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The Complimentary Role of Information Communication Technology (ICT) in Agricultural Knowledge Management in Nigeria

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ABSTRACT

This paper examines the contribution of ICT to Agriculture Knowledge Management, gathering, storing, retrieving, adopting, localizing and disseminating innovations needed for rural farm families and linkages between research and extension systems. The research focused on the situation in Nigeria and strategies to be adopted for enhancement as well as the challenges related to sharing, exchanging and disseminating agricultural information and knowledge.

INTRODUCTION

Within this century alone, our world is faced with more and more complex challenges of feeding its rising population, while assuring an equitable and sustainable development. Scientific and technological advancement is generating the knowledge and tools to make this possible. The recent scientific revolution that is taking place at the turn of the century, based on the emergency of the latest areas of science, namely in molecular production and information and communication technology, is most important to the growing significance of knowledge in present day Agriculture and natural resource management. Knowledge has turned out to be the most important factor of the production, and it plays a critical part in our capacity to respond to the challenges of the food security, poverty eradication, weather patterns and soil conditions change. Updated information allows farmers to deal with and even benefit from these changes. The appearance of Information and Communication Technologies (ICT) in the last decade has new avenues in knowledge management that could play significant roles in meeting the prevailing challenges related to sharing, exchanging, and disseminating knowledge and technologies. ICT allows capitalizing to a great degree on the wealth of information and knowledge available for agricultural knowledge. The main objectives of agricultural knowledge activities are to come up with outcomes that can advance research more in certain areas, also engender technologies that stakeholders can make use of to increase production, and conserve the environment.

According to ADB (2003), ICT has turned out to be a powerful tool in providing developing countries with unprecedented opportunities to meet very important goals far more effectively than before. ICT has also helped in giving farmers access to a variety of information sources, which are accessible, affordable, relevant and effective. This development reflects a need for alternative sources of information rather than a face-to-face, technology-driven donor promoted information service. Richardson (2003) described ICT as the only way in which agricultural extension can be achieved. ICT is known for attaining and transferring information more effectively than other communication methods in extension. This is evident in its impact in extension, especially in developing countries in Africa, South Africa and Latin America. According to Munyua, (2000); and ADB, (2003), ICT has played a major role in diffusing information to rural communities, and show even much unexpected potential in countries such as India, Peru, Mexico, South Africa and Uganda.

The term, Information Communication and Technology, (ICT) is an umbrella term that covers any communication device or application, encompassing: radio, television, cellular phones, computer and network hardware and software, satellite systems and so on, as well as the various services and applications. Ebujuwa (2005) described ICT as tools used for information collection, processing, storage, transmission and dissemination. ICT makes it possible for the society to create, collect, communicate, consolidate, process and manage information in multimedia and various digital formats for different purposes (Olaifa & Oyeniyi, 2014).Agricultural Knowledge Management on the other hand is best described as the process of sharing, exchanging and disseminating agricultural knowledge and technology.

The Value of ICTs in Agricultural Development

There can never be any notable development in agriculture without the use of ICT. Agricultural information and latest innovations are better transferred from the government to the farmers through the use of ICTs. This over time, especially in Nigeria has aided the free flow of agriculturally relevant information, which has in-turn recorded several notable developments.

Lambas (2003) quoted in Nwogu et al. (2014) noted that “the use of agricultural information services can bring about positive changes in the production level of farmers profit, production cost and postharvest losses”. This implies that, when all the necessary information that has to do with ideas, developments and innovations that can boost agricultural production, maximize profit, reduce production cost and avoid losses of farm produce after harvesting are well disseminated to farmers, a notable agricultural development can be guaranteed. However, in this present age, the said information cannot be well disseminated without the aid of ICT.

The introduction of ICT technologies has greatly improved and simplified information dissemination covering all the facets of life. Olaifa and Oyeniyi (2014) enumerated the following advantages of using ICT as a medium of information dissemination:

Speed: Agricultural information through ICT reaches the target without delay. ICT is definitely the fasted means of disseminating information.

Storage: Computers and other ICT technologies have a larger capacity to store information or data better than even the human brain.

Accuracy: ICT technologies such as Computer, Telephone, and Satellite etc. are more accurate in any analysis and thus, free from errors compared to the human brain or other means of information dissemination.

Reliability: If maintained properly, ICT technologies can live longer than humans.

Compactness: Considering the problems of space in the traditional information system, computers and other information gadgets in the present days are compact and thus do not occupy more space.

"ICT" is a catch-all term for an increasing number of technologies, each offering corresponding opportunities for innovation. Improved agriculture, environmental, and food security planning: Planning tools and systems for the agricultural sector are obvious areas where ICTs can add significant value. There are numerous ICT channels through which information can reach the farmers in a bid to enhancing agricultural development. Some of these channels are Text messaging, E-mail, radio, television, fax etc.

Accurate and timely information regarding areas of food surplus and shortages driven by the vagaries of climate can be facilitated through ICT. Such use can contribute to improved food management and food security.

Geographic Information System (GIS) also offer agriculture and natural resource management planners an increasing way to plan for land use, track or estimate environmental impacts, visualize important social data, and compare different agriculture development scenarios. Agriculture and Land use planners have used maps as a standard tool for years, but the ability of GIS to remake maps rapidly in response to new data or analysis allows planners new degrees of freedom in foreseeing and preventing disaster, or planning development scenarios (Eastman et.al, 1996).

ICT enables a better understanding of issues such as can be changed and linked to the management and conservation of biodiversity. The power of ICT as information and networking medium enables citizens to act as environmental enforcement agents, alerting decision makers to compliance infringements while leveraging on their power to reach and influence public opinion. Any programme that provides connectivity has the potential to increase sustainability, given appropriate content and training. Two application areas key to natural management are land registration and GIS mapping.

ICT can contribute to environmental sustainability by providing public access information and means of participation by the public in decision making, information dissemination, accountability of governments; source of alternative livelihoods; and environmental monitoring, mapping and management (Nnadi, et al,2010).Effective environmental databases can be used to track the status of various environmental management and protection.

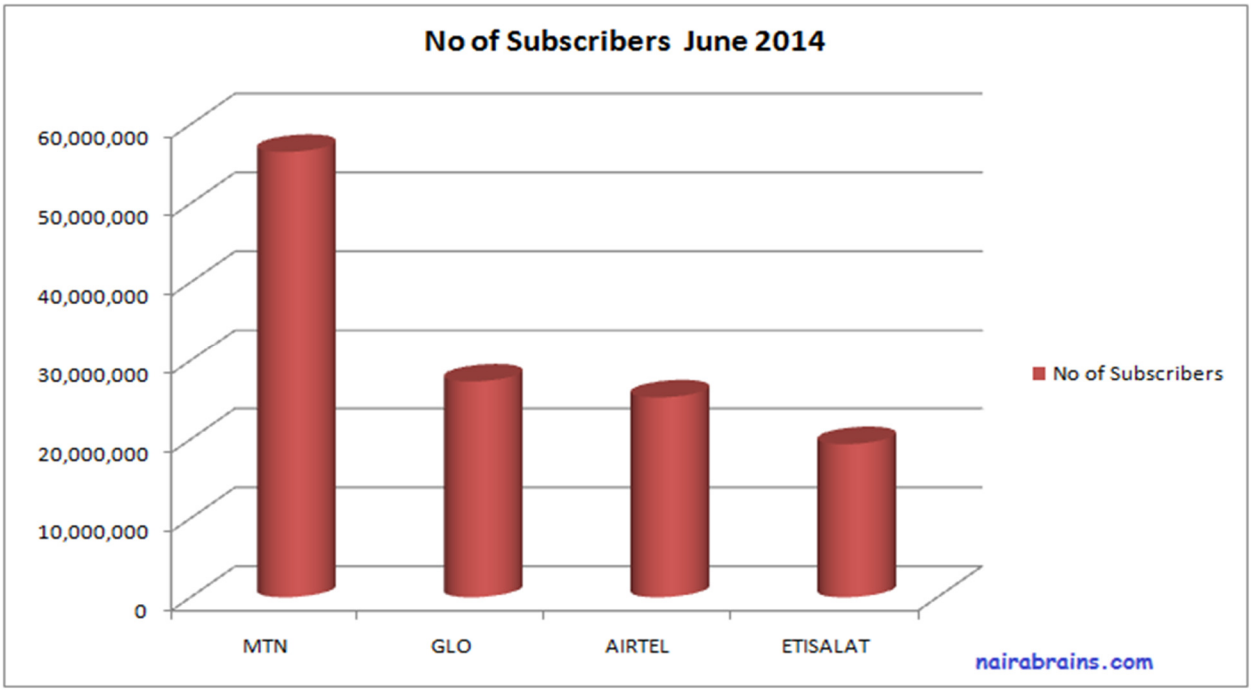
The use of Mobile Phones for Agricultural Information Dissemination

Mobile phones are in the vanguard of ICTs in agriculture. By the end of 2011, over 6 billion mobile phone subscriptions or more accurately, subscriber identity module (SIM) cards are expected to be in use worldwide (Wireless Intelligence 2011). Mobile phone penetration in the developing world now exceeds two subscriptions for every three people, driven by expanding networks in Asia and in Africa. The ability to purchase a low-cost mobile phone is complemented by the expansion in telecommunications infrastructure; most countries now have more than 90 percent of their population served by a cell phone signal, including coverage in rural areas. This rapid expansion results from enabling regulations that ensure competition in the telecommunications sector as well as from high demand for mobile phone subscriptions.

In a research on the preferred source of information by farmers in Nigeria, Olaifa et. al (2014) revealed that 91.4% of the farmers in Kwara State prefer sourcing or receiving information from the government via text messaging on their various phones. The reasons for these are not unconnected with the fact that information via phone is easier, more affordable and convenient for both the sender and the receiver.

The reach and affordability of mobile phone internet is dramatically improving especially in developing countries like Nigeria. In 2010, the number of Internet users surpassed 2 billion and over half of these users are now in developing countries. Internet connectivity around the world has grown exponentially since 2000, by over 480 percent (Internet World Statistics, 2011).The price of mobile phones and internet bandwidth is continually dropping, easing the availability of internet connectivity to all. In sub-Saharan Africa, which lags other regions in ICT accessibility, a recent surge of investments in international undersea cables and inland infrastructure to complete those connections is making ICTs services substantially more accessible and affordable across Africa by 2010, 12.3 terabits per second of backbone capacity was operational in Africa, up from less than 1 gigabit per second at the start of the decade (Tele Geography 2011).

The chart below shows the forecasts for mobile subscribers in Nigeria as at June, 2014.



Source: nairabrains.com

From the chart above, it is evident that the numbers of Nigerians that are connected via mobile phones are on the majority. This situation is not only peculiar to Nigeria but to all the countries in the world. Thus, ICT technologies such as mobile phone (text messaging, call or internet browsing) has become the most effective and efficient medium of communication to the masses. For instance, in Nigeria today, registered farmers get information regarding government's agricultural policies or aids via text messaging in their various mobile phones.

Role of ICT in Agricultural Information Dissemination/Research and Development

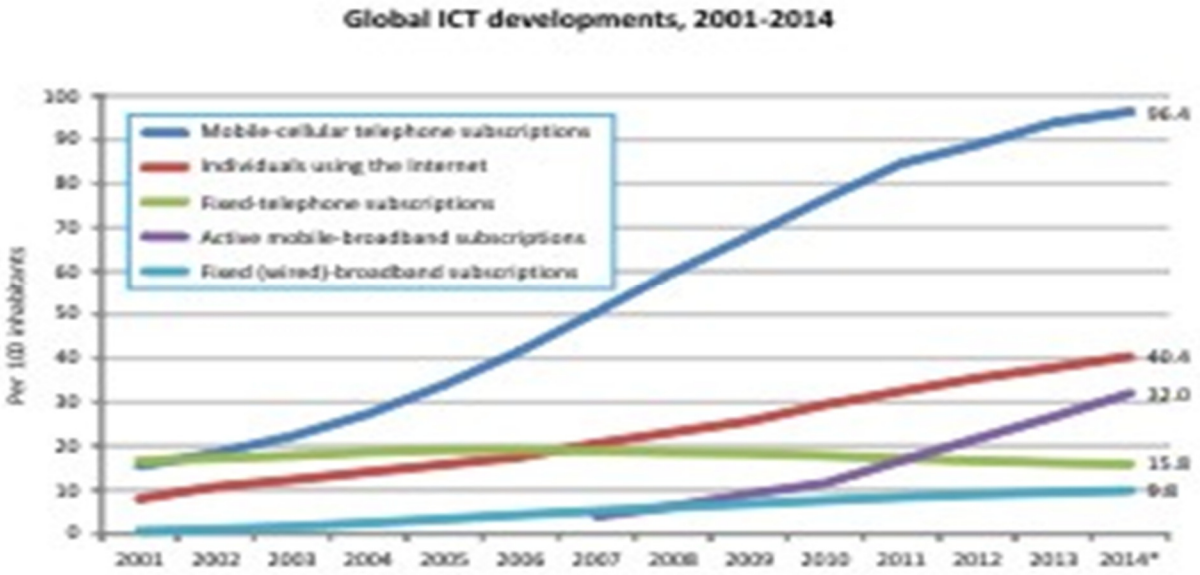
It is important to note that information dissemination can never be very effective in this present age and era without the use of ICT. Information dissemination is crucial to knowledge management. Information becomes knowledge when it is properly disseminated. Sharing of knowledge, exchanging and dissemination are elements in a broader theme known as 'knowledge management'. The essential purpose of knowledge management is to transform our intellectual assets into enduring value (Metcalfe, 2005). The basic idea is to strengthen, improve and propel an organization by using the wealth of information and knowledge that the organization and its members collectively possess (Milton, 2003). It has been pointed out that a large part of knowledge is not explicit but tacit (Scheiber et al., 1999). This is correct for knowledge in agriculture where a lot of good quality practices are transferred without being well documented in books, papers or extension documents. For knowledge to be managed properly, ICT is needed. Thus, there are many information technologies that can be used for effective agricultural knowledge management. Building an information system of indigenous agricultural practices can enable researchers to examine this knowledge, decide on its usefulness for sustainable development and for future generations before it disappears as a result of advanced technologies. It is not exaggerated to say that ICT is the major effective and efficient means for agricultural information dissemination.

The impact of ICT in agricultural research and extension is also quite positively significant. As supported by Lambas (2003) who concludes that "the use of agricultural information services can bring about positive changes in the production level of farmer's profit, production cost and postharvest losses". This assertion by Lambas (2003) is based on the fact that all the needed information that has to do with boosting agricultural production, maximizing agricultural profit, reducing agricultural production cost and avoiding losses of farm produce after harvesting are uncovered by various ICT mediums that are available to farmers. Olaifa et.al, (2014) opined that the achievement of high agricultural productivity depends largely on the availability and access to appropriate agricultural information, which is best, sourced via ICT.

One of the major significance of ICT to agricultural research and extension is reflected in the changing nature of agricultural information systems,

which is having a profound impact on how research results are communicated and disseminated. Various researches have proved that the possibility of accessing databases and information online has increased dramatically with the development of web-based information systems. The rapid expansion of Web publishing is dramatically changing the way people access information, and is leading to the development of metadata bases. Based on virtual, a library that provides direct access to the publication is accessible through the Web. Secondly, the very significant advances that are being made in software applications related to agricultural research techniques coupled with advances in other area of science, such as molecular biology, is accelerating the research process enormously and making it more efficient. Access to research software is one of the important dimensions through which the ICT technology gap can be avoided or reduced. But the most important impact on research is being generated by a third factor. The presence of new actors in agricultural research (such as the private sector, NGOs and Universities), the changing composition of scientific fields related to agricultural research (increasing importance of molecular biology and ICT as compared with agronomy and veterinary), the changing nature of networking, the possibility of working jointly with researchers in different institutional locations by interacting with them in real time, the possibility of developing virtual communities of Scholars working on the same topic but dispersed in space, and the increasing importance of knowledge system and learning system that are based on interactive knowledge development process, and thus on a different concept on how knowledge is generated and managed in this new environment, is leading to profound changes in the research world.

Global ICT Development from 2001-2014



Source: International Telecommunication Union's World Telecommunication/ICT Indicators database.

Mobile-based applications are also becoming more suitable for poor and isolated communities, especially through feature phones. Drawing on simple, available technologies such as SMS, service providers can offer mobile agricultural transactions, other transactional services (selling inputs, for example), and information services (market price alerts). Other publicly and privately provided services such as extension and advisory services are delivered over mobiles, which are increasingly not just “phones” but are actually multifunctional wireless devices.

Geospatial information is also becoming easier to access and use as mapping tools, such as Microsoft Earth or Google Maps, bring geographical data information to non -specialist users. Scientists and development organizations have created substantial sets of geo referenced data on population, poverty, transportation, and any number of other public goods and variables through more affordable, usable geographic information systems available on standard PCs and mobile devices using web-based tools. Satellite images and similar representations have improved exponentially in quality and detail. These tools and remote sensors use less energy and require less human attention than in previous years. The capacity to overlay geospatial information with climate and socioeconomic

data opens many options for analyzing biophysical trends (such as erosion or the movement of pathogens), making projections (about the effects of climate change or the best location of wholesale markets in relation to transport infrastructure), and selecting particular groups to test new technologies or farming practices (for instance, identifying farmers that are most likely to benefit from using e-vouchers to purchase fertilizer).

Developing business opportunities for farmers

The development and use of many ICTs agricultural development has focused on helping small farmers to develop their operations as small businesses and take advantage of global trade opportunities by inserting themselves efficiently into larger agribusiness sectors. In this regard, creating mechanism for small farmers to access, learn about and contribute to the information networks that integrate global agribusiness is not only useful, but absolutely essential. Supporting ICT systems and training that link small or big producers to markets and provide technical support and guidance to enter higher value markets strategy. Access to ordinary and micro – credit is increasingly seen as an essential strategy to promote business development in rural areas, including both farm credit and credit for off farm activities. ICT systems, including computers, portable devices and "smart cards" are supplementing the information infrastructure that allows credit agencies to extend deeper into rural areas, produce credit risk/return profits rapidly, and help both borrowers and creditors keep track of their payment status and obligations (USAID, 2002).

Challenges of ICT in Agricultural Knowledge Management in Nigeria

Despite the importance and contributions that ICT has brought to Agricultural knowledge management in Nigeria, it is bedeviled by myriads of challenges. These challenges hinder the effective use of ICT as the most appropriate channel for agricultural knowledge management. This is however typical of all developing nations, and not peculiar to Nigeria or Africa alone. From the point of view of Olaifa & Oyeniyi (2014), the telecommunication services that are available for usage in most developing nations are those of low bandwidth, marred with technical faults or other network configuration problems.

In the same vein, Jensen (2005) noted that there are equally many external systemic factors such as electricity, transport networks, import duties etc, which impact on internet services delivering in Nigeria and Africa at large.

Another challenge that can be identified is that of the shortage of expertise. Minishi Maiania (2004) enumerated three major tasks here.

- Re-skilling lecturing staff to improve their ICT competency
- Lack of system manager support staff/ICT experts.
- Low level of users' epistemological access

Olaifa and Oyeniyi (2014) further observed that challenges of technical support and maintenance aspects of ICT are another major problem confronting ICT in Nigeria. There is the dearth of adequate skills to diagnose problems with systems and the maintenance culture is not strong. As usual, this is not peculiar to Nigeria but to any developing nation in the world. The problem of technical expertise could be in form of inadequate personnel or the problem of brain drain whereby the few experts that are available opt for more financially rewarding prospects or prospects with better incentives generally outside the country and continent.

Onilude & Apampa (2010) reported a study carried out to assess the effects of ICT on research and development activities at FIIRO in Lagos. In their report, they observed that the challenge of ICT in the institute included the following;

a. The bandwidth available to the institute is not in commensurate with the number of users. As a result of this, there is low speed of connectivity encountered by users.
b. There is the inability to monitor the network from a central location. This underscores the underdevelopment of ICT infrastructure.
c. Analysis showed that although many of the staff are conversant with the use of ICT, a vast majority still needed to undergo further training to be ICT compliant.

Other challenges identified included irregular power supply, high cost of subscribing for internet facilities from the providers,(ISPS) Poor designs and dissatisfaction by users because of the low bandwidth supply.

Bringing it closer home to Agricultural Knowledge and Management in Nigeria, apart from those problems identified with the general application of ICT in Nigeria and Africa generally, there are further challenges peculiar to Agriculture. These further limitations to the application of ICT includes

- The high level of rural poverty in Nigeria where most of the farmers are either poor or struggling for the middle class. For many of these farmers, affording ICT is a daunted task for them.
- The high level of illiteracy in the rural areas, where we have majority of these farmers.
- The high level of computer illiteracy among the rural dwellers. Many have never even seen a computer system before.
- Resulting from these high illiteracy level, some of the farmers view ICT with suspicion and are not willing to take advantage of ICT

CONCLUSION

The use of Information and Communication technology for development is a medium that has radically enhanced interaction throughout the world. Then, the need to develop a strong connection complimented by flawless information flow improved through use of information and communication technologies by the extension service towards the boost of agricultural production and improves rural livelihoods in Nigeria. It will improve the quality of interaction between extension agents and their clientele instead of moving "message" through a long chain of hierarchical system. Web – based system would strive to create high – yielding agricultural technologies that are sufficiently adopted and applicable to specific local environments, it will provide useful services desired to raise the quality of life by accelerating the diffusion and mass adoption of modern technologies on Nigerian farms. An effective information technology will create demand and supply information package that are wanted to start necessary modifications of given technologies or help towards new agricultural research agenda.ICT enables effective and easy dissemination of agricultural information and knowledge, which has always enhanced agricultural development in both research and development.

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