

## ICT TOOLS AND THEIR UTILIZATION IN ACCESSING AGRICULTURAL INFORMATION AMONG SMALLHOLDER FARMERS IN RURAL AREAS OF SOUTHEAST NIGERIA

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**Abstract:** Although many studies have been done on ICT usage, most did not explain how effective are some of these ICT tools in accessing not only market information but information on inputs. This article identified the effectiveness of different ICT tools being used by farmers to fetch different information on agricultural activities and other constraining factors that affect the effective use of ICT tools in accessing information apart from socio-economic constraints. The study used structured questionnaires to collect primary data from 360 smallholder farmers. Data were analyzed using descriptive statistics and factor analysis. The study revealed that averagely mobile phone has a mean of 4.29 which was an indication that despite other ICT tools listed for the survey, smallholder farmers in rural area perceived mobile phone more effective in accessing information on agricultural activities. Inadequate human resources, lack of social influence, high cost of repairing, high operation cost, cost of ICTs component, cost of maintenance and problem of theft and general insecurity were other constraining factor that influences ICT use. To reduce some of the hindrance to effective use of ICT especially mobile phone in getting information on new improved varieties which appear to be very important for agricultural sustainability, this study recommends that government and nongovernmental organization should support rural farmer to boost their access to the use of ICT tools. This can be achieved by providing rural farmer with financial aid, subsidizing cost of ICT component as this would reduce the cost of maintaining ICT tools.

**Keywords:** ICT Tools; Utilization; Agricultural Information; Smallholder Farmers

### 1. Introduction

Agriculture is an important sector for economic development and food sustainability in Nigeria and digital devices are being used in the agriculture sector to enable farmers' access accurate and timely information that they need when making important decisions (Hung, 2020). Rural areas in the developing countries of the world need improve technologies in agriculture that would help farmers attain better yield (Vallejo *et al.*, 2021) and increase their share of consumer price (Corazzin, Schermer and Park, 2017). This improve technology can be in the form of effective use of ICT tools. Therefore, ICT tools can be defined as communication devices that consist of mobile phone, radio,

television, computer, and internet etc which store, retrieve and transmit information (Ekwonwune et al., 2017).

The application of Information communication technology will not only boost food production and economic development but enhance the marketing of food produce in order to improve farmers' livelihood. Smallholder farmers need up to date ICT to access some of the information for effective marketing of agricultural food produce. The uses of information and communication technologies (ICTs) are an approach of linking smallholder farmers to the market and provide them with current marketing information such as finding new buyers, when and where to sell, price fluctuation, output price etc (Tonny, Palash & Moniruzzaman, 2019). Furthermore, easier access to all sorts of information through ICT tools may raise farmers' income, nutrition, knowledge and awareness of new market to sale agricultural produce, which could also contribute to economic development in Nigeria. Through the help of ICT, farmers can get profitable and suitable market for their agricultural produce (Azeem & Ali, 2015). It promotes updated, relevant, reliable and timely information to both farmer and other consumer.

As a result of low utilization of ICT, rural farmers in the developing countries like Nigeria are still facing difficulties in accessing knowledge, skills and marketing information that could boost their income (Nakasone & Torero, 2016; Misaki, Apiola, Gaiani, & Tedre, 2018). According to Vosough (2015), age, education and knowledge level of ICT and other socio-economic characteristics adversely affect the use of ICT devices and applications. Sometime farmers have to travel to a long distance places frequently in order to access information traditionally on marketing of agricultural produce (Tonny, Palash & Moniruzzaman, 2019).

Using only one of the ICT tools (mobile phone), some studies has suggested that mobile phone improves outcomes (Aker & Ksoll, 2016), food security (Nakasone & Torero, 2016), gender equality and nutrition (Sekabira & Qaim, 2017). Some other reviewed work (Kante, Oboko, & Chepken, 2016; Kiambi 2018; Abebe & Mammo Cherinet, 2019; Tonny, Palash & Moniruzzaman 2019) identified socio-economic factors as the hindrance to effective use of ICT for agricultural marketing. It is claimed that ICT tools is an approach that links smallholder farmers and provide them with necessary marketing information. Some empirical studies conducted in different part of the world such as in Bangladish, Tanzania and Indonesia has tried to test this claim (Tonny, *et al.* 2019; Okello, *et al.* 2020 and Akhmadi, 2018). The results are mixed and none has specifically examined how effective some of these ICT tools are in accessing not only market information but information on inputs. Specifically, this work would

assess the effectiveness of different ICT tools (mobile phone, radio, internet, computer and television) used by farmers to fetch different information on agricultural activities and also to identify other technical constraining factors that hinder the effective use of ICT in assessing agricultural information. The rest of the paper is arranged in the following order; Section 2 provides Method, Section 3 results and discussion and Section 4 conclusion and recommendation.

## **2. Method**

### **2.1 Study Area**

The study area is the South-east geopolitical zone of Nigeria. Five states constitute this zone: Abia, Anambra, Ebonyi, Enugu, and Imo, covering latitude 40 50'N to 70 10' N and longitudes 60 40'E to 80 30'E. The zone spreads over a total area of 78,618 km<sup>2</sup>, representing 8.5% of the nation's total land area. The area has a projected total population of 23,402,470, (National Population Commission, 2019).

### **2.2 Sources and Method of Data Collection**

Primary data source were used for the study, and these were collected using a set of well structured questionnaire. The questionnaire was administered to farmers eliciting the different ICT tools with different inputs and marketing information and constraints to the use of ICT tools in accessing information.

Multi-stage sampling procedure was employed for the study. In the first stage, two states (Enugu and Ebonyi) were randomly selected. The second stage involves a purposive selection of one agricultural zone (Nsukka agricultural zone and Ebonyi south agricultural zone) from each of the two selected state. This was necessary to allow for the selection of zones that are participating well in producing and marketing of staple crops. In the third stage, three LGAs were purposively selected from each of the two agricultural zones, giving a total of six LGAs (Igbo-etiti, Nsukka, Uzo-uwani, Afikpo south, Ohaozara and Ivo). This is to allow for the selection of LGA that participate in production and marketing of staple crops. The fourth stage also involved a purposive selection of two communities from each of the six LGAs, making a total of twelve communities. In the fifth stage, two villages were purposively selected from each of the twelve communities to get a total of twenty four villages. In the Final stage, 15 farmers were randomly selected from each of the twenty four villages and this gave a total sample size of 360 respondents.

### 2.3 Method of Data Analysis and Model Specification

The first objective was realized using descriptive statistics (Likert scale) and exploratory factor analysis was used to achieve objective two. A five point Likert scale was used to identify effectiveness of different ICT tools (mobile phone, radio, internet, computer and television) used by farmers to fetch different information on agricultural activities. We measured effectiveness by asking rural farmers' how often a particular ICT tool is used to access particular information on agricultural activities. Then, value 1 indicates less effective, value 2 indicate slightly effective, value 3 indicate neutral, value 4 indicate effective and value 5 indicate highly effective.

Exploratory factor analysis was used to identify other technical constraining factors that hinder the effective use of ICT in assessing agricultural information. To group the identified constraints, principal component analysis with varimax rotation and factor loading 0.30 were adopted. Therefore, factor loading less than 0.30 or variable that load in more than one factor were dropped (Brook *et al.*, 2014). It is specified below:

$$P1 = b_{11}F1 + b_{12}F2 + \dots + b_{1m}Fm$$

$$P2 = b_{21}F1 + b_{22}F2 + \dots + b_{2m}Fm$$

$$P3 = b_{31}F1 + b_{32}F2 + \dots + b_{3m}Fm$$

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$$Pm = b_{m1}F1 + b_{m2}F2 + \dots + b_{km}Xm$$

**Where:**

**P1, P2 ...Pn** = observed variables / constraints to the use of ICT tools by small household farmers

**b1 – bn** = factor loadings or correlation coefficients.

**F1, F2, ... Fn** = unobserved underlying factors constraining ICT use by household farmers.

### 3. Result and Discussion

This section is made up of two subsections. The first section being the effectiveness of different ICT tools being used by farmers to fetch different marketing information while the second section is the constraining factors that affect the effective use of ICT tools in accessing marketing information.

### 3.1 Effectiveness of Different ICT Tools As Perceived By the Respondents in Accessing Different Marketing Information of Agricultural Produce

ICT tools such as mobile phone, radio, television, internet and computer were selected to examine their effectiveness with regard to different marketing information as listed in Table 1. Information on input costs: Results shows that internet perceived more effective in getting information on input cost (M = 4.52). Mobile phone was perceived effective very close to internet with (M= 4.33) while radio was also effective in getting information on input cost but less than that of internet and mobile and it has (M = 4.00). Computer was neutral compare to internet, mobile phone and radio while television was seen as slight effective. The above results show that farmers are comfortable getting information on input cost through internet, mobile phone and radio.

Information on new improved variety: Results shows that television is perceived more effective in getting information on new improved variety (M=4.66) while internet was perceived effective closely to television (M=4.03). Mobile phone was effective in perceiving information on new improved variety (M=3.68). Computer was perceived as less effective in getting information on new improved variety (M=1.70). This could be that television is more users' friendly among farmers (Raza *et al* 2020) and that internet can displace and update more recent information on improved variety.

Information on transportation cost: Result showed that, mobile phone was perceived effective in getting information on transportation cost (M=4.31). Effectiveness of mobile phone was perceived more than other ICT tools because it helps the respondents in reducing transportation cost and many other types of transaction costs (Aker and Ksoll, 2016). Computer was neutral (3.0) while radio and television were slightly effective in getting information on transportation cost with mean of 2.28 and 2.11 respectively. Internet was seen as less effective in perceiving information on transportation cost (M=1.64).

Information on price fluctuation: According to the respondents, they get information on price fluctuation more by using mobile phone (M=4.14). This is an indication that Mobile phone helps in monitoring changes in price of agricultural produce , thereby enhancing household food security (Sekabira & Qaim, 2017), reducing price fluctuation, waste of grains and other related agricultural products which increases market participation (Nakasone & Torero, 2016). After mobile phone the next following it in getting information on price fluctuation was radio with mean of 4.07. This may be that radio is less mobile. Internet was close to effective (M=3.73) while television and computer were slight effective with mean 2.24 and 2.02 respectively.

Information on output price: From the results mobile phone was seen as the only ICT tools that farmers perceived more effective in getting information on output price (M=4.45). This may be that most farmers can easily afford to buy mobile phone and adopt the use than other listed ICT tools. Mobile phone is one of the ICT tools widely use in developing countries to deliver market information among smallholder farmers. However output price is mostly shared with the use of ICT (mobile phone) hence this would benefit smallholder farmers by rising their bargaining power (Zhang, Wang & Duan, 2016; Chikuni & Kilima, 2019).

Information on when to sell: Mobile phone and radio were seen to be the effective tools for getting information on when to sell agricultural produce (M=4.43 and 4.00) respectively. This could be as a result of timely information provided by the two tools (Raza *et al* 2020). Mobile phone was rank the highest followed by radio while others were not perceived to be effective tools.

Information on where to sell: Place to sell agricultural produce plays a vital role for food security. Getting information on where to sell agricultural produce through mobile phone, radio and internet would enhance food security and economic development. The effective use of mobile phone, internet and radio were ranked in this order (M= 4.33, 4.17 and 4.09) respectively while others were not perceived to be effective.

Information on new buyers: Finding new buyers and additional buyers is of great advantage to producers of agricultural produce not only at small scale level by also at large scale. These could be achieved through the effective use of mobile phone, internet (M=4.73, 4.00 and 4.63) respectively. This could be that new buyers may agree to pay higher or buy more quantity and these facilitate transaction and improves the income of smallholder farmers.

In summarizing this section, considering all listed characteristics of ICT use, the average effective use of mobile phone was perceived higher as compare to other ICT tools (M= 4.29). This implies that the effective use of mobile phone was more among smallholder farmer.

**Table 1.** The Effectiveness of Different ICT Tools as Perceived By the Respondents in Accessing input and Market Information of Agricultural Produce

Effective as concern to	Mobile phone	Radio	Television	Internet	Computer
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
Information on input cost	4.33±0.473	4.00±0.000	2.00±0.000	4.52±0.502	3.00±0.000
Information on new improved variety	3.67±0.665	3.07±0.250	4.66±0.476	4.03±0.377	1.70±0.46
Information on transportation cost	4.31±0.464	2.28±0.448	2.11±0.834	1.64±0.776	3.00±0.000
Information on price fluctuation	4.14±0.350	4.07±0.264	2.24±0.430	3.73±0.440	2.02±0.809
Information on output price	4.45±0.500	3.67±0.473	2.09±1.053	1.59±0.494	2.87±0.341
Information on when to sell	4.43±0.498	4.00±0.000	3.45±0.500	2.41±0.494	2.38±1.317
Information on where to sell	4.33±0.488	4.09±0.350	2.51±0.494	4.19±0.350	2.09±1.117
Information on new buyers	4.73±0.463	4.00±0.000	2.60±0.610	4.62±0.502	3.20±0.000

Scale: 1 = Less effective, 2 = Slightly effective, 3 = Neutral, 4 = Effective, 5 = Highly effective

Field survey 2019

### 3.2 Constraints to the Use of Information and Communication Technologies (ICTs) by smallholder Farmers in Enugu State, Nigeria

In Table 2, varimax-rotated principal component factor analysis was used to identify the constraints to the use of ICT in getting marketing information by smallholder farmers. By grouping the identified constraints, principal component analysis with varimax rotation and factor loading 0.3 were adopted. Therefore, factor loading less than 0.30 or variable that load in more than one factor were dropped like in inefficient electricity, lack of education and skills, network issue and lack of surplus produce to market (Brook *et al.*, 2014). Under factor 1, the specific constraining variables to the use of ICTs by smallholder farmers in Enugu State, Nigeria includes: inadequate human resources (0.4266) ,high operation cost (0.5289), cost of ICTs component (0.3544) and cost of maintenance (0.3173). Constraining variables that loaded under factor 2 was only high cost of repairing (0.4691). Under factor 3, lack of social influence (0.3839) and problem of theft and general insecurity (0.4304) appeared as the constraints to the use of ICT toot in getting marketing information by smallholder farmers in the study area.



**Table 2.** Varimax Rotated Factors/Variables Constraints to the Use of ICTs by Smallholder Farmers in Enugu State, Nigeria

Observed Constraining Variables	Factor 1	Factor 2	Factor 3	Factor 4
Inadequate human resources	<b>0.4266</b>	-0.2717	0.2776	0.2652
Inefficient electricity	<b>-0.4032*</b>	<b>0.5182*</b>	0.1950	0.0461
Lack of social influence	0.0857	0.1244	<b>0.3839</b>	-0.1354
High cost of repairing	0.0105	<b>0.4691</b>	-0.2088	-0.0157
Lack of skills	<b>-0.5280*</b>	<b>0.4104*</b>	-0.0292	0.2644
High operation cost	<b>0.5289</b>	-0.0009	0.1252	-0.2998
Cost of ICTs component	<b>0.3544</b>	0.2966	0.2668	0.1525
Cost of maintenance	<b>0.3173</b>	0.0633	0.0250	0.2588
Problem of theft and general insecurity	-0.2504	0.2639	<b>0.4304</b>	0.0330
Network issue	<b>-0.5653*</b>	<b>-0.4060*</b>	0.0778	<b>0.3428*</b>
Health- related problems	0.1194	0.2055	-0.0718	0.2056
Lack of surplus produce to market	<b>0.4611*</b>	<b>-0.4439*</b>	-0.2046	0.1888

**Note:** Factor loading of **0.30** was used at 10% overlapping variance.

Variables with factor loadings of less than **0.30** were not used.

\*Variables were discarded for loading in more than one factor.

Source: Field survey data, 2019.

#### 4. Conclusion

Many studies have proved that Information communication technologies play a vital role in assessing information on agricultural production among smallholder farmers in rural area of Africa. But none has filled the gap of how effective is some of the ICT tools in accessing not only market information but information on inputs. Apart from socio-economic factors, there are other constraining factors that affect the effective use of ICT tools in accessing information among smallholder farmers in rural areas. The study revealed that mobile phone were perceived more effective in getting information in almost all the agricultural activities surveyed in the study area. And the exception is in getting information on new improved variety probably as a result of some constraining factors. Apart from socio economic factors that influence ICT use as revealed by previous findings, Inadequate human resources, lack of social influence, high cost of repairing, high operation cost, cost of ICTs component, cost of maintenance and problem of theft and general insecurity were other constraining factor that influences ICT use.

To reduce some of the hindrance to effective use of mobile phone in getting information on new improved varieties which appear to be very important for agricultural sustainability, this study recommends that government and



nongovernmental organization should support rural farmer to boost their access to the use of ICT tools especially mobile phone. This can be achieved by providing rural farmer with financial aid, subsidizing cost of ICT component as this would reduce the cost of maintaining ICT tools.

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