

Implications Of The Nigerian Information Technology Policy For Agricultural Extension Services In Nigeria

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Abstract

The purpose of this inquisition was to examine the implications of the national information technology policy for agricultural extension services in Nigeria. The specific objectives were to: examine the provisions of the Nigerian National Policy for Information Technology for agricultural extension services; and identify areas of the policy that need updating for effective agricultural extension practice. The study was based on desk review. The information presented was from secondary sources. Namely the National Information Technology Policy for Nigeria and relevant literature. The general objectives of IT policy in Nigeria are to include the following: Ensure that information Technology Resources are readily available to promote efficient national development. Guarantee that the country benefits maximally, and contributes meaningfully by providing the global solutions to the challenges of an information age. Empower Nigerians to participate in software and IT development. Empower the youths on IT skills prepare them for global competitiveness. Integrate IT into the main stream of education and training. Create IT awareness and ensure universal access in order to promote ICT diffusion in all sectors of our national life. Stimulate the private sector to become the driving force IT creativity and enhance productivity and competitiveness. Build a mass pool of IT expertise using the platforms as "train the trainer" scheme (TTT) for capacity building. The aspects of IT policy that are relevant to agricultural extension can be arranged in six areas, namely to: access to relevant information for improve food production and food security, access to relevant information to enhance the effectiveness of environmental monitoring and control systems, access to relevant information to re-engineer and improve urban and rural development schemes, access to relevant information to empower children, women and the disabled by providing special programmes for the acquisition of IT skills, access to relevant information to empower the youth with IT skills and prepare them for global competitiveness; and access to relevant information to integrate IT into the mainstream of education and training. Communities and farmer organisations can be helped through the use of ICTs to strengthen their own capacities and better represent their constituencies when negotiating input and output prices, land claims, resource rights and infrastructure projects. ICT enables rural communities to interact with other stakeholders, thus reducing social isolation. It widens the perspective of local communities in terms of national or global developments, opens up new business opportunities and allows easier contact with friends and relatives. A role is also played by ICT in making processes more efficient and transparent. It helps in making laws and land titles more accessible. Rural communities benefit from better access to credit and rural banking facilities. Recent mobile banking initiatives offer further scope to reduce costs and stimulate local trade through ICT facilities. There is the need to review the national IT policy objectives in order to ensure that more aspects of agriculture are captured such as in specific extension programmes of Agricultural Development Programmes (ADPs), Fadama Projects and E- wallet for fertilizer distribution in Nigeria in the information dissemination. Measures must be taken to make ICTs affordable, accessible and easy to use by educating major stakeholders and extension personnel through extension education for farmers and national seminars/workshops for extension officers.

Keywords: implications, information technology, agricultural extension services and education and training.

INTRODUCTION

The term 'information technology' (IT) involves computers, ancillary equipment, software and firmware (Hardware) and similar procedures, services (including support services) and related resources. Nigerian National Policy for Information Technology defined the term information technology to include any equipment or interconnected system or subsystem of equipment that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission or reception of data or information. Information

Technology (IT) has long been viewed as having great potential for improving decision making in agriculture. In all phases of the agricultural industry, information technologies are vital to the management and success of a business (National Information Technology Policy, 2014).

A policy is a deliberate plan of action to guide decisions and achieve rational outcomes. It is also a guideline consisting of principles and rules governing the behaviour of persons in an organization. Policies prescribe how people in an organization should act or

behave. Policy differs from rule of law. While law can compel or prohibit behaviours, policy merely guides actions toward those that are most likely to achieve a desired outcome (Iwuchukwu and Igbokwe, 2012). The goal of the Agricultural Extension Policy (AEP) must align with that of the information technology policy (ITP) to meet the needs of the extension services and farmers. The goal of the agricultural extension policy (AEP) is to achieve a well-organized extension system for efficient and effective extension delivery in all aspects of sustainable agriculture and rural development (Koyenikan, 2008).

Tamukong (2007) summarized the objective of Information Technology (IT) in agriculture in Africa as ensuring the systematic dissemination of information using ICTs on agriculture, animal husbandry, fisheries, forestry and food, in order to provide ready access to comprehensive, up-to-date and detailed knowledge and information, particularly in rural areas where the majority of farmers are located. The Nigerian IT policy provides for the use of radio, television and Global System of Mobile (GSM) to popularize the use of ICTs in agricultural activities. In order to keep pace with disseminating the increasing number of information or findings from different research institutes, computers and telecommunications must be utilized to handle information processing and dissemination with greater speed and accuracy than manual processing and delivery through extension agents. We live in a rapidly changing world marked by increasing emphasis on information. Effective communication of agricultural information to farmers is of critical value in achieving optimum efficiency in agricultural extension administration and practice in Nigeria. Various forms of ICT devices abound in the country today. It is expected that these available forms of ICT devices should be effectively utilized by extension agents to enhance agriculture extension services. The available ICT facilities are grouped into broadcast technology, print technology and telecommunication/computer technology (Orikpe and Orikpe, 2013). 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, calendars 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), CDROM, internet, etc. Effective communication of agricultural information to farmers is of critical value in achieving optimum efficiency in agricultural extension administration and practice in Nigeria (Orikpe and Orikpe, 2013).

To participate and make informed decisions in the agricultural industry a person must have ability to gather, process, and manipulate data. Arokoyo (2006)

stated that people who use information technology creatively are pioneering careers in agriculture today. Jobs in today's agricultural workforce require greater use of technological skills than ever before. IT supports new methods for precision agriculture, like computerized farm machinery that applies for fertilizers and pesticides (Arokoyo, 2006). Farm animals are fed and monitored by electronic sensors and identification systems. Selling or buying online began to become popular in the world. However, it's most important role remains communication, and the Internet has provided us with an ideal opportunity to do so. One such communication tool is the Web Site, which simply replaces the newspaper as a communication tool. Presently, almost every company has its own website (Arokoyo, 2006).

Problem Statement

A developing nation like Nigeria that aspires to participate effectively and become a key player in the emerging information age needs to have in place, an information technology system that improves on agriculture. Okeke, Nwalieji, and Uzuegbunam, (2015) stated that in Nigeria, the concept of ICT has become a global concern and increasing application of it in every segment of our natural life has been felt essentially through the use of the global system of mobile telephone, radio, television, internet, camera, computers to mention but few. They further explained that, the ICT facilitates and promotes the collaboration between agricultural researchers, farmers, extension agents and other stakeholders. One question that must be asked is the implication of the Nigerian IT policy on agricultural extension services. To what extent are needs of agricultural extension provided for by the policy?

Purpose of the Study

The purpose of this inquisition was to examine the implications of the national information technology policy for agricultural extension services in Nigeria. The specific objectives were to:

- 1) examine the provisions of the Nigerian National Policy for Information Technology for agricultural extension services;
- 2) identify areas of the policy that need updating for effective agricultural extension practice; and
- 3) make recommendations for an extension friendly IT policy.

Methodology

The study was based on desk review. The information presented was from secondary sources. Namely the National Information Technology Policy for Nigeria and relevant literature.

Limitation of the Study

The study was constrained by few and limited literature on information technology policy document of 2014 only, with no more recent IT policy facilities

to explain the current realities on telecommunications in Nigeria.

PRESENTATION AND DISCUSSIONS

General Objectives of the Nigerian Information Technology Policy

This section presents the objectives and structures of the IT policy in Nigeria. The objectives of the Information Technology policy in Nigeria comprise the following as highlighted by Baro (2011), who succinctly summarized the general objectives of IT policy in Nigeria to include:

1. Ensure that information Technology Resources are readily available to promote efficient national development.
2. Guarantee that the country benefits maximally, and contributes meaningfully by providing the global solutions to the challenges of an information age.
3. Empower Nigerians to participate in software and IT development.
4. To ensure local production and manufacture of IT components in competitive manner.
5. Empower the youth on IT skills prepare them for global competitiveness.
6. Integrate IT into the main stream of education and training.
7. Create IT awareness and ensure universal access in order to promote ICT diffusion in all sectors of our national life.
8. Stimulate the private sector to become the driving force IT creativity and enhance productivity and competitiveness.
9. Build a mass pool of IT expertise using the National Youth Service Corp (NYSC), National Directorates of Employment (NDE) and other platforms as "train the trainer" scheme (TTT) for capacity building.

Strategies for Achieving the Stated Objectives

According to the Nigerian National Policy on Information Technology document, the methods for achieving these enumerated objectives include the followings:

1. Establishing a coordinated programme for the development of a National Information Infrastructure (NII), State Information Infrastructure (SII) and Local Information Infrastructure (LII) backbone by using emerging technologies such as satellite, including VSAT, fibre optic networks, high-speed gateways and broad band technologies;
2. Providing adequate connectivity to the Global Information Infrastructure (GII);
3. Addressing open standards for further liberalization and the fiscal measures including incentives to substantially improve telephone teledensity and make IT more affordable to the citizenry;

4. Establishing IT Parks as incubating centres for the development of software applications at national, state and local levels;
5. Restructuring the education system at all levels to respond effectively to the challenges and imagined impact of the information age;
6. Restructuring the healthcare system by providing a national databank to provide on-line national healthcare information, administration and management at primary, secondary and tertiary levels;
7. Encouraging massive local and global IT skills acquisitions through training in the public and private sectors with the view to achieving a strategic medium-term milestone of at least 500,000 IT skilled personnel;
8. Empowering the labour force with IT skills and improving Small to Medium Enterprises (SMEs) productivity;
9. Establishing adequate institutional framework at the federal, state, and local government levels in order to effectively accomplish the objectives of the IT vision and mission;
10. Establishing national IT awareness machinery at all levels of government and encouraging private sector participation in exposing Nigerians to the features and benefits of IT;
11. Strengthening government and private sector collaboration for the attainment of national self-reliance;
12. Utilizing IT facilities to develop and transform the entertainment industry for wealth and job creation;
13. Establishing appropriate mechanisms to accelerate and enhance trade and commerce transactions in the sector;
14. Creating national database management systems as a tool for effective planning & communication between citizens at home and abroad;
15. Establishing national databases and other IT infrastructure to enhance defence and law enforcement;
16. Enacting Bills & Acts to stimulate and protect the rights of users and developers including intellectual property rights;
17. Bringing the government to the doorsteps of people by creating virtual forum and facilities to strengthen accessibility to government information and facilitating interaction between the governed and government leading to transparency, accountability and the strengthening of democracy;
18. Utilizing IT opportunities to restructure government, citizens and business interfaces for better governance, improved trade and commerce and administrative effectiveness;
19. In order to achieve the short to medium term objectives of this policy with maximum effectiveness, government will establish a National Information Technology Development Agency (NITDA) to implement the IT Policy, regulate, monitor, evaluate and verify progress on an ongoing basis under the

supervision and coordination of the Federal Ministry of Science and Technology; and

20. Establishing a National Information Technology Development Fund (NITDEF) under the aegis of the National Information Technology Development Agency (NITDA).

Provisions of the IT Policy for Agricultural Extension Services

The aspects of IT policy that are relevant to agricultural extension can be arranged in six areas. Reporting on the adequacy of IT policy for agricultural extension services in Nigeria indicates insufficiency of the policy for agricultural extension, because of the smaller areas considered by the policy in relation to other areas of the economy. These inadequacies of the policy can be explained in the following areas below:

Access to relevant information for Improve food production and food security:

The role of ICTs to stimulate agriculture, enhance food security and support rural livelihoods is increasingly recognized and was officially endorsed at the World Summit on the Information Society (WSIS) 2003-2005 (Simon, 2011). The computers, internet, geographical information systems, mobile phones, as well as traditional media such as radio or TV stimulates participation enhances value to productivity. Evidence of the contribution of ICT to agricultural development and poverty alleviation is becoming increasingly available. Simon (2011) further stated that, it is clear that ICTs have brought to the fore, new ways of doing things in Agriculture. There is realization that ICTs should be integrated to be effectively used in agriculture extension and development as facilitating tools to boost its impact to the lives of farmers. Information and Communication Technologies (ICTs) have shown evidence for easier access to markets and information resources. Due to opportunities and unique services community telecentres and local multimedia centres do provide to the rural communities in Africa, the role of these local entities should be embraced in order to achieve much talked about universal access and stimulate regional economic development (Simon, 2011).

Access to relevant information Enhance the effectiveness of environmental monitoring and control systems:

This objective of the IT policy could be achieved by employing the following strategies in agricultural extension service:

(i) Developing Geographical Information Systems (GIS) to monitor the environment and plan sustainable environmental usage, Global Positioning Systems (GPS) linked to Geographical Information Systems (GIS), digital cameras and internet, help rural communities to document and communicate their situation (Stienen, et. al., 2009). IT is to be used in

land and water management, offshore resource exploitation, yield assessment and livestock management. Government will revitalise agricultural extension services by empowering and equipping farm extension workers with IT skills to support farmers through the use of IT in areas such as:

a. Digital Mappingb. Land Usec. Soil typesd. Meteorologye. Ecologyf. Oceanography particularly off-shore fisheries exploitationg. Hydrologyh. Agricultural records

(ii) Establishing an agricultural information system to provide support for planning, production, storage and distribution of horticultural crops, livestock, and fisheries products.

(iii) Creating IT awareness for all types of farmers at all levels nationwide (*National ICT Policy, 2012*).

GIS and agro-meteorological technologies have been introduced into programmes for various purposes including land-use planning, crop forecasting and early warning systems. Space technology is also essential to monitor threats from the growing number of natural disasters. In addition, use of mobile phones has become more common for exchanging information such as for disease surveillance and pest tracking (FAO, 2015).

Access to relevant information to Re-engineer and improve urban and rural development schemes

The government shall facilitate the development of the Geographical Information Systems (GIS) and its utilization with other IT facilities for urban and rural area development. The objectives of rural and urban development in the IT policy include to:

(i) develop digital master plans for our cities; (ii) improve rural area development and management; (iii) reduce the trend of rural to urban migration; (iv) achieve environmentally clean cities and rural areas; (v) generate IT related jobs for urban and rural youths; (vi) introduce the benefits of e-governance to urban and rural communities; (vii) make tools available to predict environmental problems in advance for necessary action; (viii) promote the development of rural IT facilities; (ix) promote the proper documentation of ownership of land and property in urban and rural areas and the transformation of dead property assets to capital.

The strategies for achieving these stated objectives include: Creating environmental networks; Organizing enlightenment campaigns about IT amongst city and rural area planners; Developing the GIS technologies for use in urban and rural areas for planning and design; Re-training the present core designers and planners for relevance in the information era; Establish rural internet resource centres with VSAT capability where such communities can have access to IT and the Internet and information; Developing community tele-centres for boosting the socioeconomic activities in the rural

areas; and Establishing IT facilities in rural areas through the use of Mobile Internet Unit, Community Tele-Centres, etc using satellite, wireless, HF-radio and cellular technologies.

The use of ICT in agricultural extension and rural development is significant, especially now that its use has witnessed an upsurge in almost all areas of rural life in several African countries. However, the persisting problems of connectivity, literacy, content, and accessibility have continued to hinder expansive utilization of these facilities for agricultural information. In this respect, it has been observed that agricultural extension depends largely on information exchange between farmers and broad range of other actors particularly the front line extension workers that are the direct link between farmers and other actors in the Agricultural Knowledge and Information System (AKIS). The implication of IT policy can be seen in the utilization and in terms of usage of ICTs among the extension personnel and programmes (Sulaiman et al., 2015).

In their study Sulaiman et al. (2015) showed that the majority of extension agents use mobile phone (90 percent), while 84.3 percent use radio and 77.1 percent use television because of high level of awareness and easy accessibility. Meanwhile, only few of them use modern and sophisticated ICT gadgets: 41.4 percent use storage device, 38.6 percent use search engines, 36.6 percent use GIS and only 31.4 percent use E-library. Improving and boosting the socio-economic activities in the rural areas through the IT policy will by implication lead to agricultural improvement and productivity of farmers, in that majority of farmers reside in the rural areas of Nigeria.

People in rural areas are now using mobile money to receive payments, as start-up capital for their agricultural businesses, and even for crop insurance,” says Gavin Krugel, chief customer strategy officer at mobile financial services provider Fundamo (Klasa and Green, 2012). In this domain, the Global System Mobile for Agriculture (GSMA), Mobile for Development programme has set up the mFarmer initiative to encourage mobile phone operators to partner with private and public sector agriculture organisations. Operators including Airtel, Tigo and Orange have all launched mAgri services in Africa, and the Farmer initiative aims to benefit more than 2 million farmers. These services provide smallholders with up-to-date information on markets, weather patterns and pest outbreaks. Services are also being developed that use mobile technology a major IT component to detect counterfeit seed and fertiliser and to provide easy direct payments to farmers. These will be game-changers due to their unprecedented reach, according to Fiona Smith, Agriprogramme manager for GSMA Mobile. “Many countries only have one

agricultural extension officer for every 4,000 farmers,” she says. “These new mobile services allow farmers to access and share information via their phones at any time, by talking to an expert in a call centre, via SMS or via interactive voice response (Klasa and Green, 2012).

The type of ICT used by local communities is subject to rapid change. However, broadband internet access is seen as central for societal innovation because storing of large datasets and live communication requires good connectivity. Until recently, connectivity in rural areas was limited to slow dial-up lines. Satellite connections now make broadband access possible in remote areas. Use of mobile phones has seen an enormous increase in recent years, especially in rural areas in Africa (Stienen, et. al., 2007).

As of October 2013, 98 mobile phone projects were being implemented in the agricultural sector of developing countries. Arguably, by implication, because of their wide availability, mobile phones are used in most of these projects. Delivery of information is mainly through short message service (SMS), although voice messages, interactive voice response systems, or mobile applications are also used. Most projects deliver information regarding market prices (48 percent) and agricultural extension (39 percent), combined with weather advisory information in a number of important cases (Torero, 2013). Successful value chains depend on the willingness of all chain actors to communicate, coordinate and collaborate. There is a need for an information system that can provide farmers with significant information and education throughout the crop cycle, to produce high crop yields, as well as high quality, uniform grade produce that is usable by target consumers. This could be realized by utilizing suitable ICT component like GSM (Klasa and Green, 2012).

Studies by (Olajide and Meroyi, 2013) have shown that one of the several ways to assist farmers in their many farm enterprises is the provision of adequate, timely and up to date information on how to increase their production is by the use of Entertainment Education (EE) ICT media technology. The overall favourable perception of use of EE for agricultural technology dissemination implies that if conscious efforts are made it offers a potent medium for agricultural information dissemination (Olajide and Meroyi, 2013).

Access to relevant information to empower children, women and the disabled by providing special programmes for the acquisition of IT skills:

In Nigeria today, the concept of ICTs has become a global concern and the increasing application and implication of the technology in every segment of our

natural life, especially through the GSM, radio, television, projectors, internet, video, camera, computers, e-wallet, has been felt. Okekeet.al. (2015) highlighted that the emerging role of ICTs in agricultural extension service delivery in Nigeria and suggests areas of improvement in fulfilling the roles. ICTs play numerous key roles in extension service delivery such as: helping in expanding outreach to a large number of farmers; offering a solution to resource and capacity issues within the agricultural sector; improving information flow and connecting people within the rural areas; answering questions relating to farm problems with the advantages of getting feedback using telephone; obtaining market price information, weather forecasts, etc.

ICT as the biggest factor for change in extension service plays important roles in enhancing agricultural extension administration such as helping in producing knowledgeable and well informed farming communities, individually and collectively through diagnosing problems, interpreting data and applying their meanings. Again, by providing knowledgeable and new technology, up-to-date information and services for increased production, improving market access, capacity building and empowerment and information for improvement, management of new developed agricultural practices and methods emanated from extension education (Xiaolan and Akter, 2010).

ICT would enable extension workers to gather, store, retrieve and disseminate a broad range of information needed by small producers such as information on best practices, new technology, better prices of inputs and outputs, better storage facilities, improved transportation links, collective negotiations with buyers, information on weather. Moreover, on the contrary, mobile phone technology has much less requirement on the infrastructure and hence wider applicability especially in mountainous areas. Mobile phones enable both audio and video functions which can meet most of the basic needs of the poor. It also has greater affordability for the farmers than internet. In many developing countries more than 80% population have access to mobile phones.

Xiaolan and Akter, (2010) demonstrated that the ICT helped fishers along the coastline in Kerala, India learn about prices at different locations and decide where to sell their products profitably. As a result, price volatility and variation dropped; producer prices rose and at the same time consumer prices dropped. Aker (2008) in Xiaolan and Akter, (2010) studied the impact of the mobile phone rollout on grain markets in Niger and show that mobile phone service has reduced grain price dispersion across markets by a minimum of 6.4 percent and reduced intra-annual price variation by 10 percent. The digital divide is not merely a problem of access to ICT, it is part of a

larger developmental problem in which vast sections of the world's population are deprived of the capabilities necessary to use ICTs, acquire information and convert it into useful knowledge. Balanced growth is needed and deep structural problems must be solved to make ICT-induced development more inclusive (Xiaolan and Akter, 2010).

Access to relevant information to empower the youths with IT skills and prepare them for global competitiveness:

The main objectives of the ICT agriculture media according to Simon (2011) in Africa are to:

- i. raise public awareness on the importance and role of ICTs and telecentres in agricultural development in Southern and Africa in general.
- ii. stimulate public policy responses from the government and its agencies on the status of policy implementation and strategies on ICTs and agriculture
- iii. provide an overview on the challenges and options for increased and sustained use of ICTs in agricultural development with a focus to rural telecentres.
- iv. Showcase presentations on existing ICT innovations and interventions in the agriculture sector.

The main expected results and outputs of these objectives include to: Initiated public debate on policy issues affecting ICTs and agriculture development; Commitments from public sector agencies on ICT policy; Accelerated interventions and innovations on ICTs and agriculture; Increased public awareness and recognized role of community telecentres in agricultural marketing and development; and Wider news coverage and reported pieces of information on the status of ICTs, agriculture and community telecentres in major media houses and website.

The youth are critical catalysts in Nigeria's socioeconomic development plans, and are acknowledged to be an ICT-oriented generation. For Nigeria to harness the huge potential that ICT offers, it is important to leverage ICTs for positive youth orientation/development, and also to ensure that youths use ICTs responsibly and productively. The objectives of ICT for youth include to: leverage ICT in addressing Youth-specific development and orientation issues; and ensure that the Youth use ICT responsibly and for positive purposes. The strategies the government will adopt for achieving these objectives include:

- i. Promote the use of ICTs, in partnership with Youth-focused bodies and relevant MDA's to deliver information and content that emphasize National Unity, tolerance and ethical values;
- ii. Support the delivery of programmes designed to ensure that the youth focus on positive application of ICT;
- iii. Promote Incentive and support schemes targeted at youth entrepreneurship initiatives in ICT;

- iv. Ensure that the youth is protected adequately in cyberspace; and
- v. Promote the incorporation of ICT within the education curriculum at all levels (*National ICT Policy, 2012*).

Umeano (2012) stated that Nigeria as one of the developing nations is faced with so many challenges which poverty, unemployment of many youths or graduates, inflation are among the major one. These youths end up being hoodlums and become nuisance to the society. This trend can be changed by these youths exploring the so many opportunities which ICT entrepreneurship could offer. These could help individuals to be useful to themselves and to others thereby reducing the rate of unemployment in the country and improve on the economy.

Access to relevant information to integrate IT into the mainstream of education and training:

Agricultural extension is to serve the needs of farmers, youths and women in areas of production, processing, storage, marketing, health, education and leadership. The IT document mission statement recognised the need 'To Use IT for Education' to enlighten the various stakeholders in the agricultural sector. In addition, the general objectives of the six areas stated above stressed that information technology components must be used to achieve the overall aim of agriculture/agricultural extension of attainment of optimal productivity in agricultural production and food sufficiency in Nigeria. In the IT document, Nigeria will use IT to re-engineer agriculture for the purposes of maximizing food production, improving food self-sufficiency and security, increasing output for industrial raw material utilization, minimize urban migration, providing employment for the citizenry, economic growth and minimizing environmental abuse and degradation for sustainable agricultural environment.

According to *Sulaiman et al. (2015)*, ICTs have the implication potentials to enhance farmers' ability to collate demands; collaborative learning; exchange of time sensitive information, for example, market prices and disease outbreaks; make extension systems and structures more efficient; engage farmers in assessing own needs, solutions; facilitating multi-stakeholder brainstorming; exploring alternative production technologies; facilitating access to markets and credits; training and demonstration; community learning; search, select and compile information for individual clients; early warning for disasters, weather forecast; and peer to peer sharing and exchange among extension.

In that regard, extension has an important role to play in facilitating and brokering the participation of rural and agricultural organizations in policy dialogue on telecommunications reform in order to shape national

telecommunications policies and programmes to meet the needs of rural areas and farmers. This is a very new role for extension. The call for demand-driven extension opens the door for examination of how ICTs can be cost-effective and practical tools for facilitating and channeling farmers' demands, and addressing those demands. But when so many rural areas of developing countries lack basic telecommunications services that support so many key ICTs like the telephone and the Internet, this examination is severely challenged. Any resulting programmes and projects remain totally dependent on the strength of national policies and programmes that support universal access to telecommunication services. Telecommunication policy rises to the surface as a primary enabler or obstacle to improving agricultural extension services.

Arokoyo (2005) observed that given the urgent need for current Agricultural Knowledge and Information System (AKIS) by farmers, the use of conventional communication channels such as farm/home visit, personal letters, and use of farmers' contact, for disseminating agricultural information is counterproductive. By implication, this calls for the adoption of ICT by both researchers and extension workers alike to transmit relevant information to farmers in a most efficient way. Agricultural extension, which depends largely on information exchange between and among farmers and a broad range of other actors, is an area in which ICT can relate directly with the farmers through ICT. Frontline extension workers, who are the direct link between farmers and other actors in the Agricultural Knowledge and Information System (AKIS), are well positioned to make use of ICT to access expert knowledge or other types of information that could be beneficial to the farmers. Furthermore, *Arokoyo (2005)* further listed the potential advantages of the application of ICTs in agricultural extension to include capacity to reach a large audience, effectiveness in utilization for training and demonstration, making the extension system and structures more efficient through better management of information and scarce resources; adaptability to usage for normal weather forecasts and warning systems for disease/pests outbreaks and other disasters before they occur; provision of timely and sensitive market information as well as for networking among and between the key stakeholders in the Research Extension-Farmers-Input- Linkage-System (REFILS), *Tanko, et al. (2013)*.

Agwu, et al. (2008) opined that ICTs can enhance the capacity of grassroots organizations to make their voices heard. The implication is that ICTs can improve the ability to search for information and increase the quantity of information available, ultimately reducing uncertainty and enhancing market participation. Answers to questions such as "how do

buyers and sellers find each other and what price can be achieved?" and "is it better to store the produce or sell it immediately?" can be easily achieved through the use of ICTs. ICTs also present new opportunities for individuals and communities to be not only consumers but also producers of information. The empirical study showed that majority (72%) of the researchers and extension workers (63%) had high level of awareness of the major ICT tools, while only 41% of the farmers interviewed were highly aware of these tools. They further stated that it is important to recognize that awareness among policy makers on the potentials of ICTs is a critical element for its development. The study also entailed that 65% of the researchers, 56% of the extension workers and 33% of the farmers asserted that they had access to ICT facilities. The fact that majority (67%) of the farmers do not have access showed that most rural areas in Enugu and Abia states don't have access to major ICT facilities and so are not likely to be aware of major agricultural findings. Furthermore, according to *Agwu, et. al. (2008)* in the problem of underdevelopment is attributable to the inability of a large portion of the world's population to access and effectively use ICTs, this showed a negative implication to IT policy objective in Nigeria.

If agricultural extension is linked to agricultural production services for economic development and poverty reduction, the implication is that ICT can be regarded as the most important component of modern knowledge economy, in order to understand the use of ICT in socio-economic development and poverty alleviation; we must recognize roles of ICT in shaping the country's economy. ICT can be summarized as in (*Koyenikan, 2008*):

- a) ICT as Economic Sector: it means commercial significance of ICT industry for country's economy. Economic activities encompass hardware manufacturing and software development.
- b) ICT for Socio-Economic Development: The benefits of ICT are manifold as it contributes heavily in increasing productivity, increasing work efficiencies achieving economies of scale in every sector whether it is manufacturing, communication, education, rural development, etc.

Areas of the IT Policy that Need Updating for Agricultural Extension Services

A policy is only as effective as its implementation, policy initiatives must be irrigated with a national environmental and culture that permit and catalyze their execution. The most significant aspect of ICTs and globalization that should concern the developing countries like Nigeria is the fact that it has led to unprecedented inequalities in the distributing of benefits between developed countries and the less developed (*Baro, 2011*). Certain prerequisites, such as reliable power supply to operate the computers, a well-functioning telephone network to transmit data,

foreign currency to import the technology, and the computer literate personnel are necessary for successful use of IT in agricultural extension delivery (*Baro, 2011*).

Therefore, the areas that needed updating in the IT policy is by providing the teeming population through interaction with rural farmers by using modern communication instruments of the policy like GSM, email and internet to provide the required information to farmers. This is necessary because of the large population of Nigerian farmers who reside in the rural areas. *Obinna and Nzeakor (2014)* postulated that farmers need more qualified digital (ICT compliant) extension professionals to update them on new technologies. The updating required for ICT policy in Nigeria should be directed toward attaining the goal of ICT as documented by a brief paper of United States Agency for International Development (USAID) (2013) as the significance of ICT for disseminating agro-meteorological information in agriculture to include:

- a) Transmitting simple weather forecasts including seasonal, ten day, or short-term forecasts that are daily or every few days;
- b) Reminders or tips that are related to the actions that farmers can take in response to the expected weather conditions (e.g. sunshine tomorrow, spray fertilizer or pesticide for a given crop); and
- c) Warnings or alerts for disasters or extreme weather events. Extreme weather events such as storms and lightning are particularly prevalent in tropical climates and especially so in coastal areas where low-lying land is susceptible to frequent flooding due to inclement weather. Flood warnings are also important for farmers situated along major river systems.

ICT-based data collection can also provide a mechanism to survey farmers to understand localized needs. Text surveys with simple yes/no responses or longer surveys completed through an intermediary on a smartphone platform can then be used to customize information to be relevant for specific micro-climate areas and the challenges farmers are facing based on their crops or farming practices (*USAID, 2013*).

The science of forecasting weather and climate change has improved significantly with the development of more complex models and the use of powerful computers enabling much greater accuracy and relevance at the micro-climate level. The Nigerian IT policy needs to therefore update the use of super-computers in metrological purposes for improved information delivery among farmers. ICT tools can also be updated to disseminate weather information directly to users in a cost effective way that can be customized by geography, language and specific needs of the users. With weather information particularly, the granularity of the information and the timing is very important; this is a key strength of ICT

over the traditional dissemination strategies. For example, farmers prefer to receive daily forecasts of weather information early in the morning so that they can plan accordingly. No other traditional channel can be as precise as an automated weather feed sent out via SMS or voice message to the farmer at a specific time and for his particular geographic area down to village level (USAID, 2013).

While substantial progress has been made in making ICTs available and accessible for rural communities, challenges that require update in the IT policy remain in respect to seven critical factors of success as highlighted by the report Food and Agriculture Organisation (FAO), (2015) as follows:

1. Content: Adaptation of content to local needs, languages and contexts remains challenging. Appropriate information resources (i.e. content) and trusted intermediaries are necessary for the success of e-agriculture initiatives. Dissemination of information as one of the major goals of agricultural extension may be constrained if the nature of information does not match farmers' needs in terms of format and relevance. Locally adapted content and existing relationships based on trust are not yet given sufficient attention and priority in development plans. Bringing ICTs and development planning closer together, with information innovations coming directly from the rural communities themselves, remains an often overlooked design consideration in meeting the demands of the poorest communities. This needs to be updated to achieve the goal of dissemination of information in agricultural extension in Nigeria.

2. Capacity development: This is comprised of three dimensions: the enabling environment, the organizational capacity and individual's capacity. Capacities at the individual, organizational and institutional levels need to be strengthened and updated. The focus on improving access to agricultural information without addressing the ability to effectively use the information has not yet yielded the desired impacts among farmers. Models of capacity development need to be based on social characteristics, information needs and the function of technology in context. The price of access to ICTs can be very high in some countries. Pricing of broadband or mobile services is an important barrier for most vulnerable groups, such as women, youth, older farmers and people living in most remote areas. These groups are the target of agricultural extension and their needs require policy updating in the Nigerian IT policy.

3. Gender and Diversity: Access and opportunities are not distributed equitably among users, creating asymmetries that must be addressed with specific policies targeting the source of the inequalities. Access for women, youth, older farmers and people living in the most remote areas is hindered by the price of access to ICTs (e.g. broadband or mobile

services) and by persistent inequalities. Gender inequalities remain a serious issue in the digital economy, as does the gap between urban and rural populations.

The digital divide is not only concerned with technological infrastructure and connectivity; it is a multifaceted problem of ineffective knowledge exchange and management of information content; insufficient human resources and institutional capacity; and lack of sensitivity to gender and the diverse needs of different groups.

4. Access and participation: Access to ICTs is not yet equitable. Improved access to ICTs alone will not resolve the gender digital divide. As with the challenges reported in other key areas, proper design and implementation based on a bottom-up and participatory approach that involves the communities themselves can reduce the potential for information inequity that can be created when introducing new ICTs into a community.

5. Partnerships: Public-private partnerships are recognized as a critical factor in sustainable business models at the community level. Diverse advisory and extension services offered by different types of providers are more likely to meet the various needs of farmers, as there is no one type of advisory service that can fit all circumstances. With a broader variety of potential partners comes a new challenge: the formal recognition of information and service quality standards, and the partners' agreement to be held accountable for meeting them.

6. Technologies: Identifying the right mix of technologies that are suitable to local needs and contexts is often a challenge, in spite of – or because of – the rapid increase in mobile telephone penetration in rural areas. While this offers great potential for increasing access to information, challenges remain in the area of effective use of mobile telephony that are related to access and capacity. Technologies should be suited to local contexts and needs. The appropriation of ICTs by youth in support of farming activities is also creating shifts in the social dynamics between youth and older community members, or between rural and urban/peri-urban communities.

7. Economic, social and environmental sustainability: Scaling up pilot ICT projects to reach millions of smallholder farmers and identifying sustainable business models are still challenges. On the one hand, pricing is critical to sustainable agribusiness models at the community level. Investments are needed to cover the cost of creating content and collecting data. On the other hand, social sustainability can be hindered if clear roles and responsibilities have not been clarified among stakeholders. For example, the location of an ICT centre should be socially convenient for all users (including women and older people). Last but not least, technology waste is an issue and a polluting factor that should not be underestimated. Sustainability of ICTs for agriculture initiatives may

be at risk if development organizations, governments and the private sector do not succeed in defining indicators and data that validate investments in ICTs and the positive results these may have (FAO), (2015).

Stienen, et. al., (2007) opined that, there is ample potential for effective use of ICT in agriculture and initiatives are promising. However, much still remains to be done by providing updates in the Nigerian IT policy to improve the policy to consider rural communities, especially where the bulk of Nigerian farmers reside. Several future trends and updates of great importance according to (Stienen, et. al., 2007) include: Converging of media and tools for communication; Increased web-based storage of agricultural information; Cheaper and improved connectivity for rural communities; Increased recognition by governments of the importance of the use of ICT in rural development; and Increased tailor-made, quality agricultural information services.

CONCLUSION AND RECOMMENDATIONS

This paper concludes and recommends a friendly IT policy for extension as follows:

1. There is the need to review the national IT policy objectives in order to ensure that more aspects of agriculture are captured such as in specific extension programmes of Agricultural Development Programmes (ADPs), Fadama Projects and E- wallet for fertilizer distribution in Nigeria in the information dissemination.

2. There is also the urgent need to mobilise resources for the development of the IT policy in Nigeria through ensuring that the National Information Technology Development Fund takes effect with special intervention allotted for agricultural extension programmes in Nigeria for information delivery.

3. There is also the need to have all stakeholders to cooperate, collaborate and harmonized efforts in the implementation of the IT policy. This can be realised by creating IT policy implementation forum sector by sector with the stakeholders as members including Subject Matter Specialists (SMSs) from extension programmes.

4. Government should set up powerful V-SATs and pay for adequate size of bandwidth in all federal and state tertiary institutions including agricultural research institutes to accelerate the dissemination educational and agricultural information to farmers.

5. Measures must be taken to make ICTs affordable, accessible and easy to use by educating major stakeholders and extension personnel through extension education for farmers and national seminars/workshops for extension officers.

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