**ASSESSING THE USE OF ICT IN AGRICULTURAL EXTENSION SERVICE DELIVERY IN CROSS RIVER STATE, NIGERIA.**

**BY**

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**(19PGAB000042)**

**August, 2022**

**DECLARATION**

I, STEPHEN OTU ETTA-OYONG, a Master student in the Department of Agricultural Extension and Rural Development, Landmark University, Omu-Aran, hereby declare that this thesis entitled “Assessing the use of ICT in Agricultural extension service delivery in Cross River State, submitted by me is based on my original work. Any material(s) obtained from other sources or work done by any other persons or institutions have been duly acknowledged.

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Student’s Full Name and Matriculation number

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Signature & Date

**CERTIFICATION**

This is to certify that this thesis has been read and approved as meeting the requirements of the Department of Agricultural extension and Rural Development, Landmark University, Omu-Aran, Kwara state, Nigeria, for the award of a Master Degree in Agricultural Extension and Rural Development.

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**Abstract**

*Dearth of extension agents due to lack of employment, poor funding, understaffing and the consistent use of the conventional extension system are presiding issues facing the extension service organizations in Nigeria and Cross river state agricultural development programme (CRADP) is not an exception. This study therefore sought to assess the use of ICT in extension service delivery in Cross river state, Nigeria. The analysis was based on primary data collection using a set of structured questionnaire personally administered to 64 extension agents who were selected through a census sampling technique that constituted all members of the population due to the limited number of extension agents in the a Cross river state. The mean age of the respondent was 51years with 59.5% within the age bracket of 51years and above. 75.0% of them had tertiary education and majority (M =28.1) of the extension agents have gained professional experience of over 21years and above; most of the ICT tools used were personally owned by the agents such as smart phones (M=71.9), Memory card (M=75.0), Television (M= 71.9), Radio (M=68.8), Laptop (M=54.7) and DVD (M=43.8). The commonly used ICT tools were; Radio, laptop and memory card with a uniform mean score of (M=1.4) followed by television, video camera and tablet with GPS also with a uniform mean score of (M=1.3). Inviting farmers for meeting (M= 65.7), Creating awareness about innovations (M=47), (42.3%) and link farmers with input dealers using ICT tools (M=42.2) were the predominant activities for which ICT tools were used. Majority (M=67.2) used smart phone, public address system, desktop computers and memory card “very frequently”. High cost of getting ICT gadget (M=2.9), poor rural infrastructure (M=2.7), Inadequate ICT gadget in extension organization, illiteracy of farmers and poor signals and network in rural settings with a uniform mean of (M=2.6) were considered constraint hindering ICT use in extension service delivery. Marital status (X2 =7.239; P<0.05) had significant relationship with the use of ICT by extension agents which implies that as more extension agents get married, the use of ICTs increase, which means marital status positively influence the use of ICT tools.*

**Key words:** ICT, Extension agents, Extension services

**DEDICATION**

This research is dedicated to God Almighty for his loving kindness, peace, good health granted unto me over the years. I also dedicate it to the entire Etta-Oyong’s family.

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**CHAPTER ONE**

1. **INTRODUCTION**
   1. **Background of study**

Agriculture is the pivot around which most African countries' economies revolve. It is the primary source of employment and income for a large portion of the population, contributes to the gross domestic product, and is necessary for the production of value and wealth (Kolawole, Isitor, & Owolabi, 2016). The sector is known to be one of the largest in the Nigerian economy, accounting for approximately 30% to 40% of the gross domestic product between 2000 and 2010, as well as being a major employer of labor. It is dominated by small-scale farmers who live in rural areas and participate in agricultural operations mostly for sustenance and to a lesser extent for commercial purposes. (Ekerete & Ekanem, 2015).

Agriculture is incorporated into extension as a service that aids rural farmers improve agricultural methods and techniques, upsurge production competence and revenue, improve their quality of life, and raise social and educational standards in rural areas (Balasubramanian, 2019). It major stakeholders are farmers, farmers’ organizations, extension organizations, NGOs, educational institutions, research institutions, private companies, markets, and policymakers who play the roles of informing service providers of what inputs are appropriate and needed in affected areas of farmers communities and which of this input could be locally sourced (Van Loon, Woltering, Krupnik, Baudron, Boa, & Govaerts, 2020).

Historically, extension service operates in the conventional ways of using the training and visit (T & V) system, farmer field school, to reach out to farmers as these system entails that an extension agent have the primary responsibility of linking up with researchers to acquire knowledge and disseminate it to farmers through training on the farm on regular and continuous basis (Baloch, & Thapa, 2019). Despite the effort, resources, and modifications, the extension system is still practiced unsystematically in many region of the federation due to challenges such as lack of staff, insurgency, banditry, communal conflict, no means transportation, increase in transportation costs, failure of farmers being available for contact with extension agents, farmers disappointment to be present at meetings, language barriers, and inability to cover the recommended agent-to-farmer ratio, among others (Mbagwu, 2021).

As previously stated, the T&V system's limitations have some repercussions on the Nigerian extension system, as a decline in the frequency of regular training for extension personnel or the inability to provide such trainings means that employees may lack the skills and expertise to teach farmers (Suvedi, Ghimire, & Kaplowitz, 2017). In the same vein, there is a drastically reduction of extension worker in most of the ADPs, around different states of the federation prior to numerous reasons, distinguished amongst which is poor funding to pay salaries and provide logistics, however, leveraging on Information and Communication Technologies (ICT) offers great opportunity in mitigating most of the setbacks. Using ICTs, agricultural outreach can reach a larger number of farmers, resource and capacity issues can be solved, information flow is improved, people in rural areas are better connected, questions about farm issues can be answered with the benefit of receiving feedback over the phone, and market prices and weather forecasts can be obtained (Perez, Neubauer, Marshall, Philip, Miguel-Cruz, & Liu, 2022).

More so, from the time when there was an outbreak of the new coronavirus in country, rural farmers faced the challenge of accessing timely agricultural extension services for sustaining their livelihoods due to movement restrictions and social distance regulations. These control measures have limited agricultural extension agents face-to -face contact with rural farmers who may require extension services; as a result, the food security and well- being status of these farmers may be threaten (Bidemi, 2020). The use of ICTs offers a possible alternative to mitigate disruptions in domestic food supply chains, especially in crisis times, such as the pandemic.

* 1. Recognizing the significance, agricultural extension personnel can make use of different ICT tools to disseminating appropriate and timely information to rural residents about better agricultural innovation in order to boost agricultural production and income (Okello, Feleke, Gathungu, Owuor, & Ayuya, 2020). It can be used to assist farmers in communicating effectively, overcoming time and space constraints, and empowering farmers by providing information and knowledge, earning and learning opportunities, boosting government accountability, improving competency, and allowing citizens to voice their concerns and participate actively in decision-making processes (Ekerete *et. al.,* 2015).**STATEMENT OF THE PROBLEM**

Dearth of extension agents due to embargo on employment, poor funding, conflict or insecurity in the country are presiding issues facing the extension service organizations in Nigeria and the cross river state agricultural development programme is not an exception (Camillone, Duiker, Bruns, Onyibe & Omotayo, 2020).

The use of conventional communication channels such as farm/home visit, personal letters, and use of contact farmers, for disseminating agricultural information as entrenched in the T and V extension approach is becoming less effective due to problems of inadequate funding, untimely or late disbursement of funds by the government for implementing Agricultural extension policies after the withdrawal of the World Bank funding (Ajayi, Alabi, & Akinsola, 2013).

Furthermore, in a study conducted by the National Agricultural Extension Service (NAES) on the Agricultural Performance Report (APR) 2017/2018, they reported that there are 14,000 farm extension workers in Nigeria with a ratio of one extension agent to 10,000 farmers (Olugbenga, 2020). This is similar to (Ogunniyi, Babu, Balana, & Andam, 2020) who affirmed that in Cross River State, there are only 94 active extension agents as at 2019, but recently an extension officer in the Cross River Agricultural Development Programme (CRADP) stated in an interview which took place on January 2022, that there are now 64 active extension agents in the state creating a ratio of an extension agent to 4,000 farmers as against the recommended ratio of 1:1000 – 1,500 farmers by World bank. This strongly indicates that CRADP is obviously understaffed with little or no effort to recruit new staff, also with the withdrawal of incentives such as item six (6) for lunch breaks which is paid monthly or twice a month, kilometer allowances, mobility/logistics makes it difficult for extension agents to carry out their duties effectively as most of them focus on rendering their services to Non-governmental organizations (NGOs) and their personal businesses.

Since extension agents are the first point of contact on matters of agriculture amongst rural communities in Cross river state, there is therefore an urgent need to change the method of AES from traditional face-to-face farm advisory to supporting extension agents with digital tools to deliver good agricultural services and reach many farmers simultaneously to overcome the geographical challenges of extension service delivery in Cross river state and Nigeria at large (Bidemi, 2020). It is therefore necessary to assess ICT use among extension agents who are the principal officers in the delivery of Agricultural services to farmers.

* 1. **Justification of the study**

This research work will be of great significance in both theoretical and practical aspect. The beneficiaries of this study will be both extension agents as well as people living in the rural and urban area. Also this will help both governmental and non-governmental agencies who are in charge of disseminating agricultural information know how effective ICT can be used to facilitate the transfer of technologies from extension agents to farmers and also the appropriate training programmes and facilities that will enhance the use of ICT in the delivery of agricultural extension services in Cross river state and the nation at large.

* 1. **Research questions**

1. What are the socio-economic characteristics of the respondent in the study area?
2. What are the ICT tools available, ownership, functionality and serviceability for extension service delivery in the study area?
3. What are the ICT tools used by extension agents for extension service delivery in the study area?
4. What are the activities that ICT tools are been used?
5. What is the extent of use of ICT tools in extension service delivery?
6. What are the constraints to the use of ICTs in agricultural extension service delivery?
   1. **Objectives of the study**

The main objective of the study is to assess the use of ICT in Agricultural extension service delivery in Cross River State, while the specific objectives of the study are to:

1. describe the socio-economic characteristics of the respondent in the study area
2. identify the ICT tools available, ownership, functionality and serviceability for extension service delivery in the study area
3. identify the ICT tools used by extension agents for extension service delivery in the study area
4. identify the activities that ICT tools are been used?
5. determine the extent of use of ICT tools in extension service delivery?
6. determine the constraints to the use of ICTs in agricultural extension service delivery?
   1. **Research Hypotheses**

* **H0:**There is no significant relationship between selected socio-economic characteristics of the extension agents and ICT use in extension service delivery.
  1. **Scope of the study**

The study focused geographically on Cross river state, Nigeria. The main focus is on assessing the use of ICT in agricultural extension service delivery in Cross River State, the available, ownership, functionality and serviceability of ICT tools in extension service delivery, the ICT tools used by extension agents for extension, activities that ICT tools are been used, the extent of use of ICT tools, constraints to the use of ICTs in agricultural extension service delivery, as well as recommendations aimed at encouraging the use of ICT in extension service delivery in the study area.

* 1. **Significance of the Study**

The findings of this study highlight the use of ICT in agricultural extension service delivery. This will enable extension agents understand more about the benefits of these ICTs in extension services and hence be able to fully utilize their potential while rendering their services to their clienteles. This study will also give data based on a rigorous evaluation of the use of ICTs in conveying agricultural information to farmers. As a result, it is expected that the study would assist policymakers and the district extension system in developing policies and programs that make use of the appropriate ICT technologies for agricultural extension service delivery. As a result, agricultural extension services will be strengthened, resulting in greater farm productivity. Furthermore, the study will assist extension agents in making good use of current ICTs to offer farmers with crucial access to knowledge, information, and technology that they demand in their agricultural activities.

* 1. **Operational definitions of terms**

**Information and Communications Technology (ICT):** are technologies used to handle communications processes such as telecommunications, broadcast media, intelligent building management systems, audiovisual processing and transmission systems, and network-based control and monitoring functions ( <https://www.techopedia.com/about> ).

**Agricultural Extension:** is a service or system that helps farm people improve agricultural methods and techniques, increase production efficiency and revenue, improve their living standards, and raise the social and educational standards of rural life through educational procedures. (Balasubramanian, 2019).

**Extension Agent:** is an advisor employed by the government to assist people in rural areas or community with method of farming with intension to change their knowledge skills and attitude toward their farm practices (Amadu & McNamara, 2019).

**CHAPTER TWO**

* 1. **REVIEW OF LITERATURE**
  2. **Theoretical Framework**

According to Rogers (1962) cited in (Miller, 2015), diffusion is the process by which an invention or new concept spreads through farmers or members of a social system through certain communication routes over time. The diffusion of new ideas alters the structure and function of a social system, resulting in repercussions that bring about social transformation (Rogers, Medina, Rivera, & Wiley, 2005). In extension theory and practice, "Roger's diffusion of innovation theory" played a crucial role. The research on diffusion offered farm researchers with feedback on the fate of their recommendations.

* + 1. **FACTORS THAT INFLUENCE THE ADOPTION OF AN INNOVATION**

**The Innovation Itself:** Understanding the nature of innovation and how it contributes to the well-being of smallholder farmers and rural communities can aid in predicting whether or not it will be adopted. Furthermore, the rate at which smallholder farmers embrace innovation is largely determined by the innovation itself, its qualities, the personal characteristics of rural farmers, and the local environment in which the technology/innovation transfer process occurs (Dyck & Silvestre, 2019).

However, any attempt by extension workers to transfer innovation cannot be successful without an excellent knowledge how innovation and potential users (smallholder farmers) interact in their local setting prior to and during the innovation process. Accordingly, there can be no overemphasis on successful participation by rural farmers in the innovation development process. The primary purpose of diffusing agricultural technology and innovation between the rural communities, however, is to increase the well-being of households by validating and promoting the application of farm innovation, which can boost crop production and farmers' incomes (Dyck & Silvestre, 2019).

**The Communication Channels:** This component determines how information about the innovation is disseminated through various channels. The use of precise and relevant communication channels aids in promoting and influencing the rate of innovation adoption in rural areas. Sennuga (2019) believe that the correct communication channels have the inherent ability to disseminate timely and up-to-date information to smallholder farmers. Researchers and extension workers use a variety of communication channels, including mass media, traditional media, print media, on-farm researcher-led demonstrations, farmer-to-farmer information sharing systems, community leaders, community broadcasting, modern ICT, interpersonal and small group communication, according to the literature (Mingxiang & Qingfen, 2016). On the other hand, the use of current ICT tools, particularly mobile technology text messaging, has been found to be very efficient in influencing the quick transmission of agricultural innovation and subsequent acceptance among Nigerian smallholder banana farmers (Mwombe, Mugivane, Adolwa, & Nderitu, 2014).

**Time:** Diffusion is a process in which innovation is transmitted through channels among members of a social system over time (Rogers *et. al.,* 2005). The time it takes to disseminate knowledge about an innovation may have an impact on whether or not smallholder farmers embrace it. Furthermore, the more complicated an innovation is, the more likely farmers will need to modify their mindset and beliefs in order to acquire timely information before adopting it. On the contrary, the easier it is for farmers to experiment with an innovation, the more likely it is to be embraced (Dyck & Silvestre, 2019). Smallholder farmers may be classified into categories based upon the time of adoption of innovation as an innovator, early adopters, early and late majority, and late adopter or laggards (Rogers, 1995) in (Miller, 2015),

**The Nature of The Society:** Who is introduced to it or the social system, the local context of the smallholders to whom the innovation is communicated may have a significant impact on the adoption of the innovation. The success of innovation diffusion is dependent on a variety of factors, including the nature of the society, social norms, beliefs, attitudes, and knowledge of target users. As a result, the nature of the farmers' society may influence their decision to adopt an innovation.

* 1. **ICT in extension service delivery in Nigeria**

A comprehensive evaluation of Nigerian agricultural extension services shows that most farmers do not have access to reputable information sources, restricting their production and their income (Chande, 2018). A nationwide survey indicated that government extension activities and public coverage were quite low.

ICTs are high-value hand tools for agricultural extension services including: TV; radio; SMS; camera; computer; email; 2go; you-tube; web metrics; DVD; video; contact data and system; CD-ROM; web-based publication; web publishing; distance learning; packet Digital Assistants; printed materials; group meetings; contact farmers; photos; workshops; (Uzo-Okonkwo, Oduh, & Okeke, 2020). The acceptance of ICTs in agricultural extension receives the firmest response in some unindustrialized countries of the world, such as Nigeria. Currently, the extension service and farmers are looking for new digital opportunities to interchange, process, manage and transmit information and ideas (Kothari & Kameswari, 2019). As (Uzo-Okonkwo *et. al.,* 2020) indicated, the use of digital video cameras has become popular as a result of the 1,000 works worth of the picture that can even be used by literacy-bound individuals.

More so, Radio has grown in popularity as a result of its unique interest and concentration on transmitting to audiences in their native language. This is in accordance with (Sanusi, Petu-Ibikunle, & Mshelia, 2021) who claims that radio has the widest reach of any ICT, with 4 out of 10 people living in rural regions owning one. Cell phones, the Internet, radio, and web-based apps, according to (Tata & McNamara, 2018), are the most common methods for exchanging and distributing agricultural information among agricultural extension workers and farmers.

Also, Nigerian extension staffs can also use Digital screen video technology to teach farmers in rural areas how to create films and distribute good agricultural practices in order to increase farm production and advance the nutritional level of rural dwellers. Radio is also used by the African Farm Radio Research Initiative (AFRRI) to educate farmers in rural African areas (FAO, 2017a, 2017b).

The need to deal with the information boom in several industries, including agricultural, prompted the use of ICT. To keep up with the ever-increasing amount of data being generated by various research institutions, computers and telecommunications must be employed to process and distribute information more quickly and accurately than human processing and distribution through extension agents and/or contact farmers (Sejane, 2017).

The Global Positioning System (GPS) have changed the game in terms of extended information sharing. Crop extension advisors in other countries have utilize robust data collecting equipment with GPS for precise location to map pests, insects, and weed infestations in farmers' fields, this can help harness the Nigerian extension service as well (Nyarko, & Kozári, 2021).

* 1. **ICT tools for extension service delivery**

The following ICT tools have a lot of potential for application in agricultural extension services:

1. Cameras
2. CD Rom
3. Desktop Computer
4. DVD
5. E-mail
6. Facebook
7. Instagram
8. Laptops
9. LinkedIn
10. Multimedia projector
11. photographs
12. Printed Materials
13. Radio
14. Short Message Service (SMS)
15. Smart phones
16. telegram
17. Television
18. twitter
19. Video
20. Web publishing
21. Web-metrics
22. WhatsApp
23. You-tube

The usage of ICT in agricultural extension is gaining influence in numerous developing nations throughout the world, including Nigeria. Farmers and the extension service are now examining these developing digital solutions for exchanging, processing, storing, managing, and conveying material and ideas. The use of a digital camera has gained attractiveness because, as stated by (Chinedu-Okeke, & Obi, 2016), an image is worth a thousand words and will allow even illiterate individuals to communicate.

Radio communication is employed by rural farmers since it is faster compared to other gadgets, most powerful, and commonly used ways of communication. It addresses the difficulties that extension workers face (Lamptey & Baah-Ennumh, 2021). Many studies have shown that, when it comes to agricultural extension administration, radio is one of the most important and successful ways of disseminating information. According to Ingabo (2001), the construction of community radio stations with a 100-kilometer radius allows extension agents to reach nearly half a million farmers in their native dialects. Radio is also suited to local settings because it may be operated without electricity and is very inexpensive.

On the other hand, television set combines sight and sound, making it easier to understand and remember the information. It creates a strong sense of engagement in its listeners. Projectors may be used to deliver information via motion visuals to demonstrate various agricultural methods. With telephones communicate is made easy between agents and farmers, as well as to respond to enquiries regarding agricultural concerns and solicit input.

However, computer being able to storage and retrieve information is utilized for visual work, such as the creation of pictures that are used as instructional aids for farmers. The importance of ICTs in improving food security and rural livelihoods is becoming more widely acknowledged, and it is being approved officially at the World Summit on the Information Society (Pamphily, 2018).

The usage of ICT arose as a result of the necessity to deal with the information boom in different industries, including agriculture. Computers and telecommunications must be utilized to handle information processing and distribution more quickly and accurately than manual processing and delivery through extension agents and/or contract farmers since we live in a fast dynamic world.

* 1. **Use of ICT in extension service delivery by extension agents**

Several researches on extension organizations have found that when a grass-roots extension worker covers a narrow area of authority with numerous purposes, the distribution of commodities is effective. The current arrangement of large jurisdictions, each with a limited scope of activities, is inefficient. Broad basing, on the other hand, necessitated grassroots people being on the critical edge of extension and masters of a variety of trades, which is not realistic. ICT can assist in this area by allowing extension workers to collect, save, retrieve, and communicate a wide range of information to farmers.

In agricultural extension, ICT has a wide range of possible uses. It has the potential to offer innovative information services to rural regions, giving farmers significantly more influence over present information channels than before. Access to such new information sources is crucial for agricultural systems' long-term growth. When extension agents utilize information and communication technology (ICT) properly and efficiently, it streamlines their work and, more significantly, makes information distribution and post-extension services easier. Computers will assist them in analyzing data and writing scientific papers, preparing work plans and budgets, assisting trainers in producing curriculum and handouts, and easily reaching out to farmers. They can submit documents via email that may be used as a demotion topic in an online conversation group, and they can be posted on websites meant for public reading. Extension is interested in communication for development, which can be described as "a creative means of reaching and communicating with people efficiently wherever they may be", making ICTs more relevant (Adelakun, & Ambassador-Brikins, 2019).

In addition, the ICT tools available in agriculture include radio, television, telephone, the web, search engines, digital packets, cameras, videos, email messages, computer databases and systems, CD-ROM, DVD, awareness-raising, group ware, rural radio, etc. Whatever the tool, people who utilize technology and content instead of technology themselves must be the main focus. Experience has revealed that extension agency use a wide range of traditional information technology, including radio, theater and video/television, in most developing nations. Currently, both extension service and other service providers and their customers explore all the digital alternatives that they can efficiently employ for information and knowledge exchange, process management and communication. Because "an image confined by literacy to communicate, the digital camera with video capabilities is becoming increasingly popular, Hobbs (2017).

* 1. **Relevance of information communication technology (ICT) in extension service delivery**
* ICTs can improve the livelihoods of small farmers as a development instrument. New ICTs are the biggest self-learning, remote education, sustainable development and empowerment package for women to date (Juma, 2016). Sennuga, (2019) confirms that ICTs have become a most efficient teaching and dissemination strategy for farmers of rural regions, so that extended farmers are able to acquire new technologies, predict rainfall and, among other things, commodity prices.
* The Internet, offers options for distance training and education, thereby overcomes some of the issues linked to places and shortage of time for family-running small businesses (Chinedu-Okeke, & Obi, 2016)
* Moreso, web publications are generated in the form of loadable elections rather than paper, which enables access to information other than before you have to travel to libraries to search for books of experts.
* ICT is one of the potential fields of agricultural enlargement, information exchange help. Mobile telephone in conjunction with radio allows a huge number of listeners to receive messages.
* Some Asian and African communities have been evaluated for the use of online thresholds containing relevant invention and advertising material. The evidence also shows that in certain African nation’s technology is being employed efficiently with exceptional market pricing information, meteorological forecasting and storage transit information (Asenso-Okyere, & Mekonnen, 2012).
* (Chinedu-Okeke *et. al.,* 2016) reported that knowledge and information are the main drivers of social and economic revolution in the global environment, playing a critical role in technology transfer transformation; supporting learning, helping problems solved, and making it more active for farmers to be integrated into farm information and knowledge systems.
* The use of ICT in extension offers a lot of assistances. For example, ICT-based agricultural extension and consultancy services, among other things, present significant prospects and have the potential to empower rural communities and provide market expertise. IRRI, for example, created the Nutrient management for rice mobile (NMRice-Mobile) initiative to advise Philippine rice farmers on the ideal technique, quantity, and kind of fertilizer to apply to their rice crop in order to optimize productivity and profit while decreasing waste. (IRRI, 2011). (Collard, Gregorio, Thomson, Islam, Vergara, Laborte, & Cobb, 2019).
* Using ICTs in distribution, supply-chain management, and traceability helps to enhance proficiency and certainty, which in turn reduces waste. A few examples are Kenya's dairy and agricultural industries, as well as the fruitlet and vegetal supply chains in Mali and Ghana (Asenso-Okyere, & Mekonnen, 2012).
  1. **Constraints to the use of ICT in extension service delivery**

The problem is that Nigeria is renowned for implementing policies without a political will to implement them on a sustainable basis. Sometimes there are conflicts between national development policy and the interests of the great majority of farming poor. The creation of the enlargement policy should involve all stakeholders - both public and private - with farmers and take into account not only technical but also professional development challenges to motivate and morally encourage the workforce in the fields of extension. Political instabilities arose such that extending staff had to modify and change the policy of extension. However, there was a criticism of public expansion for not giving the extension workers sufficient motivating support (Olayemi, Ope-Oluwa, & Angba, 2021).

Prior to these khidir (2020) and (Jauert, Ala-Fossi, Föllmer, Lax, & Murphy, 2017) opined that there are some other precise constraints preventing ICT use by agricultural extension officers such as;

* The length at which ICTs will be used is determined by poor ICT infrastructure development dependent on inconsistent and fluctuating energy supply.
* High fees for presentations on radio and television. Most of the radio/TV in the state demand high charges for presentation (FM, channels, for example). It's not free, not free.
* Inadequate and insufficient ICT knowledge (user friendly technologies). For most extension workers the management and operation of ICT facilities lack skill and confidence since they lack training in the handling of most current ICTs.
* High rates of analphabetism: Most farmer/extension officers are not informed about ICT advantages as such. Through ICT, farmers are made aware of the most recent farming tools and techniques that facilitate farming rather than using the primitive way. Farmers can create organizations and recruit these instruments.
* High access/interconnectedness costs (non-functioning telecommunication systems). Due to inadequate road connections, poor environment, interconnectedness and the high cost of ICT facilities, the majority of rural regions lack Internet access.
* Insufficient capital: some farmers, particularly small farmers, in Nigeria, are unaware of existing loans because of poverty and poor literacy. ICT can provide these farmers with important information about current credit options.
* Under- developed transportation networks.
* Poor documentation and procedures for storage and recovery. Research results in African nations are renowned for their inadequate recording, preservation and retrieval in the industrialized countries but seldom in the place of origin

**CHAPTER THREE**

1. **RESEARCH METHODS**
   1. **Study Area**

The study was conducted in Cross River state, Nigeria. The state covers a region of 17,802km with a vast populace of above 2 million individuals. It lies within Longitudes 8º15' and 8º25' East of the Greenwich Meridian and Latitudes 4º40' and 5º05' North of the Equator. The state is confined by states like, Abia, Benue, Akwa-Ibom, Ebonyi, as local boundaries with Republic of Cameroon as international boundary. The main profession of the rural inhabitants is farming and fishing. The state consist of three agricultural zones which are; Calabar, Ikom, and Ogoja. Calabar zone consist of six local government areas (Calabar south, Calabar municipal, Odukpani, Biase and Akpabuyo). The zone has a population of 371,022 people according to the 2006 census, and it has a tropical monsoon climate with a ten-month rainy season and a two-month dry season. In the city, the harmattan is significantly less severe. Calabar's agricultural zone spans 406 square kilometers and has a population density of roughly 910 people per square kilometer (2400sq m). The temperature in the area is rather steady, ranging from 25 to 28 degrees Celsius. Ikom zone is a tropical rainforest and is recognized for its rich food supply in arable and cash crops production. The area is greatly populated with Cocoa dealers and consist of six local government areas (Abi, Boki, Etung, Ikom, Obubura and Yakurr) while Ogoja zone is made up of five local government areas (Ogoja, Obudu, Obanliku, Bekwara and Yala) (Effiong, J. B., C. L. Aboh, & Aya, C. F. 2021). Data/records of extension agents at Cross River Agricultural Development Programme (CRADP) indicate that there are only sixty four (64) registered extension agents in Cross river state.

Figure: 3.1 Map of Cross River State

**Image source:** Duke, Torty, Nwachukwu, Ameh, Kim, Eneli, & Bowman, (2020).

* 1. **Sampling technique and sample size**

The study adopted a census sampling procedure where all members of the population are selected. The population for this study consisted of all extension agents in Cross River Agricultural Development Programme (CRADP). This is due to the limited number of extension agents in the study area. The sample frame which is the list of all extension employees in the organization consists of 64 extension agents spread across the three agricultural zones (Calabar, Ikom and Ogoja) as obtained from CRADP. Thus a sample size of 64 respondents (Extension agents) was used for the study. The distribution of extension agents sampled from their zone is shown in table1

Table 1 Distribution sample of extension agents in CRADP

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CATEGORY** | **CALABAR** | **IKOM** | **OGOJA** | **TOTAL** |
| **EAs** | 15 | 8 | 12 | 35 |
| **BESs** | 4 | 3 | 3 | 10 |
| **ZEO/SMS** | 9 | 4 | 6 | 19 |
| **Total** | 28 | 15 | 21 | 64 |

* 1. **Instrument for data collection**

A well-structured questionnaire was used for the collection of data. It was divided into eight (6) sections (A-F), with each section designed based on the objectives of the research. Section ‘A’ focused on the socio-economic characteristic of the respondents, section ‘B’ was based on identifying the ICT tools available, ownership, functionality and serviceability for extension service delivery in the study area, which section ‘C’ covered the ICT tools used by extension agents for extension service delivery in the study area. Section ‘D’ aimed at identifying the activities that ICT tools are been used, Section ‘E’ covered the extent of use of ICT tools in extension service delivery. Section ‘F’ covered constrain to the use of ICT in extension service delivery. Section B-F was designed based on a four-point and three-point and two point rating scale

* 1. **Validity of the instrument**

To determine the face and content validity of the research instrument (structured questionnaire), the first draft of the instrument was given to the project supervisor and other research experts in agricultural extension. They assisted in scrutinizing the instrument and make appropriate corrections and inputs that was used to produce the final copies of the instrument for data collection.

* 1. **Reliability of the instrument**

The reliability of the research instrument was ascertained using the test retest reliability technique. The structured questionnaires were administered twice to twenty (20) randomly selected extension agents. The data obtained from the two tests were collected and analyzed using Pearson Product Moment Correlation (PPMC). A coefficient was attained which suggests reliability of the instrument.

* 1. **Procedure for data collection**

Study Data were collected through administrating of questionnaire. On the 10th of January 2022, structured questionnaires were administered through interview schedule to 28 Extension Agents in the Calabar ADP Zone, similarly on the 24th of January 2022; 28copies of structured questionnaires were also administered through interview schedule to Extension Agents in both Ikom and Ogoja ADP Zone all during their Monthly Technology Review Meeting (MTRM).

* 1. **Procedure for data analysis**

Descriptive and inferential statistics was used to analyze the data collected. The descriptive statistics used to analyze research objectives one to six were frequency count and percentages, mean, standard deviation and ranking. Chi-square was used to analyze the research hypothesis.

**CHAPTER FOUR**

1. **RESULTS AND DISCUSSIONS OF FINDINGS**
   1. **Socio-economic characteristics of respondents**

**Sex**

TABLE 2: Distribution of respondents according to sex

|  |  |  |
| --- | --- | --- |
| VARIABLES | FREQUENCY | PERCENTAGE (%) |
| Male | 44 | 68.8 |
| Female | 20 | 31.3 |
| Total | 64 | 100 |

Result in table 2 shows that both male and female are greatly involved in the delivery of extension services. It is observed that (68.8%) of the extension officers were male, however female constituted (31.3%) of the extension workers. This implies that the agricultural extension system is predominated by male counterpart. This corroborate with early findings of Nyarko and Kozari (2021) which assume that for every five (5) extension employees you encounter, one (1) is a female extension worker, agreeing to the fact that males predominate in agricultural extension operations. Also because farming is seen as men domain and so extension professionals are mainly male to serve the male farmers who are in the majority. This also corroborates with the findings of Olaolu, Agwu, Ivande & Olaolu (2018) which states that more male was involved in agricultural extension work then their female counter parts.

**Age**

TABLE 3: Distribution of respondents according to age

|  |  |  |
| --- | --- | --- |
| VARIABLES | FREQUENCY | PERCENTAGE (%) |
| <30 | 1 | 1.6 |
| 30-40 | 2 | 3.1 |
| 41-50 | 23 | 35.9 |
| 51 and older | 38 | 59.4 |
| Total | 64 | 100 |

MEAN: 51.06

Std. Dev.: 5.51

Result in table 3 shows that the mean age of extension agents is 51years of age and (59.8%) of them are within the age bracket of 51 and above, this implies that they are advance in age, hence there may be too old and weak to reach out to farmers in the course of carrying out their extension duties. It also implies that in 10years to come majority of the extension agents must have retired, necessitating the immediate employment of experienced young extensionist to take over from the aged majority. This is contrary to the findings of Kolawole *et. al.,* (2016) which states that majority of extension personnel are in their prime age and may be active to cope with the demand of their jobs, but corroborates with the early findings of Olaolu *et. al.* (2018) which states that extension workers working in extension services were advanced in age, which is thought to have a negative impact on their interest in the use of ICT, and there is a need for younger people to be employed/deployed into extension since these younger ones are predicted to be more interested in the use of ICT tools and can explore the advantages more than the older ones.

**Marital status**

TABLE 4: Distribution of respondents according to marital status

|  |  |  |
| --- | --- | --- |
| VARIABLES | FREQUENCY | PERCENTAGE (%) |
| Single | 7 | 10.9 |
| Married | 52 | 81.3 |
| Widow | 5 | 7.8 |
| Total | 64 | 100 |

Result in table 4 captured the marital status of the respondent and it indicates that most (81.3%) of them are married and over (10.9%) of them are single. This means that at least four (4) people are above 40years but still single, this could be as a result of their culture were most may want to explore life before settling down, however marriage makes them more responsible. This implies that marriage is probably more emphasized among agricultural extension agents as they tend to earn more respect in the course of disseminating their extension duties.

**Educational level**

TABLE 5: Distribution of respondents according to educational level

|  |  |  |
| --- | --- | --- |
| VARIABLES | FREQUENCY | PERCENTAGE (%) |
| Secondary school | 16 | 25.0 |
| Tertiary institution | 48 | 75.0 |
| Total | 64 | 100 |

Result in table 5 shows that the educational attainment of the respondents and thus reveal that all the respondents have above the primary education with majority (75%) as tertiary degree holders while (25%) have secondary school certificates. This signifies that the literacy level extension workers in cross river state is high, which can contribute positively to their understanding and ability to apply ICTs in extension service delivery. This corroborate with the findings of (Ayotunde, 2021) which buttressed that this level of educational qualification foretells to be the dominant educational qualification for employment entry into the public extension service organizations. It also supports the earlier findings of (Mustapha, Man, Shah, Kamarulzaman, & Tafida, 2022) which state that extension personnel with high educational standard can skillfully use any of the ICTs tools available to them. This might further play a major part in the extension personnel technology inclination and usage.

**Working experience**

TABLE 6: Distribution of respondents according to working experience

|  |  |  |
| --- | --- | --- |
| VARIABLES | FREQUENCY | PERCENTAGE (%) |
| <5years | 4 | 6.3 |
| 5-10years | 7 | 10.9 |
| 11-15years | 6 | 9.4 |
| 16-20years | 11 | 17.2 |
| 21-25years | 18 | 28.1 |
| 26-30years | 18 | 28.1 |
| Total | 64 | 100 |

MEAN: 24.44

Std. Dev.: 8.44

Result in table 6 captured that majority (28.1%) of the respondents have been working for 21 to 30years, while (17.2%) have been working for 16-20years, also (10.9%) have 5-10years of experience followed by (9.4%) who have 11-15years of professional experience and just a few (6.3%) of them have less than 5years working experience. The mean value for professional experience is (24.44yeras), these infer that the extension agents have acquired adequate experience in the field and have advantage in utilizing their skills with the use of ICTs. This corroborate with the findings of (Kolawole *et. al*., 2016) which states that extension staff with good working experience can make their wealth of experience bear on their jobs as it has the tendency of making them to be more receptive to better ways of using ICTs in rendering essential services as well as in the disseminating of their extension obligations to their clienteles.

* 1. **OWNERSHIP, FUNCTIONABILITY AND SERVICEABILITY OF ICT TOOLS**

TABLE 7: Distribution of ICT Tools Availability, Ownership, Functionality and Serviceability

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ICT TOOLS | OWNERSHIP | | | | FUNCTIONALITY | | | | SERVICEABILITY | | | |
| Personal | | Institutional | | Functional | | Not  functional | | Serviceable | | Not  Serviceable | |
|  | Freq. | % | Freq. | % | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| **Conventional Tools** |  | | | | | | | | | | | |
| Studio | 3 | 4.7 | 8 | 12.5 | 6 | 9.4 | 5 | 7.8 | 6 | 9.4 | 5 | 7.8 |
| Radio | 44 | 68.8 | 7 | 10.9 | 46 | 71.9 | 5 | 7.8 | 43 | 67.2 | 7 | 10.9 |
| Audio record Player | 6 | 9.4 | 8 | 12.5 | 11 | 17.2 | 3 | 4.7 | 10 | 15.6 | 4 | 6.3 |
| Landline Phone | 5 | 7.8 | 6 | 9.4 | 2 | 3.1 | 9 | 14.1 | 2 | 3.1 | 9 | 14.1 |
| Television | 46 | 71.9 | 3 | 4.7 | 45 | 70.3 | 4 | 6.3 | 36 | 56.3 | 13 | 20.3 |
| Video Camera/ Camcorder | 14 | 21.9 | 6 | 9.4 | 16 | 25.0 | 4 | 6.3 | 14 | 21.9 | 6 | 9.4 |
| Slide Projector | 3 | 4.7 | 13 | 20.3 | 9 | 14.1 | 7 | 10.9 | 10 | 15.6 | 6 | 9.4 |
| Film Projector | 3 | 4.7 | 11 | 17.2 | 8 | 12.5 | 6 | 9.4 | 7 | 10.9 | 7 | 10.9 |
| Public Address system | 4 | 6.3 | 10 | 15.6 | 7 | 10.9 | 7 | 10.9 | 7 | 10.9 | 7 | 10.9 |
| **Modern Gadgets** |  | | | | | | | | | | | |
| Digital Camera | 11 | 17.2 | 6 | 9.4 | 13 | 20.3 | 4 | 6.3 | 13 | 20.3 | 4 | 6.3 |
| Smart Phone | 58 | 90.6 | 1 | 1.6 | 59 | 92.2 | - | - | 57 | 89.1 | 2 | 3.1 |
| Desktop computer | 8 | 12.5 | 7 | 10.9 | 7 | 10.9 | 7 | 10.9 | 4 | 6.3 | 10 | 15.6 |
| Laptop | 35 | 54.7 | 6 | 9.4 | 32 | 50.0 | 9 | 14.1 | 33 | 51.6 | 8 | 12.5 |
| Multimedia Projector | - | - | 9 | 14.1 | 3 | 4.7 | 7 | 10.9 | 4 | 6.3 | 6 | 9.4 |
| DVDs | 28 | 43.8 | 2 | 3.1 | 27 | 42.2 | 3 | 4.7 | 25 | 39.1 | 5 | 7.8 |
| Flash drive | 24 | 37.5 | 3 | 4.7 | 25 | 39.1 | 2 | 3.1 | 24 | 37.5 | 3 | 4.7 |
| Memory Card | 48 | 75.0 | - | - | 48 | 75.0 | - | - | 44 | 68.8 | 4 | 6.3 |
| Tablet with GPS | 20 | 31.3 | 5 | 7.8 | 23 | 35.9 | 2 | 3.1 | 18 | 28.1 | 7 | 10.9 |

Result in table 7 captured several ICT tools based on their ownership, functionality and serviceability. In terms of ownership, Smart phone, memory card, television, radio, laptop and DVDs were ICT tools with high percentage of personal ownership possessed by extension agents with smart phone (71.9%) as the most commonly owned conventional tool. However, slide projector (20.3%) tops the list in ownership by the institution. This indicates that most of the ICT tools used by extension personnel were their personal tools with smart phone as the most regular, this could be because the extension agents in the study area can afford smart phone as it is cheap and easy to maintain. However the institutionally owned tool with the highest percentage is the slide projector (20.3%). This corroborate with the early findings of (Osiesi, Yahya, Sanni, & Okorie, 2021), which affirmed that government channel more resources to the provision of slide projector other than smart phone, memory card, television, radio, laptops and DVDs. Furthermore, among the (90.6%) of the smart phone available, (89.1%) are serviceable, among the (75.0%) of memory card available, (67.2%) are also serviceable, followed by radio (67.2%), television (56.3%) and laptop (51.6%) that were also serviceable. This implies that most of the ICT tools available and personally owned were also functional and serviceable than those owned by the institution.

* 1. **ICT TOOLS USED**

TABLE 8: Distribution of ICT tools used by extension agents

|  |  |  |  |
| --- | --- | --- | --- |
| ICT TOOLS | Std. Dev | Mean | Rank |
| **Conventional Tool** |  |  |  |
| Audio record Player | 0.40 | 1.2 | 7th |
| Film Projector | 0.39 | 1.1 | 13th |
| Landline Phone | 0.21 | 1.0 | 16th |
| Public Address system | 0.47 | 1.2 | 7th |
| Radio | 0.50 | 1.4 | 1st |
| Slide Projector | 0.44 | 1.2 | 7th |
| Television | 0.46 | 1.3 | 4th |
| Video Camera | 0.47 | 1.3 | 4th |
| **Modern Gadgets** |  |  |  |
| Desktop computer | 0.36 | 1.1 | 13th |
| Digital camera | 0.45 | 1.2 | 7th |
| DVDs | 0.45 | 1.2 | 7th |
| Flash drive | 0.47 | 1.2 | 7th |
| Laptop | 0.52 | 1.4 | 1st |
| Memory Cards | 0.50 | 1.4 | 1st |
| Multimedia Projector | 0.36 | 1.1 | 13th |
| Tablet with GPS | 0.49 | 1.3 | 4th |

Result in table 8 indicates that radio, laptop and memory card with a uniform mean score of (M=1.4) ranked first as the most used ICT tools by extension agents in the delivery of extension services to their clientele. The also showed that television, video camera and tablet with GPS also with a uniform mean score of (M=1.3) ranked forth, followed by audio record player, slide projector, Public Address System (PAS), digital camera, flash drive and DVD with a uniform mean of (M=1.2) ranked seventh while film projector, desktop computer and multimedia projector ranked thirteenth and landline phone (M=1.0) ranked sixteenth as the least ICT tool used by extension agents in the delivery of extension services to their audience.

More so, radio amongst other ICT tools seems to be the most widely used tool by extension agents, this could be because radio is affordable and easily accessible by both the extension agents and farmers. This corroborate with the early findings of Obeng and Mintah (2019) who reported that radio stations are located in various communities and have made communication more convenient and accessible, also several FM stations have links with communication centers that have been established in communities. However these communication centers help in broadcasting programmes aired by the FM station in both English and local languages and can thus be used effectively for extension services delivery. Furthermore, the reason for the greater use of laptops and memory cards by extension agents implies that it enables extension agents to access information on the internet and store relevant information at any given time.

* 1. **ACTIVITIES WHICH ICT TOOLS ARE USED**

TABLE 9: Distribution of respondents according to the activities for which ICT tools were used.

|  |  |  |
| --- | --- | --- |
| ACTIVITIES | FREQUENCY | % |
| Backstopping by a subject Matter Specialist in an interactive session. | 12 | 19 |
| Creating awareness about an innovation | 30 | 47 |
| Extension teaching on an innovation/ virtual meeting/ panel discussion | 27 | 42.3 |
| Getting Extension materials for teaching farmers | 17 | 26.6 |
| Getting study materials for personal study | 17 | 26.6 |
| Harvesting complaints from farmers | 24 | 37.6 |
| Harvesting farmers’ inputs/ feedbacks into a programme | 20 | 31.2 |
| Inviting farmers for meeting | 42 | 65.7 |
| Linking farmers with input dealers | 27 | 42.2 |
| Linking farmers with markets and advertising and selling products | 23 | 36 |
| Method and result demonstration of an innovation or technology | 20 | 31.2 |
| Record of farmers’ data or any other valuable farm records in the course of my extension work | 26 | 40.7 |
| Reporting problems or findings to a subject matter specialist (SMS). | 18 | 28.2 |
| Sending extension materials e.g bulletin, magazines, charts, to farmers | 22 | 34.5 |
| Teaching farmers in a presentation during a field day | 21 | 33 |
| Warning farmers of an emergency | 25 | 39.1 |

Result in table 9 shows that (65.7%) of the respondent have reportedly been using ICT tools in inviting farmers for meeting, also it is captured that (47%) of the them use these ICT tools in creating awareness about innovations, (42.3%) and (42.2%) of the extension agent carry out extension teaching on an innovation/ virtual meeting/ panel discussion and link farmers with input dealers using several ICT tools. Over (40.7%) of the respondents take record of farmer data or any other valuable farm records with the help of ICT tools. Furthermore, (39.1%, 37.6% and 36%) of the respondents indicated that ICT tools where used to warn farmers of emergency, harvest complains from farmers and link farmers with markets as well as advertising and selling products. Also (34.5%, 33% and 31.2%) used ICT to send extension materials such as bulletin, magazines etc, teach farmers in presentation during field days, harvest farmer input/feedback and teach during method and result demonstration of an innovation or technology. More so, the table also captured that (28.2% and 26.6%) of the respondent also use ICT tools to report problems or findings to a subject matter specialist (SMS), get extension material for teaching farmers and get study materials for personal study.

* 1. **EXTENT OF USE OF ICT TOOLS**

TABLE 10: Distribution of extent of use of ICT tools in extension service delivery

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ICT TOOLS | EXTENT OF USE | | | | | | | | | |
| Not used | | Very rarely | | Rarely | | Frequently | | Very frequently | |
| Freq. | % | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| **Conventional Tools** |  |  |  |  |  |  |  |  |  |  |
| Audio record Player | 36 | 56.3 | 9 | 14.1 | 12 | 18.8 | 7 | 10.9 | - | - |
| Film Projector | 34 | 53.1 | 9 | 14.1 | 11 | 17.2 | 8 | 12.5 | 2 | 3.1 |
| Landline Phone | 49 | 76.6 | 7 | 10.9 | 4 | 6.3 | 3 | 4.7 | 1 | 1.6 |
| Public Address system | 27 | 42.2 | 6 | 9.4 | 10 | 15.6 | 13 | 20.3 | 8 | 12.5 |
| Radio | 24 | 37.5 | 9 | 14.1 | 14 | 21.9 | 12 | 18.8 | 5 | 7.8 |
| Slide Projector | 29 | 45.3 | 8 | 12.5 | 12 | 18.8 | 12 | 18.8 | 3 | 4.7 |
| Television | 34 | 53.1 | 6 | 9.4 | 10 | 15.6 | 10 | 15.6 | 4 | 6.3 |
| Video Camera/ Camcorder | 34 | 53.1 | 8 | 12.5 | 9 | 14.1 | 12 | 18.8 | 1 | 1.6 |
| **Modern Gadgets** |  |  |  |  |  |  |  |  |  |  |
| Desktop computer | 1 | 1.6 | 38 | 59.4 | 7 | 10.9 | 10 | 15.6 | 8 | 12.5 |
| Digital Camera | 32 | 50.0 | 8 | 12.5 | 10 | 15.6 | 10 | 15.6 | 4 | 6.3 |
| DVDs | 36 | 56.3 | 8 | 12.5 | 11 | 17.2 | 7 | 10.9 | 2 | 3.1 |
| Flash drive | 35 | 54.7 | 2 | 3.1 | 13 | 20.3 | 12 | 18.8 | 2 | 3.1 |
| Laptop | 23 | 35.9 | 5 | 7.8 | 17 | 26.6 | 16 | 25.0 | 3 | 4.7 |
| Memory Card | 19 | 29.7 | 6 | 9.4 | 5 | 7.8 | 28 | 43.8 | 6 | 9.4 |
| Multimedia Projector | 39 | 60.9 | 9 | 14.1 | 9 | 14.1 | 6 | 9.4 | 1 | 1.6 |
| Smart Phone | 10 | 15.6 | 2 | 3.1 | 4 | 6.3 | 27 | 42.2 | 21 | 32.8 |
| Tablet with GPS | 30 | 46.9 | 6 | 9.4 | 12 | 18.8 | 12 | 18.8 | 4 | 6.3 |

Result in table 10 captures the extent of use of ICT tools by extension personnel in delivering their services. The extension agents used the ICT tools made available to them by their establishment or organization and also used the tools which were personally owned. A total of seventeen (17) ICT tools were selected to know the extent of use by extension agents. The table indicates that majority (67.2%) of agricultural extension agent used Smart phone, Public Address System, Desktop computer and memory card “very frequently”. This may be due to affordability, accessibility and personal ownership by the respondents, also the availability of these tools in Cross river state agricultural development programme (CRADP). This corroborates with the findings of (James, Lakshminarayan & Suresh, 2018) as they reported that “very frequently” use of desktop computer is due to their acceptability in the agricultural establishment and smart phones could be personally bought and used by the extension agents without depending on the agricultural departments or establishments.

* 1. **CONSTRAINTS TO ICT USE IN EXTENSION SERVICE DELIVERY**

TABLE 11: Distribution of constraints to ICT use in extension service delivery

|  |  |  |  |
| --- | --- | --- | --- |
| Constraints | Std. dev | MEAN | RANK |
| High cost of data for Internet subscription | 0.59 | 2.5 | 8th |
| High cost of getting ICT gadgets | 0.43 | 2.9 | 1st |
| Illiteracy of farmers | 0.58 | 2.6 | 4th |
| Inadequate ICT gadgets in Extension Organization | 0.63 | 2.6 | 4th |
| Loss of confidence in ICT as effective extension service delivery tool | 0.77 | 2.1 | 11th |
| Non functionality of the available gadgets | 0.77 | 2.4 | 9th |
| Poor budget allocation to purchase these gadgets | 0.57 | 2.7 | 2nd |
| Poor condition of service of extension personnel | 0.73 | 2.6 | 4th |
| Poor rural infrastructures that inhibit the use of these gadgets | 0.64 | 2.7 | 2nd |
| Poor signals and network in rural settings where the bulk of the farmers resides | 0.57 | 2.6 | 4th |
| Poor Technical knowhow | 0.72 | 2.0 | 12th |
| Poor training of extension staff on ICT use | 0.72 | 2.3 | 10th |

Result in table 11 shows data regarding the constraints to ICT use in extension service delivery by extension agents which depicts that high cost of getting ICT gadget (M=2.9) was a major constrain followed by poor rural infrastructure that inhibit the use of these tools alongside poor budget allocation to purchase these tools with a uniform mean of (M=2.7), poor condition of service of extension personnel , inadequate ICT gadget in extension organization, illiteracy of farmers and poor signals and network in rural settings where the bulk of the farmers resides with a uniform mean of (M=2.6) were considered minor constraints. However high cost of data for internet subscription (M=2.5), non-functionality of the available gadget (M=2.4), poor training of extension staff on ICT use (M=2.3), loss of confident in ICT as effective extension service delivery tool (M=2.1) and poor technical knowhow (M=2.0) were not regarded as serious factors limiting the use of ICT tools by extension agents in service delivery. Findings are supported by the early findings of (Agha *et. al.,*2018) which reported less knowledge of farmers about ICTs, lack of technological infrastructure, inability of extension personnel to use ICT amongst others as factors limiting the use of ICT in extension service delivery. It also corroborate with the findings of (Ezeh *et. al.,* 2020) which reported that, the lack of basic ICT infrastructure, particularly in distant locations, may be very difficult due to restricted network coverage, high illiteracy rates, and the expenses involved with acquiring ICT devices present a big issue in rural areas where poverty rates are already high, particularly in developing nations, such as Nigeria.

* 1. **Relationship of Some Socio-Economic Variables and the use of ICT**

TABLE 12**:** Chi-square test on the link between various socio-economic characteristics and the usage of ICT in agricultural extension service delivery in Cross river state.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| INDEPENDENT VARIABLES | X2 | DF | P-value | REMARK | DECISION |
| Age | 4.028 | 3 | 0.258 | NS | H0 Accepted |
| Attending ICT training | 2.202 | 1 | 0.138 | NS | H0 Accepted |
| Educational level | 2.523 | 1 | 0.112 | NS | H0 Accepted |
| Marital status | 7.239 | 2 | 0.027 | S\* | H0 Rejected |
| Sex | 1.557 | 1 | 0.212 | NS | H0 Accepted |
| work experience | 5.955 | 5 | 0.311 | NS | H0 Accepted |

\*= Significant at 0.05%

Table 12 captures the relationship between some socio-economic characteristics of the respondents and the use of ICT in extension service delivery. The result reveals that marital status (X2 =7.239, *P*<0.05) has significant relationship with the use of ICT by extension agents, so therefore the null hypothesis is rejected. This implies that as more extension agents get married, the use of ICTs increase, which means marital status positively influence the use of ICT tools. This agrees with the early findings of Ojo & Oluwatusin (2017) which states that marital status positively relates to ICTs use and it uses increases as respondent get married because it will affect their information gathering from their children who could be ICTs compliant. More so, with marriage, they are more engaged and can leverage on ICT in reaching out to many clienteles and through financial support from their spouse they can afford to subscribe their ICT tools to do their work effectively. On the other hand Age (X2 =4.028, *P*<0.05), Sex (X2 =1.557, *P*<0.05), Educational level (X2 =72.523, *P*<0.05), Work experience (X2 =5.955, *P*<0.05), Designation (X2 =9.086, *P*<0.05), and Attending ICT training (X2 =2.202, *P*<0.05) had no significant relationship with use of ICT in extension service delivery. This implies that the null hypothesis is hereby accepted and that the use of ICT by extension agents is irrespective of their Age, sex, educational level, work experience, designation and attending of ICT training but their marital status. This result coincides with that of Nwaogu and Akinbile (2018) which states that sex and educational level were not significantly related to ICT use by extension officers in extension service delivery.

**CHAPTER FIVE**

1. **SUMMARY, CONCLUSION AND RECOMMENDATION**
   1. **SUMMARY**

Agricultural extension service in Nigeria has gradually evolved through various stages. It has passed through the conventional method of extension officers visiting farmers on farms to organizing farmers into viable groups and lately to using communication technologies in impacting the necessary knowledge, attitude and skills of current agricultural innovations to the farmers.

However, there has been a continuous shortage of extension agents in relation to the increasing number of farm family ratio due to the current economic crisis in the nation (NAERLS, 2020). As a result of this, it has necessitated the greater urgency in maximizing and efficiently utilizing the available communication technologies in the various agricultural extension organizations (Davis, Lion and Arokoyo, 2019)

Also, there has been a dearth of data on the extent to which these ICT tools are being used for in their overall extension delivery activities by extension practitioners from the various agricultural extension based organizations, necessitated the need for this study. It is within this context that this study seeks to assess the use of ICT in agricultural extension service delivery in cross river state.

This study therefore specifically assesses the use of ICTs in extension service delivery in the study area. Other objectives were to describe the socio-economics characteristics of the respondents, identify the ICT tools available, ownership, functionality and serviceability for extension service delivery, identify the ICT tools used, identify the activities that ICT tools are been used, determine the extent of use of ICT tools and also determine the constraints to the use of ICTs in agricultural extension service delivery.

The survey research designed adopted was; 64 copies of questionnaire were distributed to agricultural extension personnel in CRADP (Cross River State Agricultural Development Programme). The questionnaire undertakes a face validation by the research supervisor before it was administered to the extension agents.

The study revealed that the delivery of extension service in Cross river state were mostly dominated by the male gender and were married. It also revealed that the extension personnel were literate with good working experiences which give them advantage in utilizing their skills with the use of ICTs. More so, the study revealed that modern ICT tools were more utilized than the conventional tools and most of these ICT tools were personally own by the extension agents.

Furthermore, Chi-square was used to analyze the research hypothesis which was stated in a null form, however the result revealed that marital status has significant relationship ICT use by extension agents, which implies that as more extension agents get married the use of ICT s will increase.

* 1. **CONCLUSION**

This study was conducted to assess the use of ICT in extension service delivery in Cross River State. Using both descriptive and inferential statistics, the findings of this study are supported by empirical data, the study revealed that majority of the respondent were advanced in age, married and had formal education. It also revealed that all respondent made used of the ICT tools available to them and most of the ICT resources used were personally owned by them with focus on smart phone, radio, memory card and laptop as they ranked next to each other. However, the extension agents’ most notable years of working experience predisposes them to being more ICT inclined in the use of ICTs for their extension work. This tends to make them highly relevant in disseminating agricultural information effectively and promptly irrespective of dearth of extension personnel in their various organizations. Furthermore, the two highest educational qualifications which are secondary and tertiary education foretell to be viable platforms for employment entry into the public and non-public organizations by extension practitioners for optimum performance in their extension work. The extent of utilization of ICT tools was greatly influenced by ICT tools available and accessible to extension practitioners in their extension organizations, these greatly inhibit the use of ICTs for valuable extension delivery to their clienteles. High cost of getting ICT gadgets, poor rural infrastructures that inhibit the use of these gadget and poor budget allocation to purchase these gadgets were the most prominent constraints that limited extension agents’ access to the use of ICTs in extension service delivery. Since marital status is significant to ICT use in extension service delivery, it is therefore concluded the more extension personnel get married it will positively skyrocket the use of ICT by extension agent in delivering their duties.

* 1. **RECOMMENDATION**

The following suggestions were made based on findings from this study.

* Availability of ICT tools is very paramount to the disseminating activities of extension practitioners in all the various agricultural extension organizations. Therefore ICT tools like computer, projectors, intercom, scanners, CD ROM, audio recorder and the likes should be made available and readily accessible by the organizational management to their extension practitioners. This could be done by ensuring the provision of basic office equipment which cut across several ICT tools and consistent supply of electricity be made available to accessing these ICT tools for their extension work. For example construction of high-voltage solar generating power could conveniently substitute the use of generators in agricultural firms by the state management.
* Most of the ICT tools used by the extension agent cut across the conventional tools such as radio, television, slide projector and the likes with preference to the modern gadgets, it is therefore recommended that the organization organizes training workshop for incumbent/newly employed extension personnel on ICT usage and be introduce to the use of modern ICT tools. This will bring the extension staff irrespective of their qualification up to date on the use and application of ICT for improved extension service delivery in Cross river state.
* Due to high cost of ICT gadgets, there is need for upward review of the salaries of extension agents, because an increase in income would guarantee better chances of personal acquisition of ICT gadgets for the staff. Also the government should incorporate a scheme of monthly deduction so as to empower the extension officers with valuable ICT gadgets because they may find it difficult to save up to the amount of purchasing these gadgets as they may be faced with other domestic finances.
* The mean age of the respondent was 51years which implies that they are advanced in age and may be weak to cover the recommended extension ratio gab and they are also close to the retirement age, hence it is recommended that young and vibrant extension workers be employed because it is noticeable that the young employees have greater urge for ICT use and are versatile in the use of several ICT tools which is a positive edge for improving extension service in Cross river state.
* Agricultural Extension Services Organizations can improve their use of ICTs for dissemination purposes by ensuring that their clients provide appropriate positive feedback on agricultural innovations disseminated to them via these tools. This will encourage their clients to adopt subsequent innovations on a consistent basis, as well as full consolidation of using these technologies effectively for dissemination purposes.

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**DEPARTMENT OF AGRICULTURAL EXTENSION AND RURAL DEVELOPMENT,**

**COLLEGE OF AGRICULTURAL SCIENCES,**

**LANDMARK UNIVERSITY, OMU-ARAN, KWARA STATE, NIGERIA**

**TOPIC: ASSESSING THE USE OF ICT IN AGRICULTURAL EXTENSION SERVICE DELIVERY IN CROSS RIVER STATE, NIGERIA.**

Dear Respondent,

This research on “Assessing the use of ICT in Agricultural extension service deliver in cross river state, Nigeria” is purely for the purpose of research and all information collected will be treated confidentially and be used for this study only. Your support and assistance in providing the required information will be of great value to this research.

Thanks.

**INTERVIEW GUIDE**

(Tick the Appropriate Option / Options or Write the Response where Applicable at the Space Provided)

**PERSONAL CHARACTERISTICS:**

1. Age:
2. Sex of Respondent: Male { } Female { }
3. Marital Status: Single ( ) Married ( ) Widow ( ) Widower ( ) Divorce ( )
4. Educational Level: Primary School { } Secondary School { } Tertiary Institution { }
5. Year of Schooling \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Primary school (1-6 years), Secondary school (7-12 years), Tertiary institution (13-20 years) NB: write your own number of years in the blank line above.
6. Household Size: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. Years of Work Experience\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. Designation/ Status at work: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
9. Salary Grade Level \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
10. Certification and Area of Discipline: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
11. Membership of Professional Association: Yes { } No { }
12. Name(s) of Professional Association you belong to:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
13. Have you attended ICT training before? Yes { } No { }

**INFORMATION AND COMMUNICATION TECHNOLOGY TOOLS:**

Availability of tool, Ownership Status and serviceability

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **ICT TOOLS** | **OWNERSHIP** | | **FUNCTIONALITY** | | **SERVICEABILITY** | |
| Personal | Institution | Functional | Not Functional | Serviceable | Not Serviceable |
| **Conventional Tools** | | | | | | |
| Studio |  |  |  |  |  |  |
| Radio |  |  |  |  |  |  |
| Audio record Player |  |  |  |  |  |  |
| Landline Phone |  |  |  |  |  |  |
| Television |  |  |  |  |  |  |
| Video Camera/ Camcorder |  |  |  |  |  |  |
| Slide Projector |  |  |  |  |  |  |
| Film Projector |  |  |  |  |  |  |
| Public Address system |  |  |  |  |  |  |
| **Modern Gadgets** | | | | | | |
| Digital Camera |  |  |  |  |  |  |
| Smart Phone |  |  |  |  |  |  |
| Desktop computer |  |  |  |  |  |  |
| Laptop |  |  |  |  |  |  |
| Multimedia Projector |  |  |  |  |  |  |
| DVDs |  |  |  |  |  |  |
| Flash drive |  |  |  |  |  |  |
| Memory Card |  |  |  |  |  |  |
| Tablet with GPS |  |  |  |  |  |  |

1. Have you use ICT tools in extension service delivery before? Yes { } No { }
2. Which of these ICT tools have you used before? Tick as many as possible

|  |  |  |
| --- | --- | --- |
| **ICT TOOLS** | **Yes** | **No** |
| **Conventional Tool** |  |  |
| Radio |  |  |
| Audio record Player |  |  |
| Landline Phone |  |  |
| Television |  |  |
| Video Camera |  |  |
| Slide Projector |  |  |
| Film Projector |  |  |
| Public Address system |  |  |
| **Modern Gadgets** |  |  |
| Digital camera |  |  |
| Desktop computer |  |  |
| Laptop |  |  |
| Multimedia Projector |  |  |
| Flash drive |  |  |
| DVDs |  |  |
| Memory Cards |  |  |
| Tablet with GPS |  |  |

**Which of these activities have you used ICT for before? Tick and write the tool(s) used before it**

|  |  |  |
| --- | --- | --- |
| **Extension Activity** |  | **Tool(s) used** |
| Inviting farmers for meeting |  |  |
| Harvesting complaints from farmers |  |  |
| Warning farmers of an emergency: (Disease and pest outbreak, variation in weather condition etc.) |  |  |
| Creating awareness about an innovation |  |  |
| Extension teaching on an innovation/ virtual meeting/ panel discussion |  |  |
| Method and result demonstration of an innovation or technology |  |  |
| Linking farmers with input dealers |  |  |
| Linking farmers with markets and advertising and selling products.( e marketing) |  |  |
| Sending extension materials e.g bulletin, magazines, charts, to farmers |  |  |
| Harvesting farmers’ inputs/ feedbacks into a programme |  |  |
| Record of farmers’ data or any other valuable farm records in the course of my extension work |  |  |
| Reporting problems or findings to a subject matter specialist (SMS). |  |  |
| Backstopping by a subject Matter Specialist in an interactive session. |  |  |
| Getting Extension materials for teaching farmers |  |  |
| Getting study materials for personal study |  |  |
| Teaching farmers in a presentation during a field day |  |  |
| Other activities not captured. List them below: |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **ICT TOOLS** | **Not used** | **Very Rarely** | **Rarely** | **Frequently** | **Very Frequently** |
| **Conventional Tools** |  |  |  |  |  |
| Radio |  |  |  |  |  |
| Audio record Player |  |  |  |  |  |
| Landline Phone |  |  |  |  |  |
| Television |  |  |  |  |  |
| Video Camera/ Camcorder |  |  |  |  |  |
| Slide Projector |  |  |  |  |  |
| Film Projector |  |  |  |  |  |
| Public Address system |  |  |  |  |  |
| **Modern Gadgets** |  |  |  |  |  |
| Digital Camera |  |  |  |  |  |
| Smart Phone |  |  |  |  |  |
| Desktop computer |  |  |  |  |  |
| Laptop |  |  |  |  |  |
| Multimedia Projector |  |  |  |  |  |
| DVDs |  |  |  |  |  |
| Flash drive |  |  |  |  |  |
| Memory Card |  |  |  |  |  |
| Tablet with GPS |  |  |  |  |  |

**EXTENT OF USE OF ICT Tools in Extension service Delivery**

**CONSTRAINTS TO ICT USE IN EXTENSION SERVICE DELIVERY**

|  |  |  |  |
| --- | --- | --- | --- |
| **CONSTRAINT** | **Major Constraint** | **Minor Constraint** | **Not a Constraint** |
| Illiteracy of farmers |  |  |  |
| Poor signals and network in rural settings where the bulk of the farmers resides |  |  |  |
| Inadequate ICT gadgets in Extension Organization |  |  |  |
| Poor Technical knowhow |  |  |  |
| Poor training of extension staff on ICT use |  |  |  |
| Cost of getting ICT gadgets |  |  |  |
| Cost of data for Internet subscription |  |  |  |
| Poor rural infrastructures that inhibit the use of these gadgets |  |  |  |
| Poor condition of service of extension personnel |  |  |  |
| Lost of confidence in ICT as effective extension service delivery tool |  |  |  |
| Poor budget allocation to purchase these gadgets |  |  |  |
| Non functionality of the available gadgets |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ACTIVITY** | **JUNE**  **2021** | **JULY**  **2021** | **AUGUST**  **2021** | **SEPT.**  **2021** | **OCT.**  **2021** | **NOV.**  **2021** | **DEC.**  **2021** | **JAN.**  **2022** | **FEB.**  **2022** | **MARCH.**  **2022** |
| **CHAPTER 1- WRITE UP** |  |  |  |  |  |  |  |  |  |  |
| **CHAPTER 2-WRITE UP** |  |  |  |  |  |  |  |  |  |  |
| **CHAPTER 3- WRITE UP** |  |  |  |  |  |  |  |  |  |  |
| **DATA COLLECTION** |  |  |  |  |  |  |  |  |  |  |
| **DATA CODING/DATA CLEANING** |  |  |  |  |  |  |  |  |  |  |
| **STATISTICAL ANALYSIS** |  |  |  |  |  |  |  |  |  |  |
| **CHAPTER 4-WRITE UP** |  |  |  |  |  |  |  |  |  |  |
| **CHAPTER 5-WRITE UP** |  |  |  |  |  |  |  |  |  |  |

**RESEARCH TIMELINE CHART**