ICT-Based Market Information Services Utilization by Small scale Farmers in Southwest Nigeria

Oluwatusin, Femi Michael* and Ojo, Olutope Stephen

Department of Agricultural Economics & Extension Services, Ekiti State University
P. M.B 5363, Ado-Ekiti, Nigeria
*E-mail: femi.oluwatusin@eksu.edu.ng

Abstract: The small scale farmers that produce a significant portion of the world's food need ICTs- based agricultural market information services to boost their production. The study was done to examine the main ICT components used by small scale farmers; determine the factors influencing the use of ICT-based MIS by respondents; determine the factors influencing choice of ICT components used by respondents; and identify constraints to the use of ICT components. A multistage random sampling method was used to select 180 small scale farmers in the study area. Analytical tools used were descriptive statistics, Logit model and Multinomial Logit model. The study revealed that the majority (64%) of the respondents made use of mobile phone to access agricultural market information services while Incessant power supply mostly affected the use of ICTs-base MIS as stated by 94.4 percent of the respondents. the main determinants of the use of ICTs-based MIS were, years of education, perception towards ICTs, farm size, monthly expenses on ICTs and farming experience. The major determinants of the choice of radio over the base outcome mobile phone were, knowledge of existence of ICT groups, major objective of using ICTs, ICTs usage experience, household size, distance to and from nearest town centre and household income while the major factors influencing the use of others (WWW, CD-ROM and internet/email and TV) components compared to mobile phone were, knowledge of existence of ICT groups, household size and household income. It is recommended that since mobile phones are widely used in the study area government should make the gadgets available to the farmers at affordable prices and the problem of erratic power supply should be tackled with provision of solar power in the rural areas.
[Oluwatusin, Femi Michael and Ojo, Olutope Stephen. **ICT-Based Market Information Services Utilization by Small scale Farmers in Southwest Nigeria.** *Rep Opinion* 2017;9(2):82-89]. ISSN 1553-9873 (print); ISSN 2375-7205 (online). http://www.sciencepub.net/report. 6. doi:10.7537/marsroj090217.06.

Keywords: ICTs, Farmer, Logit, Market, Small scale.

Introduction

Agriculture is a vital sector for the sustained growth of the developing countries such as those in sub-Saharan Africa. Farming business is confronted with the major challenge of increasing production to feed the ever increasing population in a situation of dwindling resources necessary for production. Feeding the global population that will hit 9 billion by 2050 requires a 70 percent increase in food production (FAO, 2009). World Bank (2011) advocated that more effective interventions are essential in agriculture with rising food prices that have pushed over 40 million people into poverty since 2010. Melchioly and Sæbø (2010) found that over 75 percent of the developing countries live in rural areas, and most of them are small scale farmers who contribute significantly to the economy yet remain very poor and food insecure. To cope with these problems, new approaches and technical innovations such as information communication and technologies (ICTs) are required.

The role of Information Communication Technology (ICT) to enhance food security and production by small scale farmers cannot be over emphasized. In agriculture, information and communication have always mattered. Information has been sought from one another on how to improve production and marketing. ICT is any tool, device or application that allows the exchange or collection of data through transmission and interaction. It ranges from radio to satellite imagery to electronic money transfers or mobile phones. There are two types of ICTs, the old and new. The new ones include, mobile phone, World Wide Web (WWW), internet or e-mail, compact disc read only memory (CD-ROM), etc. while the old ones that complement the new ones are radios and television sets (TV).

Over the years, Information Communication Technology (ICT) has dominated the world daily life. Drastically, ICT has grown whether for financial information, general knowledge, news, production, marketing, etc. Past development programmes in the developing world have been focused on the application of technologies to the lives and work of farmers with improvements in farming implement and techniques. But apply ICT is rarely seen on the agenda of development programmes. Mukhebi (2007) believed that ICT can bring unprecedented potential to deliver information, provide links to markets and much more. The role ICTs-based Market Information Services (MIS) in agriculture is vital.

According to Sekabira (2012), market is defined as arenas or places where products and services of interest to consumers are found and exchanged between sellers and consumers. On the other hand, Jensen (2007) regarded information as a prepared and planned chain or series of cryptogram, secret language and or sign that trace, prove, confirm and or verify a message, point and or a communication while services are defined as non material equivalents of a good. In agricultural production and marketing, access to information is very important, for without adequate and reliable information a farmer is unable to make a rational decision and hence expose to exploitation. ICT can enhance Market Information Services (MIS) by providing timely information on prices of inputs and outputs and markets where there are surpluses and shortages of agricultural products. Apart from these, information on latest agricultural technologies, early warning of natural disasters and credit are needed by farmers to expand and energize agricultural production.

Many of the challenges facing the small scale farmers in Nigeria can be addressed by using ICT-based MIS effectively. Hence, it is critical to identify the main ICT components used by small scale farmers; determine the factors influencing the use of ICT-based MIS by respondents; determine the factors influencing choice of ICT components by respondents; and identify constraints to the use of ICT components in the study area.

Materials and Methods

The Study Area

The study was carried out in Southwest, Nigeria. The zone is made up of six States which are; Ekiti, Ondo, Osun, Ogun, Oyo and Lagos (fig. 1). The area lies between longitude 2^0 3^1 and 6^0 00^1 East and latitude 6^0 2^1 and 8^0 37^1 N with a total land area of 77,818 km^2. National Population Commission, (2007) reported that 27 511 892 people lived (14 049 594 males and 13 462 298 females) in Southwest, Nigeria. It has two distinct seasons which are: rainy season (April-October) and dry season (November-March). The temperature zone ranges between 21 and 28 degree centigrade (^{0}C) with high humidity of 77 percent. Hence, crops and livestock production are done with little problems in the area. The major occupation of the people is agriculture. The other occupations include trading, driving, carpentry, etc. The official language is English, while the major informal language for communication in this region is Yoruba, which has different dialects.

Data Collection

Primary data were collected from the respondents with the aid of questionnaire. The data include socio-economic characteristics of farmers, ICT components used by the farmers and constraints to the use of ICTs-based MIS by the households.

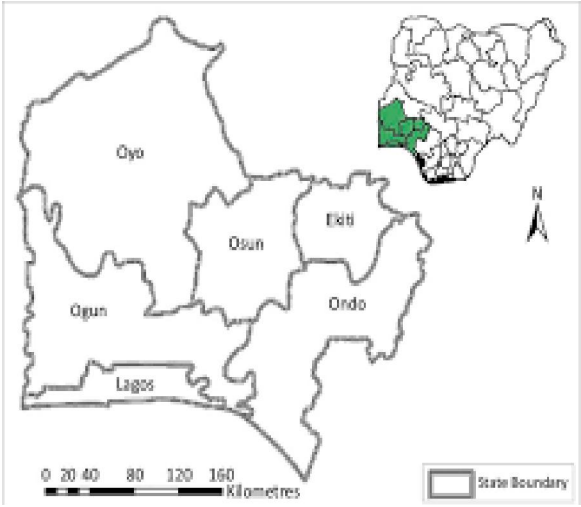

Fig. 1: Map of Nigeria showing the Southwest States.
Source: article.sapub.orgsors

Data Analysis

Descriptive statistics such as frequency counts, means and percentages were employed to examine the respondents' socio-economic characteristics, identify ICT components used by farmers in MIS as well as the constraints to the use of ICTs based MIS. Logit regression analysis was used to determine the factors influencing farmers' use of ICTs based MIS while Multinomial Logit (MNL) regression analysis was employed to establish factors influencing choice of ICT components used by households in the study area.

Models specification

With exception of Linear Probability Model (LPM), estimation of binary choice models is usually based on the method of maximum likelihood (Greene, 2002). According to Greene (2002) cited by Sekabira (2012), choice models are based on random utility where an individual 'i' is confronted with 'j' choices. If U_{ij} is the utility function, then equation 1:

$$U_{ij} = \sum \beta X_{ij} + \varepsilon_{ij} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 1$$

Where;

X_{ij} = vector of characteristic of individual 'i'.

β = vector of parameters to be estimated.

ε_{ij}= error term.

Using logit models for equation 1 utility function and assuming that Y_{ij} represents the final decision of an individual from a pool of choices available, we have equation 2;

$$Prob(Y_{ij} = 1|\sum(X_{ij})) = \frac{e^{\alpha_j + X_{ji}^{'}\beta}}{1 + e^{\alpha_j + X_{ji}^{'}\beta}} \dots\dots\dots\dots\dots\dots 2$$

The binomial logit is the unique case where j=1, and can be used to know the determinants of the choice made by an individual given equation 3;

$$Prob(Y = 1|X) = \frac{e^{X'\beta}}{1 + e^{X'\beta}} = \Lambda(X'\beta) \dots\dots\dots\dots\dots\dots\dots\dots 3$$

Where, $\Lambda(.)$ = logistic cumulative function. The binomial logit model is specified as equation 4;

$$y = X_i'\beta + \varepsilon \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 4$$

Also a set of probabilities for the j+1 choices for the decision maker with characteristics X_i can be represented as equation 5;

$$Prob(Y_i = j|X_i) = \frac{e^{\beta_j' X_i}}{1 + \sum_{k=1}^{J} e^{\beta_j' X_i}} \; For\; j = 0,1,2, \dots J, and\; \beta_0 = 0 \dots\dots\dots\dots\dots 5$$

Equation 5 is referred to as multinomial logit model. When equations 3 and 5 are integrated, j log-odds ratios are computed with equation 6;

$$In\left(\frac{P_{ij}}{P_{ik}}\right) = \sum X_i' \left(\beta_j - \beta_k\right) = X_i'\beta_j \; if\; k = 0 \dots\dots\dots\dots\dots\dots\dots 6$$

The farmers' logit model is explicitly specified as;

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \cdots + \beta_{10} X_{10} + \varepsilon_i \dots\dots\dots 7$$

Where Y_i = Dependent variable (1 if farmers used ICTs-based MIS, 0 otherwise)

β_0 = Intercept

β_1.....β_{12} = parameters to be estimated

X_1.....X_{12} = vector of explanatory variables

ε_i = error term.

Specifically the explanatory variables in the model are;

X_1 = Age (year)

X_2 = Gender of respondent (1 if male, 0 otherwise)

X_3 = Years of education (year)

X_4 = Perception towards ICTs (1 if positive, 0 otherwise)

X_5 = Household size (number)

X_6= Farm size (Hectare)

X_7 = Monthly expenses on ICTs (Naira)

X_8 = Farming experience (year)

X_9 = Access to loan (1 if yes, 0 otherwise)

X_{10} = Extension contact (1 if yes, 0 otherwise)

Also, the farmers' determinants for choice of ICT components were determined by using Multinomial Logit Model which estimated equations 8 and 9 simultaneously;

$$ln\left(\frac{P_F}{P_B}\right) = R_F = \psi_0 + \psi_1 X_1 + \psi_2 X_2 + \psi_3 X_3 + \psi_4 X_4 + \psi_5 X_5 + \psi_6 X_6 + \psi_7 X_7 + \varepsilon_I \dots\dots 8$$

$$ln\left(\frac{P_S}{P_B}\right) = R_S = \omega_0 + \omega_1 X_1 + \omega_2 X_2 + \omega_3 X_3 + \omega_4 X_4 + \omega_5 X_5 + \omega_6 X_6 + \omega_7 X_7 + \epsilon_I \dots\dots 9$$

Where;

P_B = probability that respondent chooses the base (mobile phone) alternative component.

P_F = probability that respondent chooses the first (radio) of ICT component.

P_S = probability that respondent chooses the second (others - WWW, CD-ROM and internet/email and television) of ICT component.

R_F = respondent chooses to use first alternative (radio) (1 if respondent uses, 0 otherwise)

R_S = respondent chooses to use second alternative (others) (1 if respondent uses, 0 otherwise)

Where;

Ψ_0..... Ψ_7 and ω_0…….ω_7 are parameters to be estimated, ε_i and ϵ_i are error terms.

X_1 = Knowledge of existence of ICT groups (1 if Yes, 0 otherwise)

X_2 = Major objective of using ICTs, (1 improve income, 0 otherwise)

X_3 = ICTs usage experience (year)

X_4 = Household size (year)

X_5 = Distance to and from nearest town centre, (Kilometre)

X_6 = Household income (Naira)

X_7 = Farm size (Hectare).

Results and Discussion

Main ICTs components used for Market Information Services.

Table 1 shows the main ICTs components used by farmers in the study area. The components used include radio, mobile phone, WWW, CD ROM, internet/e-mail and television.

Table 1: Distribution of respondents by main ICTs components used for MIS

Component	Frequency	Percentage
Radio	30	25
Mobile phone	77	64
Others(WWW, CD ROM, internet/E-mail, and television)	13	11

According to table 1, 64 percent used mobile phone to receive agricultural market information services while 25 percent of the farmers sourced for useful market information through radio. Also, 11 percent used other components such as WWW, CD ROM, internet/e-mail and television. This means that majority of the respondents use mobile phone. This may be due to its mobility and speed in information delivery. These findings are in line with Singh (2006), who found that mobile phones are the most usable ICTs in connecting agricultural systems of India. Also, the reason behind the use of radio may be because market days of villages and towns as well as agricultural commodities that are prominent are usually made public through radio programmes. Other components are used by few farmers in the study area because of limited academic ability to read technical instructions that are involved in using them. Also most of the gadgets for the other components are very expensive.

Factors Influencing Farmers' Utilization of ICTs for MIS.

The likelihood estimates of the logit model indicated that Chi-square (χ^2) statistic of 82.89 was highly significant ($P<0.0001$) suggesting that the model had a strong explanatory power. The pseudo coefficient of multiple determination (R^2) showed that 67 percent of the variation in the dependent variable was explained by the included independent variables. This implies that the model showed a good fit to the data. The results of the logit model as presented in Table 2 show that years of education, monthly expenses on ICTs and farming experience were statistically significant at 1 percent level of significance while perception towards ICTs and farm size were statistically significant at 5 percent level, implying that these variables greatly influenced utilization of ICTs for MIS by the farmers.

There was a negative relationship between age and the use of ICTs for MIS. The result shows that as the age of farmer increases, ability to make use of ICTs for agricultural market information services decreases and vice versa. This may be so because older farmers a times prefer to rely on the information gained over the years for their farming activities.

Gender had positive relationship with the use of ICTs for MIS. This shows that male farmers are more likely to make use of ICTs for MIS when compared with their female counterparts. This could be attributed to the fact that farming in the study area is mostly carried out by men who have the primary responsibility of providing for their households.

In the same vein, there was a strong significant (1%) positive relationship between years of education and utilization of ICT for MIS, implying that the more the years spent in formal school the more likely a farmer makes use of ICTs – based MIS and vice versa. This is due to the fact that education exposes farmers to the relevance of ICTs – based MIS. In addition, perception towards ICTs had significant (5%) positive correlation with the ICTs-based MIS. This indicates that probability of a farmer using ICT-based MIS is higher when he/she has a positive perception towards ICTs. Household size was positively related to the dependent variable. This is an indication that as the household size increases, the probability to rely on ICTs – based MIS also increases and vice versa. This may be so because as the household size increases, more mouths are fed by the farmers and hence the need for more reliable information on how to improve on his farming activities in order to generate more income to cater for the family.

Moreover, the farm size was significantly (5%) and positively related to use of ICTs – based MIS. The result implies that large scale farmers are more likely to use ICTs – based MIS than their counterparts that operate on small or medium scale. This corroborate the findings of Warren (2003) cited by Sekabira (2012) that positive relationship will exit between the use of ICT and farm size as farmers try to find market for their surplus production. Also, large scale farmers need more sophisticated equipment for production and this could be accessed most of the time through ICTs.

Also, the variable, monthly expenses on ICTs, was negatively and significantly (1%) related to the use of ICT – based MIS. This is an indication that the more the monthly expenses on ICTs, in terms of airtime top-up, repair and purchase of new ICT gadget, the less the probability of farmers willing to seek market information services through ICTs. This

may be necessary in order to cut costs of production since the information needed may be gotten from friends and cooperative societies sometime. This is in disagreement with Langyintuo and Mekuria, (2005) that monthly cost and expenses are positively associated with ICT use.

Farming experience had a strong positive significant (1%) relationship with ability of farmers to utilize ICTs for MIS. The results show that the more the farming experience, the more the utilization because experienced farmers would have known the benefits inherent in using ICT- based MIS in terms of easy access to information on marketing of produce and the likes.

Table 2: Logit regression results of the determinants of farmers' utilization of ICT for MIS

Variable	Coefficient	Marginal effect	P-value
Age	-0.615(0.497)	-0.563	0.215
Gender	0.586(0.564)	0.472	0.247
Years of education	0.749(0.207)***	0.714	0.001
Perception towards ICTs	0.538(0.229)**	0.412	0.013
Household size	0.146(0.204)	0.122	0.199
Farm size	0.244(0.097)**	0.211	0.032
Monthly expenses on ICTs	-0.961(0.215)***	-0.817	0.000
Farming experience	0.967(0.347)***	0.746	0.003
Access to loan	0.319(0.378)	0.297	0.174
Extension contact	0.674(0.578)	0.589	0.165
Log Likelihood function	-33.024		
LR Chi-square	82.89		
Pseudo R^2	0.67		

Source: Field Survey, 2016.*** represents 1% significance level, ** represents 5% significance level**.** Note: Figures in parentheses are standard errors.

Table 4: Multinomial Logit model estimates for determinants of choice of ICT components

Variable	Coefficient	Marginal effect	P-value
Radio			
Knowledge of existence of ICT groups	-0.713(0.198) ***	-0.043	0.002
Major objective of using ICTs	0.802(0.203)***	0.097	0.000
ICTs usage experience	0.216(0.086)***	0.104	0.001
Household size	- 0.436(0.187)**	-0.035	0.021
Distance to and from nearest town center	0.786(0.253)***	0.127	0.002
Household income	-1.893(0.554)***	3.417	0.000
Farm size	-0.338(0.229)	0.431	0.134
Others (WWW, CD ROM, Internet/Email and TV)			
Knowledge of existence of ICT groups	0.038(0.009)***	0.013	0.000
Major objective of using ICTs	-0.216(0.194)	-0.014	0.148
ICTs usage experience	0.009(0.012)	0.233	0.153
Household size	0.305(0.015)***	0.037	0.000
Distance to and from nearest town center	0.034(0.029)	0.026	0.271
Household income	0.665(0.241)***	2.759	0.001
Farm size	-0.128(0.098)	0.004	0.362
Log Likelihood Function	19.639		
Likelihood ratio (λ)	371.45		
P^2	82.9		
Number of observations	180		

Source: Field Survey, 2016. Figures in parentheses are standard errors, *** represents 1% significance level, ** represents 5% significance level. **Mobile phone is the base outcome**

Access to loan and utilization of ICT- based MIS had positive relationship, implying that the more the farmers have access to loan, the higher the probability of using ICT- based MIS because more funds will be available to buy and maintain any ICT gadget of their choice. It was observed that a positive correlation

occurred between extension contact and utilization of ICT- based MIS, indicating that the more the number of contacts recorded by the farmers from the extension agents, the higher the probability of utilizing ICT for MIS. The reason is not far-fetched because having access to extension contacts would enable the farmers to be educated on the opportunities/benefits attached to using ICT gadgets.

Factors Influencing Choice of ICT Components used by the Farmers.

Table 3 presents the results of Multinomial Logit Model (MNL) for factors influencing choice of ICT components. The users of various ICT components were categorized into three major components (radio, mobile phone, and others) based on usage.

From the result, it was discovered that, knowledge of existence of ICT groups, major objective of using ICTs, ICTs usage experience, distance to and from nearest town centre and household income were statistically significant at 1 percent level of significance while household size was statistically significant at 5 percent. These factors influenced the farmers' probability of using a radio compared to mobile phone.

In the same vein, factors influencing the use of others (WWW, CD-ROM and internet/email) components compared to mobile phone include knowledge of existence of ICT groups, household size and household income which were all significant at 1 percent level.

Knowledge of existence of ICT groups was negatively correlated to the choice of radio. This implies that Farmers with knowledge of existence of ICT groups are less likely to use the radio as compared to that of a mobile phone. Knowledge of ICT groups will give the farmers the opportunity to join such groups from where they can be educated on the uses and advantages of most modern ICTs like mobile phones, thus decreasing likelihood to use the radio.

It was revealed from the study that a positive relationship existed between the major objective of using ICTs and choice for radio, implying that any farmer whose main objective is to improve income would opt for radio because of its wide coverage, and it is a medium majorly used by extension agents to disseminate information to farmers since he/she (extension agent) cannot comprehensively have all the phone contacts of farmers. A positive correlation occurred between ICTs usage experience and preference for radio. The likelihood to use the radio increased with more years of using ICTs because farmers gained a better knowledge and ability to use it. Also, they are conversant with the time programmes with useful information are broadcast. This is in line with Bailey, (2009) who found that good experience in using ICTs positively influences demand to use such ICTs for better services.

Also, the negative sign on household size coefficient signifies that, an increasing household size is less likely to use radio compared to mobile phone. The larger the household size, the more the number of people including business partners that the farmer have to be in contact with. The different household members each have independent different movements and hence the need to communicate with each other using a mobile device thus the increasing likelihood of using a mobile phone as compared to the radio. This corroborates the findings of Sekabira (2012) that large household size necessitates the use of more mobile ICT device for communication.

Distance to and from nearest town centre was positively related to the use of radio when compared with mobile phone. This means that with increasing distance to and from nearest town centre, respondents are more likely to use radio than mobile phone for ICT based market information. A one kilometre increase in distance to and from nearest town centre increases the probability of using radio by 12.7 percent, compared to mobile phone. This might be due to limited power and their remoteness to the major towns where network masts of providers are erected.

Also, household income had negative relationship with the use of radio when compared to mobile phone. This indicates that an increase in household income reduces likelihood of them using radio instead of mobile phone. This is because more incomes is associated with better livelihood thus encouraging the farmers to have easy access to useful information and help them to enjoy their privacy and confidentiality when the need arises. With an increase in income, the farmers would find it easy to buy airtime, repair and provide energy source to power the mobile phone. This supports Shaffril et al., (2009) who found income to be positively related to mobile phone usage in small-scale business operations.

In addition, knowledge of existence of ICT groups had positive relationship with the use of other ICTs components such as WWW, CD ROM, Internet/e-mail and TV. This implies that with the Knowledge of existence of ICT groups, farmers are more likely to use the WWW, CD-ROM and internet/email compared to the mobile phone. This is because from the groups the farmers could learn how to use these more complex ICTs which help to access and exchange more bulky information as compared to the mobile phone. This corroborates the work of Latchen and Walker, (2001) that communication needs positively affect the use of modern ICTs.

Household size positively affected the use of other components of ICTs. It indicates that farmers with large household sizes are more likely to use

WWW, CD-ROM and internet/email compared to mobile phone. This might be due to the fact that large household size allows members to teach one another how to use those complex components.

Household income was positively related to the use of WWW, CD-ROM and internet/email when compared to mobile phone. This means that, with increasing household income, farmers are more likely to use WWW, CD-ROM and internet/email compared to mobile phone because of affordability. There is justification for the farmers to acquire sophisticated ICT gadgets provided it does not affect other responsibilities at home.

Constraints to the use ICT components

The constraints to the use of ICTs components and forms by the respondents were reported in multiple responses form in Table 4. It was revealed that 94.4 percent of the respondents reported incessant power supply while 61.1 percent said poor information communication methods and 56.7 percent lacked internet searching skills. Also, 46.6 percent complained of incompetent repairers in the study area. Unavailability of telephone accessories as problem was mentioned by 35.6 percent while 30 percent were faced with the problem of non availability of ICT training centers to update ICT knowledge.

Table 4: Distribution of respondents by constraints encountered to use ICT components

S/NO	Constraint	Frequency*	Percentage
1.	Incessant power supply	85	94.4
2.	Poor information communication methods	55	61.1
3.	Lack of competence in internet searching skills	51	56.7
4.	Poor attitude towards acquiring ICT skills	46	51.1
5.	Incompetent repairers	40	46.6
6.	Unavailability of telephone accessories	32	35.6
7.	Non availability of ICT training centers to update ICT knowledge	27	30

*Multiple choices recorded

Conclusion and Recommendations

Improving small scale farmers' productivity is one of the goals in this century which must be achieved. Farming business is faced with problems of growing population, rising poverty, climate change, growing demand for food and economic stagnation, but the growing number and sophistication of ICTs offer some hope of raising agricultural productivity.

The main ICT components used by small scale farmers for MIS and the constraints to the use of ICT components were identified by descriptive statistics while Logit and Multinomial Logit models were respectively used to determine factors influencing the use of ICTs-based MIS and choice of ICT components.

The study revealed that the majority (64%) of the respondents make use of mobile phone to access agricultural market information services while just few (11%) use other forms of ICTs such as, WWW, CD-ROM, internet/e-mail and television. Also some (25%) make use of radio. Incessant power supply mostly affect the use of ICTs-base MIS as stated by 94.4 percent of the respondents while 61.1 percent are affected by poor information communication methods. Some (56.7%) complain of lack of competence in internet searching skills while 46.6 percent are faced with the problem of incompetent repairers of gadgets in the study area.

Moreover, the main determinants of the use of ICTs-based MIS are, years of education, perception towards ICTs, farm size, monthly expenses on ICTs and farming experience. The major determinants of the choice of radio over the base outcome mobile phone are, knowledge of existence of ICT groups, major objective of using ICTs, ICTs usage experience, household size, distance to and from nearest town centre and household income while the major factors influencing the use of others (WWW, CD-ROM and internet/email and TV) components compared to mobile phone are knowledge of existence of ICT groups, household size and household income. The following recommendations are hereby proffered based on the findings of the study.

- Since mobile phones are widely used in the study area because they allow two way communications and also allow farmers to access vital agricultural market information services in a timely and cost effective manner, government should make the gadgets available to the farmers at affordable prices.
- Also, since incessant power supply is one of the major problems confronting the use of ICTs based MIS, stakeholders especially the governments should make available alternative source of power such as solar power by providing the farmers with highly subsidized solar panels and other gadgets needed to convert solar energy to electricity.
- Stakeholders should encourage the ICTs gadgets manufacturers especially the handset

manufacturers to establish centers where handsets are repaired at the Local Government Area Headquarters. This will allow the farmers to repair faulty handsets.

- Since monthly expenses on ICTs have significant effect on the use of ICTs –based MIS and in order to reduce costs, government should encourage the service providers to always charge reasonable and affordable amount on agricultural information.
- Training and retraining of the farmers on the use of ICTs-based MIS should be advocated and encouraged.

References

1. Bailey A., (2009). Issues Affecting the Social Sustainability of Telecentres in Developing contexts: A Field Study of Sixteen Telecentres in Jamaica", *The Electronic Journal on Information Systems in Developing Countries,* Vol. 36, No. 4, pp. 5-12.
2. FAO,(2009). How to feed the world 2050.http// www.fao.org/ fileadmin/templates/ wsfs /docs / expert _paper_How_to_feed the world in 2050.pdf.
3. Green, H. W., (2002). Ecomometric Analysis, 5th edition, Prentice-Hall, Upper Saddle River, New Jersey.
4. Jensen R, (2007). The Digital Provide: Information (Technology), Market Performance and Welfare in the South Indian Fisheries Sector", accessed on the 4th August, 2011 from: http://www.psu.edu
5. Langyintuo, A and Mekuria, M. (2005). Modelling Agricultural Technology Adoption Using the Software STATA CIMMYT, Harare, pp 3-6.
6. Latchem C. and Walker D., (2001). Perspectives on Distance Education, Telecentres: Case Studies and Key Issues. The Common Wealth of Learning, Vancouver, Canada.
7. Melchioly, S. R. & Sæbø, Ø. (2010) ICTs and Development: Nature of Mobile Phones usage for SMEs Economic Development - An Exploratory Study in Morogoro, Tanzania. ICT and Development - Research Voices from Africa. International Federation for Information Processing (IFIP), Technical Commission 9 – Relationship Between Computers and Society Workshop (March 2010). Makerere University, Uganda.
8. Mukhebi, A. (2007) Linking Farmers to Markets through Modern Information and Communication Technologies in Kenya. Nairobi, KACE.
9. Muriithi, A. G., Bett, E. & Ogaleh, S. A. (2009) Information Technology for Agriculture and Rural Development in Africa: Experiences from Kenya. Tropentag. Hamburg, University of Hamburg.
10. NPC (2007). Census Results of the 2006, Abuja Nigeria (April 2007).
11. Sekabira, H. (2012). Determinants for adoption of ICT-based market information services by smallholder farmers and traders in Mayuge District, Uganda. An M.Sc. thesis. Makerere University, Uganda.
12. Shaffril H. A. M., Hassan M. A., and D" Silva J. L., (2009), Developing Agriculture in Malaysia: Internet Utilization among Malaysian Youth Agro-Businessman", *European Journal of Social Sciences,* Vol. 11, No. 2, pp. 215 – 223.
13. Singh, S. (2006). Selected success stories on agricultural information systems, Emerald 86 Group Publishing Limited, Pathumthani, available from http://www.apaari.org
14. Warren M., (2003). Farmers and the Internet, Six Years ON", *EFITA Conference*, Debrecen, Hungary, accessed on 20 February 2016 from http://www. Citeseerx.ist.psu.edu. 10. 1.1.3.3418.pdf.
15. World Bank (2011). Food Price Watch. http://siteresources.worldbank.org/INTPREMNET/Resources/Food_Price_Watch_Feb_2011_Final_Version.pdf.

2/25/2017