EFFECTS OF INFORMATION AND COMMUNICATION TECHNOLOGIES PATRONAGE BY SMALL-SCALE YAM FARMERS IN DELTA NORTH AGRICULTURAL ZONE OF DELTA STATE, NIGERIA.

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Abstract
This study examined the effects of Information and Communication Technologies (ICTs) by small-scale yam farmers in Delta North Agricultural Zone of Delta State, Nigeria. The objectives of the study were to: analyze the socio-economic characteristics of small-scale yam farmers, determine their level of access and use of ICT on yam production, determine the effects of use of ICT on yam farm income and to identify the factors hindering the small-scale yam yammers effective use of ICT in the State. Sample size was eighty-eight and this was arrived at through multi-stage sampling technique. Descriptive and inferential statistics was respectively used to analyze the objectives and hypotheses of the study. Results revealed that the average age, farming experience, farm size and household size was 43.05 years, 12.66 years, 3.79 ha. and 7 person respectively. The farming was dominated by males (70.45%), and they mostly (42.02%) had NCE/OND/ND qualification with most (64.64%) of them been married. The level of access and use of ICT tools by the yam farmers was high and this was responsible for the difference in income (₦105,113.63) in favour of farmers who had access and usage of ICT tools in yam production. Some of the challenges limiting effective use of ICT on yam farming were poor nature or unavailability of mobile network, poor electricity supply, lack of funds and high cost of ICT tools amongst others. Socio-economic variables like age, gender, farm income, educational level, farming experience and farm size were significant to yam farmers access and use of ICT tools in yam production. The study recommends that government needs to compel mobile network providers to improve on their services and spread same to the rural areas where such has not gotten to. Government needs to revamp the poor electricity supply which was pointed out by the farmers as a major challenge.

Keywords: Effects, Information, Communication Technologies, small-scale, farmers, income, access, yam, production

INTRODUCTION

Yam is a tuberous crop and it is a major staple food for those in the tropics (Okoedo-Okojie and Okwuokenye, 2016). The authors noted that the crop is better than other tuberous crops at least when compared to cassava. The reason for its preference according to Pius-Chinwba and Odjuvwuederhie (2006) is that yam crop is a major source of carbohydrate, with some reasonable quantity of protein (when compared to other tubers), vitamin C and an alkaloid called dioscorine, a heart stimulant. Pius-Chinwba and Odjuvwuederhie (2006) also asserted that yam crop has various species numbering up to 600 and out of which only dew of them are cultivated as staples and these include *Dioscorea rotundata, D. alata, D. dumenterum, D. esculenta and D. bulbifera***.**

Yam production has been described by Ariyo *et al.*, (2020) as being profitable, viable and a worthwhile enterprise which can be embarked upon by the youths and adults. Okwuokenye and Onemolease (2011) remarked that yam can be eaten in different forms like boiled, fried and pounded into *fufu* or even processed into yam powder which can be made into *fufu*. In terms of production capacity, Nigeria is the World largest producer of yam and she accounts for about 70 – 76% of World total output. FAO (2002) reported that there has been a steady increase in yam production, but this has not been able to meet up with the demand of the populace. Okoedo-Okojie and Okwuokenye, (2016) ascribed this shortfall to production related problems which is in line with having the bulk of the production in the hands of small-scale farmers. Though it has been accepted that agricultural development (yam inclusive) in Nigeria depend upon the small-scale farmers and that they form the bulk of our farming community (Lucky and Achebe, 2013). Lucky and Achebe (2013) further stated that these small-scale farmers live in rural areas which makes them unable to access necessary agricultural information for the improvement of their agricultural productivity.

In revamping this aforementioned ugly trend, Lucky and Achebe (2013) posited that the farmers need to know and be equipped with agricultural information that is necessary to advance them beyond their present level. Such information will help to increase their yield and that such can be accessed through the use of techniques that involves Information Communication Technologies (ICT). Lucky and Achebe (2013) stated that ICT are those technologies that can be used to inter link information technology devices such as personal computers with communication technologies like telephone and their telecommunications networks. Joyous and Paul (2016) explained the role

of Information and Communication Technology (ICT) in agricultural production and this include being able to expedite the process of agricultural technology transfer from research and development institutions to farmers. Joyous and Paul (2016) also identified the fact that ICTs help to improve adoption of agricultural technology by supporting farmer learning, problem solving and accessibility to profitable markets for their crops.

In view of the aforementioned benefits of ICTs this study seeks to examine the extent to which ICT has really influenced the output of small-scale yam farmers in Delta North Agricultural Zone of Delta State, Nigeria. Against this background, the following objectives were examined.

Objectives of the study

i. To analyze the socio-economic characteristics of small-scale yam farmers in Delta State.

ii. To determine the level of access and the use of Information Communication Technologies by small-scale yam farmers in the study area.

iii. To determine the effects of use of Information and Communication Technologies on farm income of yam farmers in the study area, and

iv. To identify the factors hindering the small-scale yam farmers effective use of Information and Communication Technologies in the State.

Hypotheses of the study

The hypotheses were stated in their null forms as:

Hoi: Socio-economic characteristics of the small-scale yam farmers have no significant relationship with their level of access and use of Information and Communication Technologies in yam production in the Delta Agricultural zone of Delta State.

Hoii: There is no significant difference in farm income of small-scale yam farmers adopters and non-adopters of Information and Communication Technology tools in yam production.

METHODOLOGY

This study was carried out in Delta North zone, Delta State. It is made up of 25 local government areas with its capital at Asaba. National Population Commission (NPC) (2018) estimation of the State's population stands at 5,663,400 and the geographical boundary reads that the State is accommodated between Longitudes 5.00^0 and 6.45^0North and Latitudes 18^0 and 23^0 South. It is flanked by Edo State in the North, Ondo State to the North-West Anambra State to the East and it is bounded in the South by the Bight of Benin and has an Atlantic Coastline of 160km (AWC, 2006). Isoko, Ika, Urhobo, Itshekiri, Ijaw, Ukwuani and Aniocha are the major and diverse ethnic and tribal groups existing in the State. Occupationally, the inhabitants are known for farming that includes fishing, cropping an animal rearing. Others are known for oil prospecting, civil services, trading and commerce (AWC, 2006).

NAEC (2008)m estimated that Delta State has 72 communities in Delta North, 80 communities in Delta Central and 48 communities in Delta South. The climate is marked by two distinct seasons, the dry and the rainy seasons. The average rainfall of the State ranges between 252 – 254mm and the average temperature ranges from a minimum of 24^0C to a maximum of 33^0C (Federal Office of Statistics, 2004). The validated instruments produced a reliability coefficient (Cronbash Alpha) of 0.773 implying that the research question instrument was suitable for the study.

Sampling techniques and sample size of the study

The study's respondents were selected through the use of multi-stage random sampling method. This started with the purposive selection of the Delta North Agricultural zone. This purposive selection was as a result of the fact that the zone is majorly known for yam production. The second stage involved the random selection of five (5) local government areas (LGAs) in the zone and from each, there was the random selection of three (3) towns (stage 3), making it a total of fifteen (15) towns that were used for the study. The LGAs and the towns were: Aniocha North LGA from which Onicha-Ugbo, IsseleUku and Issele-Azagba were randomly selected; Ika North East LGA from which Mbiri, Umunede and Ute-Ogbeje were randomly selected; Ika South LGA from which Abavo, Ekuku-Agbor and Ihuozomor (Ozanogogo) were randomly selected; Ndokwa West LGA from which Abbi, Ogume and Utagba-Uno were randomly selected and Oshimili North LGA from which Okpanam, Ibusa and Illahwere randomly selected. Stage 4 involved the random selection of six farmers per community who are adopters of ICT in yam production, and this brought the total number of farmers administered with the question instrument to ninety (90). Out of the returned question instrument eighty – eight (88) (i.e. 97.78%) of them suitable for analysis were used for the study. An equivalent number of non-adopters of ICT were also randomly sampled per community for comparative purposes.

Analytical techniques of data

Descriptive statistics (frequency distribution, percentage and mean) was used for determining the socio-economic characteristics of the respondents, level of access and use of Information Communication Technologies by small-scale yam farmer and the effects of use of ICT on yam farm income. Four point Likert scale was used to analyze the factors hindering the effective use of ICT in small-scale yam production. The scale ranges from, Strongly Agree: coded 4; Agree: (coded 3); Disagree: (coded 2) and Strongly Disagree: (coded 1), the weighted mean score of 2.50 and above was agreed as factors hindering the effective use of ICT in yam production while factors with values that are less than 2.50 were considered otherwise. The weighted mean score (2.50) was obtained as follows: (4 + 3 + 2 + 1) / 4 = 2.50.

Inferential statistics (multiple regression and Chow-test) were used to test the hypotheses of the study. Multiple regression was used to estimate the relationship of socio-economic characteristics of the small-scale yam farmers adopter of ICT with their level of access and use of Information Communication Technologies in yam production in Delta Agricultural zone of Delta State.

Determinants of the regression equation is specified as:

Y $Y = a + b_1X_1 + b_2X_2 + b_3X_3, \ldots, + b_nX_n + e$

Y = Dependent variable

a = Coefficient

X_i = Independent variables

e = Error term

The variable in the equation are defined below

The variables in the equation were defined below as;

Y = Level of access and use of ICT in yam production

X_1 = Gender (dummy: male = 1; female = 2)

X_2 = Age (years)

X_3 = Education (Pri. Edu. = 1; Sec. Educ. = 2; Post Sec. Educ. = 3)

X_4 = Marital status (single = 1, married = 2, divorced = 3, widow(er) = 4)

X_5 = farming experience (years)

X_6 = Farm size (ha.)

X_7 = Household size (number of people living and feeding together)

X_8 = farm income (₦)

The best fit model or lead equation was the Linear equation amongst others like Exponential, Cobb Douglas an Semi-log equation. The Linear equation was selected as the lead equation based on the model's highest adjusted R^2 with most likely the highest F-ratio and t-value that shows level of significance of the variables being tested (Iyoha an Ekanem, 2002).

The Chow-test was used to compare the difference in means of two variables or items. This test was used to test the effect of yam farmers having access and those without access to ICT on yam farm income. Chow test is a statistical and econometric test to whether the coefficients in two Linear regressions on different data sets are equal. Chow-test was used to confirm if farmers access and use of ICT on yam production had any significant effect on their farm income. The test involves producing three linear regressions, one equation for the restricted model (pooled data) and separate regressions for the unrestricted models (farmer's access and use of ICT and non-access model). The test statistics is formally stated as follows:

$$Fc = \frac{[Sc - (S_1 + S_2)] / K}{Sc / (N_1 + N_2 - 2K)}$$

Fc = (F 0.05, k, $(n_1 + n_2 - 2k)$) (Chow test Wikipedia, 2012)

$$F^*_{k,N1+N2-2k} = \frac{(Sc - (S_1 + S_2)) / K}{(S_1 + S_2) / (N_1 + N_2 - 2K)}$$

(Chow test Wikipedia, 2012)

Where;

Fc = the statistical test (calculated)

F* = the statistical test (tabulated)

Sc = the sum of squared residuals from the combined data

S_1 = the sum of squared residuals from the first group (i.e. ICT adopters)

S_2 = the sum of squared residuals from the second group (i.e. non-ICT adopters)

N_1 and N_2 = the observations (sample size) in each group

K = the total number of parameters in the model including the intercept.

Decision rule for Chow-test

If the test statistics, F* (F-calculated) is greater than the F-tabulated, the null hypothesis is rejected while the alternative hypothesis is accepted, or otherwise if F* (F-calculated) is less than the F-tabulated. If significant, it means that the sub-samples are significantly different in their farm income.

RESULTS AND DISCUSSION

The socio-economic characteristics of the respondents is shown in Table 1. The result showed that yam farming in the area is dominated by males (70.45%), though few (29.55%) females still participated in the farming activity. The result indicates that yam farming in the area is not gender specific. However, the dominance of males in the farming could be attributed to the tedious nature of the farming activity. Results on yam farmers' age revealed that the average age of the farmers was 43.05 years with most (38.64%) of them within the age bracket of 35 – 44 years. The result implies that the farmers are young, strong and active persons. Additionally, most (64.64%) of the farmers were married, indicating that they are responsible people and possibly have responsibilities to cater for. Sobalaje and Adigun (2013) obtained similar results regarding gender, age and marital status distribution of yam farmers in Osun State.

Results on respondents' educational qualification revealed that most (42.04%) of the farmers had National Certificate of Education (NCE) / Ordinary National Diplomas (OND) / Diploma Certificate. This implies that they are literate and so can be able to adopt farm innovations or technologies (with little or no assistance) that can boost their productivity leading to increase in farm income.

Table 1: Socio-economic characteristics of the respondents of the study. N = 88

Socio-economic variables	Categories	Frequency	Percentage	Mean
Gender	Male	62	70.45	
	Female	26	29.55	
Age range (years)	< 25	6	6.82	
	25 – 34	13	14.77	
	35 – 44	34	38.64	
	45 – 54	16	18.18	
	55 – 64	11	12.50	
	≥ 65	8	9.09	43.05
Educational status	Primary Educ.	9	10.23	
	Secondary Educ.	23	26.14	
	NCE/OND/Dip.	37	42.04	
	HND/Degrees	15	17.04	
	Higher Degrees	4	4.55	
Marital status	Single	28	20.45	
	Married	56	64.64	
	Divorced	9	10.23	
	Widowed	5	5.68	
Farming experience (yrs)	< 5	8	9.09	
	5 – 9	19	21.59	
	10 – 14	33	37.50	
	15 – 19	11	12.50	
	≥ 20	17	19.32	12.66
Farm size	≤ 2	18	20.45	
	2.1 – 4	39	44.32	
	4.1 – 6	15	17.05	
	6.1 – 8	11	12.50	
	≥ 8.1	5	5.68	3.79
Household size	1 – 3	14	15.91	
	4 – 6	34	38.64	
	7 – 9	27	30.68	
	10 – 12	8	9.09	
	≥ 13	5	5.56	6.5 = 7

Source: Field survey: 2022

The respondents' household size had an average of 7 persons with the modal (38.64%) having between 4 – 6 persons in their households. The result implies that the respondents had people to cater for in their households and that the household size could still contribute to the economic strength of the farmers farm activity. Also revealed was the fact that the average faring experience of the farmers was 12.66 years with most (37.50%) of them having between 10 – 14 years of farming experience. With such experience, the farmers could be favourably disposed to handling farm challenges and appropriately adopt farm innovations that could help improve farm productions. The aforementioned results on educational level, household size and farm experience correspond with findings of Okwuokenye (2020) which stated that most farmers who dominated the National Open University of Nigeria, Kaduna farms had post-secondary educational qualification with an average household size of 6 persons and whose farming experience range was between 10 – 14 years. The average size of the respondents' farm holdings was 3.79 ha., with majority (44.32%) of them having farm size range of between 2.1 – 4.0 ha. The result confirmed that the farmers were of small-scale category since their farm holding was less than 4 ha. Results of Erie (2009) is in consonance with this finding which thus states that majority of Nigerian farmers are still operators of small-scale farming.

The Level of access and use of ICT tools by small-scale yam farmers

The level of access and use of Information and Communication Technologies on yam production is shown in Table 2. The result reveled that most (34.09%) of the respondents indicated their access and use of ICT tools was to a high extent. Only about 7.95% of the farmers indicated that their use of ICT tools was to a very high extent. Going further, about 20.46%, 25% and 12.5% were respectively of average, low and poor extent.

On a broader consideration, Table 3 revealed that most (57.95%) of the farmers had high access and use of ICT tools on yam production. The other fraction (42.05%) had low access and use of ICT tools in yam production. The result implies that small-scale yam farmers access and use of ICT tools have not been exploited to its full potentials.

Table 2: Extent of use of ICT tools by the farmers in yam production

Extent of use of ICT tools	Frequency	Percentage
Very high extent	7	7.95
Just high extent	30	34.09
Average extent	18	20.46
Low extent	22	25
Poor extent	11	12.50

Source: Field survey: 2022

It therefore suggests that further exploitation of use of ICT tools would result to higher productivity and farm income. This assertion was corroborated by Nkwocha *et al.,* (2009) that farmers need information (most likely to be dominated through the use of ICT) to enhance agricultural production and that such information need to be accurate, complete, dynamic, concise and must be in user friendly form (package).

Table 3: Categorization of level of access and use of ICT by small-scale yam farmers

Categorization of level of access and use of ICT by small-scale yam farmers	Frequency	Percentage
Low	37	42.05
High	51	57.95
Total	88	100.00

Source: Field survey: 2022

Effects of yam farmers' accessibility to ICT on yam farming income

The income of yam farmers was assessed by categorizing the farmers into adopters and non-adopters of Information Communication Technologies (ICTs) on yam production and this was based on their accessibility and use on yam production. The farmers income was on the basis of annual consideration and it is shown in Table 4. The adopter category represents yam farmers who had access to at a single ICT tool while the non-adopter category represents those farmers who did not have any access to ICT tool. Nevertheless, the annual farm income of the respondents revealed that most (38.64%) of the yam farmers without access to ICT tools earned an annual farm income of between ₦100,000 – ₦200,000 from yam production. On the other hand, most (42.05%) of the respondents who had access to ICT tools earned an income of between ₦200,001 – ₦300,000.

Table 4: Effects of yam farmers' accessibility to ICT on yam farming income

Farm Income (₦)	Farmers with access to ICT			Farmers without access to ICT		
	Freq.	%	Mean	Freq.	%	Mean
≤ 100,000	3	3.41		23	16.14	
100,001 – 200,000	10	11.36		18	38.64	
200,001 – 300,000	37	42.05		17	14.77	
300,001 – 400,000	18	20.45		12	11.36	
400,001 – 500,000	12	13.64		8	9.09	
> 500,000	8	9.09	₦306,818.18	-	-	₦201,704.55

Source: Field survey, 2022; Difference in farm income between adopters and non-adopters = ₦306,818.18 - ₦201,704.55 = ₦105,113.63

The average farm income of the respondents with access and those without access to ICT was ₦306,818.18 and ₦201,704.55 respectively. The difference in average farm income was ₦105,113.63 and this was in favour of those farmers with access to ICT tools. The findings indicate the positive role of ICT tool usage on farm production. This finding agrees with the results of Sobalaje and Adigun (2013) who reported that production activity and marketing of crops were most appreciable benefits from the use of ICT by yam farmers in Osun State, and that the benefits were most likely connected to increased production output and farm income.

Factors hindering the small-scale yam farmers effective use of ICT

Some factors have been known to be hindering the small-scale yam farmers effective use of Information and Communication Technologies (ICTs) in yam production. These factors have been ranked according to their level of seriousness and they are shown in Table 5. First amongst them is poor nature or unavailability of mobile network (mean = 3.88), the second, third and fourth were poor electricity supply (mean = 3.67), lack of funds (mean = 3.42) and high cost of ICT tools (mean = 3.25) respectively. The constraints that ranked 5^{th}, 6^{th}, 7^{th} and 8^{th} were respectively low level of awareness (mean = 2.96), lack of infrastructure (mean = 2.73), lack of technical skills on ICT use (mean = 2.53) and low level of training (mean = 2.51).

Table 5: Distribution of factors hindering the effective use of ICT by small-scale yam farmers

S/n	Factors hindering the effective use of ICT by farmers in yam production	Mean	Standard Dev.	Ranking
1.	Poor or unavailability of network	3.88	0.63	1st
2.	Poor electricity supply	3.67	0.56	2nd
3.	Lack of funds	3.42	0.61	3rd
4.	High cost of ICT tools	3.25	0.59	4th
5.	Low level of awareness	2.96	0.66	5th
6.	Lack of infrastructure e.g. roads, schools, etc	2.73	0.61	6th
7.	Lack of technical schools	2.53	0.74	7th
8.	Low level of training	2.51	0.71	8th
9.	Low level of income earning	2.38	0.81	9th
10.	Low level of educational status	2.34	0.77	10th
11.	Farmers bias for ICT device or tools	2.15	0.74	11th

Source: Field survey, 2022; Agreed ≥ 2.50

These findings are supported by Arokoya (2005). The author identified unstable power supply, poor mobile network, high cost of ICT tools, high level of poverty at the farmers' level as major factors plaguing the accessibility and use of ICT tools by farmers. Confirming the results further, lack of infrastructure, poor technical skills of the farmers and their low level of training on the use of ICT tools were identified by Sobalaje and Adigun (2013) as serious limiting factors to use of ICTs in farm production. In where level of farmers awareness was concerned, Sobalaje and Adigun (2013) was of a contrary opinion that farmers level of awareness on the use of ICT tools in yam production was not a constraint and so in disagreement with this particular factor.

Relationship between socio-economic characteristics of small-scale yam farmers and their access to Information Communication Technologies on yam production

Multiple regression was used to analyze hypothesis one which states that: socio-economic characteristics of the small-scale yam farmers have no significant relationship with their level of access and use of Information and Communication Technologies in yam production in the Delta Agricultural zone of Delta State. Table 6 shows the estimated parameters of the small-scale yam farmers socio-economic characteristics and their level of access and use of Information Communication Technologies (ICTs) in yam production. The computed F-Statistics (6.364) was significant at the 5% level (Critical F = 3.94). since computed F-Statistics was greater than Critical or Tabulated F-Statistics, it means that the collective influence of the variables on farmers accessibility and use of ICT tools was significant at the 5% level. For this reason, the null hypothesis was rejected in favour of the alternative hypothesis. The variables in the model jointly accounted for about 59% *(adjusted R^2 = 59.2%)* variation in yam farmers accessibility and usage of ICT tools in yam production. Six out of the eight explanatory variables were found to be significant and these include: farmers' age, gender, educational level, farming experience, farm size and yam farm income.

Age of the respondents has a beta coefficient of -2.268 and t-value of 2.14. the relationship between farmers and their access to ICT tools was negative and significant at the 1% level. The result implies that older farmers would have less access and use of ICT tools in their farm production. The result is supported by findings of Joyous and Paul (2016) which observed that younger farmers are more eager to learn and use ICT tools than their older counterparts in their farm operations. Gender of the respondents revealed a beat coefficient and t-value of 3.352 and 0.04 respectively. The relationship of farmers gender with their access and use of ICT tools was positive and significant at the 1% level, thus indicating that since male constituted the majority (70.45%), it therefore implies that the involvement or inclusion of more males in yam production will result in more access and use of ICT tools in yam production. This result is corroborated by that of FAO (2011) which noted that women farmers have been reported to be 20 – 30% less productive than their male counterparts and that this shortfall is attributed to female's lack of access to resources which include technologies amongst other factors.

The relationship of farmers educational level and their access and use of ICT tools in yam production was positive and significant at the 1% level. The variable has a beta coefficient of 2.047 and t-value of 0.98. The implication of the relationship is that educational level has a positive influence on farmers access and usage in farm production. This result is similar to that of Strong *et al.,* (2014) who found educational level of farm respondents to positively correlate with access, acceptance and use of ICT tools in farm production. Farming experience of the yam farmers (b = 2.341; t = 0.29) was positively signed and significant at the 5% level to farmers access and use of ICT tools in yam production. The implication of the result is that, the more experience farmers have in farming yam crop, the more would be their accessibility and use of ICT tools. The result on farming experience is in line with

the findings of Mohammad *et al*. (2012) as they reported the existence of a significant relationship between the farming experience and application of information from ICT tools for their farm production.

Table 6: Relationship between socio-economic characteristics of small-scale yam farmers and their access and use of ICT on yam production

Socio-economic variables	B-Coefficient	Standard Error	t-values	Prob. level
Constant	14.617	4.021	1.59	0.151
Age	-2.268**	-0.875	1.14	0.001
Sex (gender)	3.352**	0.518	0.04	0.012
Educational level	2.047*	0.248	0.98	0.001
Farming experience	2.341*	1.027	0.29	0.105
Household size	-1.018	-0.924	0.41	0.26
Farm size	2.302*	0.443	0.52	0.319
Marital status	1.303	0.861	0.28	0.412
Farm income	1.462	0.314	0.79	0.008

***Significant at the 1% level;*

**Significant at the 5% level (Critical t-value = 1.645); F = 6.364 (P < 0.050); Adjusted R^2 = 0.592*

The farm size of the farmers and their access and use of ICT tools in yam production was found to have a beta-coefficient of 2.302 and t-value of 0.52. the relationship was positive and significant at the 5% level. By implication, farmers with larger farm size are bound to have more access and use of ICT tools in their farm production. The result is in line with findings of Rajni *et al.,* (2012) which found farm size to be positively correlated with farmers access and use of ICT tools in crop production. Farm income of the farmers had a positive relationship with farmers access and use of ICT tools in their yam production. The relationship's beta coefficient was 1.462 while the t-value was 0.79 and it was significant at the 1% level. The result implies that farmers with farmers with higher farm income would be more disposed and have more access to ICT tools in their yam production. The result agrees with that of Rajni *et al.,* (2012) who noted that adopters of ICT tools were able to enjoy significantly better participation in decision making and had better productivity which translates to higher farm income.

Analysis of small-scale yam farmers accessibility to ICT on yam farm income (Chow-test)

Chow-test was used to test the difference in yam farm income of small-scale farmers that have and those who don't have access to Information Communication Technologies (ICTs) on yam production (hypothesis 2) Table 7 shows the impact of ICT on yam production at the small-scale level. The results revealed that F* calculated and F* tabulated was 2.381 and 1.75 respectively. Since F* calculated was greater than F* tabulated, it led to the acceptance of the alternative hypothesis (which states: there is a significant difference in farm income of small-scale yam farmers adopters and non-adopters of Information and Communication Technology tools in yam production) against the null hypothesis. The average income of the respondents that have and those who do not have access to ICT tools was ₦306,818.18 and ₦201,704.55 respectively. The difference was ₦105,113.63 and it was in favour of the yam farmers who had access and usage of ICT tools on yam production. This difference was found to be significant at the 5% level (see Table 4). The result of yam farmers with more access to ICT tools and its usage in yam production, leading to more productivity and higher farm income was supported by the findings of Sobalaje and Adigun (2013) which stated that the use of ICT played significant role and difference in production output and income of yam farmers in Osun State, Nigeria.

Table 7: Impact of small-scale yam farmers' access to ICT on farm production

Models	RSS	Mean Income (₦)	n	F-Cal
Pooled	3660531982329.574			
- Small scale yam farmers with access to ICT tools.	2236174355613.218	₦306,818.18	88	
- Small scale yam farmers without access to ICT tools.	1424357626716.356	₦201,704.55	88	2.381

Significant at the 5% level (Critical F = 1.75; df (k, N – K, 9 581) k = 9)

Conclusion and Recommendations

The study investigated the effects of Information Communication Technologies (ICTs) access and usage by small-scale yam farmers in Delta North Agricultural Zone of Delta State, Nigeria. The study found that yam farming in the area was highly plagued by many factors like poor nature or unavailability of mobile network, poor electricity supply, lack of funds and high cost of ICT tools, amongst others. The level of access and use of ICT tools by the yam farmers was

found to be high and this has helped in creating a huge difference in terms of farm income between those yam farmers who had access to ICT tools (₦306,818.18) and their other counterparts who didn't have access (₦201,704.55). The difference (₦105,113.63) was in favour of those yam farmers who actually had access and use of ICT tools in their farming operations. It therefore implies that access and use of ICT tools have really had a strong and positive influence on farm productivity level and farmers income.

From findings of the study, the following recommendations were made:

i. There is need for the government to compel mobile network providers to improve on their services and spread same to the rural areas where such has not gotten to before. This will help to encourage farmers accessibility of ICT tools in the rural areas and their farming operations.

ii. In the same vein, the issue of poor electricity supply which was pointed out by the farmers as a major challenge needs to be revamped. This is necessary because it is highly needed to power the ICT tools.

iii. To ameliorate the poverty level of the farmers and high cost of ICT tools, the government and other supporting agencies should need to join hands to help subsidize the prices of the ICT tools so that they can be accessed and used by the farmers in yam production; and

iv. There is need to sensitize and create more level of awareness to the farmers on the use of ICT tools in farming. Such awareness campaign will increase the patronage of ICT tools in farming of yam crop in [particular and other farming activities in general. This will thus results higher productivity and farm income.

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