



Access to Information and Communication Technologies Service Delivery among Extension Agents of Gombe State, Nigeria

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Abstract: This study examined the access of Information and Communication Technologies (ICTs) in agricultural extension service delivery by extension agents of Gombe State, Nigeria. Specifically, the socio-economic characteristics along with the various types of ICT facilities used by the respondents were identified and described, and their accessibility determined. Data were collected from 79 agricultural extension agents in the state using structured questionnaire and were analyzed using descriptive statistics. The results revealed that majority (73.61%) of the respondents were male whose age ranges from 50-59 years and majority (95.84%) had tertiary education certificate which ease their understanding and utilization of ICT facilities. The types and most accessed ICT facilities used to obtained agricultural information in the area were radio, television and GSM/handset. Moreover, extension agents who belong to social associations had easy access to new inventions hosted by ICTs than their non-members counterparts and are capable of acquiring the ICT facilities needed for their optimum operations since they have an average income of ₦75,097/month. The regression analysis reveals that respondents' income, work experience, membership of association, access to ICT facilities and educational level were statistically significant and positively affect the use of ICT in extension service delivery. The major constraints militating against effective use of ICT facilities in the extension centers were lack of interactive communication, low access to internet connected computers, erratic and unstable power supply, lack of opportunity to ask questions, inadequate research materials and publications as this could have negative impact on agricultural operations. The study recommends among others that both government and non-governmental organizations should always organize training workshops on the use of ICT facilities in agricultural extension. Extension agents should be encouraged to join agricultural associations, as participation in these associations increases usage of ICT facilities for effective extension service delivery.

Keywords: Access, Extension, ICT, Delivery, Nigeria
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INTRODUCTION

Information is defined as the knowledge communicated or received concerning particular fact or circumstance (Wikipedia, 2013a). It is essential to reach large number of potential clients, without distorting its quality and to make information more valuable for its use. The delivery of agricultural information is very crucial to agricultural productivity because it is only through this means farmers can learn innovations which can improve their productivity.

Information and Communication Technology (ICT) is the integration of telecommunications (telephone lines and wireless signals), computers as well as necessary enterprise software, middleware, storage and audio-visual systems which enable users to access, store, transmit and manipulate information (Wikipedia, 2013b). It consists of various collections of resources and technical tools that are used for connecting, spreading, storing and managing information (Pigato, 2004). ICT has the ability to reach a large number of potential clients, without compromising the quality of the information. In addition, ICT can disseminate information in various forms, including text, audio-visual, downloadable and up-loadable files, movies, among others, giving information users several options to inform potential customers about their products. Compared to traditional technology dissemination methods such as printed material, field demonstrations, face-to-face or group meetings, the ICT is both faster and enables interactive communication.

The use of ICT in agriculture is fast increasing worldwide. The ICT such as mobile communication, electronic mail (email), facsimile, and internet are extensively used for information dissemination in agriculture in developed countries (Lio and Liu, 2006). ICT facilitates knowledge sharing among researchers, extension workers and farmers, while enabling the information flows by connecting rural agricultural communities to internet, both in terms of accessing information and providing local content. Over the years, agricultural extension has been at the fore-front in the delivery of adequate information to farmers for increased productivity. According to Agbamu (2007), agricultural extension service delivery all over the world has been concerned with communicating research findings and improved agricultural practices to farmers. The efficiency with which these information and practices are conveyed to farmers to a large



extent determines the level of agricultural productivity.

The major role of agricultural extension activities is to communicate relevant and useful information to the end users, to persuade them to adopt which will eventually lead to increase in agricultural production. To achieve this, extension workers and their trainers should be knowledgeable and skillful in communication (Okunade and Oladosu, 2006). Extension organizations have been concerned with what should be the appropriate means and approaches in getting the right agricultural information to the end-users (farmers). However, there has been revolution with regards to ICT in agriculture and particularly in extension service delivery of Nigeria. This revolution is an intervention with the potential to ensure that knowledge and information on important agricultural technologies, methods and practices are put into right use by farmers. Agricultural extension system has the responsibility to develop the country's agriculture. Such development is often measured through the performance of the extension agents, whose main responsibility is to communicate innovations to the end users.

According to Khodamoradi and Abedi (2011), ICT is essential component which expose the different worldwide information to society. Nowadays, ICT is one of the most important elements that determine the current presentation and the future situations for the different communities. This situation is typically seen in developed and developing countries, where the society in the urban areas are active users of ICT as compared to society that lived in the rural areas where ICT has slight or no importance in their daily life. ICT can preserve order and disseminate information to rural communities, but due to shortage infrastructure and network it is very difficult to reach rural communities. If modern ICT facilities are not adequately built into the mainstream of Nigerian agricultural system, there is likely to be stagnation in the dissemination and application of scientific agricultural information for powerful development of the system (Adebayo and Adesope, 2007). It has therefore, become necessary for all stakeholders to join hands in developing ICT in Nigeria since it has the potential of transforming agriculture through agricultural extension delivery in the country.

An agricultural extension worker can learn new technologies, rainfall forecast, and commodity



price among others and use the information to advice farmers in a village. As observed by a World Bank report (2009) on information and communication for development, economic growth increased by 1.3% as a result of 10% increase in high-speed internet connection. Hence, effective communication of agricultural information to farmers is crucial in achieving optimum efficiency in agricultural production in Nigeria. Agricultural extension in this information age has been recognized as an essential medium of disseminating information and advice to farmers and this is achieved through the ICTs (Okeke *et al.*, 2015). Even if the information on latest technologies are available with the relevant information sources, their retrieval and use for the betterment of the agricultural sector seems to be low in developing countries, due to wide gaps prevailing between information sources and the information users (Nazara *et al.*, 2004).

The importance of ICTs in the development process was long recognized and access to ICTs was even made one of the Millennium Development Goals which emphasizes on developing a global partnership for development (Adamawa State Millenium Development Goals Report, 2006). ICTs play numerous key roles in extension service delivery such as expanding outreach to a large number of farmers, offering a solution to resource and capacity issues within the agricultural sectors; improving information flow and connecting people within the rural areas; answering questions relating to farm problems with the advantage of getting feedback using telephone; obtaining market price information and weather forecast. Namaseb (1999) noted that agricultural information passed by the media caused enhanced agricultural productivity of farmers when they have access to it. However, in disseminating this information, it is imperative that the specific information needs of the large audience are taken into consideration so as to ensure that their needs and aspirations are met. The need for relevant and current information by the farmers on new agricultural practices is a vital issue that needs to be considered by every nation especially developing countries like Nigeria.

Agriculture is still the main stay of Nigerian economy, employing over 70% of the population. ICTs are therefore veritable tools for transforming Nigerian agriculture. Growth in the field of agriculture has being made possible through the use of the latest technology for communication.



The role of ICTs in enhancing food security and supporting rural livelihood is increasingly recognized and was officially endorsed at the world summit on the information society (WSIS) between 2003 and 2005 (Nwachukwu, 2010). It has been reported that ICTs increasingly bring market information, financial services and health services to remote areas, and is helping to change people's lives in unprecedented ways (Asenso-Okyere and Ayalew-Mekonnen, 2012). It has the potential of bridging the existing communication gap among the extension workers on the one hand and between the extension workers and farmers on the other (CTA, 2003).

Despite the importance of ICTs in extension service delivery, there seems to exist a gap in knowledge between what is existing and what needs to be done to ensure the optimal access and utilization of ICT infrastructures so that it will contribute significantly to the development of extension service delivery and agricultural development in Gombe State, Nigeria. This study therefore, bridge information and knowledge gap between extension agents and new agricultural information (technologies) from ICTs since it has been observed that the quickest route out of economic stagnation is the acquisition of ICT's skills. Japan, South Korea and recently China represent the clearest modern examples of countries, once regarded as backward and under developed, which have changed their fortunes by investing in ICTs (Odachi, 2008). To maintain afloat in this competitive world, Nigeria and indeed Gombe State should adopt the changing technology that is prevalent in advanced countries. Hence, this study described the socio-economic characteristics of extension agents and identified the types of ICT facilities used as well as their accessibility by extension agents in the area.

METHODOLOGY

Study Area

Gombe State is located in North-eastern Nigeria and lies between Latitude 10° and 15° N of the equator and Longitudes 11° and 10° E of the Greenwich meridian. It occupies a land area of 20, 265 Km^2 and a population of 2,353,000 (NPC, 2006). The state shares common boundaries with Borno, Yobe, Taraba, Adamawa and Bauchi States.



Gombe State has two distinct climates, the dry season (November -March) and rainy season (April – October) with an average rainfall of 850mm. Over 80% of the population is engage in agriculture and agro-allied activities. Major crops produce include: maize, millet, sorghum, cowpea, groundnuts, bambara nuts, rice, vegetables and fruits. Also livestock and fisheries are produce in large quantities. The state is confluence of economic activities by its position as the meeting points for traders from all over the country (GSG, 2013).

There are eleven Local Government Areas in the state, namely; Akko, Balanga, Billiri, Dukku, Funakaye, Gombe, Kaltungo, Kwami, Nafada, Shongom, and Yamaltu Deba. The state Agricultural Development Projects (ADPs) is located in the three senatorial zones of the state, these are: Gombe North, Gombe South and Gombe Central senatorial zones with Headquarters in Gombe.

Sampling Procedure and Sample Size

Multi-stage random sampling was used in selecting respondents for the study. First stage sampling involved the random selection of six out of the eleven Local Government Areas (LGAs) of the state since extension agents are present in all the LGAs. Secondly, the list of all the extension agents in the selected LGAs was used as the sampling frame from where 72 extension agents (representing 91.14%) were randomly selected to form the study sample. Structured questionnaire were administered to the respondents with the help of a research assistant.

Analytical Techniques

Both descriptive and inferential statistics were used in the analysis of data collected. Descriptive statistics involved the use of frequencies, percentages and means to .Inferential statistics on the other hand involved the use of multiple regression analysis to determine the relationship between some selected socio-economic characteristics of the respondents and ICT use in extension service delivery in the study area by the respondents. The implicit form of the model is expressed as:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \mu_i$$

Where;

Y = ICT used by extension agents (measured by percentage of ICT facilities used)



X_1 = Age of the respondents (years)

X_2 = Educational Level (years of formal education)

X_3 = Income of the respondents (naira/month)

X_4 = Household size (Number of family members)

X_5 = Working experience (years)

X_6 = Training on ICTs received (Received training = 1, no training = 0)

X_7 = Membership of associations (Membership = 1, while non-membership = 0)

X_8 = Access to ICTs facilities (Measured by the number of ICT facilities that extension agents have access to)

μ_i = Error term

$\beta_0 - \beta_8$ are estimated regression parameters.

RESULTS AND DISCUSSION

Socio-economic Characteristics of the Respondents

The socio-economic economic characteristics of the respondents are presented in Table 1. The age of individuals affect their mental attitude towards new ideas and influence adoption in several ways. The result in Table 1 indicates that majority (52.789%) of the respondents were within the age of 50-59 years an indication that they are advanced in age and close to retiring from civil service. Extension agents within the age range of 20-49 years constituted 47.22%. The mean age of the respondents was 49 years. This distribution implies that employment of extension workers by the state government over the years is poor considering that only 8.33% of them were between 20-39 years. This can negatively affect the use of ICT by the respondents in that the elderly are not likely to show much interest in the use of high technology communication devices that would improve their efficiency in extension work. This corroborates with the assertion made by Agwu and Chah (2007) that the elderly might be less interested in using hi-technology communication devices and would rather prefer oral and printed information channels which are less efficient.



Educational level of respondents as shown in Table 1 reveals that majority (68.5%) of the extension agents were higher national diploma (HND) and degree holders, while ordinary national diploma (OND) holders constituted only 27.78% and very few (4.17%) secondary school certificate holders. This indicates that almost all the extension agents had the minimum qualification that will enhance their job performance. By extension, this enhanced educational level is an incentive to sourcing for ICT facilities that would ensure efficient utilization of these facilities in extension work. This finding is in agreement with the findings of Salau *et al.* (2009) who identified educational level as a significant factor that affects the level of ICT utilization by researchers and extension workers in Nasarawa State, Nigeria. On the other hand, the distribution of respondents according to income indicates that majority (93.06%) earned between ₦50,000-100,000 a month, only 1.38% earned ₦101,000-150,000 whereas 2.79% earned ₦151,000-200,000 and 2.79% earned above ₦200,000 per month. The mean income per month was ₦75,097 (Table 1). This implies that the extension workers are capable of acquiring ICTs facilities such as radios, televisions, GSM phones, audio and video cassettes films and slides.

People acquire technical skills and knowledge through practicing a particular trade. The distribution of the respondents by working experience reveals that 45.83% of the respondents had between 20-29 years of extension experience, while 36.11% had extension experience of 30 years and above. Also, 15.28% had 10-19 years of work experience. The mean extension experience was 26 years (Table 1). This implies that the extension agents have enough experience in extension work that would improve their performance. By implication, it means that the extension agents are expected to be aware of innovations emanating from the use of ICT facilities. The demand for ICT facilities by the respondents is expected to be high especially if information about the improved technologies from the facilities improves their job performance. A similar study was obtained by Idrisa *et al.* (2013) in Borno state, Nigeria where the extension agents had over 20 years of experience in the service.



The results further reveals that majority (83.33%) of the respondents were members of various social associations, while 16.67% were not (Table 1). Of the respondents that belong to various groups, 54.17% were into multi-purpose cooperative association, 13.89% belong to crop production association and 6.94% were into Agro-input marketing organization. Others include; agricultural marketing organization (2.78%), multipurpose cooperative/agricultural marketing associations (16%) and multi-purpose cooperative/Agro-input marketing organizations (1.39%). Respondents who are members of social associations are likely to have easy access to innovations from ICTs than those who are non-members, hence are more likely to utilize ICTs to improve their job performance. Similar findings were obtained by Tanko *et al.* (2012) and Yakubu *et al.* (2013) who maintained that membership of association positively affect ICT use among extension agents in Niger and Kano States respectively. Individuals belong to associations for job satisfaction and this has a powerful influence on their productivity, sense of security and belonging, and meeting of individual needs in terms of increase in income, knowledge, inspiration and motivation (Michel, 2015).

Table 1: Socio-economic Characteristics of the Respondents

Variables	Frequency	Percent
Age		
20 – 29	1	1.39
30 – 39	5	6.94
40 – 49	28	38.89
50 – 59	38	52.78
Mean	49	-
Educational Level		
Secondary	3	4.17
OND	20	27.78
HND/Degree	49	68.06
Working Experience		
1 – 9	2	2.78
10 – 19	11	15.28



20 – 29	33	45.83
> 30	26	36.11
Mean	26	-
Association membership		
Non-Members	12	16.67
Multipurpose Cooperative Organization	39	54.17
Crop Production Only	10	13.89
Agro-Input Marketing Organization	5	6.94
Multipurpose Cooperatives/Agricultural Marketing Organizations	4	5.55
Agricultural Marketing	2	2.78
Monthly income (₦)		
50,000 - 100,000	67	93.06
101,000 – 150,000	1	1.38
151,000 – 200,000	2	2.79
> 200,000	2	2.79
Mean = ₦75, 097		-

Source: Field Survey, 2017

Types of ICT Facilities and their Access by the Respondents

The different types of ICT facilities available to the respondents are presented in Table 2. The result shows that the common ICT facilities available to majority of the respondents were radio (100%) and GSM (100%). Others include television (65.27%), extension research bulletins (38.89.11%), newspapers (34.72%) and internet connected computers (22.22%). On access to the ICT facilities, the analysis shows that extension agents in the state have access to electronic IT facilities than the print and this may be attributed to the relatively high cost involved in using print media. Also, the electronic IT facilities especially handset has facility that aids in accessing newspapers and other research bulletins on line at low cost. This agreed with the findings of Ezeh (2013) in a study on extension agents access and utilization of information and communication technology (ICT) in extension service delivery in South East Nigeria, who stated that the access to ICT facilities by extension agents indicates that majority had access to television, followed by a



reasonable number who had access to radio and phones, respectively. Few had access to libraries, and cassette recorder/players, while the least response was on access to internet connected computer and GIS, respectively.

Table 2: Types of ICT Facilities available to Respondents and their Access

S/NO.	ICT Facilities	Access		No Access	
		Frequency *	%	Frequency *	%
i.	Radio	72	100.00	0	0.00
ii.	Internet centers	16	22.22	56	77.78
iii.	Television	47	65.27	25	34.72
iv.	GSM/handset	72	100.00	0	0.00
v.	Newspapers	25	34.72	47	65.28
vi.	Extension research bulletins	28	38.89	44	61.11

Source: Field Survey, 2017

*Multiple Responses

Socio-economic Factors Influencing ICT Use by the Respondents

The result of multiple regression analysis (Using IBM SPSS Statistics 20) between some selected socio-economic characteristics of extension agents and ICT use in extension service delivery revealed that linear function is the best fit based on economic, econometric and statistical criteria (Table 3). The result shows that five out of the eight independent variables used in the model were statistically significant at varying levels. They include; education, income, years of working experience, membership of association and access to ICT facilities. Their coefficients are positive implying that an increase in these variables will bring about an increase in ICT use by the respondents. The value of the coefficient of determination reveals that 86% of the variation in ICT use by the respondents is explained by the variables used in the model, indicating goodness of fit of the model. The overall model is also significant at 1% level as revealed by the value of the F-statistics.

The coefficient of education is positive and significantly related to ICT use at 0.05 probability level. This implies that as the level of education of the respondents' increases, their use of ICT facilities also increases. This finding corroborates with that of Yakubu *et al.* (2013) who obtained a



positive correlation between education and ICT use among extension agents in Kano State, Nigeria. The coefficient of income is also positive and significantly related to ICT use at 0.01 probability level. This implies that as income of the respondents' increases, the use of ICT by them also increases. Increase in income increases the capacity of the respondents to acquire ICT facilities that will enhance their job performance. This finding corroborates with that of Tanko *et al.* (2012) who obtained a positive correlation between education and ICT use among extension agents in Niger State, Nigeria.

Years of working experience were also found to be positively related to ICT use and statistically significant at 0.01 probability level. This implies that as extension agents acquire more experience on the job, the use of ICT facilities increases. Similar findings were obtained by Salau *et al.* (2009) in their study on the utilization of ICTs by agricultural researchers and extension workers in selected institutions of Nasarawa State, Nigeria where years of working experience was found to correlate positively with ICT use. Membership of association is positively related to ICT use and statistically significant at 0.01 probability level. This implies that as extension agents become members of associations, their use of ICT facilities increases. A similar result was obtained by Sulaiman *et al.* (2015) in their study on the awareness and use of ICTs among extension agents in Kaduna state where membership of association correlated positively with ICT use.

As a final point, access to ICT facilities was equally found to be positively related to ICT use and statistically significant at 0.05 probability level. This implies that as extension agents have access to ICT facilities, there will be a corresponding increase in the use of the ICT facilities. The result is similar to that obtained by Yakubu *et al.* (2013) in their study on the use of ICTs among extension agents in Kano State, where access to ICT facilities was found to correlate positively with ICT use.

Table 3: Result of Regression Analysis between Socio-economic Characteristics of Extension Agents and ICT Use

Variables	Parameters	Coefficient	Standard Error	t-values
Constant	B_0	14.967	6.555	2.28*
Age	β_1	0.047	0.125	0.38
Education	β_2	4.145	2.006	2.07*



Income	β_3	3.608	0.987	3.66 ^{**}
Household size	β_4	0.333	0.329	1.01
Work Experience	β_5	0.974	0.262	3.71 ^{**}
Training	β_6	-1.076	1.750	-0.62
Membership of association	β_7	12.032	3.107	3.87 ^{**}
Access	β_8	1.427	0.645	2.21 [*]
Adjusted R ²		0.843		
R ²		0.860		
F-statistic		48.55 ^{**}		

Source: Field Survey, 2017 ** Significant at 1% level; * Significant at 5% level

Constraints Limiting Effective Use of ICTs Facilities by Respondents

The results in Table 4 examined the various constraints to ICT use as gathered under telecommunication technologies, broadcast/audio visual and print technology. The result reveals that most (76.39%) of the respondents indicated poor and erratic network as a constraint limiting effective use of ICT facilities, 68.05% of the respondents indicated high cost of contemporary ICT facilities, 94.04% reported to have experienced erratic and unstable power supply, while 90.28% 95.83% had no room for interactive communication, 51.35% lacks radio listening groups, 55.6% of them do not address emerging problems whereas 6.94% encountered difficulties in comprehending the audio visual contents. Similarly, 77.78% of the respondents indicated that newspapers and magazines are expensive, 95.83% indicated that their lack of opportunity to ask questions is a major constraint to their effective performance, 68.05% indicated that circulation is limited, 79.17% reported to have lack adequate research materials and publication, while 76.39% indicated high cost of research publications and books as a constraint limiting the effective use of ICT facilities for extension service delivery. However, these findings agreed with that of Arokoyo (2007) who observed that the adoption and utilization of ICTs in agriculture are constraints among other problems such as inadequate infrastructure, limited human resources capacity, absence of national policies and low ICTs literacy. Arokoyo (2005) also stated that the major constraints affecting the use of ICTs are erratic and unstable power supply, difficulty in connectivity, low level readiness of research and extension organization to embrace the use of ICTs, high cost of



telephone service, limited access to computers, lack of communication policy, high level of rural poverty and illiteracy, limited access to world wide data bases on CD-Room or DVD due to foreign exchange constraints.

Table 4: Constraints Limiting Effective Use of ICT facilities in the Extension Centers

Constraints	Frequency*	Percent
a) Telecommunication Technologies		
i. Poor and erratic network	55	76.39
ii. High cost of contemporary ICT facilities	49	68.05
iii. Erratic and unstable power supply	68	94.04
iv. Low access to internet connected computers	65	90.28
b) Broadcast / Audio visual		
i. Poor and erratic power supply	63	87.05
ii. No room for interactive communication	69	95.83
iii. Lack of radio listening groups	37	51.39
iv. Do not address emerging problems	40	55.60
v. Difficulties in comprehending the content of the audio visual	5	6.94
c) Print Technology		
i. Newspapers and magazines are expensive	56	77.78
ii. No opportunity to ask questions	69	95.83
iii. Circulation is limited	49	68.05
iv. Lack of adequate research materials and publications	57	79.17
v. High cost of research publications and books	55	76.39

Source: Field Survey, 2017

* Multiple response exists



CONCLUSION

Information and Communication Technologies have great potentials in improving agricultural extension service delivery. To this end, it could be said that radios, television followed by mobile phone were the most accessed and utilized ICT facilities among the extension agents in the study area. Majority of the extension agents were found to be highly experienced and educated which aid in their understanding and utilization of ICT facilities that could lead to improved performance. Also, agents who are members of social associations are likely to have easy access to new innovations broad about by ICTs than those who are non-members and could as well accessed ICT facilities needed for their optimum operations since they have an average income of up to ₦75,097/month. The regression model's outcome indicated that respondents' educational level, income, working experience, membership of association and access to ICT facilities were statistically significant and positively influence ICT use in extension service delivery. Their positive coefficients implied that an increase in each of these variables would increase the use of ICT facilities by the respondents. Moreover, the study observed that erratic and unstable power supply, lack of interactive communication, low access to internet connected computers, inadequate research materials and publications, and lack of opportunity to ask questions were among the major constraints militating against effective use of ICT facilities in the extension centers as this could have negative impact on agricultural operations.

Based on the findings of this study, the following recommendations have been put forward:

1. Government and non-governmental organizations should always organize training workshops on the use of ICT facilities in agricultural extension.
2. Extension agents should be encouraged to be members of agricultural associations, as participation in these associations increases usage of ICT facilities for effective extension service delivery.
3. Extension agents with higher work experience have shown more utilization of ICT facilities, therefore agents with low work experience should collaborate with extension agents with higher experience on how to access and utilize ICT facilities.



4. Extension agents with lower educational level should be encouraged to pursue higher education so as to expose them to agricultural innovations that are accessed through ICT.

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