UNIVERSITY OF CAPE COAST

INFORMATION AND COMMUNICATION TECHNOLOGIES TRAINING NEEDS OF AGRICULTURAL EXTENSION AGENTS IN BAYELSA AND RIVERS STATES, NIGERIA

CHIMKANMA CHIMENEM WIGWE

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BY

CHIMKANMA CHIMENEM WIGWE

Thesis submitted to the Department of Agricultural Economics and Extension, School of Agriculture, College of Agriculture and Natural Sciences, University of Cape Coast in partial fulfilment of the requirements for award of Master of Philosophy degree in Agricultural Extension

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DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Name: Chimkanma Chimenem Wigwe

Signature:..... Date:.....

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Name: Prof. Festus Annor-Frempong

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ABSTRACT

Despite the fact that information and communication technologies (ICTs) have been proposed as a means to improve extension delivery in Nigeria, very little has been done to identify the ICT training need of agricultural extension agents. The study examined the ICT training need of agricultural extension agents in Bayelsa and Rivers States of Nigeria. A descriptive survey design, content validated and pretested questionnaire were used to collect data from 100 public extension agents in the two States. Descriptive statistics, T-tests and stepwise regression were used to analyse the data with the help of SPSS version 20 Software. The study revealed that hardware, software and World wide web were not frequently used for extension activities. There were differences in ICT training need for hardware, word-processing, statistical and presentation software, World wide web, social media and electronic mail according to State, sex, income, specialty of EAs, location of operational area, educational qualification, age and experience of extension agents. Selected socioeconomic characteristics determines ICT training need. Human, financial, policy, infrastructural and institutional constraints prevent extension agents from accessing training in ICT. The study recommends among others training in the use of hardware, software and World wide web for extension agents taking into consideration the sex, location, income of extension agents. Moreover, there should be stakeholders collaboration to address the numerous constraints preventing agricultural extension agents from accessing ICT training.

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LIST OF ACRONYMES

ACGS	Agricultural Credit Guaranteed Scheme
ADP	Agricultural Development Programme
AEAs	Agricultural Extension Agents
AEOs	Agricultural Extension Officers
AGRISNET	Agricultural Resources Information System Network
ATA	Agricultural Transformation Agenda
BEAs	Block Extension Agents
BLP	Better Life Programme
CD-ROM	Compact Disc Read Only Memory
DFRRI	Directorate of Food, Roads and Rural Infrastructure
EAs	Extension Agents
EOs	Extension Officers
FAO	Food and Agricultural Organisation
FCT	Federal Capital Territory
FDA	Federal Department of Agriculture
FERMA	Federal Roads Management Agency
FGN	Federal Government of Nigeria

FMARD	Federal Ministry of Agriculture and Rural Development
FNTs	Fort-Nightly Technological Trainings
FSP	Family Support Programme
GDP	Gross Domestic Product
GIS	Geographic Information System
GPS	Global Positioning System
GSM	Global System for Mobile Communication
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ICTA	Information and Communication Technology Agency
ICTs	Information and Communication Technologies
IFMR	Institute for Financial Management and Research
IIIT	International Institute of Information Technology
MDAs	Ministries, Departments and Agencies
MTRT/Ms	Monthly Technological Review Trainings/Meetings
MWDS	Mean Weighted Discrepancy Score
NACB	Nigerian Agricultural and Co-operative Bank
NAFPP	National Accelerated Food Production Programme
NALDA	National Agricultural Land Development Authority
NDE	National Directorate for Employment

OFN	Operation Feed the Nation
PAP	Poverty Alleviation Programme
RBDA	River Basin Development Authority
RFIDs	Radio Frequency Identification Devices
SIM	Subscriber Identification Module
SMS	Subject Matter Specialists
SURE-P	Subsidy Re-investment and Empowerment Programme
TNA	Training Need Analysis
TOT	Transfer of Technology
TV	Television
T & V	Training and Visit
VTFs	Virtual Trading Floors
WWW	World Wide Web

CHAPTER ONE

INTRODUCTION

This chapter examines the Information and Communication Technologies Training Needs of Extension Agents in Bayelsa and Rivers States, Nigeria. It discusses the background to the study, statement of the problem, research questions, objectives of the study, hypothesis, significance of the study, scope and definition of terms.

Background to the Study

Agriculture as a field of study, is concerned with activities of rearing animals, cultivation of soil to grow crops, and improvement of the quality of agricultural produce, products and by-products for utilisation by man, animals and industries. Agriculture is the mainstay of the economy of many nations and in most developing countries, agriculture provides employment for over 70 percent of the entire population (Anthony, 2010). For instance, in Benin, Tossou and Zinnah (2005) asserted that agriculture is the foundation of the economy, accounting for about 70 percent of export income and 40 percent of Gross Domestic Product (GDP). Agriculture is the backbone of Indian economy as the sector remains the principal source of livelihood for more than 52 percent of the population and contributes 14.2 percent to the Gross Domestic Product (GDP) (Raghavalu, 2012).

In Mozambique, agriculture is the pillar of the national economy with 80 percent of the population employed in the agriculture sector and 11 percent

contribution to the national GDP (Ministry of Agriculture, 2010). The strength of the Ghanaian economy is based on agriculture, which contributes some 45 percent to the nation's GDP and employs about 70 percent of its labour force (Okorley, Gray & Reid, 2009). In the case of Nigeria the situation is not very different. In addition to petroleum sector, agricultural sector is a key sector in the Nigerian economy with the sector accounting for over 26.8 percent of the national GDP and two thirds of the employment (Umaru & Zubairu, 2012).

The rural farmers are the backbone of agricultural production in Nigeria. Largely, the resource poor with fragmented farm plots, indigenous agricultural production and post-harvest activities, the rural farmers have continued to provide some level of sustenance and even contribute to the economic growth (Omotesho, Ogunlade & Muhammad-Lawal, 2012a). Nigeria is largely described as an agrarian society with at least 70 percent of her estimated population living in the rural and sub-urban areas constituting the major food producers (Ibe, 2011). Despite the endowment of Nigeria with 74 million hectares of arable land and 2.5million hectares of irrigable land, Nigeria is unable to take comparative advantage of the climatic condition, the large expanse of land and ever increasing teaming population to make her sufficient in food production, irrespective of variety of crops that thrive well with maximum yield in different ecological zones of the country (Oriola, 2009). The problems militating against agricultural productivity in Nigeria had been traced to use of primitive technologies and over-dependence on human labour (Ibe, 2011) and ineffective extension system (Nwachukwu & Kanu, 2011).

Nigeria's Government in a bid to achieve sufficiency in food production and food security, introduced several programmes such as School to Land

Project, Farmers Settlement Scheme, Operation Feed the Nation, Green Revolution, River Basin Development Authority (RBDA), Directorate of Food, Road and Rural Infrastructure (DFRRI), Federal Roads Management Agency (FERMA), Subsidy Re-investment and Empowerment Programme (SURE-P) and Agricultural Development Programmes (ADPs) which is the extension arm of Federal Ministry of Agriculture and Rural Development (FMARD) in Nigeria. Agricultural extension services were identified with most of the programmes of Government to improve the livelihood of the people. Agricultural extension as an organisation supports and facilitates the people involved (engaged) in agricultural production to access or obtain timely beneficial knowledge, information, skills and technologies to address the problems of clienteles so as to improve the livelihood and overall standard of living of people (Birner et al, 2006).

Agricultural extension also links research with farmers by communicating agricultural innovations from point of innovation development to innovation users and then from farmers problems to research stations. Adekunle (2013) demonstrated the relationship between research, extension and farmers systems when he emphasised that knowledge (technology and information) would not be communicated from research to farmers and farmers problem(s) to research stations if extension is absent. In contributing to the pivotal role played by extension, Mabe and Oladele (2012) posited that agricultural extension bridges the gap between available technology and farmers' practices through the provision of technical advice, information and training and, they further indicated that without this bridge of gap, farmers' ability to adopt new technologies and plant varieties to enhance production

and income would be limited. Food and Agricultural Organisation (FAO, 2013) posited that in order to effectively bridge the gap between technology developers and technology users that is capable of improving livelihoods of the technology users, there has to be sufficient extension service system and timely agricultural knowledge transfer from point of invention to point of use. Suffice to say that insufficient extension services and poor access to information are known to widen the gap in the adoption of new technologies.

More so, agricultural information to and from farmers to research are time bound, and effective agricultural extension service delivery therefore depends on ability of extension to deliver agricultural knowledge to farmers and take farmers problems in turn to research on time. The extension agent who is the only extension staff saddled with such responsibility is therefore key to information delivery. Information and Communication Technologies (ICTs) have enormous potentials to facilitate timely communication of agricultural knowledge, bridge the gap between agricultural information developers and farmers, and also develop the agricultural sector especially by improving the performance of agricultural extension agents and the overall extension sub-system if, the extension agents are equipped with necessary competence in the effective use of ICTs for extension activities.

Unfortunately, agricultural extension agents in Nigeria, still depend on traditional system of agricultural information communication such as face-to-face home and farm visits. Aboh (2008) opined that extension agents in most developing countries have used all sorts of traditional information communication technologies such as radio, television, drama and video in the delivery of extension service to clienteles. The traditional system of

communication is no longer effective for time bound innovation transfer and, is unable to manage the high farmer extension agent ratio in recent time, thus, limiting farmers' productivity. The goal of the knowledge transfer is to raise farmers knowledge that will translate into increased efficient and effective agricultural production.

The agricultural development programmes (ADPs) which is the extension arm of the Federal Ministry of Food and Agriculture (FMARD) in Nigeria, realising the immense benefits of ICTs and in a bid to establish an effective extension system as well as alleviate the problems militating against high agricultural productivity, have made information and communication technologies (ICTs) an integral part of the extension communication process. ICT according to Odiaka (2011), is an umbrella term that includes all technologies for the storage, retrieval, manipulation, and communication of information. ICT is any device, tool or application that permits the exchange or collection of data through interaction or transmission (World Bank, 2011). Information and communication technologies (ICTs) are those technologies that are currently in use to interlink information technology devices such as personal computers with communication technologies such as telephones and their telecommunication networks (Okon, 2013). Information and Communication Technology (ICT) encompasses the use of existing technology such as hardware, software and telecommunication options, including the internet and telephony (mobile and landline) systems (FAO, 2013).

Meera, Jhamtani and Rao (2004) had stated that some of the numerous areas ICT play an important role are in agricultural extension activities, development of farming system research and extension, having location-

specific modules of research and extension, promoting market extension, sustainable agricultural development and participatory research. The present rapid changes that information and communication technologies are causing in agriculture as well as agricultural extension work environment, is as a result of new practices and new ICT gadgets. The rapid changes make it imperative for agricultural extension agents who are employed in agricultural extension delivery organisations such as the ADPs to be skilled in the use of ICTs in performing extension activities in an efficient and effective manner.

ICTs enable extension system orient towards overall agricultural development of small production systems by creating the enabling environment for small scale farmers with appropriate knowledge to compete in the agricultural sector (Nnadi, Chikaire, Atoma, Egwuonwu & Echetama, 2012). ICTs such as mobile telephones, Internet web and search engines, radio, television, optical disks, electronic communications, computer, digital cameras, videos, audio recorders, software and many more are known to play diverse roles in agriculture. World Bank (2011) opined that the types of ICT-enabled services such as, the use of mobile phones which serve as a platform for exchanging information through Short Messaging Services (SMS) are growing quickly in usefulness and improving the capacity and livelihoods of poor smallholders.

Similarly, Qiang, Kuek, Dyamond and Esselaar (2012) opined that mobile communications technology has become the world's most common way of transmitting voice data and services and, no technology has ever spread faster. Extension agents trained in the appropriate use of ICTs, are able to answer faster with greater ease and increased accuracy, many of the questions

asked by farmers (including questions on how to increase yields, access markets and adapt to weather conditions) (World Bank, 2011). Hence, appropriate use of ICTs by extension agents improve performance of extension agents and the overall performance of the extension organisation such as the ADPs.

The performance of an organisation such as the ADPs, depend on the performance of the extension agents who are the human resource capital of the ADPs that play an important role in the growth and performance of the extension system in Nigeria. It has however been established that the public extension organisation is not effectively and efficiently delivering extension service, hence, the training of extension personnel is regarded as the quick way to assess the necessity of agricultural extension transformation agenda, and the overall goal of agricultural transformation agenda (ATA) is to develop well-trained staff that will carter for a variety of actors along the targeted value chain in the States (Haruna & Abdullahi, 2013). The training of personnel in any organisation is increasingly becoming an important issue to the need for the management and its employee to be successful. Ovwigho (2011) had argued that the training of agricultural extension workers is an integral part of the overall agricultural production process since it is the duty of agricultural extension agents to reach farmers with useful and practical information for increased agricultural production. More so, jobs are becoming more technical and organisation specific and there are fewer candidates whose qualifications meet such requirements, hence the need to increase the technological knowledge and abilities of staff (McConnel, 2003). To improve organisational

and employee performance, the employee of the organisation is trained (Khan, Khan & Khan, 2011).

Training is the process of providing knowledge and skills that are capable of bringing about desired changes in attitude in order to improve the competence of people being trained with the ultimate goal of improving performance (Youdeowei & Kwarteng, 1995). Armstrong (2009) opined that training is the use of systematic and planned instructional activities to promote learning, and training involves the application of formal processes to impart knowledge that assist people acquire necessary skills to perform jobs satisfactorily. Armstrong (2009) further posited that training is one of the several responses an organisation such as the ADP can undertake to promote learning. In order to improve the performance of extension agents in ADPs across the 36 States of Nigeria, the extension agents are trained during fort-nightly technological training (FNTs) and monthly technological review trainings. To effectively and efficiently respond to training need of extension agents through training, the training need of trainees (agricultural extension agents) have to be identified through need identification assessment in order to channel resources toward the desired need.

Training need refers to the competence that must be acquired by employees to enable them perform jobs at optimal level (Youdeowei & Kwarteng, 1995). ICT training need, thus refers to ICT competence that must be acquired by agricultural extension agents to perform assigned tasks at optimal level. ICT training need identification is not conducted in proxy but by identifying needs from the extension agents who need the training through survey. The survey method of training needs identification is supported by

McConnell (2003) who defends that, the most used need identification method is survey approach whereby questionnaire is used. The training need identification survey assisted in revealing agricultural extension agents training needed in ICTs such as hardware, word-processing, presentation and statistical software, social media, electronic mail and internet browsing to successfully integrate ICTs in the agricultural extension communication process and, improve ICTs competence of agricultural extension agents through training such as in-service training. Thus, the need to examine ICT training needs of extension agents in Bayelsa and Rivers States.

Statement of the Problem

Agricultural Development Programmes (ADPs) are responsible for extension delivery in Nigeria. However, the ADPs have been noted to be ineffective and inefficient in delivering extension services to many farmers in Nigeria. For example, there is large extension to farm family ratio of 1:10,568 and 1:3,450 that the ADPs in Bayelsa and Rivers States respectively need to address. Ekong (2005) as cited in Orikpe and Orikpe (2013) had recommended the ideal extension officer to farmer ratio in Nigeria to be 1:750 or even less. Onyenkazi and Gana (2009) found that the private extension agents rated their agricultural extension communication, methods and programme competencies to be higher than the public extension service providers in Rivers State.

Training of agricultural extension agents have therefore become an important means of addressing the problems of extension services delivered by ADPs. To the extent that the Agricultural Transformation Agenda (ATA) had well trained extension agents along the agricultural value chains as its overall goal (Haruna & Abdullahi, 2013). Training on application of ICT for extension

delivery has been found to be important to address the problems in extension. Odiaka (2011) suggested capacity building and training of extension agents to apply ICTs as intervention for ADPs to be effective. Haruna and Abdullahi (2013) recommended that addressing ICT training needs of extension agents will help curb the high extension to farm family ratio. Albert and Onwubuya (2013) have identified partial application of ICT tools by extension agents to improve extension delivery. The release of ₦200 million grant by Federal Government of Nigeria in partnership with Sasakawa Africa Association to train 5,000 agricultural extension workers in the use of ICTs in five States including Bayelsa and Rivers States, buttresses the need to train extension agents in the effective use of ICTs in Bayelsa and Rivers States ADPs (The Nation, 2014).

Despite the need to train extension agents to apply ICTs in extension, very little is known as to aspects the extension agents should be trained on. According to Tirkey, Kabi and Sarkar (2013), extension services have used on the job training to acquire knowledge and skills on technology to improve performance. Efforts made by individuals and ADPs to acquire ICT training and apply them in extension are not reported on in Bayelsa and Rivers States. Hence, the need for the study to examine the information and communication technologies training needs of public agricultural extension agents in Bayelsa and Rivers States of Nigeria.

Objective of the Study

The general objective of the study was to examine information and communication technologies training needs of public agricultural extension agents in Bayelsa and Rivers States of Nigeria.

Specific Objectives

The specific objectives of the study were to:

1. Examine the extent of use of ICTs by agricultural extension agents in extension service delivery.
2. Examine the differences in ICT training needs among agricultural extension agents in Bayelsa and Rivers Sates.
3. Predict ICT training needs from selected socio-economic characteristics of extension agents.
4. Examine constraints faced by extension agents in accessing ICT training in Bayelsa and Rivers States.

Research Questions

1. To what extent are agricultural extension agents using ICTs in agricultural service delivery?
2. Are there differences in ICT training need among extension agents?
3. Do the background of extension agents determine ICT training need?
4. What are the constraints faced by extension agents in Bayelsa and Rivers States in accessing ICT training?

Hypotheses

The following non-directional hypotheses were tested at 0.05 alpha level of significance.

1 $\mathbf{H_0}$: There is no significant difference between state where ADP is located and ICTs training needs of extension agents.

$\mathbf{H_1}$: There is a significant difference between state where ADP is located and ICTs training needs of extension agents.

2 $\mathbf{H_0}$: There is no significant difference between sex and ICTs training needs of extension agents.

$\mathbf{H_1}$: There is a significant difference between sex and ICTs training needs of extension agents.

3 $\mathbf{H_0}$: There is no significant difference between location of operation area and ICTs training needs of extension agents.

$\mathbf{H_1}$: There is a significant difference between location of operation area and ICTs training needs of extension agents.

4 $\mathbf{H_0}$: There is no significant difference between area of specialisation and ICTs training needs of extension agents.

$\mathbf{H_1}$: There is a significant difference between area of specialisation and ICTs training needs of extension agents.

5 $\mathbf{H_0}$: There is no significant difference between income and ICTs training needs of extension agents.

$\mathbf{H_1}$: There is a significant difference between income and ICTs training needs of extension agents.

6 $\mathbf{H_0}$: There is no significant difference between experience and ICTs training needs of extension agents.

$\mathbf{H_1}$: There is a significant difference between experience and ICTs training needs of extension agents.

7 $\mathbf{H_0}$: There is no significant difference between age and ICTs training needs of extension agents.

$\mathbf{H_1}$: There is a significant difference between age and ICTs training needs of extension agents.

8 $\mathbf{H_0}$: There is no significant difference between educational level and ICTs training needs of extension agents.

$\mathbf{H_1}$: There is a significant difference between educational level and ICTs training needs of extension agents.

Significance of the Study

Information and Communication Technologies (ICTs) are bringing about rapid technological changes in agricultural extension activities. There is a paradigm shift of agricultural extension from narrow mindset of transferring technological packages to knowledge transfer. This new shift is being propelled through application of information and communication technologies (ICTs), which is expected to make extension more diversified, knowledge-intensive, demand driven and market oriented and most importantly, effective in meeting information needs of farmers. To this end, agricultural extension agents in Bayelsa and Rivers States, need to be abreast with the prevailing changes. Appraisal of ICT training need of extension agents in relation to the prevailing changes in extension work brought about by technological changes, can lead to fashioning out an in-service kind of training so that extension agents can be effective in achieving organisational goals.

Mabe and Oladele (2012) posited that, agricultural extension bridges the gap between available technology and farmers' practices through the provision of technical advice, information and training and, without bridging this gap, farmers' ability to adopt new technologies and plant varieties, which would benefit their production and incomes, would be limited. ICT has enormous potentials to bridge the communication gap between agricultural information developers and farmers that in turn, develop agricultural extension and the

agricultural sector through faster, accurately, reliable and consistent information that can be stored and retrieved irrespective of time and location. There is indeed, a need to train agricultural extension agents in the areas of ICT in order to; manage the decrying extension to farmer ratio, curb the ravaging food crises in the two States, facilitate the realisation of ATA, sustain value chain in agriculture, reduce the annual food import bill of the country, increase the rating of public extension service and, build an ICT competent extension workforce that meets not just the prevailing challenges in the States but also, the increasing global changes in agricultural extension service delivery.

The study hence, reveals the ICTs training need of agricultural extension agents in Bayelsa and Rivers States of Nigeria. The recommendations made will assist policy planners to close the ICT incompetence gap of extension agents to cope with the challenges they face in the course of service delivery. Furthermore, stakeholders such as extension agents, agricultural extension service delivery organisations, training developers and, Ministries and Departments as well as Agencies of agriculture can use the findings to plan and channel resources toward efficient capacity building in the identified ICTs training need of the extension agents. The results could be used to facilitate the actualisation of agricultural transformation agenda (ATA) by developing well trained agricultural extension agents capable of applying ICTs when delivering extension services to farmers. This will reduce the country's annual food import bill as well as sustain the value chain agriculture in Nigeria through effective and timely extension intervention that can improve farmers' performance and productivity. The study will serve as a reference point for academics (students, lecturers, organisations and other researchers) to carry out further research in

the subject matter. This is so because, such researchers may use the research methodology, the theoretical and empirical literatures reviewed, the findings of the study and other aspects of the study to improve future research in the area.

Delimitation of the Study

The study focussed on the examination of information and communication technologies training needs of public agricultural extension agents in Bayelsa and Rivers States as required for extension service delivery. The study did not consider private agricultural extension agents in the States who are known to be better equipped in the use of ICTs for extension work. The dependent variables were the ICTs training needs (such as hardware, word processing, presentation software, statistical software, world wide web internet service, social media and use of electronic mail) of the extension officers in Bayelsa and Rivers States.

The study examined agricultural extension agents training needs in ICTs such as hardware, word-processing, presentation software, social media, statistical software, WWW internet services and electronic mailing so as to, find out the type of ICT that appropriate training resources should focus on when developing training in ICTs for the extension agents. The study obtained responses only from the public extension agents who are geographically located in the ADPs in Bayelsa and Rivers States.

Definition of Terms

Agricultural Extension Agents

These are staff of Agricultural Development Programme who deliver information and guide farmer clienteles on community, youth and human development issues as well as agricultural, environmental, economic and rural

concerns. Extension agents facilitate the adoption of improved skills and knowledge and change attitude of farmers, families, youth and all relevant stakeholders on a day-to-day basis. Specifically, they are staff with rank as Block Extension Agents (BEAs), Village Extension Agents and Subject Matter Specialists (SMS).

Information and Communication Technologies (ICTs)

These are technologies for the storage, retrieval, manipulation, and communication of information for extension delivery. They include ICT hardware, word-processing software, world wide web internet, spreadsheets software, presentation software, electronic mail and social media**.**

Information

Information is processed data that conveys meaning that is useful to people (Shelly & Vermaat, 2011). In this study, information refer to agricultural related messages which convey meaning or sense and are useful to agricultural extension agents and farmers.

ICT Training Need

Training need refers to the competence that must be acquired by employees to enable them perform jobs at optimal level (Youdeowei & Kwarteng, 1995). ICT training need, thus refers to ICT competence agricultural extension agents perceive to acquire to perform assigned tasks at optimal level.

Socio-economic characteristics

This refers to age, income, educational qualification, marital status, experience, membership of associations, location and sex background of extension agents.

Access

The opportunity of extension agents to use ICTs to perform extension activities.

Extent of ICTs Usage

Number of ICTs used in a week to perform extension activities.

Constraints

These are challenges faced by extension agents in acquiring competence to use ICT for extension delivery.

Extension Service Delivery

Activities ranging from programme planning, implementation, monitoring, evaluation, home and farm visits, training of farmers, demonstrations and transfer of agricultural information between research stations and farmers.

Organisation of Study

The thesis is organised into chapters. Chapter One which is the introductory chapter focussed on background of the study, statement of the problem, objectives of the study, the research questions, hypothesis, justification for the study and delimitation of the study. Chapter Two is devoted to review of relevant literature on the concept of information and communication technologies (ICTs), agricultural extension service delivery, training need identification and training need identification models, ICTs application in agriculture and extension work, extent of use of ICTs for extension work, constraints in accessing training in ICTs and socioeconomic correlates of training need.

The methodology for the study is found in Chapter Three. Items covered include study design, study area, study population and sample, instrumentation, data collection procedure and data analysis techniques. Chapter Four discusses the results in relation to the objectives and hypothesis of the study. Finally, chapter Five presents the summary, conclusions, recommendations and areas of further research.

CHAPTER TWO

LITERATURE REVIEW

This chapter reviews relevant literature related to the research objectives and hypothesis of the study. It starts with the review of concept of information and communication technologies, agricultural extension service delivery, training models and training needs identification. Based on this, the conceptual framework was developed and empirical literature based on the objectives and hypothesis were done.

The Concept of Information and Communication Technologies (ICTs)

According to World Bank (2011) report, ICT is any device, tool or application that permits the exchange or collection of data. The device ranges from radio, satellite imagery and mobile phones. ICTs include all technologies for the storage, retrieval, manipulation, and communication of information or digital data. The specific range of such technologies include magnetic disk or tapes, optical discs, flash memory, scanners, radio, television, camera, microphone, loudspeaker, landed/mobile telephones, personal computers, internet and softwares (Odiaka, 2011)**.** Okon (2013) emphasised that ICTs are those technologies that link information technology devices such as personal computers with communication technologies such as telephones and telecommunication networks.

The definition of ICTs seemed to centre on mobile telephony due to its ability to encompass all aspects of ICT. For example, FAO (2013) described

ICTs as not only encompassing the use of existing technology such as hardwares, softwares and telecommunication options but include, the internet and telephony (mobile and landline) systems. The use of mobile communication technologies to transfer information in various formats such as voice, written and other data is making it versatile among ICTs. Qiang, Kuek, Dymond and Esselaar (2012) noted that the mobile phenomenon, its applications and high growth rate among users are becoming important for developing countries.

Overview of Agricultural Extension Efforts in Nigeria

Nwachukwu and Kanu (2011) summarised the origin and management of agricultural extension in Nigeria from its inception in three phases. Phase I organised and managed extension through a combination of coercion, manipulation and provision of services. In this phase, there were absence of scientific information to extend to its clients, conflicting role from the adoption of incongruous strategies such as coercion and manipulation, dual structure of agricultural development strategy, cash and food crops dichotomy in favour of cash crops and neglect of food crops. This is the stage that recorded the establishment of Botanical Garden in 1893 at Olokomeji now, Ogun State, the acquisition of a plot of land at a site (now called Moor Plantation, Ibadan) by the British Cotton Growers Association in 1905 for the production of cotton for the British Textile Industry and the establishment of a unified Department of Agriculture in 1921 with its headquarters at Moor Plantation in Ibadan.

Phase II covers the period of 1952 to 1968 when the federal government started getting involved in agriculture. The phase II is characterised by the establishment of; Federal Ministry of Agriculture and Natural resources in

1946, regions where agricultural extension and rural development became the exclusive responsibility of the regional governments, Farm Settlement Scheme, School Leavers Farmers and special commodity extension service of export crops such as cocoa and rubber, leaving the general extension services for food crops and livestock. Phase III witnessed the establishment of many agricultural extension organisations such as; (i) Federal Department of Agriculture (FDA) field officers in 1970 to supplement the activities of States Ministry of Agriculture. However, some States where reluctant to relinquish extension responsibilities to the Federal Departments of Agriculture with the fear of job security if the latter takes over the roles of the States; (ii) National Accelerated Food Production Programme (NAFPP) in 1972 which was regarded the best extension strategy by bringing researchers, extension workers and farmers together in order to improve food production.

Although, the NAFPP gradually died off as an extension strategy because it focussed more on mono-cropping; (iii) The establishment of Agricultural Development Programme (ADP) in 1975 through the introduction of an integrated approach to agricultural extension and rural development and, with the purpose of accelerating agriculture using the training and visit (T & V) extension approach; (iv) Operation Feed the nation (OFN) Programme was established in 1976 to create awareness of food situation in Nigeria; (v) River Basin Development Authority (RBDA) in 1977/78 was established but faced poor management that limited its impact; (vi) In 1980, Green revolution Programme was introduced to replace OFN but the change in government halted its performance; (vii) The ADPs which started as pilot programme in 1975 and was completed in 1980 because of seemingly encouraging results

obtained, became operational till date in all the States of Nigeria including the Federal Capital Territory, Abuja (FCT). ADP was a joint effort of the Federal Government of Nigeria and World bank that provided funds for the programme. The ADP is presently the official agency in charge of extension service delivery in Nigeria. It was in this phase that the World bank also established the T & V system as the management strategy for running the ADPs in the States.

Ogunsumi and Abegunde (2011) had argued that while the programmes summarised in the three phases of extension have been applied and pursued as pure extension systems in Nigeria, they however lack one or more of the necessary characteristics of a true extension system, and the strategies usually served as interim measures to correct specific deficiencies in an existing extension system. Ogunsumi and Abegunde (2011) also included Nigerian Agricultural and Co-operative Bank (NACB), University based extension projects, Agricultural Credit Guaranteed Scheme (ACGS), Directorate of Food, Roads and Rural Infrastructure (DFRRI), Better Life Programme (BLP), Family Support Programme (FSP), National Directorate for Employment (NDE), Poverty Alleviation Programme (PAP) as part of government efforts to improve extension system in Nigeria.

Daneji (2011) classified the the intervention programmes of successive governments in Nigeria based on; (i) Policy-based intervention programmes such as NAFPP, OFN and Green revolution Programme (GR); (ii) Agency-based intervention programmes such as National Agricultural Land Development Authority (NALDA), River Basin Development Authority (RBDA), the ADPs and DFRRI. The phases of agricultural extension in

Nigeria revealed that extension system in Nigeria has changed from several extension approaches such as the unified extension approach, transfer of technology (TOT), commodity specialised and the T & V approach within which value chain in agriculture is now practiced. The agricultural extension system especially, the ADPs are still faced with several challenges such as absence of defined agricultural extension policy framework, inadequate funding, inadequate qualified extension staff, lack of appropriate extension approach, inadequate staff training, inadequate mobility provisions, top-down approach in project design and implementation and bureaucratic bottlenecks (Auta & Dafwang, 2010; Daneji, 2011 and Ogunsumi & Abegunde, 2011).

The Concept of Agricultural Extension Service Delivery

Agricultural extension service delivery focuses on development of rural sector, improving the living conditions of farming households through increased farm production and improved productivity worldwide (Lawal-Adebowale, 2009). Lawal-Adebowale (2009) further asserted that in achieving the above goals, extension provides the rural farmers with applicable research-based technologies and relevant skills for the implementation of acquired technical information. The provision of needed technical knowledge to farmers makes agricultural extension a knowledge transfer system. Asiabaka (2012) described agricultural extension as a communication process that facilitates the transfer of agricultural information among principal actors within the research-extension-farmer continuum. The continuum enables extension agents to play a pivotal role by communicating agricultural innovations to farmers from research and also transfer farmers' concerns as feedback to the research centres (Adekunle, 2013). Within the continuum, extension agents teach and assist

farmers to acquire appropriate knowledge and skills capable of increasing productivity and improving farmers well being.

Agricultural extension agents also play roles or functions that enable them to coordinate principal actors within the agricultural value chain and harness relevant agricultural knowledge capable of improving farmers' livelihood. Anandajayasekeram, Puskur, Sindu and Hoekstra (2008), FAO (2001) and Nwosu and Nwachukwu (2013) summarised the services/roles expected to be delivered by the agricultural extension system especially, the ADPs in Nigeria to include transferring agricultural knowledge from research to farmers, assisting farmers identify farm related problems that are communicated to research by extension agents, providing specialised extension education during monthly technology review meetings (MTRMs) and fortnightly trainings (FNTs), teaching farmers to solve farm related problems through demonstrations or trainings, planning, monitoring and evaluating developmental programmes/projects and, stimulating or inspiring farmers to participate in developmental projects.

The roles identified to be played by extension agents mirrors that of Van den ban and Hawkins (1996) and Swanson and Rajahlati (2010) who stated that extension agents are responsible for advising, motivating and transferring information on improved agricultural practices to farmers, planning, monitoring and evaluating agricultural programmes. Extension agents adopt extension methods in the course of delivering services to farmers. According to Van den Ban and Hawkins (1996), the extension methods include individual or face-to-face extension, group and mass media. Anandajayasekeram, Puskur, Sindu and Hoekstra (2008) also classified the extension methods into the three

categories but referred to the individual method as household method. The individual extension consists mainly of dialogue between extension agent and farmer whilst the group methods reach fewer farmers but, offer more opportunities for interaction compared to the mass media method which help extension agents to reach large number of farmers simultaneously (Van den Ban & Hawkins, 1996).

In the words of Anandajayasekeram, Puskur, Sindu and Hoekstra (2008), individual or household extension method is most effective for activities undertaken by or within the full control of the individual farmer or household such that, discussion with the whole family highlights more problems and more experience is brought to the discussion. Anandajayasekeram, Puskur, Sindu and Hoekstra (2008) further stated that group method involves working with groups especially when there are activities to be undertaken by a group whilst the mass media method involves the use of radio, drama, television, posters, newspapers, films, slide shows and are mainly used to create awareness. Van den Ban and Hawkins (1996) had stated that the group method adopts approaches such as group discussions and demonstrations and, modern information and communication technologies such as audio and video recorders, CD-ROM, World Wide Web and Internet are now incorporated into extension methods. However, none of the extension methods can be singled out as the best one due to the fact that they all have their advantages and disadvantages and, the choice of method is dependent on several factors such as tenure system in the community and resources available for the extension agent however, a combination of extension methods are more effective than just one method (Anandajayasekeram, Puskur, Sindu & Hoekstra, 2008).

Training Needs Identification

Training is the process of teaching people to acquire relevant knowledge and skills that are capable of bringing about desired changes in attitudes to improve the competence of people being trained (Youdeowei & Kwarteng, 1995). The goal of training is to improve performance of the trainees. Youdeowei and Kwarteng (1995) noted that apart from knowledge and skills, training also changes the attitude of people. Training is often differentiated from education. Training is usually short term, narrowly focused and specific, designed to meet a specific need and has immediate application. However, education is long term, broadly focused and aimed at preparing people for the future. In the words of Armstrong (2009), training is a systematic and planned process and involves the application of formal processes to promote learning, impart knowledge and skills that are needed to perform jobs satisfactorily. Training of personnel in an organisation such as agricultural extension system, is capable of bringing about favourable and desirable change(s) in attitude, knowledge, achievements and skills (AKAS) of the staff being trained. A trainer at one point in time, can also be a trainee at another time. For instance, agricultural extension agents serve as trainers to farmers. The extension agents in turn, become trainees during FNTs and MTRMs as captured in the training and visit (T & V) approach.

Organisations train their staff to develop the competence of staff. Training of extension agents take many forms namely; (i) on the job (in-service) training and (ii) pre-employment (pre-service) training (Asiabaka, 2012). Pre-service training impart knowledge and skills to people in a school, college or university prior to recruitment and staffing. In the course of the pre-

service training, the trainee receives training specific to a technical subject matter such as crop science that is required for job entry. For instance, the village level extension agents and subject matter specialists in Nigeria, receive intermediate level education from polytechnics or its equivalent that award a diploma and, university to be awarded a bachelors degree respectively. According to Tirkey, Kabi and Sarkar (2013), on the job training also known as in-service training or induction course arise as a result of technological change such as ICTs, is the type of training given to an individual who is gainfully employed but requires certain knowledge and skills to improve performance. In the views of Asiabaka (2012) in-service training is a type of training given to an individual who is gainfully employed but requires certain knowledge and skills to improve efficiency. In-service trainings are planned and implemented, after a skill gap assessment or training need(s) identification exercise. It is based on the training needs identified, that in-service training can take varying length of time such as hours, days, years and also take different forms such as workshop, seminar, symposium and induction course, that is undertaken *post facto* that is, after the pre-service training of the staff (Asiabaka, 2012).

McConnell (2003) stated that training increases the technological knowledge and skills of staff and is also important to the success of any organisation since jobs have become more technical, organization specific and there are fewer candidates with qualifications that meet such requirements. Promotion, transfers, recruitment and changes in work description or working conditions are some of the factors capable of resulting in need for in-service kind of training of staff (Armstrong, 2009; Asiabaka, 2012; Itika, 2011 and McConnel, 2003). In the face of prevailing changes in technology, especially

in the area of information and communication technologies, staff need to keep abreast with such prevailing changes by appraising and upgrading the competence of staff. However, in order to provide staffs with appropriate training, the skill gap of the staffs have to be identified through training need assessment or analysis.

The term "training need" or "skill gap" according to Youdeowei and Kwarteng (1995), refers to the competence that must be acquired by employees to enable the employees perform their jobs at optimal levels. Training need can be expressed as the difference between the employees' present or actual level of competence/performance or actual knowledge and skills possessed (actual) and, the required levels of knowledge and skills (optimal) (Youdeowei & Kwarteng, 1995; McConnell, 2003; Armstrong, 2009). In the words of Itika (2011), a training need is any shortfall between the knowledge, skills and attitudes of the employee vis-à-vis what is required by the job or the demands of organisational change.

Itika (2011) asserted that training needs assessment is a systematic process that identifies skill gap of staff in order to provide the basis for training the staff. Itika (2011) further stated that new technology, new approach or service, clientele interest, poor performance, lack of basic skills are some factors that give rise to training needs analysis. Training needs analysis enables organisations to put training resources to valuable use by identifying specific and appropriate needs before venturing into the training. However, training resources can only be put to valuable use if, the training needs assessment is successful. Training needs analysis is said to be successful if, it identifies only the people that need the training as well as the kind of training that is needed.

Suffice to say that, training needs analysis will be counter-productive if, the training is mix-matched by either offering training to persons who do not need it and or offering the wrong kind of training. To avoid the provision of mix-matched training, Armstrong (2009) suggested that the training has to be relevant and realistic as possible, anticipating and dealing with any potential transfer difficulties. Relevant and realistic training make trainees to apply learning especially, when training is not perceived to be difficult and, what is learnt is relevant and useful to the trainees. Thus, training is useful only when it is designed according to training needs and offered to people who will benefit from it (Youdeowei & Kwarteng, 1995). Effective training is the one conducted to meet specific employee needs that are recognised by the employees as developmental needs (McConnell, 2003).

The first step in any training need assessment is to identify or determine the training needs (performance levels expected) of the training beneficiaries (Armstrong, 2009; Youdeowei & Kwarteng, 1995). This implies that, training needs identification is the first stage in any need assessment. Armstrong (2009) and Itika (2011) classified need into four different inter-related categories such as organisational, person, performance and task needs. The person (also called individual) need has been described as that skill gap required by an individual to execute assigned tasks at optimal level in order to achieve organisational goal(s). Armstrong (2009); Brown (2002); Itika (2011) and McConnel (2003) opined that the various needs assessment approaches or techniques for collecting data on training need topic include direct observation of individuals at work or work samples, survey using questionnaire and or check list, review of relevant literature, interview of persons in key positions such as opinion

leaders, focus group discussions or meetings, simulations, archives and documents such as records and reports. Training needs identification survey using questionnaire is the most used approach (McConnell, 2003). McConnell further stated that the questions in the questionnaire should be flexible such that, some answers may require follow up question(s) and, subjects/respondents should be given wide range of scaled choices from which their responses can easily fit.

Training Needs Identification Models

Training needs identification models include Delphi Technique, Q-sort methodologies, Borich's model and O-T-P model (Waters & Haskell, 1989; Layfield & Dobbins, 2002; Alibaygi & Zarafshani, 2008; Sorensen, Tarpley & Warnick, 2010; Sherazi, Ahmed, Iqbal, Umar & Rehman, 2011). The need identification models have been categorized as either single-need survey (otherwise referred to as direct method) or dual-need survey. For instance, Watkins, Meiers and Visser (2012) referred to the Borich's model as dual-need assessment survey whilst the direct method such as the delphi technique was referred to as single-need assessment survey. Watkins, Meiers and Visser (2012) further recommended Likert-type scale to be used for either dual-need or single-need survey. McConnel (2003) had argued that there is no one best model for identifying training needs irrespective of the category of need in that, the essence of identifying the training needs is to develop a description of the exact training need topic that is required such that, the identified needs are then transformed into measurable objectives from which training designers or developers select or create appropriate training course.

The dual-need survey such as the Borich's model, collects the perceived training needs in two parts/dimensions by soliciting for information on respondents (i) actual knowledge level and (ii) optimal level. According to Waters and Haskell (1989), Borich's model attempts to gather additional information relating to respondents current knowledge (called the actual or what is) of the topic and also, respondents ability or importance to apply the needed knowledge (referred to as the optimal/standard or what ought to be). In the Borich model, the respondents scale their perceived current knowledge of the training need topic and also perceived importance of the training need topic. In the Borich model, the Mean Weighted Discrepancy Score (MWDS) for each individual's need is calculated by subtracting the mean score of the "actual" from the mean score of the "optimal" (this gives the discrepancy score) and then, multiplying the discrepancy score by the mean score of the "optimal" (Waters & Haskell, 1989; Alibaygi & Zarafshani, 2008; Sorensen, Tarpley & Warnick, 2010). Based on the scores obtained from the calculation of the MWDS, the needs are then ranked in order of priority (needs are prioritised in descending order of MWDS).

The single-need survey models, unlike the dual-need survey models, do not collect additional information rather, directly obtain respondents perception on the training need topic. This is the reason for which the single-need survey models are also referred to as direct need identification models. In the direct method, the ranked needs are based on respondents perception of the current knowledge level as well as the required knowledge without separating the actual from the optimal need. While the dual-need survey models are more time consuming in soliciting for additional information from respondents, the

single-need survey models save time especially, when the survey involves large sample size (where sample size is >30% of the population). Hence, Ovwigho (2011) argued that most dual-need survey models are cumbersome and time consuming. It is evident that the direct need models aim at managing response fatigue by directly identifying perceived need of the subjects. In the light of the forgone, the single-need identification model was deemed appropriate for this study.

Relevance of Training

Training in any form is intrinsic to organizational effectiveness, efficiency and is important for the survival of the organization such as agricultural extension service delivery in a world of ever changing technologies (Tirkey, Kabi & Sarkar, 2013). Training has many advantages for the individual, the department and the organisation because, training is expected to provide skilled human resources by improving existing knowledge and skills of employees capable of improving job performance and opportunity for career development (Itika, 2011). Similarly, Khan, Khan and Khan (2011) started that the actualisation of organizational goals depend on the human resource capital of organization which play an important role in the growth of the organization. To facilitate the actualisation of set goals of an organization, the employees performance are enhanced through training (Khan, Khan & Khan, 2011). Training of personnel is very essential in facilitating the level of productivity and the development of personnel in any organisation (Olaniyan & Ojo, 2008).

Armstrong (2009); Itika (2011) and Asiabaka (2012) summarised that the justifications/rationales for training is to develop the knowledge and skill of staff in a given subject matter such that the staff can meet new demands of

executing complex or specialised tasks, be up-to-date on latest research findings and technologies, conform to new working conditions, develop career and manage decrying state of extension to farmer ratio due to shortage of staff.

Review of Empirical Studies

This section consists of review of empirical literature relating to application of ICTs to agriculture and agricultural extension work, extent of use of ICTs in agricultural extension activities, constraints faced by extension agents in accessing trainings ICTs, studies that adopted single-need identification model and socio-economic correlates of training needs.

Application of ICTs in Agriculture and Agricultural Extension

The most common sources of many farmers information needs are television (TV), radio, newspaper, fellow farmers, traders, friends and family relatives (FAO, 2013). Okon (2013) stated that the common sources of communication such as radio and television, are being used by extension agents to disseminate information to a wide range of audience. However, these common sources of information can be biased, inconsistent and unreliable, but encouragingly, different information and communications technologies (ICTs) have emerged (FAO, 2013). The ICTs that have emerged in recent times include mobile phones, computers, geographic information system (GIS), internet facilities and voice recorders.

The emergence of information and communication technologies (ICTs) gave rise to the use of ICTs for development projects in agriculture. Mobile phones, internet connectivity, computers and GIS are capable of overcoming the information gap that exist between key players along the value chain and, improve food production. For example, Ezeh (2013) reported that ICTs such as

radio, television, telephones, media vans, internet connectivity, personal computers, GIS, projector and audio recorders were accessed by farmers in south-east Nigeria for agricultural purposes. ICTs are capable of promoting sustainable development of the farming systems through, transfer of information on improved agricultural practices to rural farmers (Meera, Jhamtani, & Rao, 2004). ICTs enable extension agents to timely and accurately respond to farmers concerns such as how to increase yields, access markets, and adapt to weather conditions (World Bank, 2011). Literatures from Adetumbi, Olaniyi and Adewale (2013), Aphunu and Atoma (2011), Egbule, Agwu and Uzokwe (2013), Ezeh (2013), FAO (2013), Meera, Jhamtani and Rao (2004) and World Bank (2011) revealed that ICTs are used for farming and extension service delivery in the area of farm husbandry and post-harvest operations. The application of ICTs to agriculture and agricultural extension in the area of farm husbandry and post-harvest operations as revealed in literatures from Adetumbi, Olaniyi and Adewale (2013), Aphunu and Atoma (2011), Egbule, Agwu and Uzokwe (2013), Ezeh (2013), FAO (2013), Meera, Jhamtani, and Rao (2004) and World Bank (2011) are summarised below.

FAO (2013) in a study of services rendered by government, private and public-private partnerships of India's Kisan Call Centre, found that ICTs were used to provide information on; (i) productivity, improvement of crops and dairy yields such as weather information to help farmers decide when to plant or harvest, training on proper fertilizer usage; (ii) risk management information services that essentially help prevent losses, provide alert information on how to protect crops from oncoming disease spread, freezing weather in order to minimize the negative effects of crisis and; (iii) the implementation of crop

rotation to preserve the soil. According to World Bank (2011) and FAO (2013), E-Sagu Project of the International Institute of Information Technology (IIIT) in Hyderabad in India, provided farmers crop advice on planting, field management, harvesting of crops and, pesticide and fertilizer usage based on digital photos taken by the farmers. The farmers obtained appropriate information using global positioning system (GPS), radio, mobile phone, digital soil maps and, biophysical technologies such as nitrogen- sensors (to determine the correct fertilizer dose).

In Nigeria, farmers used ICTs to access information on best and quantity of agro-chemicals to use, improved planting materials such as seeds and cuttings, livestock issues or production (such as improved snail and animal breeds, best animal feed to use and best feeding method), land preparation, best planting technique, diseases and pests control/management strategies, best harvesting time (Adetumbi, Olaniyi & Adewale, 2013; Egbule, Agwu & Uzokwe, 2013; Ezeh, 2013). Aphunu and Atoma (2011) reported that fish farmers in Isoko agricultural zone of Delta State of Nigeria, used mobile phones and internet to search, receive and send information and also, word processing computer software was used by the farmers to prepare farm reports and records.

In Sri Lanka, the e-dairy project that is part of the efforts of the country's information and communication technology agency (ICTA), used web and mobile technologies to assist dairy farmers achieve self-sufficiency in milk production by disseminating information on how to contact artificial insemination agents and milking. In Turkey, the agricultural department established five weather sites that monitor the need for pest control and frost

prevention in order to provide the information to farmers through cell phones. The Chilean aquaculture project provides daily information about the sea surface temperature, the clarity of the seawater and the amount of chlorophyll in the water which enable fish farmers to take precautionary measures when harmful algal blooms get to its risk level. In 2004, the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) created a virtual academy that trains local women who then, with the help of remote scientists, provide critical information to farmers in 21 villages. These women meet ICRISAT scientists via audio and video conferences platforms where information about droughts, planting practices, pest control, soil fertility, are exchanged.

Internet and web portals are also used in agriculture. For example, the Agriculture Resources Information System Network (AGRISNET), is a project created by the Tamil Nadu Department of Agriculture in southern India and the Government of India, to provide web-based portal for sharing needed information with farmers. The AGRISNET project enable the gathering and dissemination of agricultural information by 385 local agricultural extension centres. Some of the information provided by AGRISNET are on weather forecasts, market trends, quality requirements, policies and eligibility for benefits. The Local Language Speech Technology Initiative's National Farmers' Information Service project in Kenya, use the combined radio and phone-based voice messages to provide Kenyan farmers in remote rural areas with information on crops, livestock, market prices, inputs, disease outbreaks and weather reports. The project converts text-based information to audio in either English or Swahili that are provided over a landline or cell phone to

farmers. Call centres and community radio systems are also used in India and Uganda to communicate agricultural information from trained experts in a trained language to farmers.

Existing literature from Adetumbi, Olaniyi and Adewale (2013), Aphunu and Atoma (2011), Egbule, Agwu and Uzokwe (2013), Ezeh (2013), FAO (2013), Meera, Jhamtani, and Rao (2004) and World Bank (2011), revealed that ICTs application to post-harvest operations are in the area of market pricing services, downstream and upstream administration, financial inclusion ICT services and, holistic trading services and virtual trading floors (VTFs). The application of ICTs to post-harvest operations are basically to provide information on marketing, weather forecasting and, other market oriented and demand-driven information. Pricing services involve transferring current market data on one or more agricultural products to farmers via mobile text messaging. The pricing service is similar to the VTFs and is the most common type of market access ICT service. The pricing system and VTFs provide enhanced services that are often provided through print, radio or television. The advantages of the pricing service include price transparency and improved negotiating leverage for often-disempowered sellers (farmers).

Downstream and upstream administration are systems that assist in monitoring the level of moisture or temperature for products stored in a ware-house using satellite systems to avoid spoilage and facilitate tracking of trucks moving produce from the cooperative to the processor's plant. In Botswana, the downstream administration is used for tracking of livestock using radio-frequency identification devices (RFIDs) that capture data on individual cattle. The RFID equipment are able to test the quality and fat content of dairy

products, calculate payment amounts and provide databases of input suppliers for farmer customer management that is practiced in Botswana, Kenya and Nigeria.

The primary types of financial services offered through ICT solutions for value chains include transfers and payments, credit, savings, insurance and financial derivatives. For instance, farmers in developing countries such as Kenya and Nigeria, are able to access credit and input facilities using telephones. The farmers are also able to make payments, bank transfers, recharge vouchers through the same platform. India's Institute for Financial Management and Research (IFMR), with its insurance company partner HDFC Ergo, uses RFID tag technology to verify the location and ownership of each animal being insured. Field officers and veterinarians then use hand-held scanners connected to netbooks to scan the RFID tag, in order to track the animal's health each time the animal is visited. This practice of using RFID trackers, triggers a requirement for the extension agent to enter data into the management database while on the visit. The use of ICT in the financial inclusion service, have eliminated the fraud of intermediaries who access farm inputs that never get to the farmer at exorbitant prices.

The Extent of Use of ICTs in Agricultural Extension Service Delivery

In literature, the extent of use of ICTs for extension activities, have been referred to as frequency or level of use of ICTs for extension activities. Adetumbi, Olaniyi and Adewale (2013) used a 4 point Likert rating scale of never = 0, rarely = 1, sometimes = 2 and always = 3 to examine the level of use of ICTs by extension agents in Oyo State, Nigeria. Adetumbi, Olaniyi and Adewale (2013) analysed the responses of respondents using descriptive

statistics such as mean and standard deviation and found that, among the ICTs studied, radio (M = 4.0) was the most used ICT as it ranked first, television ranked second with a mean score of 3.9, mobile phone (M = 2.8) ranked third and, the least ranked were the use of the internet with mean score of 0.73 and multimedia projector with mean score of 0.2. Virtually all the respondents could at least afford to procure and maintain a transistor radio in case there is no electricity or reception to access television. Mobile phones on the other hand, are gaining popularity among extension agents in information dissemination sequel to its time saving and cost effectiveness. The use of internet is constrained by factors such as inadequate of infrastructure facilities, poor connectivity and low technical know-how. However, the respondents indicated that CD-ROM technology were never used for information sourcing or dissemination to clientele.

Omotesho, Ogunlade and Muhammad-Lawal (2012a) examined the extent of access to ICTs by extension officers in Kwara State, Nigeria, using a 5-point Likert-type scale of strongly disagree = 1, disagree = 2, indifferent = 3, agree = 4 and strongly agree = 5. This study by Omotesho, Ogunlade and Muhammad-Lawal (2012a) recorded that 11.4% of extension agents used personal computers for extension activities and only 2.5% of the personal computers were connected to the internet. The findings revealed that extension agents access level to ICTs is very poor. Egbule, Agwu and Uzokwe (2013) found that extension agents in Delta State ADP in Nigeria disseminated information on crop varieties and livestock, farming practices, trainings and marketing issues using mobile phones.

Mabe and Oladele (2012) in a study of awareness level of use of information communication technologies tools among extension officers in the North-West Province of South Africa, used a two scale of yes or no and found that prominent information and communication technologies used by extension agents in the course of extension service delivery were mobile phones (M = 1.79), internet (M = 1.77), overhead projector (M = 1.62), fax machines (M = 1.60), organisational email (M = 1.58), personal email (M = 1.52) and website (M = 1.50). The findings revealed that the respondents were aware of ICTs but experience less use of ICTs for extension work. Aboh (2008) found that extension agents less frequently used ICTs for extension activities in Imo State of Nigeria with overall mean score of 0.89. Albert and Onwubuya (2013) had reported that the ICTs used by extension agents in Rivers State of Nigeria include mobile phones, radio, television, printers, email, internet and computers. It was based on the findings of Albert and Onwubuya (2013) that this study examined the extent of use of ICTs by extension agents in Rivers and Bayelsa States of Nigeria.

Constraints Faced by Extension Agents in Accessing Training in ICTs

Despite the outcry for development in the area of ICT and institutional efforts to incorporate ICTs in agricultural extension activities, extension agents are however, faced with several challenges that undermine the developmental efforts in ICTs. For example, Archibong and David (2009) studied ICT usage and challenges among academic staff of a university and revealed that 81.25% of the respondents agreed that inadequate infrastructure is a challenge, 58.75% said financial constraints, 46.25% for lack of access to ICT facilities, 72.5% for low operational knowledge and skill, 61.25% agreed to inability to keep

abreast with the present technological changes/demands, 66.25% to no training opportunity while 65% showed insufficient time to practice. Archibong and David (2009) further explained that the high percentage of inadequate infrastructure (81.25%) emanated from unstable electricity power supply in Nigeria due to the fact that majority of ICT gadgets are dependent on power supply (electricity).

Okon (2013) opined that access to ICT is not only the physical availability of equipment and methods of utilisation but also, the existence of the right conditions for the use of the ICTs in getting information. The constraints militating against the effective use of ICTs for extension activities, are as a result of inadequate access to trainings in ICTs by extension staff. Constraints that lead to ineffective use of or access to ICTs include user friendliness or interest of the user to the technologies, inadequate ICT infrastructures, unstable electricity supply, poor or unstable network, high cost of ICT equipment and internet access, unfavourable broadcasting tariff, low economic status, lack of funds, availability of time and users capabilities or poor technical know-how resulting from inadequate training or skills on ICTs (Margono & Sugimoto, 2011; Obinna & Nzeakor, 2014; Okon, 2013; Omotesho, Ogunlade & Muhammad-Lawal, 2012b).

Also, Bingimlas (2009) found competence, resistance to change and negative attitude, lack of time, lack of training opportunity and lack of accessibility to resources as possible constraints militating against the effective use of ICTs. The constraints are classified into human, institutional, infrastructural, policy and financial constraints. For instance, Sutrisno and Yi-Hsuan (2010) examined four factors of barriers towards ICT programmes for

agricultural extension officers in Indonesia. The factors included organisational, individual, technological and policy barriers. The classification of the constraints is also supported by Annor-Frempong, Kwarteng, Agunga and Zinnah (2006) who found that, major constraints to infusing ICTs in extension service delivery as perceived by extension agents, bordered on technology, human, policy and infrastructure.

Studies that have used Single-Need Identification Model

Direct need identification survey technique has been used in several perception studies. Sherazi, Ahmed, Iqbal, Umar and Rehman (2011) used the OTP direct model of a 5-point Likert response scale ranging from;'1 = never', '2= rare', '3= seldom', '4= frequent' and '5 = always', as levels of training needs analysis (TNA) in conducting the training needs of managers in the study. Other studies that have directly solicited for respondents perception on a training need topic, without using the dual-need survey technique such as the Borich's model, include Ovwigho (2011) who studied the training needs of agricultural extension agents in the Central Agricultural Zone of Delta State, Nigeria, using a 4-point Likert type scale of highly needed=4, moderately needed =3, slightly needed =2, and not needed=1 to identify the training needs of the extension agents in Delta State. Omoregbee and Ajayi (2009) analysed the training needs perception of agricultural extension agents of Edo State Agricultural Development Programme (ESADP) using the direct method of a 5-point Likert- type scale ranging from "strongly agree" (5), " agree" (4), "Undecided" (3), "disagree" (2), to "strongly disagree" (1). Also, Rodič, Vvukovič, Završnik and Miglič (2012), in a study on issues in introducing training needs analysis in Slovenia's public administration, used a five-point

Likert scale: strongly disagree=1, disagree=2, No opinion=3, agree=4, and strongly agree=5, to obtain the agreement of respondents to the current practice of training.

More so, Rossilah and Hishamuddin (2007) in a study of training needs analysis: practices of top companies in Malaysia, used a 5-point likert scale ranging from;'1 = never', '2= rare', '3= seldom', '4= frequent' and '5 = always', to determine the respondent's perceptions regarding TNA practices. Wasihun, Kwarteng and Okorley (2013) also used the single need survey technique of a four point likert scale ranging from "very low = 1"; "low = 2"; "high = 3" and "very high = 4", to examine the professional and technical competency levels perceived by extension agents and farmers in southern part of Ethiopia. Conversely, Haruna and Abdullahi (2013) used the single need assessment survey model to study the training needs of extension agents in the ADPs in Nigeria, from 2008 – 2011.

The empirical studies reviewed above, calculated mean scores from the likert type scale, to obtain a ranking of training needs. In the studies reviewed under this section, the priority of the training needed, were ranked in descending order of mean scores. It is in the light of the above reviewed empirical studies that, this study adopted the single-need survey model or approach to study the ICTs training need of agricultural extension agents in Bayelsa and Rivers State, using a 6-point likert-type scale ranging from very high need = 6, high need = 5, somewhat high need = 4, somewhat low need = 3, low need = 2 and very low need = 1.

Socioeconomic Characteristics Correlates of Training Needs

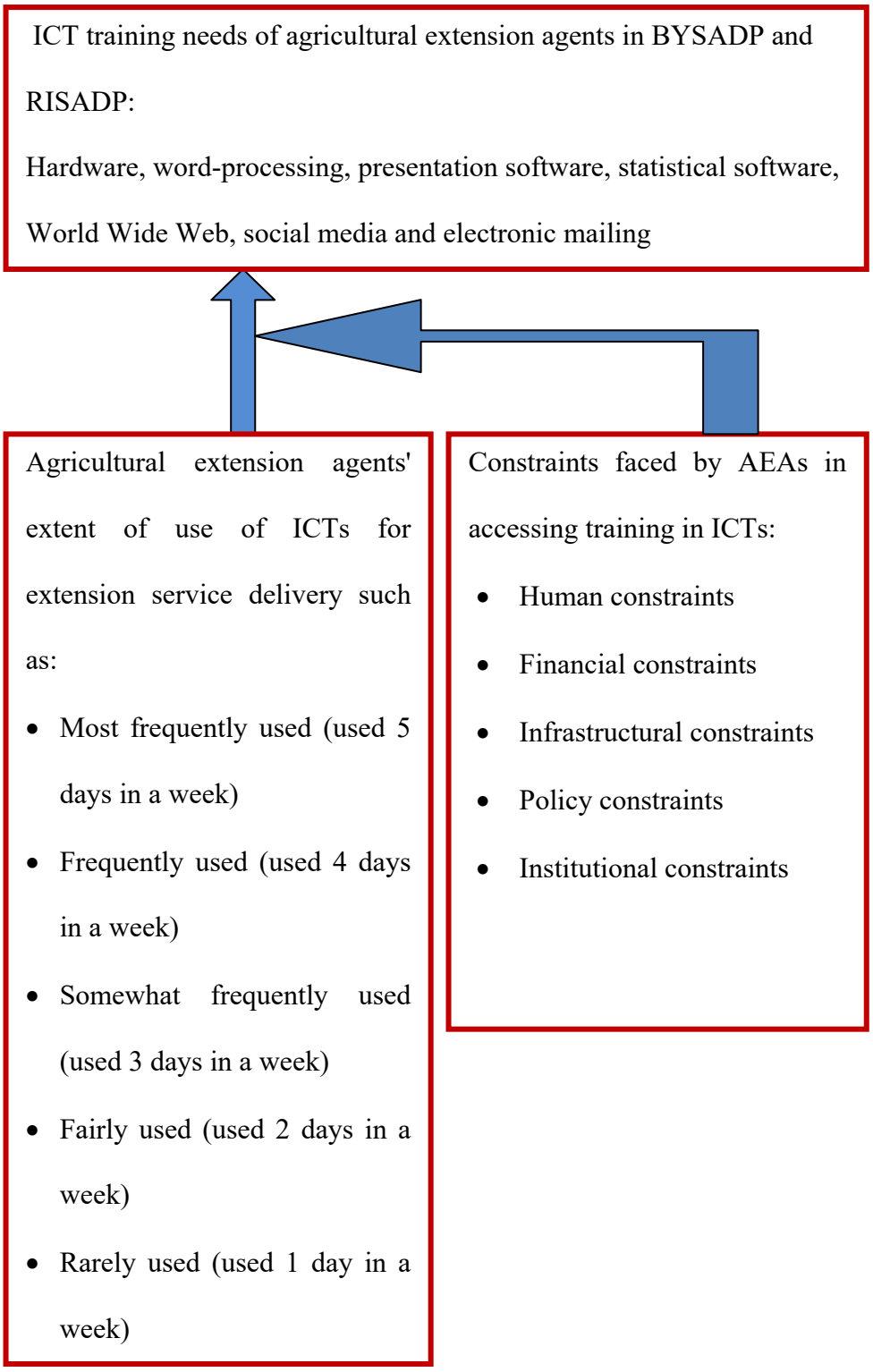
Adesoji, Farinde and Ajayi (2009) in a study of determinants of training needs of Fadama farmers in Osun State, Nigeria and implications for extension workers, reported that level of education, tribe and membership of associations among others, have significant relationship with extension agents training needs. Also, Omoregbee and Ajayi (2009) in a study of assessment of training needs of extension staff of Agricultural Development Programme (ADP) in Edo State, Nigeria, found education and job experience to be significantly related with extension agents training needs. Similarly, Rodič, Vvukovič, Završnik and Miglič (2012) in a study on issues in introducing training needs analysis in Slovenia's public administration, found that age, gender, job position, experience and education, have a significant relationship with the training needs. In the study by Adesiji (2006), a four-point Likert type scale was used in examining single need assessment survey of village extension agents in Osun State. Adesiji (2006) found that age, educational level and length of service were significantly related to the competency needed by the extension agents. The foregone buttress that some demographic characteristics of subjects have significant relationship with perceived training needs.

Conceptual Framework of the Study

This section presents the link between the key concepts and variables in this study. The literature shows that the extent of use of ICTs for extension activities by agricultural extension agents is poor (not frequent) and has necessitated the need for the extension agents to access training in ICTs, but the respondents are however faced with human, financial, infrastructural, policy and institutional constraints that limit the access to ICT trainings. The

key concepts and variables that interplay as presented in the conceptual framework of this study (Figure 1) are discussed under the sub-headings extent of use of ICTs for agricultural extension activities by AEAs, the ICT training needed by the extension agents in BYSADP and RISADP as well as the constraints faced by extension agents in accessing training in ICTs.

It is pertinent to point out that in a typical ADP, the agricultural extension agents are known to possess some socioeconomic characteristics such as age, sex, marital status, income, academic qualification, job designation or rank, working experience, job location, ICT training, computer literacy, ownership of ICT gadgets such as mobile phones and personal computers and membership in professional associations or unions (Adetumbi, Olaniyi & Adewale, 2013; Mabe & Oladele, 2012; Obinna & Nzeakor, 2014; Omotesho, Ogunlade & Muhammad-Lawal, 2012a).



Source: Author's construct, 2015

Figure 1: Conceptual framework of information and communication technologies training needs of agricultural extension agents in Bayelsa and Rivers States of Nigeria

Extent of use of ICTs for Agricultural Extension Activities by AEAs

The literature reveals studies that have examined the number of days ICTs are used for extension activities which is also referred to as frequency or level of use of ICTs for extension activities. For instance, Adetumbi, Olaniyi and Adewale (2013) found that radio (M = 4.0) was the most used ICT as it ranked first, television ranked second with a mean score of 3.9, mobile phone (M = 2.8) ranked third and the least ranked were the use of the internet with mean score of 0.73 and multimedia projector with mean score of 0.2. Virtually all the respondents could at least afford to procure and maintain a transistor radio in case there is no electricity or reception to access television. Mobile phones on the other hand, are gaining popularity among extension agents in information dissemination sequel to its time saving and cost effectiveness. The use of internet is constrained by factors such as lack of infrastructure facilities, poor connectivity and low technical know-how. However, the respondents indicated that CD-ROM technology were never used for information sourcing or dissemination to clientele.

Omotesho, Ogunlade and Muhammad-Lawal (2012a) recorded that 11.4% of extension agents used personal computers for extension activities and only 2.5% of the personal computers were connected to the internet. The findings revealed that extension agents level of access to ICTs is very poor. Egbule, Agwu and Uzokwe (2013) found that extension agents in Delta State ADP in Nigeria, disseminated information on crop varieties and livestock, farming practices, trainings and marketing issues using mobile phones.

Mabe and Oladele (2012) who examined the awareness level of use of ICTs among extension officers in the North-West Province of South Africa

found mobile phones (M = 1.79), internet (M = 1.77), overhead projector (M = 1.62), fax machines (M = 1.60), organisational email (M = 1.58), personal email (M = 1.52) and website (M = 1.50) as the ICTs that the respondents were aware but experience less use of the ICTs for extension work. Aboh (2008) found that extension agents less frequently used ICTs for extension activities in Imo State of Nigeria with overall mean score of 0.89. Albert and Onwubuya (2013) had reported that the ICTs used by extension agents in Rivers State of Nigeria include mobile phones, radio, television, printers, email, internet and computers. The findings of Albert and Onwubuya informed this study to examine the extent of use of ICTs by extension agents in Rivers and Bayelsa States of Nigeria.

Information and Communication Technologies Training Needs of AEAs

According to World Bank (2011) report, ICT is any device, tool or application that permits the exchange or collection of data. The device ranges from radio, satellite imagery and mobile phones. ICT includes all technologies for the storage, retrieval, manipulation, and communication of information or digital data (Odiaka, 2011). The specific range of such technologies include magnetic disk or tapes, optical discs, flash memory, scanners, radio, television, camera, microphone, loudspeaker, landed/mobile telephones, personal computers, Internet and softwares**.** Okon (2013) emphasised that ICTs are those technologies that link information technology devices such as personal computers with communication technologies such as telephones and telecommunication networks.

The ICTs that the extension agents in BYSADP and RISADP need training encompasses hardware, softwares (such as word-processing, statistical

and presentation software), Internet web browsers, emails and social media. For instance, FAO (2013) described ICTs as not only encompassing the use of existing technology such as hardwares, softwares and telecommunication options, but include the Internet and telephony (mobile and landline) systems. The use of mobile communication technologies in agricultural extension activities to transfer information in various formats such as voice, written and other data is making it versatile among ICTs. Qiang, Kuek, Dymond and Esselaar (2012) noted that the mobile phenomenon, its applications and high growth rate among users are becoming important for developing countries. In Nigeria, cellular telephones such as global system for mobile communication (GSM) are no longer considered extravagant luxuries in development work and are now even the object of micro-business and micro-credit loan policies (Okon, 2013). Okon (2013) further asserted that telephone has been used in extension service for communication with other field extension staff as well as other sectors. It is a known fact that Federal Ministry of Agriculture and Rural Development in Nigeria, now uses the cell phone in distributing inputs to farmers in rural areas. The GSM is designed to work with a Subscriber Identification Module (SIM) card provided by a service provider some of which are MTN Nigeria, Zain Network, Etisalat and Globacom networks.

Computer, fax and telex are used by extension agents for documentation of agricultural information and for processing, storing, exchange and retrieval of data (Lawal-Adebowale, 2009). Shelly and Vermaat, (2011) defined a computer as an electronic device which operates under the control of instructions stored in its own memory that can accept data, process the data according to specified rules and produce results and store the results for further

use. The computer, commonly called personal computer (PC) or desktop computer provide users with interface for connection of computer peripherals such as printer, CD-ROM, scanners, geographical information systems (GIS), flash drives, memory cards and modems for internet connectivity. Wired and wireless internet networks as well as electronic mail (e-mail) enable extension staff to assess information through service providers. Electronic mail is the most commonly used new ICT and has caused a cultural revolution in the way individuals and organisations use internet in terms of time, cost and distance (Okon, 2013). GIS assist extension agents and farmers collect geographic data through computer hardware and software to capture, store, update and display all forms of geographically referenced information by matching coordinates and time to other variables (World Bank, 2011).

Constraints Faced by Extension Agents in Accessing Training in ICTs

The constraints militating against the effective use of ICTs for extension activities are as a result of inadequate access to trainings in ICTs by extension staff. Okon (2013) opined that access to ICT is not only the physical availability of equipment and methods of utilisation but also, the existence of the right conditions for the use of the ICTs in getting information. The constraints that lead to ineffective use of or access to ICTs include user friendliness or interest of the user to the technologies, inadequate ICT infrastructures, unstable electricity supply, poor or unstable network, high cost of ICT equipment and internet access, unfavourable broadcasting tariff, low economic status, inadequate funds, availability of time and users capabilities or poor technical know-how resulting from inadequate training or skills on ICTs

(Margono & Sugimoto, 2011; Obinna & Nzeakor, 2014; Okon, 2013; Omotesho, Ogunlade & Muhammad-Lawal, 2012).

Within the context of this study, the constraints are classified into human (such as low interest in ICTs, inadequate time to receive training in ICT and inadequate ICT skills), institutional (such as inadequate formal ICT training, inadequate partnership with ICT organisations, bureaucratic bottle-necks and inadequate ICT training opportunities), infrastructural (such as unstable electricity supply, unstable mobile and internet network and inadequate ICT infrastructures), policy (such as weak ICT policy framework for extension, weak ICT regulatory system and poor management of ICT infrastructures) and financial (such as high cost of ICTs, unfavourable tariff from telecom network service providers, high costs of transmission by broadcasting media, inadequate funding, misappropriation of funds and inadequate income to undertake training in ICTs) constraints.

These classes of constraints in this study is consistent with that of Sutrisno and Yi-Hsuan (2010) who examined four factors of barriers towards ICT programmes for agricultural extension officers in Indonesia. The factors included organisational, individual, technological and policy barriers. Also, Archibong and David (2009) who studied the ICT usage and challenges among academic staff of a university revealed that 81.25% of the respondents agreed that inadequate infrastructure is a challenge, 58.75% said financial constraints, 46.25% for inadequate access to ICT facilities, 72.5% for lack of operational knowledge and skill, 61.25% agreed to inability to keep abreast with the present technological changes/demands, 66.25% to no training opportunity while 65% showed insufficient time to practice. Archibong and David (2009)

further explained that the high percentage of inadequate infrastructure (81.25%) emanated from unstable electricity power supply in Nigeria due to the fact that majority of ICT gadgets are dependent on power supply (electricity).

More so, Bingimlas (2009) found competence, resistance to change and negative attitude, lack of time, lack of training opportunity and lack of accessibility to resources as possible constraints militating against the effective use of ICTs. The classification of the constraints mirrors that of Annor-Frempong, Kwarteng, Agunga and Zinnah (2006) who found that major constraints to infusing ICTs in extension service delivery as perceived by extension agents, bordered on technology, human, policy and infrastructure.

Summary of Literature Review

This section summarises literature relating to application of ICTs to agriculture and agricultural extension work, extent of use of ICTs in agricultural extension activities, constraints faced by extension agents in accessing trainings ICTs, studies that adopted single-need identification model and socio-economic correlates of training needs. In this study, the review of literature on application of ICTs in Agriculture otherwise known as ICT for Agriculture, was done in three overlapping perspectives. Firstly, the use of ICTs in the farm (plant, forest, soil and animal) for husbandry practices which include, the application of ICTs in pre-planting operations, planting and post-planting or harvesting operations. The second perspective focused on the application of ICTs in Post-harvest operations such as processing, marketing and other value chain processes. Due to the myriad of overlapping solutions or services provided by ICTs, the third perspective tried to reduce the overlap by

relating the use of ICTs by extension agents in extension education, information provision and other extension service delivery in relation to the previous two perspectives.

Based on reviewed literatures, the most common sources of farmers information needs are television (TV), radio, newspaper, fellow farmers, traders, friends and family relatives. These common sources are being used by extension agents to disseminate information to a wide range of audience. However, these common sources of information can be biased, inconsistent and unreliable but encouragingly, different information and communications technologies (ICTs) such as, mobile phones, computers, geographic information system (GIS), internet facilities and voice recorders have emerged. The emergence of information and communication technologies (ICTs) gave rise to the use of ICTs for development projects in agriculture and have assisted in overcoming the information gap that exist between key players along the value chain thus, improving food production. Existing literatures revealed that ICTs were used for farming and extension service delivery in the area of farm husbandry and post-harvest operations. Based on reviewed literatures, in countries such as Botswana, Chad, India, Kenya, Nigeria and Sri Lanka, the applications or services of ICTs to farm husbandry and post-harvest operations showed that farmers used ICTs to access information on best and quantity of agro-chemicals to use, improved planting materials such as seeds and cuttings, livestock issues or production (such as improved snail and animal breeds, best animal feed to use and best feeding method), land preparation, best planting technique, diseases and pests control/management strategies, best harvesting time, market pricing services, downstream and upstream

administration, financial inclusion ICT services and, holistic trading services and virtual trading floors (VTFs).

On the extent of use of ICTs for agricultural extension activities, literatures consistently revealed that, the most used ICT were radio, television and mobile phones. The reason adduced for the most frequently used ICTs were that extension agents are able to afford a transistor radio in the event of electricity power outage and due to the affordability of most mobile phones and its all inclusive nature, extension agents no longer perceive mobile phones as extravagant luxuries. Inadequate technical know-how, high costs of ICTs and high tariff of internet service providers were reasons for the low use of ICTs such as internet, GIS and overhead projectors. The reasons for ineffective use of ICTs for extension work also accounted for the constraints faced by extension agents in accessing trainings in ICT. The constraints found in literatures are categorised as human, financial, infrastructural, institutional and policy constraints.

Reviewed empirical studies revealed that several studies adopted the single-need survey model in identifying training needs or needed competencies of staff. Unlike the dual-need survey model that is cumbersome and time consuming in seeking for respondents perception in two dimensions, the single-need survey otherwise known as direct need identification model, simply ask respondents to scale or rank perceived need for a training need topic. The single-need model takes into consideration the concept of response fatigue and noting that the responses obtained reflects only the respondents perception of a training need topic. Also, empirical studies reviewed showed that socioeconomic characteristics such as age, sex, educational level, length of

service, income, job position were significantly related to the competency needed by the extension agents.

CHAPTER THREE

METHODOLOGY

This chapter presents the methods and procedures that were used to collect data for the study. The items presented in the chapter include research design, study area, population and sample, data collection and data analysis.

Research Design

The study adopted a comparative descriptive survey design. The survey design was deemed appropriate in that, according to Asika (2008) survey research focuses on a population from which data of some characteristics of the population are collected for intensive study and analysis. Similarly, Nwankwo (2010) stated that a descriptive survey is a study in which: (i) a researcher collects data that are of interest to the researcher from a sample drawn from a given population; (ii) describes certain features of the sample as it exists at the time of the study; (iii) generalises the findings to the population from which the sample was drawn. The objectives of the study fell within the above hence, the choice of the design.

Study Area

The study was conducted in Bayelsa and Rivers States located in the south-south geo-political zone of Nigeria (Figure 2). They are part of the six States that constitute the Niger Delta States. Rivers State is headed by a Governor whose administrative office is located at the State capital, Port Harcourt. The motto of the State is "Treasure Base Of The Nation". Rivers

State is bounded on the south by the Atlantic Ocean and in the north by Anambra, Imo and Abia States. In the east, it is bounded by Akwa-Ibom State and, in the west by Delta and Bayelsa States. Rivers State has many ethnic groupings such as Ikwerre, Ogoni, Kalabari, Ijaw, Etche, Ogba, Ekpeye, Engenni, Igbani, Andoni and Okrika with diverse languages, traditions, and cultures. Rivers State has a population of about three million people and occupies an area of 21,850 square. km. Ikwerre, Ogoni and Ijaw are the most spoken local languages although English is widely used on radio and television broadcasts (FGN, 2012).

Source: Adopted from Federal Government of Nigeria (FGN, 2012)

Figure 2: Map of Nigeria Showing Rivers and Bayelsa States in Sketches

Rivers State is currently made up of 23 Local Government Areas (LGAs) headed by democratically elected Local Government Chair Persons. The LGAs are Ogba/Egbema/Ndoni, Ahoada East, Ikwerre, Port Harcourt City Council, Etche, Andoni, Bonny, Okrika, Oyigbo, Khana, Gokana, Tai, Obio/Akpor,

Emohua, Degema, Aseri Toru, Akuku Toru, Abua/Odual, Omuma, Opobo/Nkoro, Ogu/ Bolo, Ahaoda West and Eleme (Ogoloma, 2013). The Agricultural Development Programme (ADP) office in the State is located in Obio/Akpor LGA. Cassava and yam are mostly produced in the upland area of Rivers State such as Ikwerre and Etche while fishing is the major occupation of the inhabitants in the riverine areas such as Ndoni, Andoni and Opobo. Rivers State has a total land mass of about 1,940,000 hectares of which the cultivable area is about 760,00 hectares which is approximately 39% of the land mass of the state (Ogoloma, 2013).

Bayelsa State is bordered on the west by Rivers State, on the east and south by the Atlantic Ocean and on the north by Delta State. The eight Local Government Areas (LGAs) in Bayelsa State are Kolokuma Opokuma, Brass, Nembe, Sagbama, Ekeremor, Ogbia, Yenagoa, Ijaw North and Ijaw South. The major languages spoken in the State are Izon, Nembe, Epie-Atissa and Ogbia. However, English is the official language of instruction in Bayelsa State. Bayelsa State is also a major producer of crude oil. However, majority of the rural populace are farmers who produce oil palm. Others are into artisanal and fishing. The fishing industry is greatly affected by the oil spillages in the region. Bayelsa State occupies an area of 21,100 square km with population of 200,000 (FGN, 2012).

Agricultural extension services to farmers in Bayelsa and Rivers States are organised at the Agricultural Development Programme (ADP) level. The field operations of extension at the ADPs are divided into zones, blocks and villages. In the typical hierarchy of ADP, the programme manager is the highest ranking officer which is followed by the zonal managers, block and

village extension officials often called extension officers. The requirement for employment of extension agents in Bayelsa and Rivers States ADPs are the same. The extension agents perform similar agricultural extension services in both States. The duties include replication of innovations and education of farmers involved.

Study Population, Sampling Procedure and Sample

The population of the study included all the public agricultural extension agents in Bayelsa and Rivers States of Nigeria. According to the official records provided by Directors of Extension service at Bayelsa State Agricultural Development Programme (BYSADP) and Rivers State Agricultural Development Programme (RISADP), there were 26 extension agents at BYSADP and 74 extension officers at RISADP. Therefore, census of 100 agricultural extension officers in Bayelsa and Rivers States were used as the sample for the study because they were accessible and not many for the study to deal with.

Instrumentation

A content validated questionnaire (Appendix A) was used to collect data for the study. The questionnaire was divided into parts based on the objectives of the study. Part I measured the extent of use of ICTs. Items include ICT hardware (17 items), word-processing software (6 items), statistical software (8 items), presentation software (6 items), use of World Wide Web internet services (7 items), use of social media (9 items) and use of electronic mail (5 items). The extent of use of ICTs was measured in terms of number of use of ICT item in a week. A 5-point likert type scale of '5 = most frequently used' (used 5 days in a week), '4 = frequently used' (used 4 days in a week), '3 =

somewhat frequently used' (used 3 days in a week), '2 = fairly used' (used 2 days in a week), '1 = rarely used' (used 1 day in a week). Those who had never used an item was coded 0 and eliminated in the analysis.

Part II of the instrument consisted of questions eliciting responses on constraints faced by extension agents in accessing training on ICTs. The constraints were grouped under human (4 items), financial (6 items), infrastructural (4 items), policy (3 items) and institutional (4 items). The constraints were measured in a 3-point likert type scale of '0 = not a constraint', '1 = minor constraint' and '2 = major constraint'.

Part III focussed on ICTs training need of respondents. The needs were grouped under hardware (17 items), word-processing software (6 items), statistical software (8 items), presentation software (6 items), use of World Wide Web internet services (7 items), use of social media (9 items) and use of electronic mail (5 items). The training need in ICTs were measured based on level of need on a 6-point likert type scale of '1= very low need', '2 = low need', '3 = somewhat low need', '4 = somewhat high need', '5 = high need', '6 = very high need'.

Part IV elicited responses on socio economic characteristics of the extension agents such as age, state, State, location of operational area, income, sex, educational qualification, number of years of working experience, marital status, membership of association and ownership of ICT gadget.

Face validity was ensured by supervisors and staff of the Department of Agricultural Economics and Extension who examined the superficial appearance of the questionnaire. Content and construct validity were ensured by the principal supervisor and co-supervisor, who ensured that the

questionnaire items were appropriate and measured what they were supposed to measure.

The questionnaire was pretested on ten (10) extension agents of the National Fadama Development Project (NFDP) in the study area who were not part of the study. During the pre-testing, it was observed that the extension agents took time to read through the instructions and responded accordingly to the items, which indicated a sign of clarity and understanding of the questionnaire items. The instrument was collected the same day the pre-testing was conducted. The scale items on the instrument were entered into Statistical Package for Social Sciences (SPSS version-20) to generate Cronbach's alpha in order to establish the reliability (internal consistency) on scale items of the instrument. An alpha level of 0.70 (70%) was set *a priori*. This was based on George and Mallery as cited in Gliem and Gliem (2003) findings that, a reliability between 0.7 to 0.8 is acceptable, 0.8 to 0.9 is good and 0.9 is excellent.

The alpha coefficients for the sub-scales are presented in Table 1. The Cronbach's alpha coefficient for the sub-scales ranged from 0.71 on institutional constraints to 0.99 for software: word- processing and training on the use of electronic mail respectively. However, the Cronbach's alpha on human constraints was '0.57'. The '0.57' is a short fall to the '0.70' Cronbach's alpha set *a priori* by the researcher in accordance to literature. As such, a Cronbach's alpha of '0.75' was obtained when item three (inadequate skills to manage my digital data from threats) was deleted. The item was deleted and therefore, not included in the final instrument.

Table 1: The Cronbach's Alpha Coefficient for Sub-Scales.

Scales	Number of Items	Cronbach's Alpha
ICT Hardware	17	0.91
Software: Word-processing	6	0.94
Software: Statistical	8	0.85
Software: Presentation	6	0.92
Use of World Wide Web Internet Services	7	0.93
Use of Social Media	9	0.92
Use of Electronic Mail	5	0.89
Human Constraints	3	0.75
Financial Constraints	6	0.91
Infrastructural Constraints	4	0.72
Policy Constraints	3	0.91
Institutional Constraints	4	0.71
ICT Hardware	17	0.93
Software: Word-processing	6	0.99
Software: Statistical	8	0.95
Software: Presentation	6	0.84
Use of World Wide Web Internet Services	7	0.93
Use of Social Media	9	0.96
Use of Electronic Mail	5	0.99

Source: Field Survey Data, 2014

Data Collection

A meeting was arranged with the Deputy Director for extension service in Rivers State Agricultural Development Programme (RISADP) and the Director for extension service in Bayelsa State Agricultural Development Programme (BYSADP) to present an introductory letter from University of Cape Coast and also to seek permission to conduct the study in the ADPs.

Other meeting days were scheduled for the researcher to meet with the respondents. At the arranged meeting days, the purpose of the study was explained to the respondents and the respondents were taken through the content of the questionnaire. The extension agents took the questionnaire home to respond. Several telephone calls to follow up were made to inquire whether there were challenges and the response situation. Since the Director and Deputy Director were involved, the one hundred (100) questionnaires distributed were all returned. The data collection period lasted for six (6) weeks.

Data Analysis

The questionnaires collected were screened for usability and then entered into the Statistical Package for Social Sciences (SPSS, version-20) software for data analysis. Descriptive statistics were generated for all data to check errors in data entry. Descriptive statistics such as mean, standard deviation and percentage were generated to examine the extent of use of ICTs by extension agents in extension service delivery and also, to examine the constraints faced by extension agents in accessing ICT training. The student independent T- test was generated to assess if significant differences exist in ICTs training need among agricultural extension agents. Prior to t-test, the data were tested for assumptions of parametric statistics and were found to be normally distributed with skew and kurtosis values of 0. The assumptions of parametric statistics which the study met as adduced in literatures include, normally distributed data, homogeneity or equality of sample variance, independence of observations from each respondent and scale of measurement on at least an interval level (Field, 2009; Gravetter & Wallnau, 2009).

Stepwise selection method of multiple linear regression analysis was used to determine the selected socio-economic characteristics of extension agents that influence ICT training needs. The general multiple linear regression model for the study is: $Y = a + b_1X_1 + b_2X_2...B_nX_n + E$. Where:

Y = dependent variable (Y_1 to Y_7)

X = Independent variable (X_1 to X_{15})

a = intercept (value of Y regardless of X)

b = contribution of each independent variable to the dependent variable

E = error term which is ~ iind (independently and identically normally distributed). The variables (dependent-Y, and independent- X) used for the step-wise regression analyses include: Y_1 = ICT hardware training need

Y_2 = Word-processing software training need

Y_3 = Statistical software training need

Y_4 = Presentation software training need

Y_5 = WWW internet service training need

Y_6 = Social media training need

Y_7 = Electronic mail training need

X_1 = State where ADP is located

X_2 = Average monthly income in Naira

X_3 = Dummy of sex

X_4 = Dummy of location of operational area

X_5 = Level of education

X_6 = Dummy of marital status

X_7 = Dummy of computer Literacy

X_8 = Use of electronic mail

X_9 = Use of social media

X_{10} = Work experience in years

X_{11} = Age of EOs as at last birthday

X_{12}= Membership of professional association

X_{13} = Major area of agricultural specialisation (specialty of AEAs)

X_{14} = Receipt of ICT training

X_{15} = Ownership of ICT gadget(s).

The multicollinearity diagnostic tests between the independent variables (predictors) were conducted before the stepwise regression was ran for each of the ICT training needs. According to Field (2009), a strong relationship or association between two or more predictor variables is not good to enter into a regression model. The predictors with strong association are capable of biasing the estimates. The tolerance and Variance Inflation Factor (VIF) were used to judge the existence of collinearity. According to Howell (2007), tolerance refers to the degree to which a predictor can be predicted by the other predictors in the model. Howell further stated that, the lower the levels of tolerance (values closer to 0), the higher the multicollinearity and (VIF), the reciprocal of tolerance refers to the degree to which the standard error of Beta coefficient of a predictor is increased because, the predictor variable is correlated with other predictors. Field (2009) had argued that there are no hard and fast rules about what value of the VIF and tolerance should cause concern but, a VIF value of 10 and tolerance value below 0.1 indicate the existence of collinearity in the model. The VIF and tolerance values presented in Table 2 to 8 indicate that there were no existence of collinearity among the specific

variables that predicted each of the ICTs training need in the regression models.

Table 2: The Tolerance and VIF Statistics of Variables that Determined ICT Hardware Training Need

Model (Step of Entry)	Predictors	Tolerance	Variance Inflation Factor (VIF)
1	State location of ADP	1.000	1.000
2	State location of ADP	0.938	1.067
	Ownership of ICT Gadgets	0.938	1.067
3	State location of ADP	0.933	1.071
	Ownership of ICT Gadgets	0.875	1.143
	Specialty of EAs	0.933	1.071

Source: Field Survey Data, 2014

Table 3: The Tolerance and VIF Statistics of Variables that Determined Statistical Software Training Need

Model (Step of Entry)	Predictors	Tolerance	Variance Inflation Factor (VIF)
1	Marital status	1.000	1.000
2	Marital status	0.980	1.020
	State location of ADP	0.980	1.020

Source: Field Survey Data, 2014

Table 4: The Tolerance and VIF Statistics of Variables that Determined Word-processing Training Need

Model (Step of Entry)	Predictors	Tolerance	Variance Inflation Factor (VIF)
1	State location of ADP	1.000	1.000
2	State location of ADP	0.987	1.014
	Sex	0.987	1.014
3	State location of ADP	0.186	5.372
	Sex	0.943	1.060
	Use of social media	0.181	5.510
4	State location of ADP	0.183	5.451
	Sex	0.903	1.108
	Use of social media	0.181	5.530
	Average Monthly Income	0.840	1.190

Source: Field Survey Data, 2014

Table 5: The Tolerance and VIF Statistics of Variables that Determined Presentation Software Training Need

Model (Step of Entry)	Predictors	Tolerance	Variance Inflation Factor (VIF)
1	Marital status	1.000	1.000
2	Marital status	0.981	1.020
	Use of e-mail	0.981	1.020
3	Marital status	0.944	1.060
	Use of e-mail	0.160	6.258
	Use of social media	0.156	6.406

Source: Field Survey Data, 2014

Table 6: The Tolerance and VIF Statistics of Variables that Determined WWW Internet Service Training Need

Model (Step of Entry)	Predictors	Tolerance	Variance Inflation Factor (VIF)
1	Use of e-mail	1.000	1.000
2	Use of e-mail	0.891	1.123
	Location of operational area	0.891	1.123

Source: Field Survey Data, 2014

Table 7: The Tolerance and VIF Statistics of Variables that Determined Social Media Training Need

Model (Step of Entry)	Predictors	Tolerance	Variance Inflation Factor (VIF)
1	State location of ADP	1.000	1.000
2	State location of ADP	1.000	1.000
	Specialty of EAs	1.000	1.000
3	State location of ADP	0.889	1.125
	Specialty of EAs	1.000	1.000
	Location of operational area	0.889	1.125

Source: Field Survey Data, 2014

Table 8: The Tolerance and VIF Statistics of Variables that Determined Electronic Mail Training Need

Model (Step of Entry)	Predictors	Tolerance	Variance Inflation Factor (VIF)
1	State location of ADP	1.000	1.000
2	State location of ADP	0.980	1.020
	Marital status	0.980	1.020
3	State location of ADP	0.980	1.020
	Marital status	0.961	1.041
	Specialty of EAs	0.980	1.020

Source: Field Survey Data, 2014

CHAPTER FOUR
RESULTS AND DISCUSSION

This chapter presents the discussion of results according to the objectives of the study.

Extent of use of ICTs by extension agents in extension service delivery

This section describes the extent of use of ICT in terms of ICT hardware, word-processing software, statistical software, presentation software, world wide web internet services, social media and electronic mail. The results on extent of use of computer hardwares are presented in Table 9. The standard deviation ranged from 0.85 to 1.63 indicating that the respondents were varied in the use of computer hardware. The composite mean of 3.00 revealed that ICT hardwares were somewhat frequently used in extension service delivery. Results in Table 9 also revealed that extension agents in Bayelsa and Rivers States fairly used GIS device (M = 1.93, SD = 1.18), Fax machine (M = 1.97, SD = 1.19), projector device (M = 2.11, SD = 1.27) and scanner (M = 2.43, SD = 1.40). This is mainly due to few number of these ICTs in the extension offices.

The respondents somewhat frequently used (3 days in 5 working days) storage media (M = 2.72, SD = 1.41), printer (M = 2.86, SD = 1.63), digital video (M = 3.07, SD = 1.12), audio recorders (M = 3.10, SD = 1.11) and digital camera (M = 3.23, SD = 1.07). These ICT hardwares were somewhat available to the agricultural extension agents. The extension agents frequently used (4 days in 5 working days) radio set (M = 4.01, SD = 0.92), mobile phones (M = 4.01, SD = 1.12) and television set (M = 4.15, SD = 0.85). These were

personally owned by the extension agents. The findings mirror that of Adetumbi, Olaniyi and Adewale (2013) who found that radio, television and mobile phones are the most used ICT by extension agents.

Table 9: Extent of Use of ICT Hardware for Extension Service Delivery

ICT Hardware	Mean	Standard Deviation
Use of television set	4.15	0.85
Use of telephone	4.01	1.12
Use of radio set	4.01	0.92
Use of digital camera	3.23	1.07
Booting of computer	3.21	1.55
Shutting down of computer	3.21	1.43
Use of audio recorders	3.10	1.11
Managing folders/directories on the computer	3.07	1.31
Use of video camera	3.07	1.12
Use of keyboard	3.00	1.54
Retrieving of files on the computer	2.97	1.36
Printing of documents from computer	2.86	1.63
Using computer storage devices	2.72	1.41
Scanning of documents onto computer	2.43	1.40
Use of projector device	2.11	1.27
Use of Fax machine	1.97	1.19
Use of Geographic Information Systems (GIS) Device	1.93	1.18
Composite	3.00	1.26

Source: Field Survey Data, 2014; Means were calculated from scale of 5= Most frequently used (used 5 days in a week), 4=Frequently used (used 4 days in a week), 3=Somewhat frequently used (used 3 days in a week), 2= Fairly used (used 2 days in a week), 1=Rarely used (used 1 day in a week).

The use of television and radio to disseminate information by extension agents is not surprising because, they are mass media that are used to reach mass audience in different geographical location (Lawal-Adebowale, 2009). In order words, they are described as electronic communication devices for reaching out to a large number of audiences simultaneously. Aboh (2008) had also found agricultural extension agents to frequently use mobile phones in service delivery. The frequent use of mobile phones for information dissemination is due to the fact that in Nigeria, cellular telephones are no longer considered as luxury for development workers (Okon, 2013).

Results on extent of use of word-processing software are presented in Table 10. The standard deviation ranged from 1.15 to 1.44 indicating that the extension agents varied in the use of computer word-processor.

Table 10: Extent of Use of Word-Processing Software

Word- Processing Software	Mean (M)	Standard Deviation (SD)
Creation of new document	3.07	1.15
Formatting documents	2.79	1.26
Managing documents (copying, cutting, pasting)	2.71	1.20
Editing documents	2.64	1.41
Checking wrong spellings/grammar	2.56	1.44
Creating tables	2.40	1.35
Composite	2.70	1.30

Source: Field Survey Data, 2014; Means were calculated from scale of 5= Most frequently used (used 5 days in a week), 4=Frequently used (used 4 days in a week), 3=Somewhat frequently used (used 3 days in a week), 2= Fairly used (used 2 days in a week), 1=Rarely used (used 1 day in a week).

The composite mean of 2.70 indicates that extension agents somewhat frequently used word processor. Results in Table 10 also revealed that extension agents in Bayelsa and Rivers States fairly created tables using word - processing (M = 2.40, SD = 1.35). The extension agents edit(M = 2.64, SD = 1.41), manage (M = 2.71, SD = 1.20), format (M = 2.79, SD = 1.26) and create (M = 3.07, SD = 1.15) document somewhat frequently using word-processor. According to Omotesho, Ogunlade and Muhammad-lawal (2012a) poor technical know-how and training on ICT limit agricultural extension agents in the use of computer word-processor.

The results on the extent of use of statistical software are presented in Table 11. The standard deviation ranging from 1.01 to 1.50 indicates that extension agents varied in the use of statistical software. The composite mean of 2.30 indicates that the extension agents fairly use statistical software for extension activities (Table 11). The extension agents fairly prepare (M = 1.89, SD = 1.01), edit (M = 2.26, SD = 1.26) templates, code data (M = 2.27, SD = 1.40) and execute appropriate data analysis (M = 2.27, SD = 1.24). The respondents somewhat frequently cleaned (M = 2.51, SD = 1.36) and entered (M = 2.62, SD = 1.50) data.

Table 11: Extent of Use of Statistical Software

Statistical Software	Mean (M)	Standard Deviation (SD)
Data entry	2.62	1.50
Data cleaning: checking for errors	2.51	1.36
Inserting columns, rows	2.33	1.36
Data coding	2.27	1.40
Executing appropriate data analysis such as t-test, chi-square, ANOVA, Correlation, Regression, charts/graphs	2.27	1.24
Deleting rows, columns	2.26	1.31
Editing data on a template	2.26	1.26
Preparing templates	1.89	1.01
Composite	2.30	1.31

Source: Field Survey Data, 2014; Means were calculated from scale of 5= Most frequently used (used 5 days in a week), 4=Frequently used (used 4 days in a week), 3=Somewhat frequently used (used 3 days in a week), 2= Fairly used (used 2 days in a week), 1=Rarely used (used 1 day in a week).

The results on the extent of use of presentation software for agricultural extension service delivery by agricultural extension agents in Bayelsa and Rivers States are presented in Table 12. The standard deviation ranged from 1.09 to 1.27 indicating that the respondents were varied in the use of presentation software for agricultural extension activities in Bayelsa and Rivers States.

The composite mean of 2.10 indicates that the extension agents fairly use presentation software for extension service delivery. Specifically, the results in Table 12 indicate that extension agents fairly create master slides (M= 2.06,

SD= 1.27), insert graphics (M= 2.41, SD= 1.21), format slides (M= 2.01, SD= 1.23) and insert sounds (M= 2.00, SD= 1.09). This is due to their inadequate knowledge in the use of presentation software.

Table 12: Extent of Use of Presentation Software

Presentation Software	Mean (M)	Standard Deviation (SD)
Inserting graphics/pictures/diagrams into slides	2.41	1.21
Creating slide shows	2.11	1.14
Create master slide	2.06	1.27
Inserting animation /transitions into slides	2.03	1.18
Format slides	2.01	1.23
Insert sounds in slides	2.00	1.09
Composite	2.10	1.19

Source: Field Survey Data, 2014; Means were calculated from scale of 5= Most frequently used (used 5 days in a week), 4=Frequently used (used 4 days in a week), 3=Somewhat frequently used (used 3 days in a week), 2= Fairly used (used 2 days in a week), 1=Rarely used (used 1 day in a week).

Results on extent of use of world wide web (www) internet service are presented in Table 13. The standard deviation ranged from 1.26 to 1.48 indicating that the respondents were varied in the use of www internet service. Results in Table 13 specifically indicate that the extension agents in Bayelsa and Rivers States fairly create tabs (M = 2.31, SD = 1.32), create windows (M = 2.41, SD = 1.30), migrate between opened tabs (M = 2.35, SD = 1.35) and open windows (M = 2.36, SD = 1.26) when browsing the Internet and teleconferencing (M = 2.38, SD = 1.29). This is due to the inadequate access to internet facility by agricultural extension agents in Bayelsa and Rivers States.

Table 13: Extent of Use of WWW Internet

WWW Internet Service	Mean (M)	Standard Deviation (SD)
Retrieve information obtained from search engines	2.58	1.47
Search for information in web browsers	2.51	1.48
Create windows when browsing	2.41	1.30
Teleconferencing	2.38	1.29
Migrate between open windows	2.36	1.26
Migrate between opened tabs	2.35	1.35
Create tabs when browsing	2.31	1.32
Composite	2.41	1.35

Source: Field Survey Data, 2014; Means were calculated from scale of 5= Most frequently used (used 5 days in a week), 4=Frequently used (used 4 days in a week), 3=Somewhat frequently used (used 3 days in a week), 2= Fairly used (used 2 days in a week), 1=Rarely used (used 1 day in a week).

The respondents sourced for information using internet browsers (M = 2.51, SD = 1.48) and retrieved information obtained from search engines (M = 2.58, SD = 1.47) somewhat frequently. The composite mean of 2.41 indicates that the extension agents fairly used WWW internet service for extension service delivery. The findings mirrors that of Aboh (2008) who found that agricultural extension agents less frequent use internet services such as web and search engines in their service delivery.

Results on extent of use of social media are presented in Table 14. Extension agents were varied in the use of social media (SD ranged from 1.07 to 1.44) (Table 14).

Table 14: Extent of Use of Social Media

Social Media	Mean (M)	Standard Deviation (SD)
Managing text messages	2.60	1.37
Involve in group charting	2.52	1.40
Creating a social media account	2.41	1.44
Adding friends to my friends list	2.33	1.42
Managing audio messages	2.30	1.31
Managing pictures (still pictures)	2.27	1.33
Managing videos (motion pictures)	2.23	1.29
Making voice calls in a social media network	2.07	1.07
Making video call in a social media network	2.06	1.15
Composite	2.31	1.31

Source: Field Survey Data, 2014; Means were calculated from scale of 5= Most frequently used (used 5 days in a week), 4=Frequently used (used 4 days in a week), 3=Somewhat frequently used (used 3 days in a week), 2= Fairly used (used 2 days in a week), 1=Rarely used (used 1 day in a week).

The composite mean of 2.31 indicates that agricultural extension agents fairly used social media for extension activities. Specifically, extension agents fairly use video (M = 2.06, SD = 1.15), voice (M = 2.07, SD = 1.07) call, manage motion (M = 2.23, SD = 1.29) and still (M = 2.27, SD = 1.33) pictures, manage audio messages (M = 2.30, SD = 1.31), added friends (M = 2.33, SD = 1.42) and created social media account (M = 2.41, SD = 1.44). Perhaps the inadequate access of extension officers to Internet facility in the ADPs caused the results. However, the respondents somewhat frequently use chat (M =

2.52, SD = 1.40) and text messaging (M = 2.60, SD = 1.37) for extension service delivery.

Results on the extent of use of electronic mail are presented in Table 15. The standard deviation ranged from 1.29 to 1.49 indicating that the respondents were varied in the use of electronic mail. The composite mean of 2.51 indicates that the extension agents somewhat frequently used electronic mails for extension service delivery.

Table 15: Extent of Use of Electronic mail

Electronic Mail	Mean (M)	Standard Deviation (SD)
Downloading files from mails sent to me	2.85	1.29
Checking my mails without assistance	2.66	1.49
Creating an electronic mail account	2.43	1.45
Sending mails without assistance	2.30	1.44
Attaching files to mails	2.30	1.40
Composite	2.51	1.41

Source: Field Survey Data, 2014; Means were calculated from scale of 5= Most frequently used (used 5 days in a week), 4=Frequently used (used 4 days in a week), 3=Somewhat frequently used (used 3 days in a week), 2= Fairly used (used 2 days in a week), 1=Rarely used (used 1 day in a week).

Results in Table 15 also revealed that extension agents in Bayelsa and Rivers States fairly send mails (M = 2.30, SD = 1.44), attach files to mails (M = 2.30, SD = 1.40) and create electronic mail account (M = 2.43, SD = 1.45). However, the respondents somewhat frequently check mails (M = 2.66, SD = 1.49) and download files from mails (M = 2.85, SD = 1.29).

Differences in ICT Training Needs Among Extension Agents

Tables 16 to 23 present results on ICT training needs of extension officers according to States, sex, location of operational area, major area of specialisation (specialty of AEAs), income, work experience, age and educational qualification.

The results on differences in ICT training needs of agricultural extension agents based on States are presented in Table 16. The results indicate that agricultural extension agents in Bayelsa and Rivers States of Nigeria perceive a training need for all ICT types. The extension agents in Bayelsa State perceived a higher ICT training need than those in Rivers State. In all cases, while the extension agents in BYSADP perceived a high training need, that of RISADP perceived theirs to be somewhat high. In all cases, the mean training need values of BYSADP were greater than RISADP indicating differences in training need.

The results in Table 16 further revealed that there were significant differences in ICT hardware, word processing, statistical software, presentation software, www, social media and e-mail (P-values < 0.05 alpha level) between BYSADP and RISADP extension agents. The study therefore, accepted the alternative hypotheses that there were significant differences in ICT hardware, word - processing, statistical software, presentation software, www internet service, social media and e-mail training need according to the States of agricultural extension agent. The findings imply that in the event of limited resources, training need efforts in ICTs should focus in BYSADP.

Table 16: T-Test Scores on Differences in ICT Training Needs by State

Type of ICT	Group	N	Mean	Mean Difference	T-Value	P-Value
Hardware	BYSADP	26	4.97	1.41	7.45	0.00*
	RISADP	72	3.56			
Word processing	BYSADP	26	5.40	1.14	6.32	0.00*
	RISADP	72	4.26			
Statistical software	BYSADP	26	5.24	0.97	4.51	0.00*
	RISADP	72	4.27			
Presentation software	BYSADP	26	5.09	0.89	3.84	0.00*
	RISADP	72	4.20			
WWW	BYSADP	26	5.29	1.03	4.94	0.00*
	RISADP	72	4.26			
Social media	BYSADP	26	5.33	1.02	5.56	0.00*
	RISADP	72	4.31			
E-mail	BYSADP	26	5.41	1.22	7.05	0.00*
	RISADP	72	4.19			

Source: Field Survey Data, 2014; * Significant at P-Value < 0.05 (two tailed); Means were calculated from scale of 1= Very low need, 2= Low need, 3 = Somewhat low need, 4= Somewhat high need, 5= High need and 6= Very high need = 6; BYSADP = Bayelsa State ADP; RISADP = Rivers State ADP.

The results on differences in ICT training need of EAs in Bayelsa and Rivers States according to sex are presented in Table 17. The male and female extension agents in Bayelsa and Rivers States perceived somewhat high to high training need for the ICTs (mean ranged from 3.95 to 4.78). The extension

agents perceived somewhat high training need for ICT hardware, high training need for word processing, www, social media and e-mail.

Table 17: T-Test Scores on Differences in ICT Training Needs according to Sex

Type of ICT	Sex	N	Mean	Mean Difference	T-value	P-Value (Two Tailed)
Hardware	Female	18	4.03	0.08	0.25	0.80
	Male	72	3.95			
Word	Male	72	4.62	0.32	0.11	0.91
processing	Female	18	4.59			
Statistical	Male	72	4.56	0.19	0.55	0.59
software	Female	18	4.37			
Presentation	Female	18	4.51	0.10	0.27	0.79
software	Male	72	4.41			
WWW	Female	18	4.71	0.20	0.76	0.45
	Male	72	4.51			
Social	Female	18	4.78	0.19	0.82	0.41
media	Male	72	4.59			
E-mail	Female	18	4.67	0.09	0.24	0.81
	Male	72	4.58			

Source: Field Survey Data, 2014; Means were calculated from scale of 1= Very low need, 2= Low need, 3 = Somewhat low need, 4= Somewhat high need, 5= High need and 6= Very high need = 6.

However, for training need in statistical software, male extension agents perceived a high need while the female extension agents perceived somewhat high need for statistical software but for presentation software training need,

the male extension agents perceived somewhat high need while, the female extension agents perceived a high need.

There were no significant differences in training need between male and female extension agents (P-values > 0.05 alpha level) for ICTs. The study therefore, failed to reject the null hypotheses that there were no significant differences in ICT hardware, word - processing, statistical software, presentation software, www internet service, social media and electronic mail training need according to sex of agricultural extension agents. The findings imply that training need efforts in ICTs should be focused equitable on male and female extension agents in Bayelsa and Rivers States.

Results on differences in ICT training needs of extension agents according to operational area of extension agents are presented in Table 18. The extension agents perceived somewhat high to high training need in the types of ICT (Mean ranged from 3.91 to 5.03). The training need for types of ICTs were higher for the extension agents in urban area than those in the rural area. Specifically, the AEAs in urban area perceived high training need for hardware and presentation software while the AEAs in the rural area perceived somewhat high training need for hardware and presentation software. However, all AEAs perceived high word processing, statistical software, use of www internet service, social media and e-mail training need.

The results in Table 18 further indicated that there was a significant difference in ICT hardware training need between extension agents in urban and rural areas (P-value = 0.02). Therefore, the study accepted the alternative hypothesis that there is a significant difference in ICT hardware training need between agricultural extension agents according to area of operation.

Table 18: T-Test Scores on Differences in ICT Training Needs according to Location of Operational Area of Agricultural Extension Agents

Type of ICT	Operational Area	N	Mean	Mean Difference	T-value	P-Value (Two Tailed)
Hardware	Urban	6	4.59	0.68	2.77	0.02*
	Rural	85	3.91			
Word processing	Urban	6	5.03	0.49	0.98	0.33
	Rural	85	4.54			
Statistical software	Urban	6	4.94	0.49	1.13	0.26
	Rural	85	4.45			
Presentation software	Urban	6	4.92	0.58	1.28	0.20
	Rural	85	4.34			
WWW	Urban	6	4.88	0.40	0.97	0.34
	Rural	85	4.48			
Social media	Urban	6	4.89	0.35	0.89	0.38
	Rural	85	4.54			
E-mail	Urban	6	4.97	0.50	1.05	0.30
	Rural	85	4.47			

Source: Field Survey Data, 2014; *Significant at P-Value < 0.05 (two tailed); Means were calculated from scale of 1= Very low need, 2= Low need, 3 = Somewhat low need, 4= Somewhat high need, 5= High need and 6= Very high need = 6.

However, there were no significant differences in word-processing, statistical software, presentation software, use of www internet service, social media and e-mail training need according to operational area (P-values > 0.05 alpha level). The study therefore failed to reject the respective null hypotheses

that there were no significant differences in training needed in word-processing, statistical software, presentation software, www internet service, social media and e-mail according to area of operational.

The results on differences in training need in ICTs of the respondents according to area of specialization (specialty) are presented in Table 19. The extension agents in Bayelsa and Rivers States perceived somewhat high to high training need for types of ICT (mean ranged from 3.91 to 4.80). In all cases, extension agents with non agricultural extension qualification (others) have higher training need values than those that obtained agricultural extension qualification. Specifically for word processing, statistics, presentation, www and e-mail, the other extension agents perceived high training need while the extension agents with agricultural extension qualification perceived somewhat high training need. However, the respondents perceived somewhat high training need for ICT hardware and high training need for social media. The results further indicated that there were significant differences in presentation software and www training need according to specialty of extension agents (P-values < 0.05 alpha level). The study therefore accepted the respective alternative hypotheses that there were significant differences in presentation software and www training need according to area of specialisation of agricultural extension. However, there were no significant differences in ICT hardware, word processing, statistical software, social media and e-mail training need according to specialty of AEAs (P-values > 0.05 alpha level).

Table 19: T-Test Scores on Differences in ICT Training Needs according to Area of Specialization

Type of ICT	Specialty	N	Mean	Mean Difference	T-value	P-Value (Two Tailed)
Hardware	Others	41	3.99			
	Agric. Ext.	47	3.91	0.08	0.34	0.73
Word processing	Others	41	4.76			
	Agric. Ext.	47	4.41	0.35	1.53	0.13
Statistical software	Others	41	4.70			
	Agric. Ext.	47	4.31	0.39	1.93	0.06
Presentation software	Others	41	4.65			
	Agric. Ext.	47	4.22	0.43	2.05	0.04*
WWW	Others	41	4.80			
	Agric. Ext.	47	4.31	0.49	2.58	0.01*
Social media	Others	41	4.73			
	Agric. Ext.	47	4.46	0.27	1.53	0.13
E-mail	Others	41	4.67			
	Agric. Ext.	47	4.40	0.27	1.19	0.23

Source: Field Survey Data, 2014; * Significant at P-Value < 0.05 (two tailed); Means were calculated from scale of 1= Very low need, 2= Low need, 3 = Somewhat low need, 4= Somewhat high need, 5= High need and 6= Very high need = 6.

The study therefore, failed to reject the respective null hypotheses that there were no significant differences in ICT hardware, word - processing,

statistical software, social media and e-mail training need according to area of specialisation of agricultural extension agents in Bayelsa and Rivers States.

Results on differences in ICT training needs of agricultural extension agents in Bayelsa and Rivers States based on income are presented in Table 20. The extension agents with income below or equal to mean income of ₦137,833 and those with income above the mean income perceived somewhat high to high training for types of ICTs (mean ranged from 3.86 to 4.85). In all ICT types, the mean training need values of AEAs with income below the mean income were higher than those with income above the mean income. Specifically, while AEAs with income ≤ ₦137,833 perceived high training for e-mail, the AEAs with income above ₦137,833 perceived somewhat high training need for e-mail. However, the respondents perceived somewhat high training need for ICT hardware and, high training need for word processing, statistical software, presentation software, www and social media.

The results further revealed that there were no significant differences in hardware, word processing, statistical software, presentation software, www and social media and e-mail training need according to income (P-values > 0.05 alpha level). The study therefore, failed to reject the null hypotheses that there were no significant differences in ICT hardware, word - processing, statistical software, presentation software, www, social media and e-mail training need according to income of agricultural extension agents in Bayelsa and Rivers States.

Table 20: T-Test Scores on Difference in ICT Training Needs based on Income

Type of ICT	Income Groups	N	Mean	Mean Difference	T-value	P-Value (Two Tailed)
Hardware	Below mean	29	4.24	0.38	1.36	0.18
	Above mean	58	3.86			
Word-processing	Below mean	29	4.79	0.28	1.09	0.28
	Above mean	58	4.51			
Statistical software	Below mean	29	4.66	0.11	0.48	0.63
	Above mean	58	4.55			
Presentation software	Below mean	29	4.55	0.07	0.32	0.75
	Above mean	58	4.48			
WWW	Below mean	29	4.80	0.30	1.41	0.16
	Above mean	58	4.50			
Social media	Below mean	29	4.85	0.29	1.55	0.12
	Above mean	58	4.56			
E-mail	Below mean	29	4.85	0.41	1.69	0.09
	Above mean	58	4.44			

Source: Field Survey Data, 2014; ₦137,833= Mean income, ₦ = Naira. Means were calculated from scale of 1= Very low need, 2= Low need, 3 = Somewhat low need, 4= Somewhat high need, 5= High need and 6= Very high need = 6.

Results on differences in ICT training needs of agricultural extension agents in Bayelsa and Rivers States according to experience are presented in Table 21. The respondents perceived somewhat high to high training need for types of ICT (mean ranged from 3.78 to 4.85). In all types of ICT, the training need mean values of extension agents that have worked ≤ 22 years were higher

than those that have worked for more than 22 years. Specifically, while AEAs that have worked ≤ 22 years perceived high training need, the extension agents that have worked for over 22 years perceived somewhat high training need for word-processing, statistical software, presentation software, www, social media and e-mail. Although, the AEAs perceived somewhat high training need for ICT hardware.

The results in Table 21 further revealed that there were no significant differences in ICT hardware, word-processing, statistical software, presentation software, www internet service and e-mail according to number of years of experience of extension agents in Bayelsa and Rivers States (P-values > 0.05 alpha level). The study therefore, failed to reject the null hypotheses that there were no significant differences in ICT hardware, word - processing, statistical software, presentation software, www internet service, and e-mail training need according to years of experience. However, there was a significant difference in social media training need between extension agents according to years of experience (P-value = 0.04) and as such, the study accepted the alternative hypothesis that there is a significant difference in social media training need according to experience of respondents.

Table 21: T-Test Scores on Differences in ICT Training Needs according to Experience

Type of ICT	Experience Group	N	Mean	Mean Difference	T-value	P-Value (Two Tailed)
Hardware	Below mean	37	4.20	0.42	1.66	0.10
	Above mean	61	3.78			
Word-processing	Below mean	37	4.85	0.47	1.90	0.06
	Above mean	61	4.38			
Statistical software	Below mean	37	4.72	0.31	1.47	0.14
	Above mean	61	4.41			
Presentation software	Below mean	37	4.61	0.28	1.21	0.23
	Above mean	61	4.33			
WWW	Below mean	37	4.70	0.28	1.28	0.20
	Above mean	61	4.42			
Social media	Below mean	37	4.83	0.39	2.40	0.04*
	Above mean	61	4.43			
E-mail	Below mean	37	4.64	0.20	0.86	0.39
	Above mean	61	4.44			

Source: Field Survey Data, 2014; *Significant at P-Value < 0.05 (two tailed) Mean years of experience; Means were calculated from scale of 1= Very low need, 2= Low need, 3 = Somewhat low need, 4= Somewhat high need, 5= High need and 6= Very high need = 6.

The results on differences in ICT training needs of extension agents in Bayelsa and Rivers States according to age are presented in Table 22. The extension agents perceived somewhat high to high training need types of ICT (mean ranged from 3.85 to 4.73). Agricultural extension agents above the mean

age of 48 years perceived high need while those below the mean age perceived somewhat high training need for presentation software, internet and e-mail.

Table 22: T-Test Scores on Differences in ICT Training Needs according to Age

Type of ICT	Age Groups	N	Mean	Mean Difference	T-value	P-Value (Two Tailed)
Hardware	Below mean	49	4.00	0.15	0.61	0.54
	Above mean	48	3.85			
Word-processing	Above mean	48	4.64	0.17	0.71	0.48
	Below mean	49	4.47			
Statistical software	Above mean	48	4.60	0.15	0.73	0.46
	Below mean	49	4.45			
Presentation software	Above mean	48	4.54	0.21	0.94	0.35
	Below mean	49	4.33			
WWW internet service	Above mean	48	4.61	0.29	0.88	0.38
	Below mean	49	4.32			
Social media	Above mean	48	4.67	0.19	1.02	0.30
	Below mean	49	4.48			
E-mail	Above mean	48	4.73	0.45	2.00	0.05*
	Below mean	49	4.28			

Source: Field Survey Data, 2014; *Significant at P-Value < 0.05 (two tailed)

48 years= Mean age; Means were calculated from scale of 1= Very low need, 2= Low need, 3 = Somewhat low need, 4= Somewhat high need, 5= High need and 6= Very high need = 6.

However, the AEAs perceived high training need for word-processing, statistical software and social media but perceived somewhat high training need for ICT hardware. There were no significant differences in ICT hardware, word processing, statistical software, presentation software, use of web browsers and social media training need according to age (P-values > 0.05 alpha level). The study therefore, failed to reject the null hypotheses that there were no significant differences in ICT hardware, word - processing, statistical software, presentation software, www internet service, and social media based on age of EAs. However, there was a significant difference in training need for use of e-mail between extension agents according to age (P-value =0.05 alpha level). Hence, the alternative hypothesis that there is a significant difference in electronic mail training need between AEAs according to age was accepted.

Table 23 show results on the differences in ICT training needs of extension agents according to educational qualification. The extension agents perceived somewhat high to high training need for ICTs (mean ranged from 3.69 to 4.77). The extension agents perceived somewhat high to high hardware and presentation software training need. The AEAs however, perceived high training need for statistical, www, social media and e-mail. The AEAs with BSc perceived somewhat high training need in word processing while other EAs (EAs with qualification such as diploma) perceived high training need. There were no significant differences in training need for types of ICT based on educational qualification (P-values > 0.05 alpha level).

The study therefore, failed to reject the null hypotheses that there were no significant differences in ICT hardware, word - processing, statistical software, presentation software, www internet service, social media and e-mail training

need according to educational level of agricultural extension agents in Bayelsa and Rivers States.

Table 23: T-Test Scores on Differences in ICT Training Needs based on Educational Level

Type of ICT	Group	N	Mean	Mean Difference	T-value	P-Value (Two Tailed)
Hardware	Others	39	4.17	0.48	1.87	0.06
	BSc	49	3.69			
Word-processing	Others	39	4.76	0.37	1.48	0.14
	BSc	49	4.39			
Statistical software	Others	39	4.60	0.15	0.64	0.53
	BSc	49	4.45			
Presentation software	Others	39	4.43	0.00	0.00	0.99
	BSc	49	4.43			
WWW	Others	39	4.55	0.05	0.23	0.82
	BSc	49	4.50			
Social media	Others	39	4.77	0.26	1.36	0.18
	BSc	49	4.51			
E-mail	Others	39	4.75	0.30	1.29	0.20
	BSc	49	4.45			

Source: Field Survey Data, 2014; BSc = Bachelors Degree, Others = EAs that posses degrees other than BSc. Means were calculated from scale of 1= Very low need, 2= Low need, 3 = Somewhat low need, 4= Somewhat high need, 5= High need and 6= Very high need = 6.

Determinants of ICT Training Needs

Tables 24 to 30 present results on determinants of ICT training needs of agricultural extension agents using step-wise regression method. The results in Table 24 indicate that ownership of ICT gadgets by extension agents, the specialty of extension agents and the State where ADP is located are the best predictors of ICT hardware training need. These predictors significantly (P-value = 0.001) accounted for 61.1% (R^2= 0.611) of the variance of ICT hardware training needed by extension agents in Bayelsa and Rivers States.

Table 24: Determinants of ICT Hardware Training Need of Extension Agents

Predictors	Step of Entry	Unstandardized B Coefficients	R^2	Adjusted R^2	R^2 Change	F-Reg.	P-Value
Constant	1	6.000					
			0.276	0.236	0.276	6.861	0.012*
X_1		-1.163					
Constant	2	4.030					
X_1		-1.427	0.490	0.430	0.214	8.173	0.003*
X_{15}		1.323					
Constant	3	3.233					
X_1		-1.481					
			0.611	0.538	0.121	8.380	0.001*
X_{15}		1.588					
X_{13}		0.797					

Source: Field Survey Data, 2014; *P-value<0.05=Significant

X_1 = The State where ADP is located, X_{13} = Specialty of EAs and X_{15} = Ownership of ICT gadget

The remaining 38.9% of the variance observed in the ICT hardware training needed by agricultural extension agents in Bayelsa and Rivers States is

said to be residual which may be due to error. The model is statistically significant (P- value= 0.001), implying that the predictors make a significant contribution to predicting ICT hardware training need and the contribution is very unlikely to have occurred by chance alone. The findings imply that efforts to address ICT hardware training need of extension agents in Bayelsa and Rivers States of Nigeria should focus on the State where ADP is located, extension agents that owned ICT and specialty of respondents. The model for ICT hardware training need(Y_1) is thus = 3.233 -1.1481State where ADP is located + 0.797specialty of EAs + 1.588AEAs that owned ICT. The unstandardized B value for the state where ADP is located (-1.481), AEAs that owned ICT (1.588) and specialty (0.797) indicate that, if an extension agent is transferred from RISADP to BYSADP, the model predicts that ICT hardware training needed will increase by 1.481 whereas an extension agent who own an ICT will increase the ICT hardware training need by 1.588 and also, specializing in agricultural extension will increase the ICT hardware training need by 0.797.

The results in Table 25 revealed that State location of ADP, sex of EAs, use of social media and income of AEAs significantly (P-value = 0.000) accounted for 73% (R^2 = 0.730) of variance observed in word-processing training need. The remaining 27% of the variance (the residual) and may be due to error. The model is statistically significant (P-value = 0.000) implying that the predictors make a significant contribution to predicting word-processing training need and, the contribution is very unlikely to have occurred by chance alone. The findings in Table 25 imply that efforts for word-processing training of AEOs in Bayelsa and Rivers States of Nigeria should

focus on the State where ADP is located, sex, use of social media and average monthly income in Naira.

Table 25: Determinants of Word-Processor Training Need of Extension Agents

Predictors	Step of Entry	Unstandardized B Coefficients	R^2	Adjusted R^2	R^2 Change	F-Reg.	P-Value
Constant	1	6.000					
			0.297	0.258	0.297	7.599	0.013*
X_1		-1.147					
Constant	2	6.000					
X_1		-1.046	0.466	0.404	0.169	7.428	0.005*
X_3		-1.007					
Constant	3	6.000					
X_1		-2.861					
			0.637	0.569	0.171	9.358	0.001*
X_3		-1.224					
X_{13}		-1.148					
Constant	4	6.000					
X_1		-2.681					
X_3		-1.386	0.730	0.658	0.093	10.140	0.000*
X_{13}		-1.199					
X_2		-8.598E-006					

Source: Field Survey Data, 2014, *P-value <0.05=Significant

X_1 = The State where ADP is located, X_2 = Average monthly income in Naira, X_3 = Sex and X_{13} = Use of social media.

The model for word-processing training need (Y_2) = 6.000- 2.681State where ADP is located - 0.000008average monthly income - 1.386sex - 1.199use of social media. The unstandardized B values for the State where ADP is located (-2.681), sex of AEAs (-1.386), use of social media (-1.199) and

income of AEAs (-8.598E-006) indicate that reposting an extension agent from RISADP to BYSADP will increase the word-processing training need by 2.681 while, increasing the number of respondents that need training in word-processing by an introduction of a male extension agent will predict an increase in the word-processing training need by 1.386 and also, if an extension agent does not use social media for extension service delivery, the model predicts that word-processing training needed will be increased by 1.199 whereas, if an extension agent whose monthly income is below ₦137 834, is included among respondents that require word-processing training, the model predicts that word-processing training need will increase by 8.598E-006.

Table 26 revealed that marital status of extension agents and the State where ADP is located are the best predictors of statistical software training need. The predictor significantly (P-value = 0.000) accounted for 81% (R^2= 0.810) of the variance observed in statistical software training need of extension agents.

Table 26: Determinants of Statistical Software Training Need of Extension Agents

Predictors	Step of Entry	Unstandardized B Coefficients	R^2	Adjusted R^2	R^2 Change	F-Reg.	P-Value
Constant	1	3.167					
X_6		1.797	0.439	0.408	0.439	14.105	0.001*
Constant	2	4.754					
X_6		2.030	0.810	0.788	0.371	36.285	0.000*
X_1		-1.191					

Source: Field Survey Data, 2014; *P-value<0.05=Significant

X_1 = State where ADP is located and X_6 = Marital status

The remaining 19% of the variance is said to be residual and this may be due to error. The model is statistically significant (P-value = 0.000), implying that the predictors make a significant contribution to predicting statistical software training need of AEOs and the contribution is very unlikely to have occurred by chance alone. The findings imply that efforts to address statistical software training need of AEOs in Bayelsa and Rivers States of Nigeria should focus on the State where ADP is located and marital status of AEOs.

The model for statistical software training need (Y_3) is thus = 4.754 - 1.191State where ADP is located + 2.030marital status. The unstandardized B for marital status of extension agents (2.030) and for the State where ADP is located (-1.191) imply that transfer of extension agents from RISADP to BYSADP will increase the statistical software training need by 1.191 whilst an extension agent that change marital status to married, the model predicts that the statistical software training need will be increased by 2.030.

The results presented in Table 27 indicate that marital status of extension agents, the AEAs that use e-mail and social media for extension work significantly (P-value = 0.001) accounted for 63.4% (R^2= 0.634) of the variance observed in presentation software training need. The remaining 36.8% of the variance is said to be residual and may be due to error. The model is statistically significant (P-value = 0.001), implying that the predictors make significant contribution to predicting presentation software training need and the contribution is very unlikely to have occurred by chance alone. The findings in Table 27 imply that efforts to address presentation software training need of extension agents in Bayelsa and Rivers States of Nigeria should focus

on marital status of AEAs, use of e- mail and use of social media for extension activities.

Table 27: Determinants of Presentation Software Training Need of Extension Agents

Predictors	Step of Entry	Unstandardized B Coefficients	R^2	Adjusted R^2	R^2 Change	F-Reg.	P-Value
Constant	1	3.444					
			0.259	0.218	0.259	6.284	0.022*
X_6		1.187					
Constant	2	2.926					
X_6		1.339	0.476	0.414	0.217	7.712	0.004*
X_8		0.311					
Constant	3	3.181					
X_6		1.153					
			0.634	0.565	0.158	9.235	0.001*
X_8		0.913					
X_9		-0.944					

Source: Field Survey Data, 2014; *P<0.05=Significant

X_6 = Marital status, X_8 = Use of electronic mail and X_9 = Use of social media.

The model for presentation software training need (Y_4) = 3.181 + 1.153marital status + 0.913use of e-mail - 0.944use of social media. The unstandardized B value for marital status of EAs (1.153), use of electronic mail by extension agents (0.913) and use of social media (-0.944) indicate that, attainment of married marital status by an extension agent will increase the presentation software training need by 1.153 whereas an extension agent who do not use electronic mail will increase the presentation software training need by 0.913 and also, agricultural extension agents that do not use social media will increase the presentation software training needed by 0.944.

The results in Table 28 revealed that use of electronic mail by extension agents for extension service delivery and location of operational area of respondents significantly (P-value = 0.000) accounted for the observed change of 60.3% (R^2= 0.603) in www internet training need.

Table 28: Determinants of WWW Internet Training Need of Extension Agents

Predictors	Step of Entry	Unstandardized B Coefficients	R^2	Adjusted R^2	R^2 Change	F-Reg.	P-Value
Constant	1	4.31					
X_8		0.398	0.474	0.445	0.474	16.234	0.001*
Constant	2	3.394					
X_8		0.471	0.603	0.556	0.129	12.917	0.000*
X_4		0.924					

Source: Field Survey Data, 2014; *P-value <0.05=Significant

X_4 = Location of operation area and X_8 = use of electronic media

The remaining 39.7% of the variance is said to be residual and this may be due to error. The model (Table 28) is statistically significant (P-value = 0.000), implying that the predictors make a significant contribution to predicting www internet training need and the contribution is very unlikely to have occurred by chance alone. Based on the findings, efforts to address www internet training need of extension agents in Bayelsa and Rivers States of Nigeria should focus on location of operational area and use of electronic mail. The model specification for www training need (Y_5) = 3.394 + 0.924location of operational area + 0.471use of e-mail. The unstandardized B for use of electronic mail (0.471) and extension agents location of operational area (0.924) indicate that extension agents who use electronic mail for extension

service delivery increased the www internet training need by 0.471 whilst an extension agents whose operational area is located in the rural area increased the www internet service training need by 0.924.

The results presented in Table 29 indicate that the State where ADP is located, the specialty of extension agents and operational area of EAs significantly (P-value = 0.000) accounted for 71.6% (R^2= 0.716) of the variance observed in social media training need. The remaining 28.4% of the variance observed in social media is said to be residual and this may be due to error.

Table 29: Determinants of Social Media Training Need of Extension Agents

Predictors	Step of Entry	Unstandardized B Coefficients	R^2	Adjusted R^2	R^2 Change	F-Reg.	P-Value
Constant	1	5.896					
			0.515	0.488	0.515	19.107	0.000*
X_1		-0.729					
Constant	2	5.731					
X_1		-0.729	0.620	0.575	0.105	13.860	0.000*
X_{13}		0.329					
Constant	3	5.398					
X_1		-0.840					
			0.716	0.662	0.096	13.414	0.000*
X_{13}		0.329					
X_4		0.556					

Source: Field Survey Data, 2014; P<0.05= Significant

X_1 = State where ADP is located, X_4 = Location of operational area and X_{13} = Specialty of EAs.

The model is statistically significant (P-value = 0.000), implying that the predictors make a significant contribution to predicting social media training need and the contribution is very unlikely to have occurred by chance alone. The findings revealed that efforts in social media training need of extension agents in Bayelsa and Rivers States of Nigeria should focus on the State where ADP is located, location of operational area of extension agents and specialty of respondents.

The model for social media training need (Y_6) is thus = 5.398 - 0.840State where ADP is located + 0.556location of operational area + 0.329specialty of EAs. The unstandardized B value for ADP (-0.840), specialty (0.329) and operational area (0.556) indicate that transferring an extension agent from RISADP to BYSADP will increase the social media training need by 0.840 whereas specializing in agricultural extension will increase the social media training need by 0.329 and also, change in operational area from urban area to rural area will increase social media training need by 0.555.

The determinants of training need in the use of e-mail for extension activities are presented in Table 30. The State where ADP is located, marital status of extension agents and the specialty of extension agents were the best predictors by, significantly (P-value=0.001) accounting for 65.6% (R^2= 0.656) of the change observed in electronic mail training need. The remaining 34% of the variance recorded in electronic mail is said to be residual and may be due to error. The model is statistically significant (P-value = 0.001), implying that the predictors make a significant contribution to predicting electronic mail training

need of extension agents in Bayelsa and Rivers States and the contribution is very unlikely to have occurred by chance alone (Table 30).

Table 30: Determinants of Electronic Mail Training Need of Extension Agents

Predictors	Step of Entry	Unstandardized B Coefficients	R^2	Adjusted R^2	R^2 Change	F-Reg.	P-value
Constant	1	6.000					
			0.248	0.207	0.248	5.946	0.025*
X_1		-0.900					
Constant	2	5.304					
X_1		-1.028	0.499	0.441	0.251	8.481	0.003*
X_6		1.280					
Constant	3	4.842					
X_1		-1.042					
			0.656	.592	0.157	10.182	0.001*
X_6		1.424					
X_{13}		0.722					

Source: Field Survey Data, 2014 * P<0.05=Significant; X_1 = State ADP;X_6 = Marital status and X_{13} = Specialty.

The findings revealed that training need efforts for electronic mail should focus on the State where ADP is located, marital status of extension agents and specialty of respondents. Thus, the model for e-mail training need (Y_7) = 4.842- 1.042State where ADP is located + 1.424marital status + 0.722specialty of EAs. The unstandardized B value for ADP (-1.042), marital status of extension agents (1.424) and specialty (0.722) indicate that, reposting an extension agent from RISADP to BYSADP will increase the electronic mail training need by 1.042 whereas, extension agent who changes status to married

will increase the training need by 1.424 and also, specializing in agricultural extension will increase the electronic mail training needed by 0.722.

Constraints Faced by Extension Agents in Accessing ICT Training

The human, financial, infrastructural, policy and institutional constraints faced by extension agents in accessing ICT training are presented in Table 31 to 35. Results on the human constraints faced by agricultural extension agents in accessing ICT training in Bayelsa and Rivers States are presented in Table 31. The respondents indicated that inadequate ICT experts to train extension agents (78%) to be a major and minor human constraint. The respondents also perceived inadequate time to receive training in ICT (86%) to be a major and minor human constraint. More so, 70% of the extension agents perceived inadequate interest in ICT as a human constraint. However, about 30% of the respondents perceived it is not a constraint. This mirrors the findings of Omotesho, Ogunlade and Muhammad-Lawal (2012b) who found that some extension agents perceive fear of ICT usage is not a constraint.

Table 31: Human Constraints Faced by Extension Agents in Accessing ICT Training in Bayelsa and Rivers States

Item	Human constraints in receiving training in ICT- F(%)		
	MajC	MinC	NonC
Inadequate interest in ICT	12(12.00)	58(58.00)	30(30.00)
Inadequate time to receive training in ICT	25(25.00)	61(61.00)	14(14.00)
Inadequate ICT experts to train extension agents	61(61.00)	17(17.00)	22(22.00)

Source: Field Survey Data, 2014; NonC = Not a constraint, MinC = Minor constraint, MajC = Major constraint

The results on financial constraints faced by extension agents in accessing training in ICTs are presented in Table 32. The results in Table 32 indicated that majority of extension agents perceived the financial constraint to be major or minor constraints. Specifically, majority of AEAs perceived inadequate funding (96%), high cost of information technology gadget (95%), unfavourable tariff from telecom network providers (95%), high cost of transmission by broadcasting media houses (94.90%), inadequate income to undertake training in ICT (92%) and misappropriation of fund (91%) to be major or minor constraints faced by extension agents in accessing training in ICTs.

Table 32: **Financial Constraints Faced by Extension Agents in Accessing ICT Training in Bayelsa and Rivers States**

Item	Financial Constraints in receiving training in ICT- F(%)		
	MajC	MinC	NonC
High cost of Information Technology gadgets	55(55.00)	40(40.00)	5(5.00)
Unfavourable tariff from telecom network service providers	33(33.00)	62(62.00)	5(5.00)
High cost of transmission by broadcasting media houses	42(42.40)	52(52.50)	5(5.10)
Inadequate funding	75(75.00)	21(21.00)	4(4.00)
Misappropriation of funds	57(57.00)	34(34.00)	9(9.00)
Inadequate income to undertake ICT training	49(49.00)	43(43.00)	8(8.00)

Source: Field Survey Data, 2014; NonC = Not a constraint, MinC = Minor constraint, MajC = Major constraint.

Results on infrastructural constraints faced by extension agents in accessing trainings in ICT are presented in Table 33. The results revealed that 83% of extension agents in Bayelsa and Rivers States perceived unstable electricity power supply as a major constraint whilst unstable internet network (96%) and inadequate ICT infrastructures (97%) were perceived as major or minor infrastructural constraints. More so, 98% of the extension agents perceived unstable mobile network as major or minor constraints implying that, unstable mobile network coverage is an infrastructural constraint faced by the extension agents.

Table 33: **Infrastructural Constraints Faced by Extension Agents in Accessing ICT Training in Bayelsa and Rivers States**

Item	Infrastructural constraints in receiving training in ICT- F(%)		
	MajC	MinC	NonC
Unstable power supply	83(83.00)	16(16.00)	1(1.00)
Unstable mobile network	49(49.00)	49(49.00)	2(2.00)
Unstable internet network	44(44.00)	52(52.00)	4(4.00)
Inadequate ICT infrastructures	46(46.00)	51(51.00)	3(3.00)

Source: Field Survey Data, 2014; NonC = Not a constraint, MinC = Minor constraint, MajC = Major constraint.

Results on policy constraints faced by extension agents are presented in Table 34. The agricultural extension agents in Bayelsa and Rivers States of Nigeria perceived poor ICT policy framework for extension (73%) to be major policy constraint. The results also revealed that the extension agents perceived weak ICT regulatory system (99%) and poor management of ICT infrastructures (84.80%) as major or minor policy constraints.

Table 34: **Policy Constraints Faced by Extension Agents in Accessing ICT Training in Bayelsa and Rivers States**

Item	Policy Constraints in receiving training in ICT- F(%)		
	MajC	MinC	NonC
Poor ICT Policy Framework for extension	73(73.00)	26(26.00)	1.(1.00)
Weak ICT regulatory system	46(46.50)	52(52.50)	1(1.00)
Poor management of ICT Infrastructures	43(43.40)	41(41.40)	15(15.20)

Source: Field Survey Data, 2014; NonC = Not a constraint, MinC = Minor constraint, MajC = Major constraint.

Results on the institutional constraints are presented in Table 35. The results show that 90% of the respondents perceived inadequate ICT training during formal education to an institutional constraint faced by extension agents in accessing training in ICT. The extension agents perceived absence of partnership with ICT organisations (97%) and inadequate ICT training opportunities (89%) as institutional constraints. However, 50% of the respondents agreed that bureaucratic bottle-neck is not a constraint. The findings from Table 35 mirror that of Archibong and David (2009); Bingimlas (2009) and, Sutrisno and Yi-Hsuan (2010) who found that institutional constraint is among other constraining factors such as human, financial, infrastructural and policy faced by extension agents in accessing ICT trainings.

Table 35: **Institutional Constraints Faced by Extension Agents in Accessing ICT Training in Bayelsa and Rivers States**

Item	Institutional Constraints in receiving training in ICT- F(%)		
	MajC	MinC	NonC
Inadequate ICT training during formal education (example; University education)	62(62.00)	28(28.00)	10(10.00)
Absence of partnership with ICT organisations	40(40.00)	57(57.00)	3(3.00)
Bureaucratic bottle-necks	26(26.00)	24(24.00)	50(50.00)
Inadequate ICT training opportunities to keep abreast with ICT innovations	27(36.00)	40(53.30)	8(10.70)

Source: Field Survey Data, 2014; NonC = Not a constraint, MinC = Minor constraint, MajC = Major constraint.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the summary, conclusions and recommendations.

Summary

Nigeria is largely an agrarian society with majority of population who are food producers living in the rural and sub-urban areas. The use of primitive technologies, over-dependence on human labour, ineffective extension system and poor access to information affect the productivity of farmers. Information and Communication Technologies (ICTs) have enormous potentials to bridge the gap between agricultural researchers, extension agents and farmers. The Federal Ministry of Food and Agriculture (FMARD) and the Agricultural Development Programmes (ADPs) have made ICT an integral part of extension service communication process hoping that it improves agricultural productivity.

Studies have revealed the need for public extension agents in Bayelsa and Rivers States of Nigeria to receive training in ICT. However, the studies failed to state the specific aspects or types of ICT training that should be provided hence the purpose for this study. The study examined the Information and Communication Technologies training need of extension agents in Bayelsa and Rivers States. Specifically, the study determined the extent of use of ICTs for extension activities, examined the differences in training needed in ICTs and predicted ICT training need from selected socioeconomic characteristics.

Furthermore, the study examined the constraints extension agents face in accessing ICT training.

The study used a comparative descriptive survey design, content validated and pretested questionnaire to solicit for information from a census of 100 public extension agents in Bayelsa and Rivers States. Descriptive statistics such as frequency, percentage, mean and standard deviation were used to describe constraints and extent of use of ICTs for extension work. The T-tests was used to identify differences in ICT training needs among AEAs based on selected socioeconomic characteristics whilst stepwise regression was used to predict ICT training need from socioeconomic characteristics. The summary of the findings of the study according to objectives are as presented below:

Extent of Use of ICTs

The agricultural extension agents in Bayelsa and Rivers States somewhat frequently use ICT hardware, word-processor and email but fairly use statistical and presentation software, World wide web and social media for extension service delivery.

ICT Training Need of Extension Agents

Extension agents perceived training need for hardware, word-processing, statistical and presentation software, World wide web, social media and electronic mail. The needs were according to socioeconomic characteristics such as State, sex, income, specialty of EAs, location of operational area, educational qualification, age and experience.

Determinants of ICT Training Need

Ownership of ICT gadgets, the specialty of extension agents and the State location of ADP predicted ICT hardware training need. The State where ADP is located, sex of EAs, use of social media and income of EAs determined word-processing training need of extension agents. Marital status of extension agents and the State where ADP is located determined statistical software training need of extension agents. Marital status of extension agents, use of electronic mail and the use of social media by extension agents determined presentation software training need of extension agents. The use of electronic mail by extension agents for extension service delivery and location of operational area of respondents determined World wide web training need of extension agents. The State where ADP is located, the specialty of extension agents and operational area of EAs determined social media training need of extension agents. The State where ADP is located, marital status and the specialty of extension agents determined electronic mail training need of extension agents in Bayelsa and Rivers States.

Constraints in Accessing Training in ICT

Agricultural extension agents in Bayelsa and Rivers States of Nigeria, face human, financial, policy, infrastructural and institutional constraints in accessing training in ICTs. The human constraints extension agents perceived include inadequate ICT experts to train extension agents, inadequate time to receive training in ICT and low interest in ICT. Financial constraint was the major among the categories of constraints. The infrastructural constraints included unstable electricity power supply, unstable internet network and inadequate ICT infrastructure. The policy constraints were weak ICT policy

framework for extension, poor management of ICT infrastructure and weak ICT regulation. The institutional constraints perceived by extension agents included weak ICT regulatory system, inadequate ICT training during formal education, absence of partnership with ICT organisations and inadequate ICT training.

Conclusions

The study concludes that:

1 Information and Communication Technologies such as hardware, word-processing, statistical and presentation software, World wide web, social media and electronic mail were not frequently used for extension work in Bayelsa and Rivers States.

2 The agricultural extension agents in Bayelsa and Rivers States perceived a training need in all types of ICT. Furthermore, differences in ICT training need were according to state, sex, income, specialty of EAs, location of operational area, educational qualification, age and experience of extension agents.

3 Selected socioeconomic characteristics predict ICT training needs of extension agents.

4 Diverse constraints affect extension agents in accessing ICT training need.

Recommendations

The following recommendations are provided according to the objectives of the study:

1 To ensure that extension agents use ICTs for extension service delivery in Bayelsa and Rivers States ADPs, there will be the need to make available the ICTs for extension agents to use. The directors of extension service in

Bayelsa and Rivers States ADPs should develop proposal and seek funding from stakeholders such as donor agencies, state and Federal governments to provide the needed ICTs. This will improve accessibility of ICT types such as hardware, word-processing, statistical and presentation software and internet services (such as World Wide Web browsers, social media and electronic mailing) for extension activities.

2 The Government of Nigeria through the Federal Ministry of Agriculture and Rural Development (FMARD) and other well meaning donors should provide adequate funds for on-the-job training of agricultural extension officers in Bayelsa and Rivers State ADPs. The training should focus on forms of ICTs such as hardware, software (word-processing, statistical and presentation) and internet services (such as World Wide Web browsers, social media and electronic mailing). The training will equip the extension agents with the competencies required to effectively use ICTs for extension activities, keep the extension agents abreast with contemporary applications of ICTs on efficient agricultural knowledge transfer system and manage the decrying extension to farmer ratio in the States by reaching more farmers timely.

3 Training of agricultural extension agents on forms of ICT should consider the state where ADP is located, marital status, extension agents that operate an email, specialty of extension agents and location of operational area of extension agents.

4 Stakeholders such as donor agencies and governments in Bayelsa and Rivers States should make efforts to manage the human, financial, institutional, policy and infrastructural constraints preventing public

agricultural extension agents from accessing ICT training. In order to facilitate access to ICT training, adequate funding in the form of ICT allowance should be included as part of remuneration for public AEAs in Bayelsa and Rivers States. While the Power Holding Company of Nigeria (PHCN) tries to provide stable electricity power supply at the national level, alternate electricity power sources such as solar energy which is not only cheaper but also environmental friendly should be made available in the ADPs for effective use of ICTs for extension work. Also, ICT policy framework for extension should be formulated and the policy framework should explicitly address the efforts of collaborators such as ICT training developers, Internet and mobile network providers so as to provide training, sale of ICT gadgets and other ICT-related services to AEAs at a subsidised rate. More so, Universities, Colleges of Agriculture and Polytechnics in Nigeria should ensure adequate ICT training of agricultural students.

Suggestion for further study

1 The study should be replicated in ADPs in other States of Nigeria to come out with a holistic policy framework on ICT training of extension agents in the ADPs for improved extension service delivery.

2 The dual-need identification model should be used to compare with results if differences in the training needs will be identified.

3 The study should be repeated in the study area after some time as a follow up to check whether suggestions made and implemented will result in changes in ICT training needs of extension agents in Bayelsa and Rivers States.

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APPENDIX A

UNIVERSITY OF CAPE COAST
SCHOOL OF AGRICULTURE
DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION

The research is to determine Information and Communication Technologies Training Needs of Extension Agents in Bayelsa and Rivers States of Nigeria. It is being carried out as part of an MPhil Programme in Agricultural Extension. However, the information obtained will be used to make recommendations that meet the needs of the extension agents in the two States. In the light of this, I humbly solicit your honest response to the following questions and be rest assured that your responses will be used solely for the research.

Thank you for your understanding and co-operation.

Sign.:_____
C. C. Wigwe
Student.

Sign.:_____
Dr Festus Annor-Frempong
Principal Supervisor.

PART I: The frequency of use of Information and Communication Technologies in extension service delivery.

Instruction: Please tick in the column or box that best represents your response and level of agreement to the questions. For instance, an ICT used **five (5) working days** in a week= 'most frequently used'; ICT used **four (4) working days** in a week= 'frequently used'; an ICT used **three (3) working days** in a week= 'Somewhat frequently used'; an ICT used **two (2) working days** in a week= 'fairly used'; an ICT used **one (1) working day** in a week= 'rarely used'. If you **do not use an ICT at all**, tick in the column of 'never used'.

S/NO	**ICT Areas:** Please tick in the column or box that corresponds to your frequency of use of the following ICTs for extension work:	Frequency of use of Information and Communication Technologies (ICTs)					
		Most Frequently Used (5)	**Frequently Used (4)**	**Somewhat Frequently Used (3)**	**Fairly Used (2)**	**Rarely Used (1)**	**Never Used (0)**
A	**ICT Hardware**						
1	Booting of computer						
2	Shutting down of computer						
3	Retrieving of files on the computer						
4	Managing folders/directories on the computer						
5	Using computer storage media (CD ROM, Diskette, Pen drive)						
6	Scanning of documents onto computer						
7	Printing of documents from computer						
8	Use of keyboard						
9	Use of Digital Camera						
10	Use of video Camera						
11	Use of Audio Recorders						
12	Operating Telephone						
13	Operating Television Set						
14	Operating Radio Set						
15	Operating a Projector Device						
16	Other Computer peripherals such as printers, scanners, Fax						

	machine						
17	Use of Geographic Information Systems (GIS) Device						
B	**Software: Word-processing**						
1	Creation of new document using Word-Processor						
2	Formatting documents in a Word- processor						
3	Editing documents using a Word-Processor						
4	Creating tables using a Word-Processor						
5	Checking wrong spellings/grammar using Word-Processor						
6	Managing documents by copying, cutting, pasting						
C	**Software: Statistical Softwares (SPSS, SAS, Minitab, Excel)**						
1	Preparing templates						
2	Data coding						
3	Data entry						
4	Data cleaning: checking for errors						
5	Inserting columns, rows						
6	Deleting rows, columns						
7	Editing data on a template						
8	Executing appropriate data analysis such as t-test, chi-square, ANOVA, Correlation, Regression, charts/graphs						
D	**Software: Presentation (e.g. PowerPoint)**						
1	Create master slide						
2	Inserting graphics/pictures/diagrams into slides						
3	Format slides						
4	Creating slide shows						

5	Inserting animation /transitions into slides						
6	Insert sounds in slides						
E	**Use of World Wide Web Internet Services**						
1	Search for information in web browsers such as internet explorer, opera mini, mozilla firefox						
2	Retrieve information obtained from search engines such as google, yahoo, Ask						
3	Create tabs when browsing						
4	Create windows when browsing						
5	Migrate between opened tabs						
6	Migrate between open windows						
7	Carry out teleconferencing						
F	**Use of Social Media such as Facebook, Twitter, WhatsApp, YouTube, 2go, Blackberry Messenger, Yahoo Messenger, Skype**						
1	Creating a social media account						
2	Managing text messages						
3	Managing audio messages						
4	Managing pictures (still pictures)						
5	Managing videos (motion pictures)						
6	Adding friends to my friends list						
7	Involve in group charting						
8	Making voice calls in a social media network						
9	Making video call in a social media network						
G	**Use of Electronic Mail such as Yahoo mail, Gmail, Hotmail**						
1	Creating an electronic mail account						
2	Sending mails without assistance						
3	Checking my mails without assistance						
4	Attaching files to mails						
5	Downloading files from mails sent to me						

PART II: Constraints faced by Extension Agents in receiving (sourcing and accessing) training in Information and Communication Technologies (ICTs)

Instruction: Please tick in the column that best represents your response and level of agreement to the questions. Please tick only in one box or column. For instance, if you perceive any question to be a major constraint, tick in the column for 'major constraint' which corresponds with the row of that particular question.

I am faced with the following constraints in receiving training in Information and Communication Technologies (ICTs):				
S/NO		**Levels of agreement to constraint**		
A	**Human Constraints**	**Major Constraint**	**Minor Constraint**	**Not a Constraint**
1	Low interest in ICT			
2	Inadequate time to receive training in ICT			
3	Experts in ICT management are not easy to come by			
B	**Financial Constraints**	**Major Constraint**	**Minor Constraint**	**Not a Constraint**
1	High cost of Information Technology gadgets			
2	Unfavourable tariff from telecom network service providers			
3	High cost of transmission by broadcasting media houses			
4	Inadequate funding			
5	Misappropriation of funds			
6	Inadequate income to undertake ICT training			
C	**Infrastructural Constraints**	**Major Constraint**	**Minor Constraint**	**Not a Constraint**
1	Unstable power supply			
2	Unstable mobile network			
3	Unstable internet network			
4	Inadequate ICT infrastructures			
D	**Policy Constraints**	**Major Constraint**	**Minor Constraint**	**Not a Constraint**
1	Weak ICT Policy Framework for extension			
2	Weak ICT regulatory system			

3	Poor management of ICT Infrastructures			
E	**Institutional Constraints**	**Major Constraint**	**Minor Constraint**	**Not a Constraint**
1	Inadequate ICT training during formal education (example; University education)			
2	Absence of partnership with ICT organisations			
3	Bureaucratic bottle-necks			
4	Inadequate ICT training opportunities to keep abreast with ICT innovations			

PART III: Areas of Information and Communication Technologies Training Needs of Extension Agents

S/NO	**ICT Areas:** Please, to what extent do you need training in the following ICT areas?	Levels of response or agreement						
		Can Not Tell (0)	**Very High (6)**	**High (5)**	**Somewhat High (4)**	**Somewhat Low (3)**	**Low (2)**	**Very Low (1)**
A	**ICT Hardware**							
1	Booting of computer							
2	Shutting down of computer							
3	Retrieving of files on the computer							
4	Managing folders/directories on the computer							
5	Using computer storage media (CD ROM, Diskette, Pen drive)							
6	Scanning of documents onto computer							
7	Printing of documents from computer							
8	Use of keyboard							
9	Use of Digital Camera							
10	Use of video Camera							
11	Use of Audio Recorders							

12	Operating Telephone							
13	Operating Television Set							
14	Operating Radio Set							
15	Operating a Projector Device							
16	Other Computer peripherals such as printers, scanners, Fax machine							
17	Use of Geographic Information Systems (GIS) Device							
B	**Software: Word-processing**							
1	Creation of new document using Word-Processor							
2	Formatting documents in a Word-processor							
3	Editing documents using a Word-Processor							
4	Creating tables using a Word-Processor							
5	Checking wrong spellings/grammar using Word-Processor							
6	Managing documents by copying, cutting, pasting							
C	**Software: Statistical Softwares (SPSS, SAS, Minitab, Excel)**							
1	Preparing templates							
2	Data coding							
3	Data entry							
4	Data cleaning: checking for errors							
5	Inserting columns, rows							
6	Deleting rows, columns							
7	Editing data on a template							

8	Executing appropriate data analysis such as t-test, chi-square, ANOVA, Correlation, Regression, charts/graphs							
D	**Software: Presentation (e.g. PowerPoint)**							
1	Create master slide							
2	Inserting graphics/pictures/diagrams into slides							
3	Format slides							
4	Creating slide shows							
5	Inserting animation /transitions into slides							
6	Insert sounds in slides							
E	**Training on use of World Wide Web Internet Services**							
1	Search for information in web browsers such as internet explorer, opera mini, mozilla firefox							
2	Retrieve information obtained from search engines such as google, yahoo, Ask							
3	Create tabs when browsing							
4	Create windows when browsing							
5	Migrate between opened tabs							
6	Migrate between open windows							
7	Carry out teleconferencing							
F	**Training on the use of Social Media such as Facebook, Twitter, WhatsApp, YouTube, 2go, Blackberry Messenger, Yahoo**							

	Messenger, Skype							
1	Creating a social media account							
2	Managing text messages							
3	Managing audio messages							
4	Managing pictures (still pictures)							
5	Managing videos (motion pictures)							
6	Adding friends to my friends list							
7	Involve in group charting							
8	Making voice calls in a social media network							
9	Making video call in a social media network							
G	**Training on the use of Electronic Mail such as Yahoo mail, Gmail, Hotmail**							
1	Creating an electronic mail account							
2	Sending mails without assistance							
3	Checking my mails without assistance							
4	Attaching files to mails							
5	Downloading files from mails sent to me							

PART IV: Biographical Information: Please respond to the following questions as honest as possible and be assured of confidentiality as your name is not required

1. Name of ADP_____

2. Field Level:

(i) Zone----------

(ii) Operational area----------

(iii) Block ----------

(iv) Circle/Village----------

(3) Rank or Position.....

(4) Average Monthly Income in Naira(₦).....**(5)** Sex (Please tick in the space provided or you underline): (I) Male: ( ) (II) Female: ( )

(6) Location of your operational Area(Please tick in the space provided or you underline): (I) Urban: () (II) Rural ( )

(7) What is your highest Level of Education(Please tick in the space provided or you underline): (I) OND ( ) (II) HND ( ) (III) Bachelors Degree (BSc or B.Agric or B.Tech) ( ) (IV) MSc ( ) (V) PhD. ( ) (VI) Others (please specify).....

(8) Marital Status(Please tick in the space provided or you underline): (I) Single ( ) (II) Married ( ) (III) Divorced ( ) (IV) Separated ( ) (V) Widowed ( )

(9) Religion (please specify).....

(10) Computer Literacy (Please tick in the space provided or you underline): Yes ( ) or No ( )

(11) I have one or more of the following electronic mails (E-mails): (I) Yahoo Mail ( ) (II) Google Mail commonly called GMail ( ) (III) Hot-Mail ( ) (IV) Others (Please Specify)..... (V) None ( )

(12) I operate one or more of the following Social Media Account: (I) Facebook ( ); (II) Twitter ( ); (III) WhatsApp ( ); (IV) YouTube ( ); (V) 2go ( ); (VI) Blackberry Messenger ( ); (VII) Yahoo Messenger ( ); (VIII) Skype ( ); (VIV) Others (Please Specify).....

(13) How many years have you worked as an Extension Agent?(Please in years only).....

(14) Age as at your last birthday(in years only):.....

(15a) Do you belong to any professional Association/society? yes ( ) No ( ) (15b) If yes, indicate.....

(16) What is your major agricultural specialisation (example; Animal Science, Agricultural Extension, Agricultural Economics):----------

(17) Where did you receive ICT training: Home( ); University ( ); Office ( ); Others(please specify)----------; I have no training in ICT ( )

(18) Which of the ICT gadgets do you have: Television ( ); Radio ( ); Telephone ( ); Computer ( ); None ( )

I wish to express my heart-felt gratitude to you for your time and co-operation.