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The Use of Information and Communication Technology (ICT) in Agricultural Extension Service Delivery in Nigeria: A Review

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ABSTRACT: Information and communication technology is one of the driven vehicles of communicating agricultural innovation to farmers. It is a process that combines hardware and software in exchanging, processing and management of information and knowledge based technology. However, by taking into cognizant the extension agent to farmer ratio as given by World Bank (1:800) shows that there is a need for ICT in extension service delivery in Nigeria. This article concludes that any effort to improve extension service delivery through the use of ICT should be encouraged by the agricultural organizations particularly the Agricultural Development Programme (ADP). It is suggested that the government should ensure adequate integration of ICT into agriculture and provide frequent training for agricultural extension agents on the use of ICT.

KEY WORDS: ICT, Agriculture, Extension, Information, Farmer, Communication.

I. INTRODUCTION

One of the major challenges to agricultural development in Nigeria and other African countries have been the low level of agricultural information exchange among the different stakeholders in the agricultural sector which is most often due to limited access to current and relevant information sources as well as poor documentation, storage and retrieval techniques (Agwu and Uchemba, 2004). More so, poor awareness or exposure of farmers to agricultural information and channels of communication result in low performance in agricultural production (Agwu and Adeniran, 2009). These show that there is a continued need for agricultural information by farmers. Information and Communication Technology (ICT) has revolutionized human thinking, capability, capacity, all life processes and activities; and has found application in all fields of endeavor and enterprises of men (Maximo and Braun, 2006). The ICT deals with dissemination and retrieval of information through certain extension activities such as teaching-learning process, data processing and storage, research and publications (Allen, 2008). The promise of ICT in agricultural extension is that they can energize the collection, processing and transmission of data, resulting in faster dissemination of quality information to more farmers in a bottom-up and interactive channel of communication (Madukwe, 2006).

The ICT can be used as an effective communication tool, particularly where time and distance are constraints as well as cost effective alternative for some of the traditional technology dissemination methods used by the agricultural extension agents (Bell, 2002). Meera *et al*. (2004) noted that ICT can bring new information services to rural communities where farmers will have much greater control, than ever before, over current information channels. Access to such new information source is a crucial requirement for the sustainable development of the farming systems. Therefore, ICT facilitates and promotes the collaboration between agricultural researchers, farmers, extension agents and other stakeholders (Farell, 2003). This paper review articles on the concept of ICT in agricultural extension, availability of ICT facilities, level of use of ICT in extension services delivery in Nigeria, benefits of using ICT in extension services, constraints to effective use of ICT and suggestion to the constraint on the use of ICT in extension service delivery.

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II. CONCEPT OF ICT IN AGRICULTURAL EXTENSION SERVICE

Extension has been recently defined as a system that facilitates the access of farmers, their organizations and other market actors to knowledge, information and technologies (Christoplos, 2010). Agricultural Extension is an important public service with the widest range of responsibility for agricultural and rural development (Adeyanju *et al.*, 2015). Therefore, availability of agricultural information among its users for agricultural and rural development cannot be over emphasized. Agricultural information creates awareness among farmers about agricultural technologies for adoption which is needed for overall development of agriculture and for the improvement of living standard of farmers (Bello and Obinne, 2012).

The ICT is an umbrella term that includes communication and application devices such as radios, televisions, computers, cell phones, mobile phones, satellite etc (Agwu, 2012). It can also be referred to as the integration of telecommunications, computers as well as necessary software, middleware, storage, and audio-visual systems, which enable the use of ICT in agriculture vital and are increasingly fast all over the world (Lio and Liu, 2006). The ICT in agricultural extension and rural development play a significant role in providing a medium through with farmers and rural dwellers have adequate access to agricultural information (Technical Centre for Agricultural and Rural Corporation, 2008).

III. AVAILABILITY OF ICT FACILITIES IN AGRICULTURAL EXTENSION SERVICES

Different forms of ICT devices are found in Nigeria. It is expected that these available forms of ICT devices should be effectively utilized by extension agents to enhance agricultural extension service delivery. The available ICT facilities are grouped into Broadcast Technology, Print Technology and Telecommunication/Computer Based Technology (Okon, 2005). Broadcast technology refers to the broadcast media such as radio, projectors, media van etc. Print technology includes print media such as newspapers, magazines, bulletins, posters, calendar of work, newsletters, leaflets, pamphlets etc. The Telecommunication/computer based technologies include telephones, global system and mobile system, computers, facsimile (fax), electronic mail service (e-mail), CD-ROM, internet etc.

Chadwick (2003), Flor and Hazelman (2004) and Arokoyo (2005) broadly highlighted on the available ICT's in Nigeria to include: radio, television, telephone, world wide web (www), short messages (SMS), cameras, video, e-mail, computer, CD-ROM, DVD, groupware, rural radio (RR), web publishing, and search engines. Oroyokot (2003) stated that among all the available ICT facilities used in extension services, access to radio is extensive compare to any other ICT with 4 in 10 persons living in the rural areas possessing radio.

IV. LEVEL OF USE OF ICT IN EXTENSION SERVICE DELIVERY IN NIGERIA

A. LEVEL OF USE OF ICT AMONG EXTENSION AGENTS

Isiaka *et al*. (2009) opined that, most of the extension workers were not really conscious of the fact that ICT devices such as computer, internet and GSM can be used to efficiently accomplish numerous functions in extensions service delivery. The result of the mean score analysis with cut-off of 2.5 shows that the respondents utilized radio ($\bar{x}$ = 3.0), television ($\bar{x}$ = 2.8), phones ($\bar{x}$ = 3.0), prints/libraries ($\bar{x}$ = 2.8) and cassette recorder /player ($\bar{x}$ = 2.9) to a great extent in their farming activities. While internet ($\bar{x}$ = 2.2), projector ($\bar{x}$ = 1.8) and GIS ($\bar{x}$ = 1.0) recorded low level of utilization by the respondents. Salau and Saingbe (2008) reported that 56.22% of the sampled extension workers used ICT items such as telephones, internet, radio, television, video films/camera and power point for agricultural extension activities. They concluded that more education and awareness is required to improve the level of use of ICTs by extension workers.

Yakubu *et al*. (2013) studied the use of ICTs among extension agents in Kano state, Nigeria. The result revealed that the entire extension agents (100%) use radio while (99.6%) use television, (98.2%) telephone, (92.3%) camera, (90.1%) DVD, (80.1%) video, (78.3%) computer and (67.0%) printer. There was however, a low usage of web publishing (0.5%), fax (4.1%), scanner (10.9%), CD-ROM (21.3%), search engine (30.8%), web (31.2%), e-mail (37.1%) and satellite (45.3%). The result implies that majority of the extension agents had adopted one ICT or the other.

Agwu *et al*. (2008) revealed that out of 24 ICT facilities listed, the one that were frequently used by the researchers includes internet ($\bar{x}$ = 2.25), television set ($\bar{x}$ = 2.07), radio set ($\bar{x}$ = 2.25), printer ($\bar{x}$ = 2.02), flash drive ($\bar{x}$ = 2.10), diskette ($\bar{x}$ = 2.20), computers ($\bar{x}$ = 2.20), UPS ($\bar{x}$ = 2.08), mobile phone ($\bar{x}$ = 2.58), and e-mail ($\bar{x}$ = 2.30). The result also indicate that, only 4 out of the 24 ICT facilities were frequently used by the extension workers and these

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include video player ($\bar{x}$ = 2.00), television ($\bar{x}$ = 2.10), radio set ($\bar{x}$ = 2.58) and mobile phones ($\bar{x}$ = 2.55), while the other ICT facilities were not frequently used. This shows a very low level of digital ICTs utilization by the extension workers, especially the computer facilities. This implies that a large majority of the extension personnel and farmers will not have access to many useful materials found in the internet. Despite the fact that internet is a formidable source of information on recent developments in the field of agricultural extension (Agwu and Chah, 2007).

B. LEVEL OF USE OF ICT AMONG FARMERS

Olaniyi (2013) revealed that the level of utilization of different ICT facilities among the respondents include radio with weighted mean score (WMS) of 2.98, followed by television (2.97) and mobile phone (2.93). Newspaper, CD-ROM, VCD/CD and computer were ranked 5th, 6th and 7th respectively. Other ICT facilities used by farmers include e-mail, website and use of flash drive, were ranked among the least ICT used by the poultry farmers in the study area. This implies that, radio, television and mobile phone are the most often used ICTs by the respondents. This may be due to various advantages attached to these ICT facilities.

Chukwunonso *et al.* (2012) studied the adoption of ICT in agriculture in Adamawa state, Nigeria. The study revealed that, 1 (2.5%) farmer admit to the use of computer, 5 (12.5%) of the farmers use internet service while 31 (77.5%) make use of telephone and GSM respectively. The result shows that, majority of the farmers use ICT in the course of their farming activities as 36 out of 40 respondents (comprising of 90%) asserts to the use of ICTs while 4 (comprising of 10%) do not use ICTs.

V. BENEFITS OF USING ICT IN EXTENSION SERVICE DELIVERY

1. The ICT as a developmental tool can enhance the livelihoods of small scale farmers. This is due to the fact that ICTs represents greatest package to date for self-education, distance learning, and sustainable development (Mohan, 2001). Agwu and Chah (2007) reaffirms that ICTs has become the most effective method of training, informing and disseminating proven technologies to farmers; this is because an extension workers can learn new technologies, rainfall forecast, and commodity prices among others and use that information to advice farmers.
2. The ICT has an instrumental value for other related innovation; the internet for example, is very beneficial in providing opportunities for distance education and training, which helps in overcoming the problems of location and lack of time balancing career. More so, publications from the internet are downloaded instead of paper format, thereby allowing access to information unlike before where one has to go to library (Fillip, 2000).
3. The use of knowledge management, web portals with pertinent production and marketing information has been tried in some communities in Asia and Africa with some challenges which are impossible to overcome. Evidence also suggests that the technology is effectively used in some countries in Africa with remarkable success on market price information, weather forecast and information on storage facilities (World Bank, 2011).
4. Knowledge and information are the major drivers of social and economic transformation in the world. This is because they help transfer technology, support learning, assist problem-solving and enable farmers to become more actively integrated in agricultural knowledge and information system (Christoplos and Kidd, 2000).
5. The use of ICT in extension provides several benefits, such as agricultural extension and advisory service, which brings incredible opportunities and has the potential of enabling the empowerment of farming communities and market information etc. (Davis and Asenso-okyere, 2010; World Bank, 2011). For example , the International Rice Research Institute (IRRI) launch a program called Nutrient manager for rice mobile (NMRice-Mobile) to provide Philippine rice farmers with advises through their mobile phone on optimal timing, amount and type of fertilizer to apply to their crop to maximize production and profit and reduce waste (IRRI, 2011).
6. The ICTs are used in distribution and supply chain management and traceability to increase efficiency and predictability to reduce spoilage. Examples are the diary sector and agribusiness in Kenya; fruit and vegetable supply system in Mali and Ghana (Payne *et al*., 2010).
7. In Nigeria, market information is provided through short message (SMS) so that small farm holders have access to daily agricultural commodity prices, extension agents and channels to sell or bid text messages. For example, cassava growers receive market information through a new initiative known as the integrated cassava project. Its information is based on phones, internet and online market price. The services obtained by the cassava growers' include: prices, demand volumes and offers, trade assistance, training, SMS alerts and technical messages (Pyramids Research, 2010).

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VI. CONSTRAINTS TO EFFECTIVE USE OF ICT IN EXTENSION SERVICE DELIVERY

Arokoyo (2003) observed that the adoption and utilization of ICTs in agriculture are constrained among other problems by inadequate infrastructure, limited human resources capacity, absence of national policies and low ICTs literacy. The major constraints affecting the use of ICT are erratic and unstable power supply, difficulty in connectivity, low level of readiness on the part of research and extension organizations to embrace the use of ICTs, high costs of telephone services, limited access to computers, lack of communication policy, high level of rural poverty and illiteracy, limited access to world wide data bases on CD-ROM or DVD due to foreign exchange constraints (Arokoyo, 2005).

According to Chadwick (2003) and Mukesh *et al*. (2010), there are specific constraints limiting ICT utilization by agricultural extension officers and farmers. These are as follows:

1. Poor ICT infrastructural development on which ICTs depend on such as epileptic and fluctuating power supplies determines the length at which ICTs will be utilized.
2. High charges for radio/television presentations.
3. High cost of access/interconnectivity (non-functioning telecommunication systems). Most rural areas lack internet access because of poor road network, poor enabling environment, interconnectivity and high costs of ICT equipments.
4. Insufficient knowledge of ICTs. Most extension workers lack competence and confidence in handling and operation of ICT facilities because they lack training on how to handle most modern ICTs.
5. High illiteracy rates. Most farmers/extension officers are not educated and as such are not aware about the ICT benefits. Through ICT, farmers will become aware of the latest agricultural tools and methods that make farming easy instead of the use of crude method.
6. Inadequate capital.
7. Under- developed transportation networks.
8. Poor documentation, storage and retrieval techniques. Results of research in African countries are known to be available in developed countries but hardly in the country of origin due to poor documentation, storage and retrieval techniques

VII. SUGGESTIONS TO THE CONSTRAINTS ON THE USE OF ICT IN EXTENSION SERVICE DELIVERY

1. Integration of ICT to agriculture: Agricultural extension aims at improving the livelihood of farmers and high productivity, therefore integration of ICT to agriculture is a necessity. Information is an essential ingredient in agricultural administration or development programs. For example, most Nigerian farmers seldom feel the impact of agricultural innovations either because they have no access to such vital information or it is poorly disseminated.
2. Government should make ICT facilities readily available and affordable to farmers and extension agents. With this made possible, farmers can be updated on temperature, humidity and rainfall with additional parameters such as atmospheric pressure, soil moisture and wind speed/velocity.
3. Agricultural websites should be provided to farmers and they should be directed on how to register and use the websites. This will help in dissemination of vital agricultural information such as online detailed contents, crop management techniques, fertilizers and pesticides and many other agricultural related materials.
4. There should be provision of commodity prices and market information on the internet where small scale farmers can sell their products to avoid middlemen who determine the prices to the detriment of farmers.
6. There should be steady supply of electricity for prompt ICT information on agricultural production technologies/practice. For instance, in India, “aQua technology” is applied to assist farmers. It is a farmer- expert questions and answer database supporting Indian languages. It is an online multilingual multimedia informatics laboratory that answers farmers’ queries, based on location, season, crop and other information provided by farmers (Mukesh *et al*., 2010).
7. The training of extension workers should include computer literacy to enable them have access to current information and communication technologies (Aker, 2010).

VIII. CONCLUSION

Information and Communication Technologies have great potentials in improving agricultural extension service delivery in Nigeria. In order to curb with the challenges of information and dissemination of agricultural messages or innovation, there is a need for incorporation of ICT in extension service for better agricultural and rural

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development. In order to keep pace with the increasing number of discoveries from various research institutes, ICT's such as computer and telecommunications should be utilized effectively because they ensure greater speed and accuracy than manual delivery methods which is mostly done through individual contacts. With proper harnessing of the potentials of ICT's by the agricultural organization such as the ADP, Nigerian agriculture will be transformed in such a way that the farmers will have access to global knowledge system.

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