connection factor) explained 30.20% variance of the factors challenging the use of ICT tools/format, factor two (economic factor) explained 10.95% variance of the factors challenging the use of ICT tools/format, factor three (attitude factor) explained 10.59% variance of the factors challenging the use of ICT tools/format, and factor four (location factor) explained 6.46% variance of the factors challenging the use of ICT tools/format in the study area. Furthermore, the 4 factors explained 58.21% of the total factors challenging the use of ICT tools/format in Southeast, Nigeria. Thus, the variables are loaded according to the following factors as listed below:

Connection factor: fragile nature of ICT facilities (0.766), inadequate infrastructure to support the existence of ICT in my locality (0.757), inappropriate content of ICT message that do not meet farmer's need (0.717), lack of connectivity to access information in rural areas (0.64), fear that things will go wrong in using ICTs (0.559) and lack of confidence in operating the computer/other ICTs tools (0.515).

Economic factor: lack of adequate awareness of ICT (0.965), epileptic power supply (0.869), poor finance (0.714) and poor network (0.515). This is confirmed by (Syeim and Raj, 2015) that the major constraint to ICT use are high cost of ICT infrastructure and poor finance.

Attitude factor: high cost of ICT infrastructure (0.849), lack of adequate training on ICTs (0.754), poor or lack of feedback (0.717) and negative attitude of people to change (0.633).

Location factor: concentration of ICT infrastructure in urban areas (0.879).

From Table 2; fear that things will go wrong in using ICTs, lack of competence in handling ICTs, complexity in using ICTs, low ICT literacy, and poor maintenance of ICT infrastructure did not load in any of the four factors. Thus, all the challenges listed by the researcher were not peculiar to the area of study.

Table 2: Distribution of the Constraints to the Use of ICT Tools by Rice Farmers in Southeast Nigeria

Sn	Constraints	Component			
		Connection	Economic	Attitude	Location
1	Fragile nature of ICT facilities	0.766			
2	Inadequate infrastructure to support the existence of ICT in my locality	0.757			
3	Inappropriate content of ICT message that do not meet farmer's need	0.717			
4	Lack of connectivity to access information in rural areas	0.64			
5	Fear that things will go wrong in using ICTs	0.559			
6	Lack of confidence in operating the computer/other ICTs tools	0.515			
7	Fear that things will go wrong in using ICTs				
8	Lack of adequate awareness of ICT		0.965		
9	Epileptic power supply		0.869		
10	Poor finance		0.714		
11	Poor network		0.515		
12	Lack of competence in handling ICTs				
13	High cost of ICT infrastructure			0.849	
14	Lack of adequate training on ICTs			0.754	

15	Poor or lack of feedback		0.717	
16	Negative attitude of people to change		0.633	
17	Complexity in using ICTs			
18	Low ICT literacy			
19	Poor maintenance of ICT infrastructure			
20	Concentration of ICT infrastructure in urban areas.			0.879
	Data adequacy test			
	Kaiser-Meyer-Olkin(KMO)	0.777		

Source: Field Survey Data, 2023

Influence of farmers' perceived challenges on the level of use of ICT tools/format

The result on the influence of farmers' perceived challenges on the level of use of ICT tools/format is presented in Table 3. The finding on the influence of farmer's perceived challenges on the level of use of ICT tolls/format had a sum square between group and within group of 20.757 and 265.882 respectively. The total degree of freedom was 475. The F-stat. value of 1.16 was not significant at either 10%, 5%, or 1% level of probability. Thus, the challenges do not influence the level of ICT use in the area. This contradicts the findings of that stated that cultural factors have a significant relationship with the farmers' use of ICT.

Table 3 Influence of farmers' perceived challenges on the level of use of ICT tools/format

Source	Sum Square	Degree of freedom	Mean square	F-stat.	Prob>F
Between knowledge	20.757	30	0.692	1.16	0.262
Within knowledge	265.882	445	0.598		
Total	286.639	475	0.604		

Source: Field Survey Data, 2023. One-way ANOVA. F-stat. at 1.96 (prob> 0.05)

Difference in use of ICT across Anambra and Ebonyi State.

The result on the difference in the level of use of ICT across Anambra and Ebonyi State is presented in Table 4. The Table shows that Anambra State had 160 observation, while Ebonyi had 157 observation. The mean of level of ICT use for Anambra and Ebonyi State were 2.331 and 2.245 respectively. The standard deviation as high as 1 shows a serious variation in their individual responses across State wise. The Z-score value of 0.77 was not significant at 10%, 5% or 1% level of probability. Thus, there is no significant difference in the level of use of ICT tools/format in Anambra and Ebonyi State is accepted.

Table 4: Difference in use of ICT across Anambra and Ebonyi State

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
Anambra	160	2.331438	.0790569	1	2.176489	2.486386
Ebonyi	157	2.244586	.0798087	1	2.088164	2.401008
Diff		0.0868515	0.1123362		-0.1333234	0.3070265

Source: Field Survey Data, 2023. Diff. = mean (Anambra) – mean (Ebonyi), z = 0.7731. Two-sample z test

Difference in the level of use of ICT across Anambra and Enugu State.

The finding on the difference in the level of use of ICT across Anambra and Enugu State is presented in Table 5. The Table shows that Anambra State had 160 observations, while Enugu had 159 observations. The mean of level of ICT use for Anambra and Enugu State were 2.331 and 1.975 respectively. The standard deviation as high as 1 shows a serious variation in their individual responses across State wise. The Z-score value of 3.18 was significant at 1% level of probability. Thus, there is significant difference in the level of use of ICT tools/format in Anambra and Enugu State.

Table 5: Difference in the level of use of ICT across Anambra and Enugu State

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
Anambra	160	2.331438	.0790569	1	2.176489	2.486386
Enugu	159	1.975346	.0793052	1	1.819911	2.130781
Diff		.3560916	.1119791		.1366167	.5755665

Source: Field Survey Data, 2023. Diff = mean (Anambra) – mean (Enugu), z = 3.1800

Difference in the level of use of ICT across Ebonyi and Enugu State.

The result on the difference in the level of use of ICT across Ebonyi and Enugu State is presented in Table 6. The Table shows that Ebonyi State had 157 observations, while Enugu had 159 observations. The mean of level of ICT use for Anambra and Enugu State were 2.245 and 1.975 respectively. The standard deviation as high as 1 shows a serious variation in their individual responses across State wise. The Z-score value of 2.39 99was significant at 5% level of probability. Thus, there is significant difference in the level of use of ICT tools/format in Ebonyi and Enugu State.

Table 6: Difference in the level of use of ICT across Ebonyi and Enugu State.

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
Ebonyi	157	2.244586	.0798087	1	2.088164	2.401008
Enugu	159	1.975346	.0793052	1	1.819911	2.130781
Diff		.2692401	.112511		.0487225	.4897577

Source: Field Survey Data, 2023. Diff = mean (Ebonyi) – mean (Enugu), z = 2.3930

Summary and conclusion

The study was perceived constraints in the use of ICT Tools among small holder rice farmers in Southeast, Nigeria. Data were collected with a well-structured questionnaire from 476 randomly selected rice farmers. Data were analyzed using a combination of analytical tools such as descriptive statistics, Tobit regression, Analysis of variance, correlation and z-test. The level of use of ICT was classified into low, medium and high and the findings revealed that the use of ICT tools among the farmers is low and should be upgraded. The study recorded that some of the factors challenging the use of ICT tools/format in the area were; fragile nature of ICT facilities, inadequate infrastructure to support the existence of ICT in my locality, inappropriate content of ICT message that do not meet farmer's need, lack of connectivity to access information in rural areas, fear that things will go wrong in using ICTs, and lack of confidence in operating the computer/other ICTs tools. The finding on the influence of farmer's perceived challenges on the level of use of ICT

tolls/format had a sum square between group and within group of 20.757 and 265.882 respectively. This implies that the challenges do not influence the level of ICT use in the area. Finally, the study revealed that there was a significant difference in the level of use of ICT tool/format between Anambra and Enugu State (3.18)*** and Ebonyi and Enugu (2.39)**, but none exist between Anambra and Ebonyi. Government and other relevant bodies should ensure that ICT facilities are installed in rural communities and Information meant for rice farmers should be tailored to their specific need were recommended.

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