



Innovative agriculture through information and communication technology (ICT) for optimized food production among root and tuber crop farmers in Abia State, Nigeria

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Abstract

The need to facilitate access to required information and knowledge through deployment of information and communication technologies (ICTs) to empower root and tuber crop farmers especially in the rural areas of Abia state, Nigeria cannot be overemphasized. As a result, structured questionnaire was used by researchers for data collection from 120 sampled respondents for the study. The data collected were analyzed using both descriptive statistics such as frequency percentage, tables, charts, mean and standard deviation and probit regression model as inferential statistics. From the data collected and analyzed, the result showed that major factors influencing the use of ICTs by the farmers are age of the farmer, gender, educational status, farm income, location of residence (distance from town) and cooperative membership. The result also showed that the use of mobile phones, radio and WhatsApp top the chart of common ICT gadgets use by the farmers. In addition, the study identified eight (8) relevance of ICTs usage by root and tuber crop farmers and six (6) challenges experience by the farmers in the use of ICT s gadgets. Based on these findings, the study recommended that both government and non-government agencies involved in agricultural development should provide adequate stable power supply, install network facilities and provide adequate ICTs facilities and devices to the rural poor root and tuber crop farmers to improve communication and boost production of cassava and yam. More importantly, constant training and retraining of farmers in effective use of ICT devices in their farm business to improve efficiency and productivity is highly recommended.

Keywords: Innovative agriculture, ICT, food production on, root and tuber crop farmers, Nigeria

Introduction

The world population is increasing rapidly and it has become uneasy to meet the needs of the people in terms of achieving food security by expanding areas under cultivation. This challenge can be ameliorated with innovative agriculture of root and tuber crops through information and communication technologies (ICTs). Root and tuber crops most especially play critical roles in the global food system, particularly in developing countries, where they rank among the top 10 food crops. They contribute to the energy, nutrition requirements and constitute an important source of income in rural and marginal areas (Amadi *et al.*, 2022). Simultaneously, information is vital for increased root and tuber crops (cassava and yam) production, processing and improving market and distribution strategies among farmers in Abia state, Nigeria. Cassava (*Manihot esculenta* Crantz) is a staple food for over 700 million people in western and central Africa with an average consumption of approximately 500 calorie per day and it has a big potential to be a profitable cash crop in Africa (Ogbuokiri *et al.*, 2015; NRCRI, 2014). It is strategically valued for its role in food security, poverty alleviation and as a source of raw materials for agro-allied industries in Nigeria, with huge potential for the export market and for providing livelihood for over 30 million farmers and countless processors and traders (Egesi *et al.*, 2014). In terms of production, almost every farm household grows cassava for purposes

of food and as a major source of income. It is widely grown in the 36 states of Nigeria, but only ten states account for the bulk of the crop output annually (Amadi *et al.*, 2020). Yam (*Dioscorea spp.*) is a multi-species crop and of major importance in the diet and economic life of people in West Africa especially in Nigeria, Ghana, Benin, Togo and Cote de Voir (Ukpabia *et al.*, 2008 and Obidiegwu and Akpobia, 2017).

Getting farmers informed on recent advancements in cassava and yam production and processing technologies will almost be impossible without an information dissemination system that is fast and easy to operate, hence the emphasis on the need for information communication technologies use amongst farmers. The greatest concern facing the whole world today is the provision of adequate and nutritious food for its teeming population, and ICT's are tools for enhancing people's daily lives whether by increasing access to information relevant to their economic livelihood or better access to other information source. ICT has been identified as the bedrock for national survival and a critical driver for enhancing national economic development (Alocha and Umeh, 2017). According to Okwusi *et al.*, (2009), ICTs include hardware and software media for collection, storage, processing, transmission and presentation of information in any format (sound, text, image-mail, computers, the internet, CD-ROMs, telephone, radio, television, video digital cameras). Enhanced use of ICTs is paramount for sustainable agricultural development, job creation, national disaster prevention and management as well as promoting poverty eradication most especially among developing economies of the world (Odor *et al.*, 2022). This calls for improved use of information and communication technologies in accessing information needed to enhance production level of cassava and yam farmers. The specific objectives of the study include identifying common gadgets use among farmers, relevance of ICTs usage for optimized food production, identifying challenging experience by farmers in ICTs use and determinants of ICTs Usage among cassava and yam farmers in Abia state.

Methodology

This study was conducted in Abia State, Nigeria. The State lies between Longitudes 7⁰23' and 8⁰02' E of the Greenwich Meridian, and Latitudes 5⁰47' and 6⁰12' N of the Equator. According to the 2006 provisional census figures, it has a population of 3,727,300 people NPC (2006). Multi- Stage random sampling technique was adopted to select 120 root and tuber crop farmers (60 yam farmers and cassava farmers) for the study. In the first stage, two (Ohafia and Umuahia) out of the three agricultural zones in Abia state were randomly selected. In the second stage, three extension blocks were randomly selected from each of the two agricultural zones to give a total of six extension blocks. In the third stage: two extension circles were randomly selected from each of the extension blocks to give a total of twelve extension circles. A list of yam and cassava farmers in the selected circles were compiled with the help of extension agents domiciled in those circles. This list served as the sampling frame. In the fourth and final stage; 5 yam and 5 cassava farmers were randomly selected from each of the extension circles, to give one hundred and twenty yam and cassava farmers. Data were collected with the use of questionnaire and focus group discussion (FGD). The data obtained were analyzed using appropriate statistical Objectives i, ii and iii; were analyzed using descriptive statistics such as frequencies, percentages, tables and chart while inferential statistical tool such as probit regression model was used to analyzed objective iv. The model is specified as:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6 \dots \dots + X_{13} + e_i)$$

Y = use of ICTs (measured by mean utilization scores of the respondents)

Y = use of ICTs = (mean of common gadgets use)

X₁ = gender (male = 1, otherwise = 0)

x₂ = age (years)

x₃ = education (years of schooling)

x₄ = distance (Km)

x₅ = farm-income (Naira)

X₆ = cooperative membership (member = 1, otherwise = 0)

e_i = error term

Result and Discussion

Common ICT Gadgets Use among the Farmers

The result in Table 1 presents common ICT gadgets and facilities use among cassava and yam farmers in Abia state. From the results, it was showed that the use of mobile phones and radio top the chart with 97.5% and 65.8% respectively. Other ICTs gadgets usage by the farmers with their corresponding percentage values include: whatsapp (61.7%), internet (45.8%), television (41.7%), among others This implies that farmers' accessibility to various types of ICTs and appropriate utilization of such ICTs is encouraging but also need to be enhanced in order to increase the level of adoption of new improved varieties of cassava and yam which will in turn give a boost to the crops production in Abia state. This result is in tandem with Obiora (2014) that there is a high level of utilization of mobile phones among farmers in rural area. However, Aphunu and Atoma (2011) reported low level of use of ICTs facilities in rural areas.

Table 1: Frequency and percentage distribution of common ICT gadgets use by the farmers

ICTs	Frequency	Percentage	Ranking
Social media (whatsapp)	64	61.7	3 rd
Mobile phone	117	97.5	1 st
Computer	11	9.2	7 th
E-mail	4	3.3	8 th
Television	50	41.7	5 th
Radio	79	65.8	2 nd
Internet	55	45.8	4 th
NRCRI call Centre/bulletin	3	2.5	9 th
Newspaper/Magazine	34	28.3	6 th

Source: Field Survey, 2020

Relevance of ICTs Usage for Optimized Food Production

The result showed that the 8 items in the Table 2 are relevance of ICTs usage by cassava and yam farmers for optimized food production in Abia state. For the cassava and yam farmers, ICT usage enhance the overall effectiveness of farmers (100%), helps link farmers with extension agents to boost output (96.7%), link farmers together in cooperative (92.5%), enhance farmers knowledge of the best production practices (91.7%), make conversation easier for farmers in production improvement (87.5%), boost production and farm growth via easy conversation (82.5%), improve access to market information and bargaining power (80%) and increase farmers' access to climate related information (72.5%). This implied that disseminating agricultural inputs and outputs information through ICTs especially mobile phones using various applications like short message service (SMS) and portals could aid minimize information asymmetries and enhance the bargaining power of farmers and consequently income. The findings of this study corroborated the submission of Alocha and Umeh (2017) that ICTs tools have the potentials to empower and provide greater opportunity for individuals, groups and communities irrespective of age and sex.

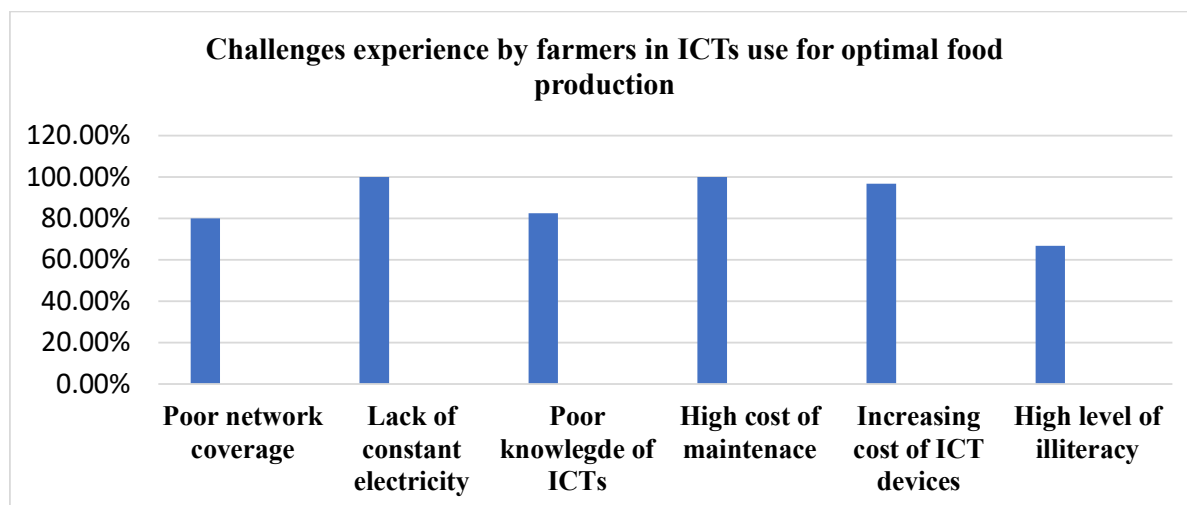
Table 2: Frequency and percentage distribution on relevance of ICTs usage for optimized food production

Relevance of ICTs Usage for Optimized Food Production	Frequency	Percentage
Enhanced farmers knowledge of the best production practices	110	91.7
Boost production and farm growth via easy conversation	99	82.5
Helps link farmers with extension agents to boost output	116	96.7
Improve access to market information and bargaining power	96	80.0
Link farmers together in cooperative	111	92.5
Enhanced overall effectiveness of farmers	120	100
Increase farmers' access to climate related information	87	72.5
Make conversation easier for farmers in production improvement	105	87.5

Source: Field Survey, 2020

Challenges Experience by cassava and yam farmers in ICTs use for Optimized Food Production

The result presented in figure 1 shows that cassava and yam farmers experience serious constraints in the use of ICTs in the study area, and these were inadequate electricity (100%), high cost of maintenance (100%), increasing cost of ICT devices (97.5%), poor knowledge of ICT (81.5%), poor network coverage (80%) and high level of illiteracy (66.2%). The implication is that the more the constraints the more difficult the farmers have in obtaining and using ICTs facilities which as a result affect the level of cassava and yam production in Abia state. According to Lawal- Adebawale (2009) knowledge, level of education and operating procedure of ICTs is a pre-requisite to effective access and successful use of ICTs. Odor *et al.*, (2022) also reported that farmers most times are constrained to obtain information from various sources of information. Alocha and Umeh (2017) identified challenges of extension agents in the use of telephones to include very limited access and use of internet, unstable/unreliable electric power supply, inadequate source of information about the ICTs, limited access to computers and limited coverage of AM/FM stations and TV signals.



Factors Influencing ICTs Usage by Cassava and Yam Farmers in Abia State

The Probit regression estimates of the factors influencing cassava and yam farmers on ICTs usage in Abia State, Nigeria is presented in Table 4. The result indicates that gender had negative influence on ICTs usage while age, educational status, distance to city, farm income and cooperative membership had positive influence on ICTs usage. Age had a positive coefficient (0.067) that was significant at 1% alpha level. This implied that an increase in age leads to an increase in the probability of using of ICTs among cassava and yam farmers in study area. Although, it is expected that younger farmers will be more ICT compliant, the result still make sense, it could be that older farmers have made significant investment and earn higher income and thus could better afford to buy and use ICTs. This finding disagrees with the report of Omotayo (2011) which posited that young people are more disposed to ICTs especially the modern ICTs (computer/internet and mobile phones). The coefficient of gender (-0.129) was significant at 10% alpha level and negatively signed. This implies that female cassava farmers had better chance of using ICTs than male farmers. This is because females are more involved in food production and processing than the male farmers. Educational status had a positive coefficient (0.098) that was significant at 1% alpha level. The positive sign of the variable implies that the more educated cassava and yam farmers are the more they use ICT facilities. The implication is that high education level have the effect of enabling farmers access and conceptualize information on good farming methods, access better paying rural labour market and capable of profitably combining various experiences. This result is in consonance with the findings of Osondu and Ijioma (2015) and Agada and Akpan (2017) that the higher the level of education, the higher the level of use of ICTs. In addition, distance to city had a positive coefficient (0.036) that was significant at 1% alpha level. This implies that the shorter the distance to cities, the higher the probability of using ICTs by cassava and yam farmers. This result makes sense considering the fact that ICT facilities such as GSM phones, facebook and internet require network signals from service providers such as MTN, GLO and 9Mobile. Farmers residing in remote rural areas may not be able to access network signals with which to access agricultural information. The coefficient of farm income (0.177) was positive and significant at 5% alpha level. This implies that an increase in farm income leads to an increase in the probability of using ICTs among cassava and yam farmers in the study area. This result compares favorably with finding obtained by Osondu and Ijioma (2015) among farmers in Anambra State of Nigeria. Cooperative membership was positive (0.665) and significant at 1% alpha level. This implies that any increase in cooperative membership leads to an increase in the probability of using ICTs among farmers in the study area.

Table 4: Probit Regression Estimates of Factors Influencing ICTs Usage by Cassava and Yam Farmers in Abia State

Parameter	Estimate	Std Error	Z –value
Age	.067	0.006	11.779***
Gender	-.129	.074	-1.740*
Educational status	.098	.040	2.468**
Distance to city (Km)	.036	.006	6.014***
Farm Income	.177	.065	2.711**
Cooperative Membership	0.665	0.102	6.546***
Intercept	-5.439	.525	-10.434***
Chi-Square			8504.128***

Source: Field Survey, 2020

***= Significant at 1% alpha level *= Significant at 10% alpha level

Conclusion

Information and communication technology (ICT) no doubt has changed the way cassava and yam farmers connect to the markets and themselves and this enables farmers exchange information more easily for improved productivity. The study examined innovative agriculture through information and communication technology (ICT) for optimized food production in Abia state. From the data collected and analyzed, the result showed that major factors influencing the use of ICTs by the farmers are age of the farmer, gender, educational status, farm income, location of residence (distance from town) and cooperative membership. The result also showed that the use of mobile phones, radio and whatsApp top the chart of common ICT gadgets use by the farmers. In addition, the study identified eight (8) relevance of ICTs usage by root and tuber crop farmers and six (6) challenges experience by the farmers in the use of ICT s gadgets. Based on these findings, the study recommended that both government and non-government agencies involved in agricultural development should provide adequate stable power supply, install network facilities and provide adequate ICTs facilities and devices to the rural poor root and tuber crop farmers to improve communication and boost production of cassava and yam. More importantly, constant training and retraining of farmers in effective use of ICT devices in their farm business to improve efficiency and productivity is highly recommended.

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