



INFORMATION TECHNOLOGY (I.T) AND THE GROWTH OF AGRICULTURE IN ENUGU STATE (E-AGRICULTURE)

ANEKE, Jesophine A.

Department of Agricultural Education, School of Vocational Education
Enugu State College of Education (Technical) Enugu, Enugu State, Nigeria

Abstract

The application of information and technology (ICT) in agriculture is increasingly important. E-agriculture as an emerging field focuses on the enhancement of agriculture and rural development through improved information and communication processes. More specifically, e-agriculture involves the conceptualization, design, development, evaluation and application of innovative ways to use information and communication technologies (ICT) in rural domain, with a primary focus on agriculture. E- Agriculture is a relative new term. This paper looks at the evidence on the role of emerging ICT's in the agricultural sector in Africa with lessons from Asia with respect to farmers access to information and other services that would help improve agricultural productivity, practices and farmer livelihoods. It suggests that countries should avoid monopoly situations and encourage pluralistic providers to induce competition for higher efficiency and lower costs to consumers.

Keywords: Information technology, Growth, Agriculture, E-agriculture.

Introduction

Information and communication technologies (ICTs) generally refer to an expanding assembly of technologies that are used to handle information and aid communication. These include hardware, software, and media for collection, storage, processing, transmission and presentation of information in any format (i.e., voice, data, text and image), computers, the Internet, CD-ROMs, email, telephone, radio, television, video, digital cameras etc. (Asenso-Okyere and Mekonnen, 2012). The advent of personal computers, the Internet and mobile telephone during the last two decades has provided a much wider choice in collection, storage, processing, transmission and presentation of information in multiple formats to meet the diverse requirement and skills of people.

In recent times there has and will always be revolution in technology. Daily, means are been devised to make work more efficient reliable and fast and deliberate measures are been taken by governments to make the most of these revolutions (inventions and innovations) for the growth of their economy. Currently the world is revolving to an age of artificial intelligence where technology drives the economy from computers to robots and machines. ICTs are believed to bring about social and economic development by creating an enabling environment. Almost every single activity in the modern world is becoming more dependent on the application of ICTs for one use or another. The benefits of ICTs reach even those who do not themselves have first-hand access to them. Through ICTs, for example, a doctor in a rural village can get up-to-date information regarding certain diseases and can use that information to advice and treat patients; an agricultural extension worker can learn new technologies, rainfall forecasts, commodity prices, etc. and use that information to advice farmers in rural villages; etc. today a new paradigm of agricultural development is fast emerging: in both developing and developed countries the overall development of rural areas is expanding in new directions; old ways of delivering important services to citizens are being



challenged; and traditional societies are being transformed into knowledge societies all over the world (Meera, *et al*, 2004).

Agriculture on the other hand plays a significant role for economic and social development in most undeveloped countries. Reasons for this include issues of food security and health of people, requirement for increasing yields and food quality improvement. Challenges in agricultural development of every country are great, not only because of fulfilment of increasing demand for food, but because of poverty and malnutrition reduction. Issues are also made more complex as agricultural sector development should be achieved on sustainable manner considering natural environment protection. Currently farmers are faced with narrowing profit margins – costs of many inputs like fertilizers and fuel have increased, while product prices have remained fairly constant or even dropped. Increased globalization and market deregulation increase pressures on many smallholder farmers in developing countries. In order to use full effect of these global changes, politics of agricultural products pricing, marketing and trade must be revisited. At the same time, mechanisms for technology transfer must be revisited and revitalized under changed conditions (Milovanvić, 2014).

In previous decades, significant transformation of agricultural sector is happened. In past, agriculture was driven by bid, but today it is driven by demand (Milovanvić, 2014). However, we may say that agriculture will be driven by information in the future. New information have to reach end-users very fast in order to use potential opportunities and achieve benefits. Information on seed, water, nutrients and plant protection is one of the main factors for successful farming. Information-intensive and precise techniques of farming based on knowledge are going to be lead factors of sustainable agricultural production. Consequently, farmers should be aware of benefits from internet and the other information and communication technologies (ICT) giving information services that are significant for management of agricultural production. The economic potential of ICT use in agriculture is not fully utilized. Examples include precision farming and livestock management where ICT could facilitate more efficient decision making not only for managers of enterprises related to agriculture, but also for policy makers

ICT in agriculture is an emerging fields focusing on the enhancement of agriculture and rural development (Mahant, *et al*, 2012). It involves applications of innovative ways to use ICT in rural domain. The advancement in ICT can be utilized for providing accurate, timely, relevant information and services to the farmers, thereby facilitating an environment for more remunerative agriculture. However all the ICT initiatives are not uniform with disparities between regions in the level and quality of telecommunications, information and the effort of individuals, public and private organizations, and differentiated nature of demand of the farmers in different areas? As a result, there have been many successes, failures, lessons learned and experience gained, so far. While these initiatives are intended to address the needs of the farmers through ICT, their actual usage and their ability to bring significant impact on the farm productivity and socio-economic development of the intended beneficiaries actually use the facilities provided for them meaningfully to meet their needs. The common problems in adoption of ICT in rural segments are ICT illiteracy, availability of relevant and localize contents in their own languages, easy and affordable accessibility and other issues as awareness and willingness for adoption of new technologies among the rural peoples etc. One critical aspect in the usage of ICT's for farmers and their groups, as seen in the some of the ICT driven initiatives, is the involvement of the human interface at the last mile indicating that there is human dependency in transmission of Information Knowledge to farmers.



• **ICT USE IN AGRICULTURAL IN ENUGU STATE**

Available reports relating to agricultural firms and farmers shows that internet access is different around the country in range between 20 and 95%. Statistical data shows that in January 2009 in average 70% of all enterprises in Enugu had little or no access to internet. Mobile internet connections were used by 28% of all agricultural firms. Considering the basic level of access to mobile communication infrastructure, the usage of mobile phones and even smart phones (with web applications) is high and it is expected to increase extremely in the coming years. In most part of the state, mobile devices are more used as cell phones for call and SMS communication than for mobile applications supporting business transactions based on data communication. Expert estimate the usage of mobile application for business purposes between 10-15% in Enugu.

Precision farming (PF) (which is a farming management concept based on observing, measuring and responding to inter and intra field variability in crops) can be used as measure of farm automation. PF is implemented to a small extent by farmers in the most in Enugu. PF and use Geospatial data are only in experimental (research) phase in some developed countries. There is an important difference in countries across Europe (for example, Western and North Europe). The case of Czech Republic is good example of progress in PF development. Manufacturers of agricultural machines are the key promoters of implementation of PF techniques in developed countries such as Germany, Denmark, Netherland and Finland (Teye et al., 2012).

In parts of Enugu, data integration at intra-enterprise and inter-enterprise level is very weak. The availability and accessibility of (broadband) internet in rural areas is an issue also. There are unions or bodies who take care of the organization of dataflow or data standardization in Nigeria like National Agricultural Research Institute (NAERLS) which IAR is one. The Institute for Agricultural Research (IAR) Collaboration between private and public organizations to advanced ICT infrastructure also is very low.

ICT development and use is critical issue because of lack of young people in agriculture is a case in Nigeria, using Enugu as case study. States having many small and probably poor farmers have some problems in the capabilities of investing in farm automation. Some states with fast growing agricultural sector such as the Baltic States have high potentials referring the implementation of new ICT infrastructure because they have not legacy of old systems and infrastructures. Availability of broadband internet in rural areas is very often mentioned as a main factor influencing ICT development and use in agriculture.

Therefore, Agriculture Network Information Centre has to be formed for providing internet access to quality, authoritative agriculture information, and specialized reference services. In this we can use technologies like satellite remote sensing (SRS) which will help in mapping and monitoring features and processes on earth's surface while Geographical Information System (GIS) stores, retrieves, analyses, and displays spatial a non-spatial attribute data in a computer to support decision-making. Seamless integration of GIS, SRS, GPS etc. Holds the key for effective utilization of spatial technologies to solve agriculture problem. Unlike most science and technology disciplines, agriculture has a mechanism for distilling and distributing research to those who need it.

Following objective can be achieved thus:-

a. It can strengthen agriculture research and accelerate technology transfer through establishing regional network on agriculture and allied disciplines, particularly among agriculture research and extensions centers, professionals, policy advisors and stakeholders.



b. To provide inputs for developing regional policies, strategies and programmers, primarily through developing networks in the crop, livestock and fisheries sectors and for efficient utilization/management of soil, water and other resources.

c. To promote new and innovative techniques and systems in agriculture include production, post-harvest and food processing.

d. To facilitate collaborative studies on agriculture marketing and distribution systems, harmonization of agriculture related standards, promotion of agricultural trade, food security, and risk and disaster management agriculture.

e. To facilitate and undertake collaborative capacity building programmers in agriculture and allied sectors with focus on skill development and research in frontier areas.

f. To collate and disseminate information for agricultural advancement in the region.

• **Contributions of ICT to the improvement of agricultural sector of Enugu state**

The potential of ICT in agricultural sector can be used on two ways:

1. Directly, where ICT is used as a tool that contributes directly to productivity of agricultural production, and

2. Indirectly, where ICT is used as a tool that provides information to farmers for making quality decisions in efficient management of their enterprises.

1. Direct contribution of ICT to agricultural production - Precise farming that is popular in developed countries is based on intensive use of ICT and it contributes directly to agricultural productivity. In order to increase agricultural production, techniques of remote sensors with support of satellite technology, geographic information systems (GIS), agronomics and soil science are applied. ICT supports farmers to track and react to weather condition changes agronomics and soil science are applied. ICT supports farmers to track and react to weather condition changes on daily basis. Meteorological stations on field supplied with solar energy can be connected to computers of farmers in order to send information on current temperature of air and soil, rainfall, relative humidity of air, moisture of leaf, moisture of soil, length of day, speed of wind and solar radiation. All these techniques and technologies of precise farming require great capital investments which are payable for big farms. They are appropriate for corporate farming while they are less suitable and efficient for small enterprises and farms.

2. Indirect contribution of ICT to agricultural production - Indirect benefits of ICT are manifested in enabling of farmers for decision making and should be realized in the future development of agriculture. Farmers need timely and reliable sources of information that is explained in previous section of paper. Presently, farmers depend on conventional sources of information that are unreliable and do not give timely information. Changes in the agricultural environment that farmers face make information not only useful but necessary for them to stay competitive and survive on globalized market.

However, efforts on providing of the information will be wasteful if farmers are not able to use ICT. In order farmers to use internet services for searching useful information and communication, elementary computing literacy is required. Through internet, they can track prices and communicate with colleagues around world as often as they want. They can exchange ideas, ask questions and get answers on specific themes. Of specific importance is receiving advices from researchers and agronomists on cultivation of crops and animals. ICT influences on reduction of gap between agricultural researchers and farmers that leads to high developed agriculture having enormous contribution to national economy and society.

Information support to agricultural production and marketing: Information of adequate quality is necessary condition for improvement of all areas of agriculture. The importance of information is particularly high in countries on the verge of entering larger markets. This is



for example the case for many countries in Africa where accession to the African Union is an issue. Agriculture in these countries is faced with deregulation that represents logical implication of process of integration to this Union which reinforces need for timely and relevant information, in order to make decisions in agricultural sector and the other sectors related with it as suppliers of inputs for it or as buyers of agricultural products and raw materials. Improved communication and access to information are directly related to the socioeconomic development of every country (Milovanvić, 2014). Agribusiness is an economic area that has great potential for ICT use in aim of social and economic development of agricultural population (community) and rural regions. However, farmers still have problems to get important information in form that is understandable for them in order to make timely decisions for agricultural production improvement. With improved evidence of data, detailed analysis of costs and sophisticated marketing strategies, farmers will be able to make better decisions and greater profits. In addition, implementation and use of ICT can significantly support increase of competitiveness of their husbandries (Cecchini, and Scott, 2003; Courtright, 2004).

In order to improve agricultural production, farmers should have following information:

Information on crops - Following information from field can be collected and transferred via internet in database server: categories of seeded crops, size of land with specific crops, time of dropping seed, time of harvest, yields etc. The information is analyzed to create statistical reviews and tables that can be accessed by farmers through internet with ordinary web browser. Farmers can make their own production plans based on the information.

Information on production techniques developed by experimental agricultural institutes and stations for agriculture improvement can be collected and integrated. The information is made available to farmers through internet and the other channels.

Information on production equipment and agricultural inputs - The information is gathered from enterprises selling equipment for soil processing and other production equipment, seed and the other agricultural inputs. Information collected in such way is offered to farmers.

Market information - In order to support farmers in gaining the best prices for their products, information on market of various agricultural products should be created. Aims of market information activities are to show review of prices on various markets and to facilitate reorientation of farmers' production to markets where better prices are expected. Farmers need overall reviews of food market information. The reviews present valuable information on some most important import and export markets. IT can support to provide forecast information on main agricultural products in subsequent years. Such information helps farmers and traders to make decisions when and how to sell their products (do they sell just after harvest or do they store products in expecting higher season prices). In combination with the other data (for example, available budget of the farm enterprise) such information can be used for decision making about crops which should be produced in next season.

The other information of interest for farmers and their families - Examples of such information includes weather forecast, availability of credit, and expert advice about maintaining crops in healthy state, etc.

There is no doubt that improved information flow has positive effect on the agricultural sector and individual producers, but gathering and distribution of information is difficult and expensive activity. ICT offers capability for increase quantity of information that is available to all stakeholders in agricultural sector and for reduction of information distribution costs to all interested users. ICT can obtain the information to farmers, even when they are in remote places.



Farmers need ICT applications supporting operative aspects of agricultural production for increase of productivity (applications for real-time decision making based on broadband wireless internet, e-mail and chat applications enriched with pictures, video clips and sounds, etc.). These applications are going to play great role in operative management of agricultural production in future. A good example of ICT use for agriculture improvement is mobile communications. This ICT is used as a tool for access to market information (prices), weather forecast, advice of agricultural experts, etc. Today, it is most accessible technology that is available to great number of people including marginalized people in remote, rural areas. All these technological changes give advantage to farmers in creation of effective and inexpensive agricultural production and marketing programs and give opportunity for reduction of poverty and improvement of their life quality (Gorla, 2009).

Revival of agricultural organization: ICT can give a new impetus to agricultural organizations and productive activity of agriculture which, if nurtured effectively, could become transformational factors. The ‘knowledge’ itself will become a technology for over all agricultural development. Agricultural extension, in the current scenario of a rapidly changing world, has been recognized as an essential mechanism for delivering knowledge (information) and advice as an input for modern farming (Jones, 1997). However it has to escape from the narrow mindset of transferring technology packages to transferring knowledge or information packages. If this can be achieved, with the help of ICT, agricultural extension will become more diversified, more knowledge-intensive, and more demand driven, and thus more effective in meeting farmers’ information needs. ICT has many potential applications in agricultural extension. It can bring new information services to rural areas where farmers, assures, will have much greater control than before overcurrent information channels. Access to such new information sources is a crucial requirement for the sustainable development of the farming systems.

Convergence of tech. info with Agricultural: Development Broad basing agricultural extension activities; developing farming system research and extension; having location-specific modules of research and extension; and promoting market extension, sustainable agricultural development, participatory research, etc. are some of the numerous areas where ICT can play an important role. Several research studies conducted on extension organizations have revealed that the delivery of goods is effective when the grass roots extension worker covers a small area of jurisdiction, with multiple purposes (broad basing). The existing system of large jurisdictions, each with a narrow range of activities, is less effective. However, broad basing requires grass roots workers to be at the cutting edge of extension and master of many trades, which is not really possible. IT can help here, by enabling extension workers to gather, store, retrieve and disseminate a broad range of information needed by farmers, thus transforming them from extension workers into knowledge workers. The emergence of such knowledge workers will result in the realization of the much talked about bottom-up, demand driven technology generation, assessment, refinement and transfer. Agricultural extension systems in most developing countries are under-funded and have had mixed effects. Much of the extension information has been found to be out of date, irrelevant and not applicable to small farmers’ needs, leaving such farmers with very little information or resources to improve their productivity. ICT helps the extension system in re-orienting itself towards the overall agricultural development of small production systems. With the appropriate knowledge, small-scale producers can even have a competitive edge over larger operations. When knowledge is harnessed by strong organizations of small producers, strategic planning can be used to provide members with least-cost inputs, better storage facilities, improved transportation links and collective negotiations with buyers.



ICT can also play an important role in bringing about sustainable agricultural development when used to document both organic and traditional cultivation practices. Developing countries can create Traditional Knowledge Digital Libraries (TKDL) to collect and classify various types of local knowledge so that it can be shared more widely. These libraries could also

Key Issues of e-Agriculture in Enugu State

This Paper discussed on key issues of implementing ICT in agriculture in Nigeria. These issues include:

1. People/Community Issues.
2. Training and Research.
3. Political Issues.
4. Adoption Barriers and their alleviation.

1. People and Community Issues: People/Community” is the important issue promoting and impeding ICT adoption for agriculture production, agriculture development and all aspects ensuring rural viability. Identification and empowering of agents of change was universally accepted as the critical adoption success factor. Table 1 below shown is an indicative quantification of what farmers think in the main constraint to ICT adoption.

	2002	2005	2006	2008
Cost of technology	19.2	21.3	17.5	10.9
Do not understand the value of ICT, awareness	60.8	41.7	46.4	40.9
Personal Impediments (Illiteracy or ICT Skills)	70.8	63.9	62.3	67.3

Source: Mahantet 'al2012.

Deliberating how to incorporate “people/community” into the ICT adoption process elicited a long list of success and failures. Closer scrutiny brought to light the following issues and constraints:

- a. We have to get the “People/community” and “Process” involves before engaging in efforts to adopt new technologies – ICT adoption is not an exception.
- b. ICT is for Communities not just individuals. This dictates a more holistic view of the communities as prerequisite to identify optimal solutions, empower leaders to effectuate them ensure relevant local content.
- c. Strong leadership from the community is essential for the success of any ICT project. Undertaking and taking on board the key requirement for users in terms of end user skills, motivation and their realities in terms of access must be factored into the ICT adoption process.
- d. ICT will not necessarily change the lifestyles of the rural communities. Rather they will introduce new methods of doing the same traditional activities and/or enable new activities.

2. Training and Research

This point discusses about how to customize ICT to be user friendly (research) and how to link training, education and research. Training and Research focused on the following issues:

- a. Research has not devoted sufficient time and resources to identify solutions for effective adoption of technological innovation including ICT.
- b. Such complacency in addition to an acceptance of inadequate “computer literacy” emphasizes the urgency to enhance ICT proficiency of Researchers, extension, relevant officials and public at large.
- c. Use of simpler technologies may get better results, can take projects forward and trigger learning that leads to adopting more advanced ICT.



d. Fundamental research elaborating local and global digital divides is crucial. At this early evolutionary stage of the Information Society ICT there are dangers yet to be recognized with measures to counter them yet to be evaluated.

3. Political Issues

Discussions were immediate in understanding that ICT adoption issues cannot be isolated from the wide range of issues and considerations involved in agriculture development and rural viability. Political issues recognized that governments today have no choice but to prioritize agriculture and rural viability as the only sustainable solution to the current, explosive rural migration, the need for ensured food security, food quality and urgency to minimize environmental abuse. With that noted the following were outlined for consideration and action:

a. ICT infrastructure for rural areas must be part and parcel of all national infrastructure planning and programs.

b. Utilization of ICT for strengthening the linkages between agriculture policy, research and extension institutions, communities and individuals is a political issue as well as an organizational option.

Conclusion

The main aim of the research study was to evaluate the use of ICT in agricultural information dissemination and consequently resulting in agricultural development of the state. The relevance farming programmers, extension bulletins in the local languages and the distribution of transistor radio by the extension programmer in IAR is a step to making communication more effective so as to achieve the intended goals

References

- Asenso-Okyere, K. and Mekonnen, D.A. (2012).The Importance of ICTs in the Provision of Information for Improving Agricultural Productivity and Rural Incomes in Africa. *Journal for agric.* **9**: 122-134
- Cecchini, S., Scott, C. (2003): Can Information and Communications Technology Applications Contribute to Poverty Reduction? Lessons from Rural India, *Information Technology for Development* **10**(2): 73-84.
- Cloete, E., Doens, .M. (2008): B2B E-marketplace Adoption in South African Agriculture, *Information Technology for Development.* **14**(3): 184-196.
- Courtright, C. (2004): Which Lessons Are Learned? Best Practices and World Bank Rural Telecommunications Policy, *Information Society* **2**(5): 345-356.
- Gorla, N. (2009): A Survey of Rural e-Government Projects in India: Status and Benefits. *Information Technology for Development,* **15**(1): 52-58.
- Lucky, A.T. and Achebe, N.E.E. (2013) Information Communication Technology and Agricultural Information Dissemination: A Case Study of Institute of Agricultural Research (IAR) Ahmadu Bello University, Zaria, Kaduna State. *Research Journal of Information Technology* **5**(1): 11-17
- Mahant, M., Shukla, A., Dixit, S., Patel, D., (2012) Uses of ICT in Agriculture *International Journal of Advanced Computer Research* **2**(3):146
- Meera, S. N., Jhamtani, A., and Rao, D.U.M. (2004) Information and Communication Technology in Agricultural Development: A Comparative Analysis of Three Projects from India. *Agricultural research and extension network.* Ppt. 13
- Milovanvić, S., (2014). The role and potential of information technology in agricultural improvement. *Economicsof Agriculture***2** (61): 471-485
- Okwusi M.C, Nwachukwu I and Adesope O.M (2009). Assessment of the usefulness of agricultural information obtained from the internet among farmers in the South East



- Nigeria. Proceedings of the International Conference on global food crisis, FUT Owerri, Nigeria, April 19-24, 2009, Pp. 420-423.
- Omotayo, O.M. (2005). ICT and Agricultural Extension: Issues in transferring agricultural technology in developing countries proceedings of 3rd annual conference of AESON Ilorin. Pp. 132-135.
- Orojobi, W.K., (1980). Improving dissemination methods of information to farmers, organization and effectiveness of the agricultural extension services in Nigeria. *Agric. Admin.*, **3**: 271-284
- Teye, F., Holster, H., Pesonen, L., Horakova, S. (2012): *Current Situation on Data Exchange in Agriculture in EU27 and Switzerland*, ICT for Agriculture, Rural Development and Environment, T., Mildorf, C., Charvat, Jr. (Eds), Czech Centre for Science and Society Wirelessinfo, Prague, pp. 37-47.