

Information Technology Literacy as Determinants of ICT Adoption by Cocoa Farmers in Ondo State, Nigeria

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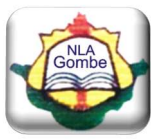
Abstract

Information Communication Technology (ICT) plays significant role in agricultural development by making information available at a cost-effective rate, providing access to global best practices and enhancing productivity. However, observation has shown that Nigerian farmers exhibit low level of ICT adoption and use, particularly in Ondo State. This is possibly due to farmers' level of Information Technology Literacy (ITL) Hence, this study investigated Information Technology Literacy, as determinant of ICT adoption and use by cocoa farmers in Ondo State. This study adopted the survey research design. The population of the study consisted of 1478 cocoa farmers in Ondo State. A stratified random sampling technique was used to select 443 cocoa farmers for the study. A self-structured, validated and reliable questionnaire was used for data collection with a response rate of 91.65%. Data were analysed using descriptive statistics, Pearson correlation and regression. The study concluded that information technology literacy influenced ICT adoption by cocoa farmers in Ondo State, Nigeria. It was therefore recommended that the government through her agencies, in collaboration with cocoa farmers association, should deploy the use of ICT such as radio and mobile phone in services delivery to the farmers, especially, in the areas of information dissemination and to organize training/seminars on ICT use for farmers to improve ICT adoption by cocoa farmers in Ondo State, Nigeria.

Keywords: Cocoa Farmers, ICT Adoption, Information Technology Literacy, Nigeria

Background of the Study

The potential benefits of ICT which include availability, low cost, large geographical coverage, ease of use and speedy dissemination of information among others may be responsible for the increase in the adoption and use of ICT in all sectors of the economy. In agriculture, ICT has been adopted and used for various purposes including information dissemination, research, weather forecast and market survey. Thereby, suggesting ICT as a vital instrument for agricultural development across the world. The growing significance of ICT adoption and use in agriculture is partly due to its ability to make information available at a cost effective rate and the chance to use global best practice to carry out farming which in the long run enhances productivity. For instance, the increased adoption and use of mobile phones for agricultural information dissemination has boosted the level of awareness among farmers especially the illiterates and the semi-illiterates that are not versatile in the use of core computer technology.



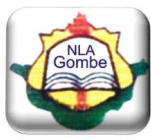
Radu (2016) defined adoption of ICT as the degree of acceptance of Information Technology (IT) and the decision of a group or individual to embrace an innovation, while IT use is the extent of its utilization to perform various actions such as communication, information retrieval, storage, analysis, programming and business. Adoption and usage of ICT are synonymous as Siamese twins. That is, there is no way one can use ICT without first adopting it. Beal and Bohlen (2015) stated that people adopt new ideas through a series of complex mental processes in which use is the final action. The processes involved in adopting and using new technology can be traced to the diffusion of technology theory which states that the process of communicating a new idea among the members of a community over time depend on perceived advantage, compatibility, ease of use, attitudinal change, decision making and economic advantage (Rogers, 1997). Perceived advantage which is the key determinant of acceptance means the user's subjective probability that using a specific technology will increase his or her job performance while perceived ease of use is the degree to which the user expects the target system to be free of effort.

Compatibility is the degree to which an innovation is perceived as being consistent with the values, past experiences and needs of potential adopters. An idea that is incompatible with the farmers' values, norms or practices will not be adopted or used as rapidly as an innovation that is compatible. Also, trialability is the degree to which an innovation can be experimented with on a limited basis. Farmers find it easier and are more willing to adopt and use technology that has been tried and tested by farmers elsewhere. Finally, positive experience in the use of technology by a set of farmers will affect positively other farmers' attitude which influences the actual adoption and further use. This means the ability of farmers to adopt and make use of ICT to access, process, store, disseminate, analyse and take decisions that will stand the test of time depends on these factors.

Information Technology Literacy (ITL) is key variable that may influence ICT adoption and use among a group of persons. For example, one has to be literate or well informed about an object before adoption and the consequent use. Information Technology Literacy is the ability of an individual, working independently or with others, to use Information Technology tools, resources, processes, and systems responsibly to access and evaluate information in any medium, and to use that information to solve problems, communicate clearly, and make informed decisions (Obayelu, 2013).

ITL deals with an understanding of the technology infrastructure that underpins much of today's life; an understanding of any technology provides better interaction with the infrastructure; and an understanding of the legal, social, economic and public policy issues that shape the development of the infrastructure and the applications and use of the technologies. Chukwunonso, Abubakar and Nkiru (2012) examined the level of ICT adoption and use in Agriculture in Adamawa State, Nigeria among farmers. It was observed that there was low level of ICT use among the respondents. It was further discovered that the use of ICT in agriculture was very poor and was cycled mostly around telephone or GSM usage. This could be well understood following that only one of the farmers examined made use of computers, and a very insignificant number made use of the Internet. The implication of this is that adoption of ICT for agricultural practices may suffer, so far ITL is low and this in the long run might affect the socio-economic development of that particular area.

In Nigeria, according to Arokoyo (2005), adopting the ICT innovations for cocoa farming is extremely important because uses and importance of ICT include increased access to relevant information for farmers on production, technology, weather, finance and marketing of farm products. Such information is instrumental in making important farming and marketing



decisions such as what species of cocoa to grow in the future and the best time and place to sell and buy them. Any relevant agricultural information which is driven by ICT can help farmers to make informed decisions about their farming enterprise, could potentially increase agricultural productivity and income. Cocoa farming or productions are strong component of Nigerian economic development strategies or policy plan. Cocoa was a major foreign exchange earner for Nigeria in the 1950s – 1970s. Then the Country was the second largest producer in the world, but following investments in the oil sector, the cocoa sector was neglected and since then revenue generation from the crop has been on the decline.

Ondo State is the leading producer of cocoa in Nigeria. According to Agency Reporter (2018), the Ondo State Government is aware of this and recently established about 2000 hectares modern cocoa plantation to boost cocoa production and revenue in the state. It was evident in the report that the main challenge of cocoa farming in Ondo State contemporarily is poor quality of seed which has made international marketers to underprice the product. This problem could be resolved through the use of ICT particularly the internet to source for high quality seedlings that could be grown in the state. Apart from this, ICT is also needed to advocate for the need to improve the quality of cocoa by individual, private organizations and government and to educate farmers more on the advantages of improved cocoa species.

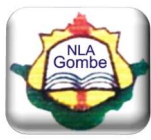
Statement of the Problem

Information and Communication Technologies (ICT) have positively revolutionised every profession nationally and globally and farming or agricultural practices is not an exemption. Its influence in agricultural practice is notably in the area of agricultural information dissemination. However, it appears Nigerian farmers exhibit low level of ICT adoption and use particularly in Ondo State, as they majorly and ineffectively make use of only mobile phone, radio and television, whereas more effective ones such as computers, multimedia, camera, database, projector, scanner, social media and Internet are being grossly underutilised (Olaniyi & Ismaila, 2016). Perhaps this could be due to low level of Information Technology Literacy skill. Also, limited work has been done relating ICT adoption by farmers being determined by Information Technology Literacy. It is based on this background that this study investigates Information Technology Literacy as determinant of ICT adoption and use by cocoa farmers in Ondo State, Nigeria.

Objective of the Study

The main objective of this study is to determine the influence of Information Technology Literacy (ITL) on Information and Communication Technologies (ICT) adoption and use by cocoa farmers in Ondo State, Nigeria. The specific objectives are to:

1. ascertain the level of Information Technology Literacy of cocoa farmers in Ondo State;
2. determine the extent of ICT adoption by cocoa farmers in Ondo State;
3. identify reasons for ICT adoption by cocoa farmers;
4. determine the extent of ICT use by cocoa farmers in Ondo State;
5. determine the influence of Information Technology Literacy on ICT adoption by cocoa farmers in Ondo State;
6. identify the challenges faced by cocoa farmers in the area of ICT adoption in Ondo State.



Research Questions

Based on the specific objectives, the study tries to address the following main research questions:

1. What is the level of Information Technology Literacy of cocoa farmers in Ondo State?
2. To what extent is ICT adopted by cocoa farmers in Ondo State?
3. What are the reasons for ICT adoption by cocoa farmers?
4. To what extent is ICT used by cocoa farmers in Ondo State?
5. What are the challenges faced by cocoa farmers by adopting ICT in Ondo State?

Hypothesis

The following null hypothesis were formulated for the study and tested at 0.05 level of significance:

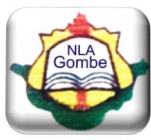
- Ho₁ Information technology literacy has no significant influence on ICT adoption by cocoa farmers in Ondo State.

Review of Literature

- Concept of Information and Communication Technology (ICT)

ICT is a general term for an increasing number of technologies, with corresponding opportunities for innovation. ICT is an enabler to understand issues such as can be changed and linked to the management and conservation of biodiversity. According to the United Nations Development Programme (2012), ICT include mobile telephones, community radios, television, video shows, information kiosks, farmer call-centers, Internet, web portals and video-conference. The strength of ICT as information and networking medium enables citizens to act as development agents, alerting decision makers to compliance infringements while leveraging on their power to reach and influence public opinion. ICT can contribute to human sustainability by providing public access information and means of participation by the public in decision making and information dissemination, (Nnadi, et al, 2010). ICT play a significant role in social and economic development in both developed and developing countries where interconnectivities and information flows can be established between communities and the more developed regions. In this context, ICT can be defined as tools that aid in the communication between people by capturing, processing, storing and communicating information electronically, as well as services and applications that assist in the management of information (Das, 2014).

ICT include electronic networks embodying complex hardware and software linked by a vast array of technical protocols (Anand, 2017). ICT cover internet service providers, telecommunications equipment and services, information technology equipment and services, media and broadcasting, libraries and documentation centers, commercial information providers, network – based information services and other related information and communication activities (Economic Commission for Africa (ECA), 1999) ICT encompass technologies that can process different kinds of information (voice, video, audio, text and data) and facilitate different forms of communications among human and information systems. They are about capturing, storing, processing, sharing, displaying, protecting and managing information, (Chowdhury, 2000 & Khattar, 2017).



Information and Communication Technologies in agriculture can be broadly classified into two groups namely; low and high equipment. Mechanism such as projectors, telephones, radio and television set are examples of low ICT (hardware). It also includes the associated software or materials such as films, slides, tapes, pictures, transparencies, radio and TV programme. High ICT consists of various means of obtaining and transferring information using computers and microelectronics (Ozor & Madukwe, 2004). Das, (2014) pointed out that whereas hardware refers to the physical equipment, software involves two components:

The technological know – how to operate, expand and maintain technology and the organisational skills needed for planning the structure to long term management of the technology.

Information and communication technologies can also be grouped into broadcast technology, print technologies and computer/ micro electronic technology. Print technology includes print media such as newspapers, magazines, bulletins, posters, calendars of work, newsletters, leaflets, pamphlets. Broadcast technology refers to the broadcast media such as radio, television, cinemas, media vans etc. The computer-based technologies and telecommunication include telephones, computer, fax, email, CD- Rom, Geographical Information System (GIS) and the internet.

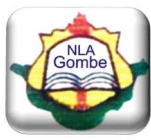
- Advantages of ICT

The adoption and use of ICT improves access to information, fosters effective communication, and improves process and market efficiency for organizations (Mustafa, 2015). Large and small organizations in developed and developing economies can rapidly become formidable competitors while using ICT to create competitive advantage and become market leaders (Elbeltagi et al., 2013). Organizations can use ICT as the means to facilitate strategic planning, future research, and business forecasting for both process efficiency and effectiveness (Agwu & Murray, 2015; Keller & Von der Gracht, 2014). Adopting ICT influences the flexibility of an organization, where companies whose leaders adopt ICT are more likely to perform better in the market and exhibit product or service differentiation (Tarutė & Gatautis, 2014).

Three of the basic characteristics of ICT are its pervasive nature as it spreads across economic sectors, its ability to improve over time and hence lower cost for users, and its ability to spawn innovation by facilitating research and development of new products, services, or processes (Mustafa, 2015). The adoption of ICT presents opportunities for organizational leaders to improve operational efficiency, reduce transaction cost, facilitate coordination between suppliers, expand market reach, and gain a competitive advantage in the global market (Mustafa, 2015). The adoption of ICT has had a positive effect on firms' productivity, directly and indirectly resulting in growth, profitability, employee and customer satisfaction, increased market value, and positive social and environmental impact (Tarutė & Gatautis, 2014).

- Types of ICT used in Agriculture

According to Das, B. (2014) ICT are tools that facilitate sharing information and foster communication. ICT include both new and traditional Information and Communication Technology although there is often an emphasis on the new personal computers, the internet, World Wide Web, mobile phones, satellite and wireless technologies. African ICT for development also encompasses traditional media including telephone, radio, television, print media (e.g. Newsletters, cartoons and graphics posters). ICT consists of three main technologies. These are: Computer Technology, Communication Technology and Information Management Technology. These technologies are applied for processing, exchanging,



managing data, information and knowledge. Murage (2011) notes that, ICT that are used to transfer agricultural information electronically in Kenya are the radio, television, internet, computers and mobile phones.

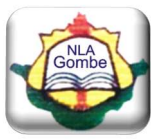
Telephone: Mobile phones are veritable ICT tool in agricultural development. By the end of 2011, there are over 6 billion mobile phone subscribers worldwide (Wireless Intelligence 2011). Mobile phone penetration in the developing world now exceeds two subscriptions for every three people, driven by expanding networks in Asia and in Africa. This is possible as a result of ability to purchase a low-cost mobile phone 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. In a research conducted by Olaifa et. al (2014) on the preferred source of information by farmers in Nigeria, the findings 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). Mugwisi, et al (2015) confirms that the mobile phones contributed to market expansion followed by fixed phone. The Global System of Mobile Communication (GSM) is ideal for rural areas, cheap to set up, easy to use, filling a vital need in Nigeria. Today most rural farmers have access to the GSM which has enabled a close interaction between them and development (Kumar, et al, 2017). Mobile phones may be useful in marketing agricultural product, getting information on prices of input, goods, weather updates, agricultural practices, animal health/husbandry. According to shepherd (2000), information made available to different markets reduces price differences across markets. The adoption of mobile phones by wholesalers in South India was associated with a dramatic reduction in price dispersion and near – perfect adherence to the law of one price (Jensen, 2007).

Radio and Television: These are electronic communication devices for reaching out to a large number of audiences simultaneously. Radio transmits mainly sound while the television transmits both sound and motion active which can be received over a wide area of geographical location through the radio box and television monitor. The sound and vision power of the television is useful in demonstrating technologies and video training (Omotayo, 2005). Community broadcast enables farmers to express themselves through a mass medium and gives a voice to the neglected farmers and the poor in general.

Computer: According to Omotayo (2005), computer encompasses input data logging, communication and digitized devices. The soft ware and operating system are essential part of the computer utilized by the central processing unit to fulfill its tasks. A computer is an essential ICT tool for marketers as it enables them to have proper record system (e.g. on Ms Excel) and using the record, they will be able to make proper market decision.

Internet services: The internet is a computer-based global information system (Kumar, 2017). It is composed of many interconnected computer networks. Each network may link tens, hundreds, or even thousands of computers, enabling them to share information and processing power. The Internet has made it possible for people all over the world to communicate with one another effectively, inexpensively and to have free access to useful data for further



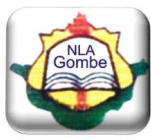
processing. The internet has caused a cultural revolution in the way individuals and organizations interact, in terms of time, cost, and distance and have enabled people access information on computer (Munyua, 2000). The internet may be used to have information on farming, check market prices, weather report and news, download forms and guides. Moreover, by using the internet, we can create a website where different kinds of information can be shared.

E-mail: According to Ugwu (2006), the e-mail is an internet based electronic substitute for the conventional post office. It provides opportunity for those people to interact with the outside world via internets. The e-mail is the most commonly used internet resource. The e-mail is similar to the traditional postal system except that the messages are exchanged via the use of computer networks and telecommunication systems. In other words, the e-mail is an internet resource in which messages are sent back and forth between individual users and organizations through an electronic medium. A user can send textual, vocal, pictorial and other multi-media information in digital forms to friends, peers, families, organizations and institutions. Ovbiagele (2006) defines e-mail as an electronic message sent from one computer to another. By e-mail, you can send or receive personal and business related messages with attachments like pictures or other documents. Basically, the e-mail is sent on a wide area network. It is a way of communicating via computer. Thus, identifying suitable ICT for a specific rural segment is of paramount importance. Knowledge and information are important factors for accelerating agricultural development by increasing agricultural production, improving marketing and distribution.

- Role of ICT in Agriculture

The role information and communication technologies (ICTs) can play in facilitating development has long been recognized (Aker & Mbiti, 2010; Jensen, 2007; Kelly & Minges, 2012; Lokanathan & De Silva, 2010; Steinfield & Wyche, 2013). Their dramatic proliferation across the developing world presents a unique opportunity to deliver high value information to places and people that could not be reached before. Prior to the 1990s, governments in the developing world used information technology mainly for internal administrative functions as well as facilitating the activities of multinational companies (Heeks, 2008). With the proliferation of the internet in the 1990s and the establishment of the Millennium Development Goals (MDGs), ICTs began to be looked at as a delivery mechanism of development and hence the rise of Information Communication Technologies for Developing (ICTD). International organizations and nonprofits were at the forefront of applying ICTs to the MDGs. Considering both the need to concentrate in rural areas where poverty persisted and the lack of infrastructure, the application of ICTs in this period involved the establishment of small community computer centers, called “tele-cottages” or “telecenters,” because they could be fairly quickly installed and easily provided tangible evidence of the organizations’ and nonprofits’ efforts. Heeks notes that a number of these colorfully named telecenters were set up in Colombia, India, Mali and many other places in the developing world. He states, however, that these efforts often resulted in failure as they were neither scalable nor sustainable, and positive reports of their impact were based largely on anecdotal evidence. This period of ICTD work was termed as ICTD 1.0. (Heeks, 2008).

Heeks notes that the period since 2000 marked yet another era of ICTD work which he termed ICTD 2.0. (Heeks, 2008). This era is characterized by the emergence of new wireless communications and devices marked by the explosive growth of mobile subscriptions in the developing world (Steinfield & Wyche, 2013). Today, there are approximately 6.9 billion SIM



connections among a global population of 7 billion people (GSMA, 2014). More than 5 billion of these connections are in the developing world where the main source of income and employment comes from agriculture. This dramatic increase has seen mobile phone technology emerge as the primary means to deliver information and services to the developing world (Steinfeld & Wyche, 2013).

Because agriculture plays a critical role in the economies of many developing economies (World Bank, 2012), most ICTD projects target this sector, especially smallholder farmers (Steinfeld & Wyche, 2013). According to the Food and Agriculture Organization, smallholder farmers produce over 70 percent of the world's food needs (FAO, 2013). Consequently, a myriad of ICTD projects target smallholders, offering advisory and extension services, market information, weather alerts, mobile payments, trader-buyer matching, and many others (Steinfeld & Wyche, 2013) (see Table for a summary of existing mobile-based agricultural services). Rural areas have been labeled as "information-poor," and provision of information has been a major goal of most development initiatives (Chapman & Slaymaker, 2002). As a result, most ICT services aim to provide the rural poor, most of whom are farmers, with access to information vital to their lives and livelihoods. Traditional extension systems responsible for providing this important information have not been sufficiently effective considering the amount of funding that has been invested. For instance, Aker (2011) reports that a previous review of public extension systems worldwide found that they were barely functioning. She also acknowledges the high cost of obtaining information through traditional means such as radio, newspapers and travel as important significant barriers to technology adoption in the developing world. In the same vein, Nakasone, Torero, and Minten (2014) state that farmers face both high transaction costs and constraints to information access which limit their optimal production. With the rapid technological changes coupled with issues of climate change, farmers more than ever need accurate and reliable information to make effective farming decisions. Their information needs at every stage of the agricultural-cycle need to be met consistently if they are to cope with the emerging challenges.

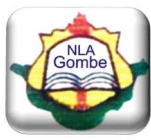
By examining early and current ICTD efforts, we see an apparent shift away from the use of more centralized approaches, such as the use of telecenters, to current efforts that rely significantly on more decentralized approaches, such as mobile phones, to deliver information into the hands of farmers. This shift is largely driven by the proliferation of mobile phones in the developing world, and the rapid expansion of associated infrastructure at relatively low cost that has made mobile phones more affordable. Their near ubiquitous presence and their potential benefits, present a unique opportunity that if well leveraged, could significantly improve the transfer of knowledge and information and thus improve the adoption of technology and facilitate agricultural development.

Methodology

The study employed a survey research design which involved a one-time interaction with individual farmers in the study area. The study's population comprised all the 1478 farmers in five dominant cocoa producing Local Government Areas (LGAs) in Ondo State, namely: Idanre, Ondo East, Odigbo, Owo, and Ile Oluji/Okeigbo. Stratified random sampling technique is used to select 30% of the total number of the cocoa farmers from each of the Local Governments. The study's sample size is therefore 443. This is shown in Table 1. One structured questionnaire designed by the researcher is used in this study.

Table 1: Population and Sample Size

S/N	Local Government	Population of Farmers	Sample Size of Farmers (30%)
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1	Idanre	321	96
2	Ondo East	270	81
3	Odigbo	274	82
4	Owo	257	77
5	Ile-Oluji/Okeigbo	356	107
	Total	1478	443

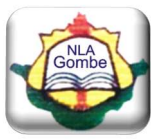
Source: Membership Register Cocoa Farmers Association, Ondo State (2016)

Discussion of Findings

On the Level of information technology literacy of cocoa farmers, the findings revealed that the farmers are at the beginners level of information technology literacy in terms of task definition, access, evaluate, manage, integrate, create and communication. This is in tandem with the findings of Terngu, Imbur and Iortima (2012) and Chukwunonso, Abubakar and Nkiru (2012) who discovered that the level of Information Technology Literacy among farmers was low in Benue and Adamawa States, Nigeria. This, in agreement with the findings of Mahapatra and Lai (2015) implies that Cocoa farmers possess insufficient knowledge in the areas of ability to define, access, evaluate, manage, integrate, create and communicate information effectively. By extension, this may hamper how the farmers source for information and may not be able to interpret information to the best of promoting cocoa farming in the Country. The Ministry of Agriculture both at state and national level should be able to view this as a challenge and synergize with the National Orientation Agency towards organizing workshops and other orientation inclined programmes that will expand the literacy of cocoa farmers in respect of Information Technology. This equally means that Agricultural extension officers should be well informed on IT so as to be able to deliver effectively when the needs arise.

In respect to the extent of ICT adoption by cocoa farmers, findings revealed that that ICT adoption (in terms of perceived advantage, compatibility, ease of use, triability and additional change) by cocoa farmers in Ondo State was to some extent moderate. That is, adoption of ICT was not too low or too high. This is contrary to the findings of Mwangi and Kariuki (2015) who stated that usage of ICT by cocoa farmers in mainly rural areas was low. Adams and Ajao (2016) assessed adoption of ICT among Ondo cocoa farmers and also, found that 24.77% of the sampled farmers adopted ICT such as telephones, Internet, radio, television and camera for farming activities. Though, it is evident that ICTs are now being used by farmers to disseminate farming activities even since low adoption had been reported by previous authors, Jain, Kumar and Singla, (2015), Khattar, M. L. (2017), the recent finding of moderate adoption implies that cocoa farmers are likely to have improved on their adoption of ICTs. This implies that more activities are still expected of the agricultural agencies and extension officers in the areas of introducing new ICTs that could enhance farming activities. Not only this, there should be practical demonstrations of how to apply these ICTs and reports from adoption over time should be evaluated and built upon.

On reasons for ICT adoption by cocoa farmers, findings revealed that ICT enables ease of communication, enhances productivity, makes farming operations simple, enhances income, provides storage capability, fast, enhances decision making and it is accurate. These were among the reasons why ICT is adopted by cocoa farmers in Ondo state. This corroborate the discovery of Oluwatayo (2014) who found that the main reason of ICTs adoption by farmers was that they can strengthen participatory communication between the research extension and farmer, and also be used to transfer and exchange information and knowledge among all stakeholders in the agricultural sector. Still on ease of communication, Nikbakhsh (2011) observed that, ICT increase interaction among the actors in agriculture as they facilitate

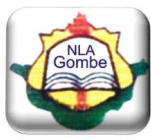


collaboration and knowledge exchange nationally, regionally and globally. At the local level, they connect rural people to sources of information. In this way, they empower individuals, groups and communities to effectively access, share and use agricultural knowledge. The use of ICT based agricultural extension can enhance the provision of extension services to farmers since information can be easily relayed to many farmers at the appropriate time and places enabling them make informed decisions about their farming business. Oladele (2015) also added that ICT bring about considerable income increase which reduces poverty amongst rural farmers and facilitate job creation. According to him, ICT also improve farmers' decision making. Since ICTs are very relevant to all professions no matter how crude or neat, it implies that the advantages or reasons that propel ICT adoption among cocoa farmers cannot be overemphasized. Consequently, cocoa farmers should embrace ICT whole heartedly; seek more knowledge about it so that it can help them to take their farming business to high level as it exists in developed nations.

Findings on extent of ICT use by cocoa farmers showed that the use of ICTs such as cameras, internet, laptop computers, desktop computers and scanners was to a low extent. However, radio and mobile phones were to a high extent used. This is in line with the findings of Adams and Ajao (2016) who found that ICTs are now being used by farmers to disseminate farming activities even though it is on a low scale. However, according to Ajani (2014), ICTs was found to at high extent strengthen the capacities of rural farmers, farming organizations and rural communities as a whole, become a cornerstone of agricultural development in contemporary times as they can increase the efficiency, productivity and sustainability of agricultural sector. ICT use in developed nations is important as it provides income and food for a large segment of the population in developing countries. As equally observed by Khattar (2017), ICT play a key role in providing extension personnel and rural people with information needed for their works which includes crop production, farm credit, input supply, pest and disease control, post-harvest techniques and improvement of market access. Therefore, since this study found that IT has a low level of use among cocoa farmers, it infers that taken into cognizance all the benefits of use as earlier explained, there is urgent need by farmers in Ondo State to start using ICTs so as to increase output. As part of incentives special recognition and ICT subsidy should be given to cocoa farmers so as to boost ICT use. Though ICT adoption has been reported moderate in this study, this has not transcended to use and therefore call for pragmatic and proactive approach.

Additionally, findings showed that the challenges of ICT adoption and use by cocoa farmers in Ondo State include: unavailability of ICT infrastructure, poor network, inadequate knowledge of ICTs, poor ICT accessibility and inexperience. To corroborate this, Albert (2014) declared that a major constraint to effective use of ICT among farmers is unavailability of ICT infrastructure. In the same vein, Salau et al. (2008) found that poor access to ICT was a major constraint to utilization of ICT among farmers in Nasarawa State of Nigeria. Ndag *et al.* (2008), found that poor network and computer inexperience were significant banes of ICT use in agriculture. Also, according to them inadequate skill as a result of lack of ICT training was a big barrier to adoption and use of ICT. This challenge implies that optimum productivity may not be gotten from cocoa production if they are not promptly addressed. There is need for government to ensure that ICT infrastructures are readily available and the prices are affordable by farmers. Besides agricultural extension officers should be at alert to train farmers, evaluate their activities and retrain them.

On relationship of information technology literacy on ICT adoption by cocoa farmers, findings from Table 2 revealed that there is a significant positive relationship between information technology and ICT adoption by cocoa farmers in Ondo State. This was evident as information



technology literacy's indicators such as task definition, access, evaluate, manage, integrate, create and communications used in this study proved to be of positive significant influence on ICT adoption by the cocoa farmers. This is in tandem with the findings of Terngu, Imbur and Iortima (2012) in Benue State, who found that the level of technology literacy was significantly related to adoption of radio, television and Internet. As a matter of fact if one is not literate in a specific area, he cannot thrive on it. By implication, and as supported by findings of Asongu & Le Roux, (2016), it is clear that Information Technology Literacy influences ICT adoption among cocoa farmers because the ability to define, access, evaluate, manage, integrate, create and communicate information effectively is central to adoption of ICTs. Therefore, agricultural extension officers should be more proactive by engaging cocoa farmers, especially the illiterates among them on the adoption of Information Technologies. They should be well monitored evaluated and encouraged so that high productivity could be recorded in the long run.

Hypothesis Testing: *There is no significant relationship between information technology literacy and ICT adoption by cocoa farmers in Ondo State.* In order to determine significant relationship between information technology literacy and IT adoption by cocoa farmers in Ondo State, the Pearson's correlation method was used. The statistics is presented in Table 2.

Table 2: Correlation showing the relationship between Information Technology Literacy on ICT adoption by cocoa in Ondo State

Group	N	Mean	Std. Dev.	r-cal	Df	Sig. P	Remark
<i>Information Technology Literacy</i>	406	55.16	19.628	.835**	405	0.00	<i>Significant</i>
<i>Information Technology Adoption</i>	406	54.55	27.382				

Correlation is significant at the 0.05 level

Table 2 shows that there is significant positive relationship between Socio-Economic Status and IT use by cocoa farmers in Ondo State ($r = .835^{**}$; $p < 0.05$). This implies that, as the level of information technology literacy among cocoa farmers in Ondo State improves, there would also be an improvement in the adoption of IT by the cocoa farmers.

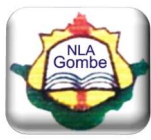
Conclusion

The study concludes that information technology literacy influenced ICT adoption by cocoa farmers in Ondo State, Nigeria. Low level of information technology literacy was found in this study. The adoption of ICT was to some extent, albeit, the level of ICT use by cocoa farmers in Ondo State, Nigeria, was found to be low in this study. Therefore, information technology literacy is a key determinant of ICT adoption by cocoa farmers in Ondo State, Nigeria.

Recommendations

In view of the findings of the study, the following recommendations are hereby made:

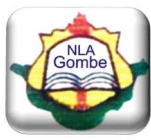
1. To improve the level of ICT adoption and use by cocoa farmers; the Ondo State government through her agencies such as the Ministry of Agriculture should deploy the use ICTs such as radios and mobile phones in services delivery to the farmers especially in the areas of information dissemination, training, and product promotion/marketing/standardization.
2. The Ondo State government in collaboration with cocoa farmers association can in the short run improve the level of information technology literacy of cocoa farmers through seminars/training of cocoa farmers in the use of ICTs, such as computers, internet,



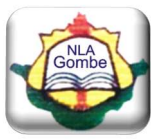
- cameras, among others in cocoa related activities and in the long run introduced ICTs into curriculum of basic education since most of the farmers had basic education.
3. The Ondo State government should provide and maintain ICT infrastructures such as Internet services, social media platform for communication, and a customized computer devices for services delivery, that would encouraged and promote the adoption and use of ICTs by cocoa farmers.
 4. Considering the diffusion of mobile phones with the attendant benefits such as ease of use and relatively cost benefit. Government and Extension Officers should leverage on the advantage of mobile phone as a tool for information dissemination to farmers. This will go a long way to boost Cocoa farming in the State.

References

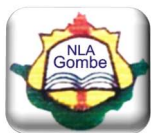
- Adams, O. K. & Ajao, Q. (2016) Assessment of the relevance and utilisation of ICT in increasing production among Cocoa Farmers in Ondo State Nigeria. *International Journal of Scientific and Engineering Research* 7, (11) www.ijer.org
- Ajani, E. N. (2014). Promoting the use of Information and Communication Technologies (ICTs) for agricultural transformation in sub-saharan Africa: Implications for policy. *Journal of Agricultural and Food Information* 15(1), 42–53. Doi: 10.1080/10496505.2013.858049
- Aker, A. & Marce, J (2015). Does digital divide or provide? Impacts of cell phones on grain markets in Niger, Working Paper Number 154, *Centre for Global Development, Washington, USA*. [<http://www.cgdev.org/content/detail/894410>] site visited on 8/12/2018.
- Aker, Jenny, C. (2011). Dial ‘A’ for Agriculture: a review of Information and Communication Technologies for agricultural extension in developing countries. *Agricultural Economics* 42(6), 631–47.
- Albert, C. O. (2014) Constraints to effective use of ICT among extension professional and farmers in extension delivery in Rivers State, Nigeria. *Singaporean Journal of Business Economics, and Management Studies*, 2 (11), 136-142.
- Anand, T. (2017). Agriculture sector a must for GDP growth, Retrieved from <http://www.thehansindia.com/posts/index/Hans/2017-04-03/Agriculture-sector-a-must-for-GDP-growth/290889> (accessed on 08 March 2018)
- Arokoyo, T. (2005). ICTs Application in agricultural extension service delivery: In Adedoyin F.S. (ed) *Agricultural Extension in Nigeria*. AESON, Illorin, Nigeria 245-250.
- Asongu, S. A. & Le Roux, S. (2016). Enhancing ICT for inclusive human development in Sub Saharan Africa. *African Governance Development Institute working paper*, 1- 25
- Asongu, S. A. (2015). Conditional determinants of mobile phones penetration and mobile banking in Sub-Saharan Africa, *Journal of the Knowledge Economy*.<http://link.springer.com/article/10.1007%2Fs13132-015-0322-z>
- Beal, George, M & Bohlen, Joe M. (1957). The diffusion process (PDF). *Special Report No. 18. Agriculture Extension Service, Iowa State College*. I: 56–77.



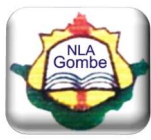
- Chapman, A. & Slaymaker, T. (2002) ICTs and rural development. Review of literature, current interventions and opportunities for action. Working paper 192, *Overseas Development Institute* (ODI) London, U.K. 1-36.
- Das, B. (2014). ICTs adoption for accessing agricultural information: Evidence from Indian agriculture, *Agricultural Economics Research Review*, 27, 2, 199-208.
- Davis, F. D. (1989). Perceived usefulness, ease of use, and user acceptance of information technology. *MIS Quarterly* 13: 319-340.
- Devadson, F.J & Lingam, P.P (1996). 62 IFLA general conference proceedings: A methodology for identification of information needs of users, Available at <http://www.ifla.org/iv/ifla62/62-devf.html>.
- Heeks, R. (2009). The ICT4D 2.0 Manifesto: Where next for ICTs and international development? *The University of Manchester Working paper*. 42
- Internet World Statistics (2012). *Internet World Stats News*, No. 069
- Jain, L. Kumar, H. & Singla, R. K. (2015). Assessing mobile technology usage for knowledge dissemination among farmers in Punjab, *Information Technology for Development*, 21,4, 668-676
- Jain, R., Ahuja, U. R. & Kumar, A. (2012). ICTs and farm women: Access, use and impact, *Ind. Jn. of Agri. Econ.*, 67 3, 385-394.
- Jensen, R. (2007). The Digital Provide: Information (Technology), market performance, and welfare in the South Indian Fisheries Sector. *Quarterly Journal of Economics*, 122(3):879-924.
- Khattar, M. L. (2017), Haryana government adopting best farm technologies to make agriculture profitable. Retrieved from <http://www.uniindia.com/haryana-govt-adopting-best-farm-technologies-to-make-agriculture-profitablekhattar/states/news/1043451.html> (accessed on 08 March 2018).
- Khattar, M. L. (2017)), Availability of Information and Communication Technologies (ICTs) tools usages by Farmers in Haryana, *Int. J. Pure App. Biosci.*, 5, 3, 648–653.
- Majanja, M. & Kiplagat, J. (2005): *The Diffusion of Innovations Theory as a Theoretical Framework in Library and Information Science Research*.
- Malhotra, N.K. (2010). Marketing research: an applied orientation. 6th ed. New Jersey: Prentice Hall Inc.
- Mugenda, O. & Mugenda, A. (2003). Research methods; Quantitative and Qualitative approaches; Nairobi, *African Center for Technology Studies* (ACTS).
- Mugwisi, T., Mostert, J. & Ocholla, D. N. (2015). Information technology for development access to and utilization of Information and Communication Technologies by agricultural researchers and extension workers in Zimbabwe, *Information Technology for Development*, 21, 1, 67–84



- Mulugeta Enki (2000). Determinants of adoption of soil conservation practices in Central Highlands of Ethiopia. The Case of three Districts of Selale. M.Sc. Thesis (unpublished). School of Graduate Studies of Alemaya University: Alemaya.
- Munyua, H. (2000). Information and Communication Technologies for rural development and food security: Lessons from field experiences in developing countries. Sustainable Development Department (SD), Food and Agriculture Organization (FAO) of the United Nations. Retrieved on 7th August from <http://www.fao.org/sd/CDdirect/CDre0055b.htm>
- Murage, A. W. (2011). Efficiency and effectiveness of dissemination pathways: A case study of push-pull technology for stem borers and Striga Weeds control in western Kenya. *SNAR Discussion Paper* 6.
- Mustonen-Ollila, E. & K. Lyytinen, (2003). Why organisations adopt information system process innovations: a longitudinal study using diffusion of innovation theory, *Information Systems Journal*, 13(3): 27597
- Mutula, S. (2005). Bridging the digital divide through e-governance: A project for Africa's Libraries and Information Centres. *Emerald Journal*, 23(5), 591-602.
- Mwakaje, A.G. (2010). Information and Communication Technology for rural farmers' market access in Tanzania. *Journal of Information Technology*, 12, 45-52
- Mwangi, M.N., Ngigi, M. & Mulinge, W. (2015). Gender and age analysis on factors influencing output market access by smallholder farmers in Machakos County, Kenya Department of Agricultural Economics and Agribusiness Management, Egerton University Kenya, *African Journal of Agricultural Research*, 10 (40), 11
- Mwangi, M. & Kariuki, S. (2015). Factors determining adoption of new Agricultural technology by smallholder farmers" in developing countries. Department of AGEC/ AGBM, Egerton, Kenya, *Journal of Economics and Sustainable Development* www.iiste.org/ ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online) 6, 5
- Mwesige, P. G. (2015). Cyber elites: a survey of internet Cafe users in Uganda. *Telematics & Informatics*, 21, 83-101.
- Ndag, I, Sanusi, R. A, & Aigbekaen, E. O (2008). Comparative analysis of information communication Technology (ICT) use by agricultural extension workers in South-west and North-central Nigeria. Proceedings of the 19th Annual *International Information Management Association*. 35-40
- Nikbakhsh, A. (2011). The role of Information and Communication Technologies (ICT) in improving agriculture. *Nature and Science*, 9 (8), 10-14.
- Nnadi, F.N., Chikaire, J., Ejiogu-Okereke, N. & Nwakwasi, R. N. (2010). Information and Communication Technology (ICT) for food production and distribution. Proceedings of the 44th Annual Conferences of *Agriculture Society of Nigeria* Held at Ladoko Akintola University of Technology, Oyo State. 18th-22nd October.
- Obayelu, A. E. (2013). Households' food security status and its determinants in the North-Central Nigeria. *Food Econ* 9:241–256



- Oladele, O. (2015). Multilinguality of farm broadcast and agricultural information Access in Nigeria. *Nordic Journal of Africa Studies* 15(2): 199-205, Available at <http://www.njas.helsinki.fi/pdf-files/vol15num2/oladele5.pdf>
- Oladele, O. I. (2015). Effect of Information Communication Technology (ICT) on agricultural information access among extension officers in North West Province South Africa, *South African Journal Agriculture Extension*, 43 (2), 1-5
- Olaifa, Taye Paul, Abdulsalam, A., & Frederick, A. (2014). Utilization of ICT for Information Dissemination to Farmers in Nigeria: A Case Study of Kwara State Cassava Growers Association. *IJBAS*, 3(4), 127–132.
- Olaniyi, O. A. & Ismaila, O. K. (2016) ICTs usage and household food security status of maize crop farmers in Ondo. www.digitalcommons.edu
- Oluwatayo, Isaac B. (2014). Information and Communication Technologies as Drivers of Growth: Experience from Selected Small-Scale Businesses in Rural Southwest Nigeria. *Spanish Journal of Rural Development* 5(2):65–76. Doi: 10.5261/2014.
- Omotayo, O. M. (2005). ICT and agricultural Extension: Emerging Issues in transferring agricultural technology in developing countries, In: Adedoyin SF, editor. *Agricultural extension in Nigeria*, Ilorin: *AESON 12*, 341-350
- Ozor, N. & Madukwe, M. (2004). Role of Information Communication Technology (ICT) in agricultural development. The Nigerian agricultural extension services. Retrieved on 8th, July 2009 from <http://www.imformaworld.com/index/769987001.pdf>
- Radu, L. D. (2016). Determinants of Green ICT Adoption in Organizations: A Theoretical Perspective. *Sustainability*, 8, 731.
- Rogers, Everett M. (2010). *Diffusion of innovations*. Simon and Schuster. Sevilla, Luis Eduardo. 2013. "Social networks and the exchange economy in rural Mozambique: A study of off-farm labor and crop marketing behaviors." PhD dissertation, Department of Agricultural Economics, Sociology, and Education, *The Pennsylvania State University*, University Park, PA.
- Rogers, E.M., 1995. *Diffusion of Innovations*, New York: *Free Press*
- Salau, E. S., Lawee, A. Y., & Bello, D. (2014). Adoption of improved fisheries technologies by fish farmers in southern agricultural zone of Nasarawa State, Nigeria. *Journal of Agricultural Extension and Rural Development*, 6(11), 339-346.
- Saloner, G & Shepard, A. (1995). Adoption of technologies with network effects: an empirical Examination of adoption of automated machines" *RAND Journal of economics* 26(3), 479-501
- Terngu, I. & Iortima (2012). Adoption of ICT as source of information on agricultural innovations among farm households in Nigeria: Evidence from Benue State *International Journal of Development and Sustainability*, 1,3, 924 – 931
- Ugwu, O. O, Kumaraswamy M. M., Ng T & Lee P. K. (2006). *Information & Communications Technology (ICT) Applications in Construction*, Report of Surveys on ICT



Applications, Benchmarks, Benefits, Costs, Barriers & Enablers, and Research & Development. *Issues in the HKSAR Construction Industry*, CICID HKU, ISBN

United Nations Development Programme (2013). *Promoting ICT based Agricultural Knowledge Management to Increase Production and Productivity of Smallholder Farmers in Ethiopia*. United Nations Development Programme, Ethiopia.

Voogt, J. & Knezek G. (2008). *International Handbook of Information Technology*. (eds.) 579–596. New York: Springer; 2008.

Wireless Intelligence (2011). Mobile operator group global ranking by connections, Q2 2011, GSMA Intelligence, company reports <https://www.gsmaintelligence.com/research/2011/10/new-scoreboard-ranks-top-20-global-operator-groups-by-mobile-connections/306/>

World Bank Group, FAO & IFAD, (2015). *Gender in Climate-Smart Agriculture Module 18 for Gender in Agriculture Sourcebook*; World Bank Group and the Food and Agriculture Organization of the United Nations and the International Fund for Agricultural Development

World Bank (2017). Mozambique. Retrieved August 24, 2017 (http://data.worldbank.org/country/mozambique#cp_wdi on 11-23-2015)

World Bank (2015). *Enhancing Agricultural Innovation: How to Go Beyond the Strengthening of Research Systems*, Agriculture and Rural Development.

Yang, K. C. C. (2005). Exploring factors affecting the adoption of mobile commerce in Singapore“, *Telematics and Informatics*, 22, 257–277, available on line at: www.sciencedirect.com, accessed on 5th August 2011, from: <http://www.jnu.edu.cn>

Yishak, Gecho (2005). *Determinants of Adoption of improved Maize, Technology in Damote Gale Woreda, Wolaita, Ethiopia*. Msc. Thesis (Unpublished) Presented to *School of Graduate Study of Alemaya University*.