ICT-enabled agribusiness: case of female fresh fish marketers in coastal area of Ogun State, Southwest Nigeria

A.A. OBISESAN*, O. ODUNTAN & E.L. ADETOLA

(A.A.O., O.O. & E.L.A.: Department of Agricultural and Resource Economics, The Federal University of Technology, Akure, Ondo State, Nigeria)
*Corresponding author's email: kemi_triumph@yahoo.com

ABSTRACT

This study investigated the use of ICTs and the influence on income among female fresh fish marketers. Multistage sampling procedure was employed in the selection of 80 respondents and primary data were collected using questionnaire. Data were analyzed using descriptive statistics, logit regression model and z-test. From the results, most of the respondents (67.5%) accessed marketing information through radio. Among the modern ICTs considered in the study, mobile phone was commonly used to access market information and to contact customers. Years of education, access to credit and marketing experience positively influenced the probability of utilizing modern ICTs in fish marketing while age had negative influence. The mean weekly net income of users of modern ICTs was significantly higher than income of non-users by ₦5,582.63 (US$15.50). The study concludes that ICTs enhanced fish marketing and have positive effect on the income of users. There should be public-private partnership investments in ICT and other infrastructure that could enhance agribusiness particularly for female agripreneurs in rural communities.

Introduction

Agriculture has been recognized as the driver of economic growth in many developing economies. Strengthening agricultural and food systems play important role in achieving Sustainable Development Goals (SDGs) of eradicating poverty and hunger (FAO, 2017). In Africa, the dynamic nature of food markets encourages transformation of the agricultural sector. Agricultural development is encouraged by commercialization but poor access to market information remains a constraint to progress in commercialization (NEPAD, 2013). According to World Bank estimates, Africa's food market can be valued at more than US$1000 billion by 2030 compared to the present US$313 billion, if developed (NEPAD, 2013). This necessitates the development of a system that promotes efficient e-commerce that could guide farmers and traders from opportunistic actors (Okello, 2010).

Technological innovations such as Information and Communication Technology (ICT) among other interventions can play a significant role in enabling and accelerating food system transformation. Information and Communication Technology comprises technologies that enhance communication and the processing of information by electronic means. They provide market information

throughout the agricultural value chain and financial services (World Bank, 2011). This includes radio and television, telephones (fixed and mobile), computers and the Internet. They are progressively gaining prominence in agriculture across the commodity value chain (Mittal, 2010). These technologies enhance market efficiency and sales. The use of information and communication devices helps people to communicate and gain access to relevant information as well as establish contacts with producers and customers (Heilig, 2003). According to FAO (2011), information exchange is vital for the different stakeholders in agricultural value chain in order to reduce the asymmetries in information and communication. It could also reduce the vicious circle of poverty. Mobile phones are in the frontline of ICTs in agriculture.

Furthermore, rapid urbanization and changing consumer preferences among other factors have led to challenges of risk of exclusion in market participation for vulnerable groups such as youth and women (FAO, 2017), hence, a need to ensure economic and social inclusion for all food system actors including women. However, ICT has been recognized as the third most important issue facing women across the globe next to poverty and violence against (FAO, 2017). Therefore, for ICT interventions to be effective, it is necessary to conduct research on its use, barriers and effects. This is necessary to assess the needs of the end users and ensure that ICT interventions do not aggravate the fundamental economic and social inequalities especially between women and men.

Women are important actors at various stages of the agricultural value chain. They constitute 43% and 60% of the agricultural labor force across the globe and in sub-Saharan Africa, respectively (FAO, 2011). With the high rate of women's participation in agriculture, harnessing their full potential will have significant impact on the growth of the sector. However, women especially in the rural areas are disadvantaged in access to information and communication assets and services (FAO, 2017). Studies have shown that improving women's access to income generation has resultant positive effects on human capital development through investment in health and education of children (FAO, 2017). Therefore, there is the need to close the digital divide existing between men and women by removing the constraints to women's access to ICTs. This may enhance their income and ensure gender equality which is vital to alleviating poverty.

Though there are many country studies conducted on ICTs in agriculture e.g., Czech Republic (Vanek *et al*., 2009); Kenya (Okello & Ndirangu, 2010; Warwimbo, 2017); India (Mittal, 2012); Uganda (Sekabira, 2012); Poland (Czapiewski *et al*., 2013); and Nigeria (Olaniyi *et al*., 2013; Okereke-Eugeria *et al*., 2016). However, there is dearth of empirical studies particularly on the use of ICTs in fish marketing and especially among women in Nigeria. Hence, this study investigates the use of ICTs and the income effect among female fresh fish marketers in the coastal area of Ogun State, Southwest Nigeria. The study proffers answer to the following research questions: What are the various ICTs utilized in fresh fish marketing? What are the factors influencing utilization of modern ICTs among female fresh fish marketers? Is there any significant difference between income of users and non-users of modern ICTs?

Materials and Methods

The study area
This study was carried out in the coastal area of Ogun State, Southwest Nigeria. It is located in the eastern part of Ogun State sharing boundaries with Ondo State in the north, Lagos State in the south and Ijebu East Local Government in the west. About half to three quarters of the length of the local government is surrounded by water extending from Lagos State to Ondo State. The study area is closely associated with other maritime states of Southwest Nigeria. It has an area of 1,000 km² and a population of 72,935 at the 2006 census. The choice of the local government is due to its proximity to the Atlantic Ocean and its relative endowment with a complex network of streams, rivers, brackish water and in particular the extension of the Lagos (Lekki) Lagoon to the area.
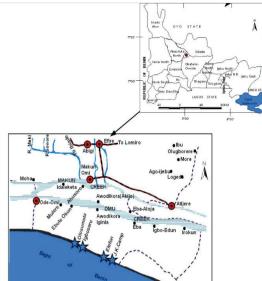

Fig 1: A map of the study area. Source: Adapted from the map of Ogun State (2014)

Sampling procedure and data collection
Multistage sampling procedure was employed in the selection of respondents for the study. The first stage involved purposive selection of Waterside local government area of Ogun state which is known for fishing activities. In the second stage, four communities were randomly selected. The third stage involved random selection of one fish market from each of the selected communities, while the last stage involved selection of 20 female fresh fish marketers from each of the selected markets using systematic sampling technique.

This resulted in a total of 80 respondents for the study. Primary data were collected for the purpose of the study with the aid of structured questionnaire. Data were collected on: socio-economic/demographic characteristics of the respondents such as age, marital status, educational status, monthly income etc.; fish marketing i.e. years of marketing experience, types of fresh fish sold, credit access etc.; access to and use of ICTs; and constraints to use of ICTs.

Analytical techniques
Descriptive statistics, logit regression model and z-test were employed in the data analysis. The logit regression model was used to examine the factors influencing utilization of modern ICTs among the respondents, while the z-test was employed to examine the significant difference between income of modern ICTs users and non-users. Data were analyzed using Stata/SE-14.2 statistical package. Z-test is a statistical test used to determine whether two sample means are different when the variances are known, and the sample size is large.

$$Z_{test} = \frac{X - \mu}{\sigma / \sqrt{n}}$$

Where:

X = Mean of the samples

μ = Mean of the population

σ = Standard deviation of the population

n = Number of observations

Logit model specification

The specification of the logit model is as follows:

$$P_i = E(Y = 1/X_i) = 1 / (1 + e^{-z}) \quad \ldots\ldots.. \quad (1)$$

Where:

Y is dependent variable which is a dichotomous response variable (use of modern ICT for marketing purposes = 1; otherwise = 0).

P_i is a probability that $Y_i = 1$, its values range from 0 to 1, and it is assumed to be non-linearly related to Z.

$$Z = \beta_0 + \beta_i X_i \quad \ldots\ldots\ldots\ldots.. \quad (2)$$

Where:

X_i is a set of independent variables

β_0 is the intercept which is a constant

β_i is the coefficient of the identified variables influencing use of modern ICTs

X_1 = Age of the marketer (years)

X_2 = Marital status of the marketer (married = 1, otherwise = 0)

X_3 = Years of education

X_4 = Marketing experience (years)

X_5 = Access to credit (yes = 1, otherwise = 0)

X_6 = Membership of organization (yes = 1, otherwise = 0)

X_7 = Secondary occupation (yes = 1, otherwise = 0)

X_8 = Monthly cost of modern ICT use (Naira)

X_9 = Monthly income (Naira)

e = Error term

Results and Discussion

Socio-economic characteristics of the respondents

The descriptive analysis of the socio-economic characteristic of the respondents showed that majority of the respondents was within the age bracket of 31-40 years with a mean age of 39 years (Table 1). This implies that majority of the fish marketers were in their active age. 80 percent of the respondents were married. Most of the respondents had no formal education. The mean year of formal education was 5.2 years. The mean household size of the respondents was six persons. Income diversification was low among the respondents as close to half of the marketers had no other source of income. The mean weekly net income from fish marketing was ₦15,436.61 (US$42.88). This is quite low especially for those without other sources of income.

TABLE 1
Distribution of respondents by socio-economic characteristics

Variables	Frequency	Percentage
Age		
≤30	5	6.3
31-40	24	30.0
41-50	21	26.3
51-60	23	28.8
>60	7	8.8
Marital status		
Married	64	80
Single	10	12.5
Divorced	6	7.5

Level of Education		
No formal	47	58.8
Primary school	15	18.8
Secondary	16	20.0
Tertiary	2	2.5
Secondary occupation		
None	36	45
Artisan	22	27.5
Trading	15	18.8
Farming	7	8.8
Household size		
1-5	44	55.0
6-10	34	42.5
11-15	2	2.5
Years of marketing experience		
1-5	19	23.8
6-10	31	38.8
11-15	13	16.3
16-20	11	13.8
>20	6	7.5
Credit Access		
Yes	36	45
No	44	55

Source: Authors' Computation

Utilization of ICT

The various types of ICTs used by the female fresh fish marketers are presented in Table 2. The ICT components were delineated into two, namely, traditional and modern. Radio was the most utilized traditional ICT among the marketers. This is in line with Mittal & Mehar (2016) and Adeniyi & Yekini (2018), that radio is the common source of information for farmers in India and Nigeria, respectively. In Nigeria, there are small and handy radios that are user-friendly in terms of affordability, reception of signals, maintenance costs compared to others such as television and newspaper. Moreover, the radios are operated with dry cell and do not need electricity. From the results, 67.5% of the respondents relied on radio for market information while 22.5% and 1.25% used television and newspaper, respectively. The low adoption of newspaper might be due to the low literacy level of fresh fish marketers while irregular power supply could be responsible for low use of television.

Among the modern ICTs considered in the study, mobile phone was commonly used to access market information and contact customers. This is done through phone calls and short messaging system. Mobile phone communication serves as an effective way of sharing market prices among marketers and enhances market efficiency. Mobile phones are useful in building network of contacts and obtain critical information easily and rapidly. This helps traders to improve their logistics and reduce transaction costs by improving the supply chain management. According to Aker (2008), mobile phones reduced traders search costs by 50% and increased profits by 29% due to the opportunity to receive better prices through market research conducted using mobile phones.

TABLE 2
Distribution of respondents by ICT utilization

ICT Component	Frequency	Percentage
Traditional		
Radio	54	67.5
Television	18	22.5
Newspaper	1	1.25
Modern		
Mobile phone	42	52.5
Internet	5	6.25

*Multiple Responses. Source: Authors' Computation

Determinants of utilization of modern ICTs

The estimates of the logit regression model on the factors influencing female fresh fish marketer use of modern ICTs in marketing are presented in Table 3. The results revealed that years of formal education, cost of ICTs, access to credit, and age and marketing experience significantly influenced the probability of utilizing modern ICTs in fish marketing. Years of formal education had a positive and significant ($p < 0.01$) influence on the use of modern ICTs among female fresh fish marketers. From the results, one unit increase in the years of education would increase the probability of ICTs usage by 0.33. Education enhances the ability to maximize the benefits of ICT usage.

This is in line with Okello *et al*. (2014), who identified that literacy had a positive effect on awareness and use of ICT-based marketing information systems among smallholder farmers in Kenya. The findings also corroborate Adeniyi & Yekini (2018), who opined that education enhanced ICT usage among farmers in Oyo State, Nigeria. Furthermore, access to credit positively and significantly ($p < 0.01$) influenced the use of

modern ICTs. Female fresh fish marketers' access to credit increases the probability of using modern ICTs by 0.20. This agrees with Abebe & Cherinet (2018) that credit influenced use of ICT in cereal marketing in Ethiopia. Access to credit improves marketers' financial status hence increasing their purchasing power to obtain and maintain modern ICTs.

Conversely, age of the marketers had a negative but significant ($p < 0.05$) influence on the probability of using modern ICTs. This implies that a unit increase in the age of marketers will reduce the use of modern ICTs. From the result, one unit increase in age would reduce the probability of utilizing modern ICTs by 0.21. Younger traders are more innovative than the older ones. As marketers advance in age, they tend to rely more on their wealth of experience and become more risk averse unlike youths. This conforms to Okello *et al*. (2014) and Yaseen *et al*. (2016), who found that age reduced the likelihood of ICT adoption among smallholder farmers. Cost of using modern ICTs had a negative but significant effect on the utilization. This agrees with Yaseen *et al*. (2016).

TABLE 3

Estimates of logit regression model on the determinants of modern ICTs utilization in marketing

Variables	Coefficients	Standard error	Z-value
Age	-0.208	0.103	2.019
Marital status	0.065	0.092	0.706
Marketing experience	0.011	0.055	0.207
Education	0.337***	0.089	3.76
Credit access	0.031***	0.004	7.750
Secondary occupation	0.897	0.651	1.378
Monthly cost of ICT	-0.260**	0.127	2.050
Membership of association	0.0075	0.173	0.008
Monthly income	0.0127	0.019	0.668
Constant Log likelihood Prob >chi²= 0.0000 Pseudo R²= 0.7667	0.682 0.766	0.211	3.230

** & *** represent 5% & 1% significance level, respectively

Comparison of income of users and non-users of modern ICTs

The result of the z-test on the income of users and non-users of modern ICTs is presented in Table 4. The mean weekly income of users of modern ICTs was ₦5582.63 (US$15.50) higher than income of non-users. The Z-value showed that the difference between the incomes of the two groups was significant at 1%. This implies that the use of ICTs in fresh fish marketing leads to increase in income. This agrees with Taphee *et al*. (2016) and Adegbidi (2012), that use of modern ICTs increased the income of Nigerian rice marketers and pineapple farmers in Benin, respectively. Hence, ICT usage has the capacity to improve welfare of marketers.

TABLE 4
Income effect of utilizing modern ICTs

Income	Mean	Difference	Z-value
Non-users	12645.30	5582.63	5.645
Users	18227.93		

Source: Author's Computation

Constraints to the usage of ICTs

The results in Table 5 show the major constraints to ICTs usage by female fresh fish marketers in the study area. The constraints encountered were lack of access to internet facilities (92.5%), lack of knowledge on the importance of ICTs (77.5%), lack of skills to operate ICTs facilities (78.8%), high cost associated with the use of ICT (68.8%), poor communication network (67.5%), and poor power supply (51.35%). This is in line with Taphee *et al*. (2016) that cost, erratic power supply, fluctuation of service and no network coverage hinder the use of ICT for rice marketing in Nigeria.

TABLE 5
Distribution of respondents by constraints to modern ICTs usage

Constraints	Frequency	Percentage	Rank
Lack of access to internet facilities	74	92.5	1st
Lack of operating skills	63	78.8	2nd
High cost	55	68.8	4th
Poor communication network	54	67.5	5th
Lack of knowledge on importance	62	77.5	3rd
Poor power supply	39	51.4	6th

Author's Computation

Conclusion and Recommendation

The study concludes that ICTs enhance marketing and have positive effect on the income of users. However, the use of modern ICTs is still low among female marketers. The study suggests ICT as a viable option for agribusiness and value chain development. Also, ICTs could be harnessed to achieve the fifth SDG of promoting gender equality and women's empowerment. There should be more sensitization on the benefits of using modern ICTs especially among female agripreneurs.

Women should be encouraged to form organization among themselves where they could be trained to improve their skills and have better access to economic opportunities. The study recommends promotion of effective policies on incentives for innovation and investment especially for women, whose work is often tailored to value chain. Agricultural policies should be tailored

towards improvement of extension delivery. There should be public-private partnership investments on infrastructure that could enhance agribusiness particularly for female agripreneurs in rural communities.

REFERENCES

Abebe, A. & Cherinet, Y.M. (2017) Factors affecting the use of information and communication technologies for cereal marketing in Ethiopia. *Journal of agricultural and food information*, **20**(1), 59 –70.

Adegbidi, A.B. (2012) Impact of ICT use on access to markets of pineapple smallholder Farmers in Benin. *Journal of research in international business and management*, **2**(9), 240–247. ISSN: 2251–0028.

Adeniyi, R.T. & Yekini, O.T. (2018) Information and communication technology for agricultural marketing information by farmers in Oyo State, Nigeria. *International journal of agriculture and development studies*, **3**(2).

Czapiewski, K., Kulikowski, R., Bański, J., Bednarek-Szczepańska, M., Mazur, M., Ferenc, M. & Konopski, M. (2013) The use of ICT in Mazovian agriculture. In: P. Chmieliński, A. Baer-Nawrocka (Eds.), Knowledge as a factor of rural development. *European rural development network series: rural areas and development*, **10**, 45–57. Institute of agricultural and food economics – National research institute, Poznan university of life sciences; Warsaw-Poznan.

Ejiogu-Okereke, E.N., Chikaire, U.J., Ogueri, I.E. & Chikezie, P.N. (2016) Roles of information and communications technologies in improving fish farming and production in Rivers State, Nigeria. *Library philosophy and practice (e-journal)*, 1445. http://digitalcommons.unl.edu/libphilprac/144.

FAO (2011) The role of women in agriculture. ESA working Paper No. 11–02. Available at http://www.fao.org/publications/sofa/en/. Food and Agriculture Organization of the United Nations (FAO); Rome, Italy.

FAO (2017) The future of food and agriculture: Trends and challenges. ISBN 978-92-5-109551-5. Food and Agriculture Organization of the United Nations (FAO); Rome, Italy.

Heilig, G. (2003) Information society and the countryside: can internet-based system bring income alternatives to rural areas? In: J. Bański, Owsiński J. (eds.), *Alternatives for European rural areas. Rural areas and development*. 1. ERDN. Warszawa, 65–79.

Mittal, S. (2012) Modern ICT for agricultural development and risk management in smallholder agriculture in India. CIMMYT. *Socioeconomics working paper 3*. Mexico, D.F.: CIMMYT.

NEPAD (2013) African agriculture, transformation and outlook. New Partnership for African Development (NEPAD). www.nepad.org. November, 2013, 72 p.

Okello J. (2010) Does use of ICT-based market information services (MIS) improve welfare of smallholder farmers? Evidence from Kenya. Proceedings of the 4th ACORN-REDECOM conference, Brasilia, D.F., May 14th–15th, 2010.

Okello, J., Kiriu, O., Gitonga, Z.M. & Georgia W. (2014) Determinants of awareness and use of ICT-based market information services in developing country agriculture. The case of smallholder farmers in Kenya. *Journal of international agriculture*, **53**(3), 263–283.

Olaniyi, O.A., Adetumbi, S.I. & Adereti, M.A. (2013) Accessibility and relevance of information and communication technologies (ICTs) among cassava farmers in Nigeria. *Academic journals*, **8**(35), 4514–4522.

Sekabira, H. (2012) Determinants for adoption of ICT-based market information services by

smallholder farmers and traders in Mayuge District, Uganda. A thesis submitted to the directorate of research and graduate training in partial fulfilment of the requirements for the award of a Master of Science degree in Agricultural and Applied Economics of Makerere University.

Taphee, B.G., Shiddi, S.A., Mahelia, S.I., Alam, M.K., Samuel, V.Z. & Gaji, M.N. (2016) Assessment of the effect of information communication technology (ICT) On rice marketing in Jalingo local Government Area of Taraba State, Nigeria. *Specialty journal of architecture and construction* **2**(1), 7–11.

Vanek J., Jarolimek J. & Simek P. (2009) Information services and ICT development in agriculture of the Czech Republic. *Agris on-line papers in economics and informatics* **1**(1), 47–51.

Warwimbo, J.W. (2017) Information communication technology (ICT) and value chains in agribusiness in Kiambu County, Kenya. University of Nairobi archive, http://hdl.handle.net/11295/102990.

World Bank (2011) ICT in agriculture: connecting smallholders to knowledge, networks and institutions, 162–163. Report No. 64605. Washington DC (e-sourcebook). www.ictinagriculture.org/ ictinag/node/105).

Yaseen, M., Xu, S., Yu, W., Luqman, M., Hassan, S. & Ameen, M. (2016) Factors inhibiting ICTs usage among farmers: Comparative analysis from Pakistan and China. *Open journal of social sciences,* **1**(5). ISSN: 2327-5960.