Original Research Article

Utilization of Information and Communication Technologies among Rural Women and Youths in Agriculture in Abia State, Nigeria

ABSTRACT

The study assessed the utilization of information and communication technologies (ICTs) among rural women and youths in agriculture in Abia State, Nigeria. Data were collected using a structured interview schedule by the researcher and other research assistants. Percentage, standard deviation, mean scores, factor analysis, and regression were used for data analysis and result presentation. Using the multistage sampling procedure, a sample size of one hundred and twenty respondents was purposefully selected. Findings of the study revealed that GSM, radio, and television were the major ICTs used by women and youths to obtain agricultural information among extension and relevant stakeholders in the state. The regression analysis revealed a positive relationship between the number of times extension agents visited and their level of ICT use in agriculture. Respondents cited low literacy, a lack of extension conviction and training as major constraints to their use of ICTs. The implication is that policymakers and relevant stakeholders in agriculture should prioritize the development of training programs and interventions that improve the technology literacy and human capacity building of rural women and youths in the state through the use of existing agricultural extension on the effective use of ICTs in obtaining agricultural information for increased productivity, income, standard of living, and agricultural development in the state.

Keywords: Utilization, information communication technologies, rural, women, youths, agriculture

1.0 INTRODUCTION

Since the advent of information and communication technologies (ICTs), human communication has undergone a drastic change. By facilitating prompt information sharing and creativity among stakeholders, the use of ICTs in agriculture can aid in the development of the sector and close the information gap among stakeholders. According to Gomez et al. [1], information and communication technology use in agriculture refers to the extent to which rural women and youths in Abia State use these technologies to share agricultural information with extension professionals and other stakeholders. In Nigeria, farming is the main source of employment, income, and food for rural dwellers, and women play a significant role in food production, processing, and marketing [2, 3].

Agricultural extension plays a key role in disseminating scientific research-based technologies to farmers that will help them develop the skills needed to solve their farm problems. But the extension to farmer ratio in Nigeria is between 1:5000 and 1:10000, compared to 1:200 in other Sub-Saharan African nations [4, 5]. This ratio demonstrates that farmers have limited access to extension services, and extension agents, in turn, struggle to reach a large number of farmers who require timely agricultural information

supported by scientific research in rural areas [6]. This suggests that farmers lack access to sufficient, reliable, and timely information about improved agricultural inputs, the market, credit sources, weather data, and other technologies. Their productivity, income, food security, and agricultural development in general will all suffer as a result of this information gap, especially in the face of a changing climate [7].

The use of ICTs in agriculture offers a great opportunity to close the information gap between rural women and youths, who handle most of the state's agricultural activities but still use face-to-face communication, which has become less effective due to technological advancement. ICTs use in agriculture can transform Nigerian agriculture and bring it into compliance with international best practices [8]. Although there have been government efforts to promote the use of ICTs to facilitate timely dissemination of agricultural information, such as the Growth Enhancement E-wallet System, where farmers received agricultural information on inputs, soft loans, improved seed varieties, and fertilizers and were educated on farming practices that would increase their yield through their registered mobile phones. But there still exists an agricultural information gap among rural women and youths, who produce the bulk of food consumed both in rural and urban centers and rely heavily on agriculture for their income and livelihood [9, 10]. Rural women and youths must use ICTs' fast information transmission and broad audience coverage to improve productivity, income, food security, agricultural decision-making, and standard of living. Although several scholars have studied ICT use among extension personnel, there are few empirical studies on rural women and youths use of ICTs in agriculture in Abia State, Nigeria. In light of this, this study examined the use of ICTs by rural women and youths in agriculture in Abia State, Nigeria. The specific objectives of the study were: to identify the agricultural uses of ICTs by respondents; to ascertain the level of use of ICTs by respondents; to ascertain the perceived importance of ICTs in disseminating agricultural information; and to identify the perceived constraints to ICT use by respondents in the state.

1.1 Hypothesis

The null hypothesis for the study was that the socio-economic characteristics of respondents do not have a significant influence on their level of use of ICTs in agriculture.

2.0 METHODOLOGY

2.1 Study Area

The study was conducted in Nigeria's Abia State. The state is in Nigeria's southeast, between latitudes 4°45' and 6°14' north of the equator and longitudes 7°10' E and 8°09' east of the Greenwich Meridian. East of Imo State, the state borders Anambra, Enugu, and Ebonyi States on the North West, North, and North East [11]. With Umuahia as the state capital, the population of the state was estimated at 3,727,347 in 2016, according to the National Population Commission (2017), and 5243.7 square kilometers, with 486 people per square kilometer [12].

The study selected Obi Ngwa and Ossioma LGAs due to their high farming and telecommunications masks. Three agricultural zones—Aba, Ohafia, and Umuahaia—make up the state [13]. The state has two main seasons, comprising low-lying tropical rainforest with rainy and dry seasons. The southern section receives 2,400 millimeters of yearly rainfall, peaking from April to October, while the rest of the state has moderately high plains and wooded savanna [14]. According to Nwankwo et al. [15], the people of Abia State are mostly farmers who cultivate small parcels of farm land ranging from 0.1 to 10 hectares. Agriculture accounts for 27% of the state's GDP and employs 70% of the population. The state grows yam, maize, potatoes, rice, cashews, plantains, taro, and cassava due to its excellent fertile terrain. Oil palm and rubber are the state's main cash crops [16].

2.2 Population and sampling procedure

All women and youths involved in agriculture in Abia State comprised the population for the study. A multi-stage sampling procedure was used in the selection of the sample size. In the first stage, Osisioma and Obi Ngwa local government areas (LGAs) were purposefully selected out of the seventeen LGAs based on the existence of high agricultural activities and telecommunications networks in the area. In the second stage, five (5) autonomous communities were purposively selected from each local government area, giving a total of ten (10) autonomous communities. In the third stage, three (3) villages were randomly selected from the selected ten communities, giving a total of thirty (30) villages. In the fourth stage, four (4) respondents, comprising two women and two youths (farmers), were obtained from each

village using a simple random technique. This gave a total of one hundred and twenty (120) respondents' (60 women and 60 youths) for the study.

Data were collected from the respondents in their homes and farms using a structured interview schedule. The researcher, with the help of other research assistants, administered the questionnaire, which captured the objectives of the study, on the literate farmers, while an interview schedule was administered on the illiterate farmers. To ascertain the agricultural uses of the ICTs provided, the respondents were asked to identify and tick from the list of variables provided across each ICT.

To determine the level of agricultural uses of ICTs, respondents were asked to rate their level of use of ICTs available to them by ticking off the list of variables provided to them. Some of the variables include radio, television, GSM, and computers. A 4-point Likert scale of very often = 3, often =2, rarely = 1, and never used = 0 was used to collect data. The values were added to get 6 and divided by 4 to get the mean value of 1.5. Variables with a mean score of 1.5 and above were regarded as being used frequently by the respondents in communicating agricultural information, while variables with mean scores below 1.5 were regarded as not being used. Furthermore, to determine respondents' level of use of ICTs, respondents were asked to tick yes (1) or no (0) against each of the ICTs listed and identified by them as to whether they use them or not in obtaining agricultural information. Then each of the respondents' scores was added up and grouped as non-user (0), low user (1–4), moderate user (5–8), and high user (9–12).

To ascertain respondents' perceptions on the importance of using ICT in agriculture in the study area, the respondents' were asked to identify from the list of variables provided those ICTs they perceived as important in obtaining agricultural information. Some ICTs that were on the list include radio, television, the internet, etc. A 3-point Likert of highly important = 2, important = 1, and not important = 0 was used to collect the data. The values were added to get 3.0 and divided by 3 to get a mean score of 1.0. Variables with a mean score of 1.0 and above were regarded as important, while variables with a mean score of less than 1.0 were regarded as not important.

To identify the perceived constraints to effective use of ICTs, respondents were asked to identify and tick off the list of perceived constraints provided. A 4-point Likert of very serious" = 4, "serious" = 3, not serious = 2, and "not a problem" = 1 was used to collect data. The values were added to get 10, which was divided by 4 to get a mean score of 2.5. Variables with mean scores of 2.5 and above were regarded as constraints, while those with mean scores below 2.5 were regarded as no constraints. The data was further subjected to factor analysis using the principal factor model with varimax rotation.

2.3 Data analysis

Data were analyzed using percentage, frequency counts, standard deviation, mean scores and factor analysis.

The hypothesis was tested using multiple regression analysis at 0.05 level of significance. The specific forms of the regression model for respondents is shown below

$Y= b_{0+} b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + \ldots\ldots\ldots\ldots b_{10}X_{10} + e$

Where, Y= Number of use of ICTs by respondents

Y (ICTs use) is the dependent variables and X_1-X_{12} is the independent variable

X_1=Age (years)

X_2 = sex (male=1, female=0)

X_3=marital status (dummy: married =1, not married = 0) (not married include: single, separated, divorced and widowed)

X_4 = years spent in school (years)

X_5=monthly income (naira)

X_6= years of farming experience (years)

X_7= number of extension agents contact (in the past one year)

X_8= household size (number of persons)

X_9= membership of organization (dummy: member =1, not a member=0)

X_{10}= access to credit (access=1, no access=0)

b_0= intercept, b_1-b_{13}=coefficients of regression and e= error term

IBM SPSS Statistics (SPSS version 22.0) constituted the software package for the analysis of the data.

3.0 RESULTS AND DISCUSSION

3.1 Agricultural uses of ICTs by respondents

Table 1 shows that 55% of women used GSM to get current commodity market prices, and 60.0% used it to get subsidized input information straight from governments. 71.7% of women watched TV to learn about agriculture policies and 55.0% to advertise agricultural products. 70.0% of women utilized radio to learn about government-subsidized inputs and finance, while 66.7% advertised agricultural products. However, 80.0% of youths use GSM for market price information and 53.3% for government-subsidized input information. 75.0% utilize television for agricultural policy and program information, 63.3% for advertising agricultural products, and 51.7% for agricultural information. 73.3% utilize radio for government-subsidized inputs and credit facilities, 61.0% for advertising, and 62.7 percent for agricultural information. This research supports Nwali et al. [17], who found that rural Nigerian women use GSM, radio, and TV to get agricultural information. It also suggests that farmers in the research area use GSM, TV, and radio for agricultural information. They can easily access those ICTs. According to Iyere-Freedom and Enwelu [18], rural women and youths in agriculture can only get agricultural knowledge through GSM, television, and radio.

Radio is also the most used. The finding verifies Sennuga et al. (19), who opined that radio is the most extensively spread electronic communication medium and is traditionally used by smallholder farmers in Nigeria for agricultural information. The result also suggests that teenagers use those ICTs more than women for agricultural purposes, likely because they are more imaginative and open to new ideas due to formal education. Manalo et al. [20], found that farmers' children (youths) can fulfill infomediary responsibilities well since they are more academically talented.

Table 1: Percentage distribution of ICTs according to agricultural uses

ICTs	Agricultural uses	Overall percentage	Women (n=60)	Youths (n=60)
			Percentage	Percentage
GSM	Obtaining information on			
	Market prices	67.5	55.0	80.0
	Subsidized inputs	56.7	60.0	53.3

	Information exchange	45.0	41.7	48.3
CD-ROM	Information purposes like			
	Back up agric. Information	25.8	18.3	33.3
	Transfer of information	24.2	15.0	33.3
	Storing information	17.5	15.0	20.0
Fax machine	Information transfer in form of			
	Document	16.7	13.3	20.0
	Text and graphics	16.7	8.3	25.0
	Used for communication	27.5	13.3	41.7
Television	Obtain Information on			
	Agric. programs and policies	73.3	71.7	75.0
	Advertisement of produce	59.2	55.0	63.3
	Communication	47.5	43.3	51.7
Radio set	Obtaining information on			
	Government subsidized inputs and credits	71.1	70.0	73.3
	Advertisement of produce	64.2	66.7	61.0
	Communication	55.8	48.3	62.7
Computer	Information purposes like			
	Documentation and record keeping	41.7	36.7	47.5
	Statistical/data computation	33.3	40.0	27.1
	Advertisement and marketing	27.5	25.0	30.0
Internet	Information purposes like			
	Sending and receiving email	36.7	35.0	38.3
	Sourcing agric. Information	32.5	35.0	30.0
	Advertisement	26.7	25.0	28.8
Remote sensor	Sourcing information like			
	predicting crop yield	22.5	10.0	35.6
	Soil suitability to specific crop	20.8	13.3	28.8
	Specific resource allocation of input	20.0	13.3	26.7
Digital camera	Information purposes like			
	Taking shots of farm events	33.3	28.3	38.3
	Storing pictorial information	37.5	31.7	43.3
	Videoing of farm events	32.5	28.3	36.7

Source: Field Survey, 2023

3.2 Level of use of ICTs by respondents

Table 2 shows that women and youths in the research area relied on radio, television, and GSM for agricultural information. This is because respondents were aware of those ICTs and knew how to use them. Effiong et al. [21] found that farmers were more conscious of radio, TV, and mobile phones. The finding also shows that radio, television, and GSM had standard deviations smaller than 1.0, indicating that respondents' individual ratings on the amount of use of those ICTs did not vary considerably from the

mean, reflecting the actual situation. Rural women and youth using ICTs like radio, television, and GSM to provide agricultural information can improve communication among all stakeholders in agriculture. According to Westermann et al. [22], ICTs in agriculture enable the effective dissemination of credible information like market prices and early warning information.

Table 2: Mean scores of level of use of ICTs by respondents

ICTs	Women		Youths			
	$\bar{x}$	SD	$\bar{x}$	SD	Overall $\bar{x}$	Overall SD
Radio set	2.47*	0.92	2.66*	0.69	2.57*	0.82
Television	2.33*	1.00	2.55*	0.87	2.44*	0.94
GSM	2.17*	1.22	2.37*	0.99	2.27*	1.11
Internet and email	1.23	1.02	1.33	1.16	1.28	1.09
CD-ROM	0.72	0.78	0.92	1.06	0.81	0.93
Video CD Player	1.05	0.99	1.22	1.11	1.13	1.05
Computer system	1.03	0.96	1.32	1.10	1.18	1.03
Digital camera	0.87	0.99	1.05	1.14	0.96	1.02
Fax machine	0.28	0.71	0.67	0.95	0.48	0.83
Multimedia projector	0.40	0.81	0.68	0.95	0.54	0.89
DVD	1.00	1.11	1.05	1.11	1.02	1.10
Online magazine	0.98	1.10	1.10	1.20	1.04	1.14

Source: Field Survey, 2023 variables * = significant Cut off: ≥ 1.5

3.2.1 Level of use of ICTs by respondents

Figure 1 shows that a greater percentage (40%) of respondents were high users of ICTs, 20.8% of them were moderate users of ICTs, 5% were low users while 34.2% were none users. This implies that the respondents were utilizing ICTs available to them in obtaining agricultural information. The high use of the ICTs by them shows that they perceived ICT use in agriculture as relevant to improve productivity and income. Also, data reveal that a bigger percentage of respondents were none users of ICTs in agriculture and this may be due to technological, institutional or human capacity constraints to ICTs use in the state. This is in line with the report of Saidu et al. [23] who revealed that lack of personnel, inadequate ICT facilities and farmers perception as some of the challenges and issues that obstruct successful use of ICTs in agricultural growth.

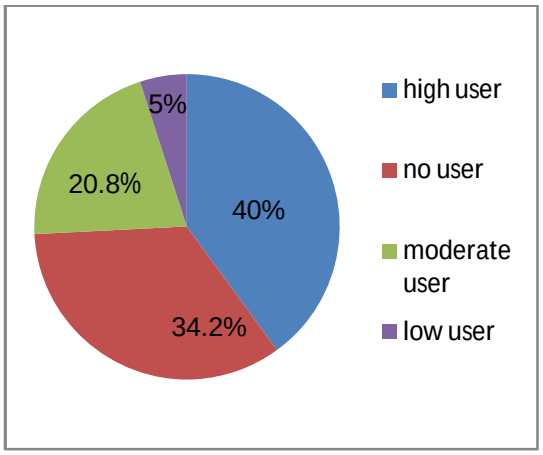

Figure 1: Level of use of ICTs by respondents

3.3 Relationship of socio-economic characteristics on respondents level of use of ICTs in agriculture

The data presented in Table 4 reveal that the regression results are based on the factors influencing the use of information and communication technologies by farmers in the state. The result shows that R^2 was 0.257, and the adjusted R2 was 0.210. The implication is that the dependent variables included in the model accounted for 21.0% of the variations in the dependent variable.

Entries in Table 4 show that the number of extension agent visits (t = 4.257, p = 0.000) had a significant positive relationship with farmers use of information and communication technologies in agriculture in the state. This implies that as extension agents conduct trainings on technology literacy, their knowledge and understanding of those technologies increase, and they tend to use those ICTs for obtaining agricultural information. Ntshangase et al. [24] found that more extension visits increased farmers' adoption of agricultural technology.

We therefore reject the null hypothesis for the number of extension visits.

Table 3: Relationship of socio-economic characteristics on respondents level of use of ICTs in agriculture

	Unstandardized coefficients		Standard coefficients	
Model	B	Std. Error	Beta	t

(constant)	22.106	4.584		4.823
Sex	-2.928	2.111	-0.121	0.168
Age	-0.040	0.088	-0.062	-0.458
Years spent in school	-0.134	0.081	-0.207	-1.654
Number of extension visit per year	1.547	0.363	0.364	**4.257***
Monthly income	-1.583E-5	0.000	-0.039	-.416
Marital status	0.231	1.679	0.014	0.137

Source: field survey, 2023 p=≤0.05 *= significant

3.4 Perceived constraints to use of ICTs by respondents

Data entry in Table 3 shows that women identified low literacy, epileptic power supply, lack of extension conviction, and lack of effective training as major barriers to ICTs use in agriculture, while youths identified lack of awareness as their main barrier. Also, a greater proportion of women's standard deviations were less than 1.0, indicating that almost all respondents' individual scores on the seriousness of the constraints to ICTs in agriculture did not vary much from their mean scores, reflecting the situation on the ground. The lone exception is the farmer's negative attitude (SD = 1.05). Youth had standard deviations greater than one from their mean scores for most variables. The circumstances may be different. Youths do not perceive some of those constraints which women cited because they depend on their parents for ICT purchase and education. Thus, rural women and youths in agriculture do not use ICTs due to these stated constraints. According to Jiriko et al. [25], farmers' ICT use is limited by a lack of appropriate training, an epileptic power supply, and low literacy.

Table 4: Mean score of perceived constraints that militate against the use of ICT by respondents

ICTs	Women		Youths		Overall	Overall SD
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	
Low ICT literacy	2.65*	0.78	2.22	1.01	2.43	0.92
Epileptic power supply	2.58*	0.83	2.10	1.13	2.34	1.02
Complexity in using ICT	2.40	0.89	1.83	1.20	2.12	1.09
Lack of competence	2.33	0.88	2.10	1.12	2.22	1.01
Lack of adequate awareness	2.42	0.92	2.50*	0.83	2.46	0.90
Negative attitude by farmers	2.30	1.05	1.98	1.03	2.14	1.05
Less concentration of ICT in rural areas	2.48	0.95	2.13	1.20	2.31	1.09
Lack of effective training	2.55*	0.811	2.17	1.03	2.36	0.94
Lack of extension conviction	2.60*	0.76	2.22	1.08	2.41	0.95

Source: Field Survey, 2023 Cut off: ≥ 2.5

3.5 Data reduction analysis of perceived constraints to ICTs use in agriculture by respondents

Table 5 shows that high ICT maintenance is a technological barrier for women and youths in agriculture. Due to a scarcity of experienced phone technicians and spare parts in the state, repairs for mobile phones and laptops might be pricey. Farmers may buy non-smart phones that are easier to maintain but less effective for agricultural information on the internet. Ekanem [26] found that high ICT maintenance costs prevented farmers from using ICTs in agriculture.

Table 5 shows that respondents' ICT use is limited by internet connectivity. This means there is no dependable and inexpensive service network to access and use online agricultural information on market information, improved crop varieties, government subsidies, and sustainable farming practices. Oke et al. [27] found that low network connections hinder Nigerian farmers' ICT use.

Table 5 shows that respondents' low literacy limits ICT use in agriculture. Gender norms in developing nations like Nigeria may hinder women's access to formal education and groups where they can learn new ICT technologies. Due to this, individuals may struggle to master the functionalities of modern ICTs like smart phones, tablets, and computers to fully benefit from agricultural information exchange. Ajayi et al. [28] found that illiteracy (91.3%) was a major barrier to ICT use in the state. Respondents' limited ICT literacy may prevent them from using computers and smart phones to use agricultural information.

Table 5 shows that respondents mentioned poor finances to purchase ICTs, a lack of extension training, and high costs as institutional obstacles to using ICTs in agriculture in the state. This means that women and youths cannot afford expensive digital technology like smart phones, computers, and internet service subscriptions to get agro-information on improved agricultural technologies in the state. This may be due to traditional gender norms that prevent women in poor countries like Nigeria from accessing finances and youths' dependence on their parents to buy them smart phones and computers. Ankrah et al. [29] found that high ICT costs prevented rural women farmers from using ICTS. Lack of extension education, training, and programs on ICT capacity building specifically targeted at women and youths may also be due to a lack of ICT-competent extension personnel and lack of government programs to develop farmers' ICT skills. Adeyemi et al. [30] found that farmers in the state use ICTS less due to a lack of training.

Table 5 shows that lack of government and private organizations ICT support and concentration of ICT infrastructure in the state as a one of the institutional constraints. This suggests that the state lacks government and commercial investment in infrastructure like masts to improve connection. ICT strategies and programs to build the state's ICT infrastructure may be lacking. This has reduced ICTs infrastructure in rural areas, which hinders network connectivity and ICT use. Izuogu et al. [31] found that the poor ICT infrastructure in rural areas (92.0%) was the biggest barrier to their usage of ICTs in Nigeria.

Table 5 shows that respondents' human capacities restrictions to ICT use include lack of ICTS awareness, lack of ICT-competence, and unfavorable farmers attitudes to using ICTs innovations. This suggests that respondents may lack the abilities to fully operate and use their accessible digital technologies for agricultural purposes, maybe due to insufficient extension education on ICTS relevance and use in collecting timely and reliable research-based agro-information that will improve their productivity and income. The finding confirms the report of Chiazoka et al. [32] who found that lack of awareness is a constraint to farmers use of ICT in Nigeria. Also, according to Tijjani [33],farmers' lack of ICT skill limits their ICT utilization.

Table 5: **Data reduction analysis of perceived constraints to ICTs use in agriculture by respondents**

Constraints	Institutional	Technological	Human capacity
high maintenance of ICTs	.346	**.738**	.165
lack of connectivity	.240	**.715**	.062
low ICT literacy	.031	**.852**	.202
Poor finances to purchase ICTs	**.719**	.162	.393
lack of competence in using ICT	.177	.128	**.814**
lack of adequate awareness on ICT	.340	.026	**.677**
high cost of ICT tools	**.769**	.050	.277
negative attitude by farmers in using ICT tools	.190	.326	**.718**
less concentration of ICT infrastructure in rural areas	**.710**	.344	.082
lack of extension training	**.697**	.267	.287
inadequate support by organizations and governments	**.841**	.176	.151

Source: Field Survey, 2023 cut off 0.04
Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization

4.0 CONCLUSION AND IMPLICATION

The study found that rural women and youths lack ICT skills and expertise in agriculture, which limits their utilization of agricultural information. Therefore, there is need for agricultural programs and interventions aimed at

improving their digital technological literacy in employing ICTs for agriculture. Thus, policymakers and relevant stakeholders in agriculture should prioritize the development of training programs and interventions that improve the technology literacy and human capacity building of rural women and youths in the state through the use of existing agricultural extension on the effective use of ICTs in obtaining agricultural information for increased productivity, income, standard of living, and agricultural development in the state.

In conclusion, the study found women and youths in agriculture in Abia State used radio, TV, and GSM extensively for obtaining agricultural information. In Abia State, youths suffered from a lack of extension awareness, while women suffered from low literacy, an epileptic power supply, and a lack of extension conviction and training. Respondents' level of ICT use in agriculture had a positive and significant relationship with the number of extension visits.

Competing interests

There is no competing interest between authors.

Authors' contributions

Author 1' designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. 'Author 2' managed the analyses of the study and literature searches. All authors read and approved the final manuscript.

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