



# Assessment of Use of Selected Information Communication Technologies (ICTs) for Extension Service Delivery: Implication for Agricultural Development in Nigeria

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## Abstract

The study was carried out to assess the implication of the use of selected Information and Communication Technologies (ICTs) for extension service delivery in Nigeria. The simple random technique was used to select fifty percent of the total extension agents which equivalent to forty-two respondents as sample size for the study. Frequency counts, percentages, mean and standard deviation were used as descriptive statistic. Also, Chi-Square test and Spearman's rho correlation were employed as inferential statistic to test for the hypotheses. Findings indicated that access to various ICTs tools especially Radio and Mobile phone and were found to be relevant to farming operations. The result of Chi square test revealed that significant relationship exist between sex, age, level of education, years of working experience of the extension agents and level of use of ICTs. Furthermore, the result of Spearman rho Correlation showed that there was no significant relationship between ICT training of extension workers and the level of use of ICTs. The study recommended among others that, there should be a periodic review of the use of current ICTs in extension service delivery to facilitate effectiveness in the use of ICTs for extension service and adequate funding of extension service should also be ensured to enhance the maintenance of ICTs made available to extension personnel.

### Keywords:

Extension service, Information, Technology, Nigeria

## INTRODUCTION

Most African countries depend on agriculture for their economic growth. International Food and Agriculture Programme (IFAP, 2004) asserted that about 80 percent of the population who live in rural areas of developing nations depend directly on agriculture for their livelihood. In Nigeria, the Federal Ministry of Agriculture and Rural Development (FMARD) (2002) stated that agriculture remains the largest contributor to the Nigerian economy, accounting for over 38 percent of non-oil foreign earnings and employing 58 percent of the active labour-force of the population. In the recent years, a number of Sub-Sahara African countries experienced slow agricultural development. The decline in the agricultural development could be attribute to a number of constraint which include: inappropriate agricultural policies, inadequate information provision, low adoption of agricultural technologies and institutional frameworks (Kiplang and Wallance, 2003).

In addressing the factors that limit agricultural production, Low External Input and Sustainable Agriculture (LEISA) now Farming Matters (2005) emphasized that the underlying factor is related to information and knowledge. Access to information is one of the most valuable resources in agricultural development. Recently, the demand for agricultural information is of great importance than ever before, thereby making information a prominent factor in agricultural production.

In view of this, this makes the extension service to be relevant most especially in making information available to the clientele. Communication is the essence of agricultural extension which seeks to provide knowledge and information for rural dwellers in order to modify their behaviour in a way to provide sustainable benefits to them and the society at large (Alex, *et al.*, 2004). Knowledge and communication are central to this process, indeed without effective communication there can be no meaningful development. The extension service system play an important role in enabling rural communities to identify and articulates their needs and to access relevant information for the

creation of knowledge.

Communication of information and knowledge is an important aspect of extension service and extension service providers must be able to access a continuous flow of new information and innovation if they are to be of continuous benefit to their clients. The Subject Matter Specialists (SMS) traditionally links this system being a specialist within the extension service who maintains contact with recent innovation and latest technologies and in turn feed these to village extension personnel (Alex *et al.*, 2004). This linkage and information flow between different actors in agricultural production can be enhanced through the use of Information Communication Technologies (ICTs). Agricultural extension is evidently an area of agricultural production where dissemination of information through the use of Information Communication Technologies (ICTs) cannot be overruled.

The term Information and Communication Technologies (ICTs) has been described as including a wide range of media used to denote the use of computer and communication systems within computers. Communication Technology Association (CTA) (2002), defined ICTs as the combination of hardware, software and all other means of production that enable the exchange, processing and management of information and knowledge. ICTs thus connote technologies and methods involved in storing, managing creating, processing and disseminating information, example of this include, Computers, Books, E-mails, Radio, Telephones, Television, Pager, Personal Digital Assistants (PDAs) and the "web".

Agricultural Extension, depends largely on information exchange between and among farmers and a broad range of other actors, is an area in which ICT can have significant impact. Research Scientists can relate directly with the farmers through ICTs. Frontline extension workers, who are the direct link between farmers and other actors in the agricultural knowledge and information system, are well positioned to make use of ICT to access expert knowledge or other types of information that could be beneficial to the farmers (Salau and Saingbe, 2008). The potential applications of ICTs in agricultural

extension include the following:

- Capacity to reach a large audience, e.g. the use of radio, TV and Internet
- Can be effectively used for training and demonstrations e.g T.V., Video, VCD, and CD-ROM.
- Can be used to make the extension systems and structures more efficient through better management of information and scarce resources e.g the use of Data bases for MIS and Networking softwares .
- For the search and packaging of information on demand and for exploring of alternative production options and technologies e.g the use of search engines, the web and data bases.
- ICT may be used for normal weather forecasts and as a warning system for disease/pests outbreaks and other disasters before they occur and also for the provision of timely and sensitive market information e.g. with the use of Radio, TV, and SMS.
- ICTs are important for networking among and between the key stakeholders in the Research-Extension-Farmers-Inputs-Linkage System (REFILS) e.g. with the use of Telephone, Video, SMS, and;
- ICTs can also be effectively used for community mobilization, learning and action e.g Radio, TV, public address systems and the Web (Arokoyo, 2005).

In spite of the constraints to the use of ICT, ICTs have enhance efficient and effective dissemination and access to scientific, technical and marketing information which are previously difficult and often expensive to come by (Aina, 2002). ICTs offers tremendous capabilities to the agricultural sector in terms of vast information storage, fast, and in-expensive communication channel, links between different media, easy and enjoyable use at comparatively low and declining cost (Kiplang and Wallace, 2003). ICTs resource centres meant for extension service system could be owned by government or its agencies, Educational Institutions, Community organization and Non-government organizations. These resource centres may be located in Churches, Mosques, Community centres, Local Government Headquarters, Post

Office, Farmers co-operative houses and Radio and/or Television Stations. In Oyo State for example, ICT resource centres are established especially in Oyo State Agricultural Development Programme (OYSADEP) resource centre located at Saki, International Institute of Tropical Agriculture (IITA) controlled resource centre in Ago-are, Atisbo Local Government Area. However, lack of adequate and timely information is one of the factors that could be responsible for low agricultural production in the rural areas of developing nations (Arokoyo, 2004), this could be sequel to the fact that many extension service providers are handicapped by administrative bottlenecks, declining public funds, farmers' conservativeness, lack of accessibility and network connectivity, high rate of illiteracy of the farmers, outrageous extension agents/ farmers ratio, coupled with extension agents' disposition to change which could affect their use of ICTs.

### Objectives of the Study

The main purpose of this study was to determine the usefulness of selected Information and Communication Technologies (ICTs) for extension service delivery in Oyo State. The specific objectives are to

- identify the socio economic characteristics of the respondents
- identify the various ICTs available for extension service delivery in the study area
- ascertain the frequency of use of available ICTs facilities
- examine the usefulness of ICTs for extension service delivery
- ascertain the constraints faced by the extension workers in the use of ICTs.

### Hypotheses of the study

Based on the objectives of the study, the following hypotheses are stated in null form:

- 1- There is no significant relationship between selected socio economic characteristics of the respondents and level of use ICTs
- 2- There is no significant relationship between level of ICTs training of the extension agents and level of use of ICTs.

## MATERIALS AND METHODS

### Site of study

This study was carried out in Oyo State, Nigeria. The State with the appellation 'The Pace Setter State' was created on February 1976 consequent upon the break-down of the old Western Nigeria. Geographically, Oyo State is located in the South West region of Nigeria, latitude 8 degree North and longitude 4 degree East bisects the State into four equal parts. The State covers a total of 27,249 square kilometer landmass and it is bounded partly by Ogun State in the south, Kwara State in the North, to the West. It is bounded partly by Ogun State and partly by the Republic of Benin while in the East it is bounded by Osun State. The topography of the study area is one of gentle lowland in the south, rising to a plateau 40 metres and above in the north. The vegetation pattern is that of rain forest in the south and Guinea Savannah in to the north, the climate is equatorial, notably with wet and dry season with relatively high humidity, the dry season starts in September while the wet season starts in April and terminate in September / October, average daily temperature ranges between 29°C and 35°C almost throughout the year. Consequent upon the prevailing climate and soil characteristics the following crops are cultivated; maize, yam, cassava, cowpea, sorghum, vegetable and tree crops like cocoa, oil palm, kola nut, walnut and citrus. Other agricultural activities in the state include fishery and livestock production. Animals are commonly reared on free range and these animals include poultry, goat, sheep, cattle and pigs amongst others.

### Sampling procedure and sample size

The population for the study comprised of extension service providers in Oyo state. As at the time of this study, there were eighty-two agricultural extension personnel in the study area and fifty percent (50%) of these extension workers were selected from each of the agricultural zones in the study area, thereby giving a total of forty-two (n=42) extension agents (Table 1).

Table 1: Sampling of extension agent in Oyo State for the study

Agricultural Zones	Total Number of Extension Agents	Number of Extension agents sampled (50%)
Oyo	21	11
Saki	22	11
Ogbomoso	18	9
Ibadan/Ibarapa	21	11
Total	82	42

Source: Field Survey (2009)

### Method of data collection

Primary data for this study were collected using structured questionnaire. The questionnaire contained both open and close ended questions.

### Measurement of variables

There were two types of variables measured in this study, they were independent and the dependent variables. The independent variables include the socioeconomic characteristics of respondents such as age, sex, marital status, religion, academic qualification, ICT training while the dependent variable was the level of use of ICTs by the respondents. This was measured on a 4 point rating scale of Never=0, rarely=1, Sometimes=2 and always=3. The respondents were categorized into three namely: Low, average and High Users based on mean and standard deviation of utilization scores. The dispersion statistics of the index are mean (46.9), median (47.0) and mode (47.0) were found to be close hence a normal distribution is assumed. The standard deviation was found to be 1.8. Descriptive statistical tools such as frequency counts, percentage were used to describe the data. Chi-square and Spearman rho Correlation were used to test the hypothesis.

## RESULTS AND DISCUSSION

### Personal characteristics

The analysis of the data collected indicated that 82.9% of the extension agents were male while 17.1% was female. The mean age of the extension agents was 44 year while 15.2% of them were of Islamic faith, 48.8% were Christians, 92.7% were married and 7.3% were either single or divorced, the result also revealed that 92.7% have a BSc or its equivalent 7.3% have a master

Table 2: Distribution of extension agents according to personal characteristics

Variables	Frequency	Percentage	Statistic
<b>Sex</b>			
Male	34	82.9	
Female	7	17.1	
<b>Age (years)</b>			
34-39	8	19.5	Mean = 44.0 SD = 4.41
40-45	14	34.1	
46-50	19	46.3	
<b>Religion</b>			
Christianity	20	48.8	
Islam	21	51.2	
<b>Marital Status</b>			
Single	2	4.9	
Married	38	92.7	
Divorced	1	2.4	
<b>Educational background</b>			
HND	7	17.1	
B.Sc	31	75.6	
M.sc	3	7.3	
<b>Work Experience (years)</b>			
1-10	10	24.4	Mean=14.2
11-20	29	70.7	
21 and above	2	4.9	
<b>Level of training on ICTs</b>			
Certificate	20	48.8	
Learning on the job	9	21.9	
Learning on my own	12	29.3	
<b>Access to ICT tools</b>			
Yes	42	100.0	
No	0	0.00	

Source: Field Survey 2009

degree and the mean of their year of working experience is 14.2 years. The result further revealed that 48.8% of the extension agents had a certificate in the use of ICTs while 21.9% of them are learning on the job and 29.3% of the respondents are learning on their own. All the respondents indicated that they all have access to the use of ICT tools

**Distribution of extension agents according to the frequency of use of various ICTs**

Table 3 shows the frequency of use of each of the identified ICTs tools in the discharge of their duties. This was achieved by assessing how frequently the itemized ICTs are employed in the discharge of extension service on a five scale of weekly, fortnightly, monthly, Quarterly and never. It was revealed that Radio (M= 4.0) was the most used ICT as it ranked first while television closely followed with a Mean score of 3.9, ranked second and mobile phone

ranked third because virtually all the respondents could at least afford to procure and maintain a transistor radio in case there is no electricity or reception to access television signal, next is mobile phone (2.8) which is fact gaining popularity among the respondents in information dissemination sequel to its time

Table 3: Distribution of respondents by frequency of use of various ICTs tools for extension delivery.

ICTs	Mean of frequency of use	Rank
Handbill & Fliers	0.90	5 <sup>th</sup>
Newspaper	1.85	4 <sup>th</sup>
Internet	0.73	6 <sup>th</sup>
Mobile phone	2.85	3 <sup>rd</sup>
Radio	4.00	1 <sup>st</sup>
Television	3.93	2 <sup>nd</sup>
Cinema	0.22	7 <sup>th</sup>
Multimedia Projector	0.22	7 <sup>th</sup>
CD ROM Technology	0.00	9 <sup>th</sup>

Source: Field Survey (2009)

saving and cost effectiveness, in the fourth position is newspapers (1.8) which could only be used because of their literacy level and next is handbills and fliers which are rarely in circulation. The use of the internet with mean score (0.73) ranked sixth and the use of this have been found to be constrained by such factors as, lack of infrastructure facilities, poor connectivity, low technical know-how etc. and sharing the seventh used ICTs are cinema and multimedia projector with mean score (0.2) respectively, which are rarely used for information dissemination in the study area.

However, all the respondents indicated that they never employed the use of CD-ROM technology neither for information sourcing or dissemination of extension information to their clientele.

### Categorisation of respondents on level of use of ICT

Table 4 shows high percentage (80.5%) of the respondents were categorized as high and average ICT users respectively and others (19.5%) were low users of ICT tools for extension delivery in the study area.

Table 4: Distribution of respondents by categorisation on level of use of ICTs.

Level of use of ICTs by Extension agents	Computation	Frequency	Percentage
High level of use (X +1SD)	48.7 to 51.0	9	21.9
Average (X -1SD to X +1SDqi)	45.2 to 48.69	24	58.6
Low level of use (X -1SD)	44.0 to 45.1	8	19.5

Table 5: Distribution of respondents according to usefulness of ICTs to in dissemination of agricultural information by extension agents relative to the satisfaction of farmers' information needs

ICT Tools	Pre-planting Operation		Post-Planting Operation		Livestock Issues	
	Mean score	Rank	Mean score	Rank	Mean score	Rank
Newspapers	0.73	5 <sup>th</sup>	1.05	6 <sup>th</sup>	0.85	5 <sup>th</sup>
Handbill/ Fliers (Under ICT tools)	0.73	5 <sup>th</sup>	0.66	7 <sup>th</sup>	0.78	6 <sup>th</sup>
Journals	0.73	5 <sup>th</sup>	1.22	5 <sup>th</sup>	0.78	6 <sup>th</sup>
Mobile Phone	2.37	2 <sup>nd</sup>	2.73	1 <sup>st</sup>	2.40	1 <sup>st</sup>
Radio	2.39	1 <sup>st</sup>	2.63	2 <sup>nd</sup>	2.39	2 <sup>nd</sup>
Television	2.15	3 <sup>rd</sup>	1.93	3 <sup>rd</sup>	2.15	3 <sup>rd</sup>
Cinema	0.66	6 <sup>th</sup>	0.44	8 <sup>th</sup>	0.66	7 <sup>th</sup>
Multimedia Projector	0.18	7 <sup>th</sup>	0.32	9 <sup>th</sup>	0.49	8 <sup>th</sup>
Internet	0.86	4 <sup>th</sup>	1.80	4 <sup>th</sup>	1.70	4 <sup>th</sup>

Source: Field Survey, 2009.

### Usefulness of ICTs to in dissemination of agricultural information by extension agents Relative to the satisfaction of farmers' information needs

In the context of the study, farmers information needs are categorized into Pre-planting operations, Planting operations and Livestock issues and the study revealed that mobile phone and radio ranked first as the most useful means of information dissemination to farmers on post planting operation (M= 2.73), livestock issues (M=2.40) and pre-planting operations (M=2.39) respectively. Radio and mobile phone ranked second most useful ICT for dissemination of information on post –planting operation (M=2.63), pre-planting operation (M=2.37) and livestock issues (M=2.39) respectively.

Television ranked third as the most useful ICT tool used by extension agents in dissemination of information to farmers on pre –planting operations (M=2.15), livestock issues (M=2.15) and post planting operation (M=1.93). The internet ranked fourth for all operations and multimedia projector was the least used ICT for disseminating information to farmers on livestock issues (M=0.49), post-planting operations

(M=0.32) and pre-planting operations (M=0.18). The finding of this study shows that mobile phone, radio and television are the most useful ICTs used for information dissemination to farmers on pre-planting operations, post-planting operations and livestock issues. Although, mobile phone is the only modern ICT used while others (radio and television) are analogue ICTs that are still found very relevant in information dissemination, perhaps because of their ease of access and cost of procurement and maintenance (Table 5).

**Constraints to the use of ICTs for extension service delivery**

Constraints to the use of ICTs for extension service delivery were discussed under various headings viz: high illiteracy level among farmers, high cost of procurement of ICTs, cost of maintenance of ICTs, negligence on the part of the farmers and inadequate technological know-how. It was however discovered that the use of internet was most constrained by illiteracy (M = 2.88), followed closely by newspapers (M = 1.80), handbills and journals (M = 1.73), then mobile phone, cinema and television in that order with the use of radio least affected by illiteracy. Also, cost of procurement was a very serious constraint to the use of internet (M = 2.76), cinema (M = 2.00) and mobile phone (M = 1.93) while radio,

journals and handbills were least affected by cost of procurement, perhaps for the fact that handbills are given free of charge. Also, internet, multimedia projector, and cinema were most constrained by cost of maintenance while newspapers, handbills and journals were least affected. Negligence of use of ICTs by the farmer was another constraint that most affect the use of internet, this could be furtherance to the fact that illiteracy and cost of procurement and maintenance have deprived the respondents the use of the internet, the use of journals, newspapers and handbills were also neglected by the farmers perhaps the print media are rarely and hardly accessed by them. The least neglected ICTs been radio, mobile-phone and television. Inadequate technological know-how is another constraint to the use of the internet, multimedia projector and cinema whereas this does not limit the use of radio, television and mobile phone (Table 6).

**Ranking of severity of constraint against various ICTs by extension agents**

The constraints to use of ICT tools in order of severity as experienced by extension agents were identified as reported in table 7. It was found that the internet was the most constrained ICT, followed by the use of CD-ROM Technology, and Multimedia Projector. Other ICT in order of descending of severity in terms of con-

Table 6: Distribution of respondents according to constraints to the use of ICTs for extension service delivery

Constraints	News-papers	Hand-bills	Jour-nals	Mobile phone	Radio	Television	Cinema	Multimedia Projector	internet
High Illiteracy Level	(2) 1.80	(3) 1.73	(3) 1.73	(4) 0.27	(7) 0.09	(5) 0.24	(6) 0.17	(6) 0.17	(1) 2.88
High cost of Procurement of ICTs	(6) 1.32	(8) 0.44	(7) 0.96	(3) 1.93	(9) 0.24	(5) 1.51	(2) 2.00	(4) 1.83	(1) 2.76
High cost of maintenance of ICTs	(6) 1.56	(7) 1.36	(6) 1.56	(4) 2.44	(5) 2.42	(5) 2.42	(3) 2.46	(2) 2.61	(1) 2.87
Negligence of use of ICTs on the part of farmers	(3) 1.27	(3) 1.27	(2) 1.37	(7) 0.12	(8) 0.09	(6) 0.15	(5) 0.19	(4) 0.44	(1) 1.76
Inadequate technological know-how	(4) 0.44	(5) 0.39	(5) 0.39	(7) 0.15	(7) 0.15	(6) 0.19	(3) 1.22	(2) 1.95	(1) 2.65

Source: Field survey, 2009

Figure in parenthesis is ranks

Table 7: Ranking of severity of constraint against various ICTs used by extension agents

ICTs	Internet	CD-ROM Tech	Multimedia Projector	Cinema	Journals	Mobile Phone	Newspaper	Handbill and fliers	TV	Radio
Level of severity of constraint	6.844	4.515	3.498	2.124	1.814	1.749	1.560	1.496	1.497	1.389
Rank Order	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	7 <sup>th</sup>	8 <sup>th</sup>	9 <sup>th</sup>	10 <sup>th</sup>

straints include: Cinema, Journal and Bulletin, Mobile Phone, Newspaper Handbill and Fliers. Television and Radio was rated the least constrained ICT. This corroborates the finding by Munyna, (2007), in which she stated that lack of adequate infrastructure militates against the use of sophisticated ICTs by extension personnel in the developing nations (Table 7).

**Hypothesis 1**

**Relationship between social economic characteristics of extension agents and level of use of ICTs**

The results of the chi – square analysis revealed that there significant relationship exists between selected personal characteristics variables of the respondents such as Sex ( $X^2 = 17.78, P<0.05$ ), Age ( $X^2 = 10.68, P<0.05$ ), level of Education ( $X^2 = 33.56, P<0.05$ ), years of working experience ( $X^2 = 14.66, P<0.05$ ) and level of use of ICTs by extension agents and This implies that the null hypothesis is hereby rejected for aforementioned variables. It is also implies that Sex, Age, level of education and years of working experience significantly influenced level of use of ICTs by the sampled extension agents in the study area.

Conversely, other variables such as marital status and religion were found not significant to the level of use of ICTs by extension agents. The implication of this is that variables such as marital status and religion were found not to

significantly influence the level of use of ICTs by extension agents (Table 8).

**Hypothesis 2**

**The hypothesis stated that there is no significant relationship between the level of ICT training of extension agents and their level of use of ICT devices**

Spearman’s rho correlation analysis was performed to test the relationship between the level of ICTs training of the extension agents and their level of use of ICTs in their extension service delivery. The result of the analysis shows that there is no significant relationship between the level of ICT training of extension agents ( $r= 0.110, P< 0.05$ ) and their level of use of ICT devices.

**CONCLUSION AND RECOMMENDATIONS**

The study assessed the use of ICTs in disseminating agricultural related information among extension agents in the Oyo State, Nigeria. Based on the findings of the study, it could be concluded that majority of the extension workers in the study area are average users of ICT tools for extension information delivery especially, Radio, Television and Mobile phones are the most relevant ICT for extension delivery. These tools are useful in dissemination of Pre planting, post planting operations as well as livestock issues information. Age, sex, education and years of working experience are important

Table 8: Summary of Chi – square analysis establishing relationship between personal characteristics of extension agents and level of use of ICTs

Personal characteristics	Df	Chi – square $X^2$	P-value	Remark	Decision
Sex	1	17.780	0.000	Significant	H0 Rejected
Age	12	10.683	0.002	Significant	H0 Rejected
Religion	1	0.024	0.876	Not-significant	H0 Accepted
Marital status	2	65.024	0.329	Not-significant	H0 Accepted
Education	2	33.561	0.000	Significant	H0 Rejected
Work Experience	13	14.659	0.000	Significant	H0 Rejected

Source: Field survey, 2009

Figure in parenthesis is ranks

factors that significantly influenced the level of use of ICT for extension delivery among extension agents in the study area.

Sequel to the findings of the study, it is recommended that

1- Extension institutions should intensify efforts towards disseminating agricultural information meant for the farmers in the study area through the use of radio, television and Mobile phone which are the ICTs that are most accessed by all concerned in the study area.

2- There should also be a periodic review of the use of ICTs in the extension service delivery so as to identify which particular, ICT is most suitable for a particular purpose at a given point in time.

3- Also the extension service providers should be made to undergo periodic on- the- job training on the use of ICT so as to keep them abreast of latest information that could facilitate an efficient extension service delivery.

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