JOURNAL OF SUSTAINABLE DEVELOPMENT

A PEER REVIEWED JOURNAL OF THE SUSTAINABLE LIVELIHOODS AND DEVELOPMENT NETWORK FOR AFRICA

ISSN – 1597-4510

Volume 18, Number 1 Special Edition December, 2020

TABLE OF CONTENTS

Editorial	1
Innovative Approach to Knowledge Sharing and Management in Agricultural Research-Extension Linkage System Soetan, O.J, Ashimolowo, O.R, Banmeke,T.O.A, Lasode, A.O, Oyebamiji, B.A, Adeuyi, O.O, Ojebiyi, W.G and Soetan, D.A.	2
Assessment of Public Extension Personnel's Capabilities and Use of Electronic Sources for Extension Service Delivery in Kwara State, Nigeria Subair, S. K., Yusuf, O. J., Ayanda, I. F. and Abdulrahman, O. L.	15
Factors Influencing Gender-Responsive Projects among Researchers in Selected Agricultural Research and Development Institutions in South West Nigeria Adebayo, T. D. and Adubi, K. O.	28
Assessing Extension-Farmer Interface on the Adoption of Improved Rice Technologies among Smallholder Farmers in Kambia District, Sierra Leone Kamara, A. M., Johnson, A. J., Bah, A. M. and Amara, A.	35
Information Source Characteristics on Climate Mitigation Practices among Cassava Farmers in Ibarapa Communities of Oyo State, Nigeria Adebayo, O. A., Ashimolowo, O. R., Osuntade, O.B., Raheem, W.K., and Ezekiel A. M.	47
Accessibility and Utilisation of Weather Forecast Information for Agronomic Practices among Arable Crop Farmers in Ido, Oyo State Nigeria Abegunrin, O.O., Adeoye, A.S., Ogunwale, O.G., Tunde-Francis, A.A. And Ojo-Fakuade, F.F.	55
Assessment of Profitability of Cucumber Production in Oyo State, Nigeria Raheem, W. K.	63
Comparative Analysis of the Effects of Organic and Inorganic Fertilizer on the Performance of Container-Based Tomato Farming Iyeh, R.O., Abdulsalam-Saghir, P.B., Adamu, C.O., Odeyemi, O.M., Adeuyi, O.O. and Iyeh, A.E.	70
Determinant of Adoption Patterns of Improved Rice Varieties among Smallholder Farmers in Kambia District Northern Sierra Leone Kamara, M. A., Bah, A.M., Johnson, A., and Sessie, T.D.	81
Assessment of Rural Women Participation in Cassava Farming in Oyo State Olagunju, O.E., Ariyo, O. C., Olafemi S.O. and Olagunju, O.S.	92
Economic Empowerment of Rural Communities through Exploration of Solid Minerals in Osun State, Nigeria Abasilim, A. N.	99
Mineral Composition and pH of Scomber scombrus and Trachurus trachurus Processed with Cassava and Gmelina Sawdust Taiwo, M.A., Alaka, I.C., and Adebayo, Q.	105
Environmental Impact of Obalende Mega Sawmill on the Residents of Ijebu-Ode, Ogun State, Nigeria Adeoye, A.S., Abegunrin, O.O., Oke, O.O., Oyewole, O.O, Ogunwale, O.G. And Olajiire-Ajayi, B.L.	113
Assessment of Livelihoods among Households in Boko Haram Insurgency Ravaged Areas of Nigeria Shettima, B. G., Mohammed, D. and Asukwo, A.	122
Lifestyle, Eating Habits and Perceived Wellbeing Status of the Elderly in Ibadan Metropolis, Oyo State Okoeguale, K. O., Fadairo, O. S., Ijeoma, M. C. and Akinyele, F.	131
Development of Dyes from Natural Materials and Management of Dye Effluent: The Nigerian Experience Braide O. and Ogunbowale M.	141
Guidelines for Authors	150

AMSTYS BOOK AND PUBLISHING

ASSESSMENT OF PUBLIC EXTENSION PERSONNEL'S CAPABILITIES AND USE OF ELECTRONIC SOURCES FOR EXTENSION SERVICE DELIVERY IN KWARA STATE, NIGERIA

S. K. SUBAIR, O. J. YUSUF, I. F. AYANDA, AND O. L. ABDULRAHMAN
Department of Agricultural Economics and Extension Services, Kwara State University, Malete, Nigeria.
Email: olayinkaj.yusuf@kwasu.edu.ng

ABSTRACT

The study assessed public extension personnel's capabilities and use of electronic sources for extension service delivery in Kwara state, Nigeria. All (125) public extension personnel in the state main extension agency were used for the study. This comprises 17, 40, 33 and 35 extension personnel from zones A, B, C and D of the state, respectively. Structured questionnaire was used for primary data collection, complemented by key informant interview. Data collected were analysed using descriptive statistics, such as frequency count, percentages, mean and standard deviation while correlation matrix and principal component (factor) analysis were used for inferential deductions. Information elicited from the key informant interview were used to corroborate the quantitative findings. The extension personnel had basic foundational education and deemed literate enough to make use of electronic resources. They possessed good technical knowledge and skills to make use of electronic resources for accessing and disseminating agricultural information. There was increasing use of electronic resources among public extension personnel within the agricultural sector, owing to continuous proliferation of digital literacy and pervasiveness of electronic gadgets, globally, Nigeria inclusive. More knowledgeable personnel had better perception about benefits of e-resources, and equally encountered more constraints using them. The principal component analysis yielded five main constraints' categories associated with use of electronic resources among the extension personnel namely 'psychomotor', 'cognitive related' and 'internet related' factors, in order of their contribution to total percent variation. Others were 'infrastructure related' and 'affective' factors, respectively.

Keywords: e-resources, e-extension, psychomotor, cognitive, affective

INTRODUCTION

Nigeria is grappling with low agricultural production partly due to untimely access to improved technologies. Consequently, the contribution of agriculture to the nation's Gross Domestic Product (GDP) which stood at 24.4% as at 2017 (CBN, 2018) remains unimpressive (Abubarkar, 2011). Technological innovation remains the silver bullet to boost agricultural productivity and make Nigeria self-sufficient and food secure. Nigerian small holders can improve their production efficiency if they have access to technologies required across the agricultural value chains (including production, harvesting and post-harvest stages). Thus, there is an urgent need for policy and institutional interventions that will ensure that African smallholder farmers enjoy uninterrupted timely access to knowledge, skills and quality inputs at fair price.

Digital literacy defined as the knowledge, skills, and behaviors used in a broad range of digital devices such as smart phones, tablets, laptops and desktop PCs, all of which are seen as network rather than computing devices, can play significant roles in this regards (Infogalactic, 2018). Renee (2010) advanced the benefits of digital literacy to include but not limited to: locating and sharing materials, comprehending information and ideas, analysing messages in a variety of forms and evaluating the quality and credibility of the content. In addition, digital literacy provides opportunity for expanding the capacity of small-scale farmers in Nigeria to access information, inputs and innovations capable of enhancing their skills for increasing agricultural productivity on sustainable basis.

Accessing information is a prerequisite and indispensable factor in agricultural practices. Adereti *et al.* (2006) define information as data that have been put into a meaningful and useful context which is communicated to recipient who uses it to make decision. The quality of information rests solidly on three pillars which

are accuracy, timeliness and relevance. Accuracy implies that information is free from bias; timeliness means that recipients can get information when they need it, while relevance implies whether the piece of information specifically answers the user's question. Digital literacy has the potential to provide information that would meet these criteria.

Agriculture has the capability to meet the food needs of increasing population in Nigeria. There is, however, no consensus on how this can be achieved by sustainable means. Past effort of the government often lacks digital component and have failed to meet the food needs of the nation. Consequently, many developing nations including Nigeria are also focusing on application of digital literacy for the implementation of programmes and policies to increase food supply. In this respect, the e-wallet approach was designed to increase access of smallholder farmers to farm inputs who hitherto appear the most hit and vulnerable by the impropriety in the fertilizer and other inputs sector of the Agriculture Ministry in Nigeria (Fadairo *et al*., 2015). Akinwumi (2013) reports that within the first 90 days of his term as Minister of Agriculture in Nigeria, the four decades of fertilizer sector corruption was terminated. Similarly, Yusuf *et al.* (2015) found out that farmer beneficiaries of the e-wallet scheme considered the approach as effective in ensuring transparency and reducing sharp practices prevalent in the old system.

Public spending on agricultural research as a proportion of agricultural GDP in Africa declined over the years (ECA-OECD Review, 2005). Most developing African countries, including Nigeria, still depend on all forms of foreign aid to support extension services, such as those provided by the United States Agency for International Development (USAID) and the U.N.E.S.C.O. The fear and uncertainty in certain quarters today is whether the 20 to 30% funding level accounted for by foreign aid would be maintained in view of the ongoing restructuring in the global, political and economic order. The collapse of Training and Visits (T&V) systems of extension services operated by all the Agricultural Development Projects (ADPs) in Nigeria with the expiration of the World Bank Funding of the ADPs in 2004, is a very clear example.

In Nigeria, extension service is bedeviled by several problems. These include inadequacy and instability of funding, poor logistic for staff especially means of transportation, use of poor trained personnel at local level, ineffective agricultural research extension linkages, inadequate and inappropriate cost effective technologies for farmers in all sub-sectors of agriculture, disproportionate Extension Agents: Farm family ratio. This is particularly relevant because of shortage of extension staff vis-à-vis geographical coverage and farming population. The Extension Agent (EA): Farm Family (FF) is very low with an average 1: 3000 as against 1:500 standard of operation recommended by FAO and many of them were unqualified for the job (Agbamu, 2005). Recent figures for some states in south east and south west is as high as 1:1,590-7,000 compared to 1:1200; 1: 800; 1: 1000; 1: 250; and 1: 500 for Indonesia, Mexico, Tanzania, Japan, and South Korea respectively. This forced the government to rely mostly on food importation to the extent that the Federal government expended a total of 100,820,200,200 US dollar on importation with 40.74% increase in 2019 (WDI, 2019), a trend which is obviously dangerous to the nation's economy. Consequently, the capacity of extension personnel to reach reasonable number of farmers for technology dissemination and demonstration, create awareness, and arouse the interest of the farmers on the potentials of new agricultural technologies to enhance farm productivity to larger population of the farmers remain stagnated, thus leading to low farmers' productivity, income and standard of living.

A doubling in global food demand projected for the next 50 years poses huge challenges for the sustainability of food production (Tilman *et al.*, 2002). In order to augment the low extension agent – farmer ratio, it is apt to exploit the window of electronic (e-) extension service through digital literacy approach for effective channeling and mass transfer agricultural messages to small scale farmers in order to improve agricultural productivity on a sustainable basis in Nigeria. However, in order to effectively achieve this feat, the capability of the extension personnel – who should be key

stakeholder in the effective deployment of the e-extension service – must be ascertained. This is particularly more discerning given the recent trend of drastic reduction on dependency on public extension agents for accessing agricultural information in Kwara state (Ayanda and Subair, 2016). It is in regards of the foregoing that the study, which is part of a larger study aimed at enhancing digital literacy amongst farmers in the state, was conducted.

Objectives of the study

The main objective of the study was to assess public extension personnel's capabilities and use of electronic sources for extension service delivery in Kwara state, Nigeria.

Specific objectives were to:

1. describe the personal characteristics of public extension personnel in relation to use of electronic resources in Kwara state, Nigeria.
2. examine the perceived benefits of e-agricultural extension services towards promoting agricultural operations of smallholder farmer in the study area.
3. identify constraints hindering accessibility of information through e-agricultural extension services among the government extension personnel in the study area

METHODOLOGY

The research work was carried out in Kwara State, north central, Nigeria. Kwara State lies between latitude 7^{o} 45N and 9^{o}30N and longitudes 2^{o}30E and 6^{o}25E. The state was created in 1976 and has sixteen (16) Local Government Areas with a population of 2.3 million (NPC, 2006). The Local Governments Areas are Asa, Ilorin East, Ilorin West, Ilorin South (Kwara Central); Baruteen, Kaiama, Edu, Patigi and Moro (Kwara North); Irepodun, Ifelodun, Oyun, Offa, Ekiti, Oke-Ero and Isin (Kwara South). This is categorized into four main agricultural zones, namely, A, B, C and D. Majority of the people rely on agriculture as means of livelihood. The land area is about 36,825 square kilometers (that is 3,682,000 hectares). The state has two main climatic seasons; the dry and wet seasons with rainfall between 1000-1500 mm. This rainfall pattern favors the cultivation of many arable crops including cassava, yam, maize, cowpea which are mostly consumed by the people.

All public extension personnel in the Kwara state main extension agency (Kwara State Agricultural Development Project - KWADP) were used for the study. This comprises 17, 40, 33 and 35 extension personnel from zones A, B, C and D of the state, respectively, thus totaling 125 respondents used for the study. Primary data were collected from the respondents by means of structured questionnaire, complemented by interview of a key informant – director of extension in the state extension agency. Data collected were analysed using descriptive statistics, such as frequency count, percentages, mean and standard deviation while correlation matrix and principal component (factor) analysis were employed to make inferential deductions using Predictive Analytics Software (PASW) package for the data analysis. Information elicited from the key informant interview were used to corroborate the quantitative findings.

Use of e-resources was measured by requesting extension personnel to indicate degree of use of listed electronic resources on a 5 point Likert-type scale viz: Never (1), Rarely (2), Sometimes (3) Often (4) and Always (5). Mean scores were computed by multiplying the points of response options by their respective frequencies, which after summed together are divided by the total number of respondents. Mean score of 3 and above indicates good use. This was arrived at as follows: (5+4+3+2+1)/5 which equals 3. Technical skills and knowledge were measured by requesting extension to express their proficiency and knowledge, respectively, on appropriate evaluative statements on a 5 point Likert-type scale as follows: very poor (1), poor (2), average (3), good (4), very good (5). Perceived benefits of electronic resource use was measured in like manners as above. Mean score of 3 was equally similarly stipulated as benchmark of low and high scores for the variables, as appropriate. Personal characteristics such as sex, marital status, educational level, etc., were operationalized at nominal level while others such as age and years of experience were measured by absolute values and categorized for descriptive purposes.

RESULTS AND DISCUSSION

Table 1 shows that 66.4% of the respondents were male and 33.6% female. This indicates that there were more male extension personnel than female in Kwara state. Although, this is quite a similar trend generally within the agricultural work force in Nigeria (Adedoyin, 1999) and particularly within the public extension system in northern part of the country of which Kwara state is reckoned to belong, however, proportion of male to female (two-third) reported here is better compared to those of other studies from the same northern part of the country. For instance, Umar *et al*. (2015) reported percentage of male public extension agents in Kaduna state as 80%, four-fifth of the total. The situation is often due to the prevalent culture of the region where women are often mostly indoors, with men more predominantly undertaking farming activities. Agwu *et al*. (2008) submitted that use of ICTs (electronic resources) could significantly reduce or eliminate sociocultural factors that restrict contact between genders in such communities. Furthermore, the fair proportion of male to female ratio reported in the study area will enable both genders have exposure to digital literacy through deployment of e-agricultural extension services in the state. However, more like this study's findings, Nwagbugwu *et al*. (2019) reported fairer proportion of female (47.8%) extension personnel in Anambra state, southeastern Nigeria, compared to male (52.2%) where the aforementioned gender-based disparity is less predominant.

The mean age of extension personnel was 43.26 years with standard deviation of 5.19. The modal age category was 41-50 years with 68.0% in this category. The results indicate that most of the extension personnel are old enough to take self-decision on the use of ICT. This concurs with the submission of Umar *et al*. (2015) who, although reported mean age of extension agents in their study in Kaduna state as 35.5 years. This notwithstanding, older age might not be a positive advantage to use of e-agricultural extension given that the elderly might be less interested in hi-tech technological devices (Agwu and Chah, 2007). However, exposure to continuous training opportunities could help them surmount this barrier.

Most (59.2%) had HND qualification and about 20% each had OND and B. Agric/B.Sc. degree qualifications indicating that extension agents in the state are educated, to at least Ordinary Diploma level. This shows that the extension personnel have basic foundational education and therefore may be deemed literate. This is similar to the findings of Nwagbugwu *et al*. (2019) where majority (87%) of extension personnel in Anambra state had B.Sc/OND degrees, and findings of Umar *et al*. (2015) who reported that most of the extension agents in Kaduna state were post-secondary school certificate degree (OND/HND/B.Sc) holders. Also, Birke *et al*. (2018) reported that large majority of agricultural expert (93%) had university degrees in Ethiopia. High illiteracy level has been identified as a serious barrier and constraint to ICT utilization among extension service workers (Arokoyo, 2005). Invariably, it is anticipated that the extension agent will be favorably disposed to use of electronic agricultural resources, given their educational qualification. This is similar to the submission of Aromolaran *et al.* (2016) who opined that educational level of extension agents in Oyo state, Nigeria contributed to their use of the internet (electronic resource).

Results further show that many (48.0%) among the respondents had specialization in animal production, with about 34% who specialized in crop production. Few (13.6%) and very few (4.8%) had specialization in agricultural economics and agricultural extension, respectively. These indicate that majority of extension agents in the study area did not primarily have specialization in agricultural extension, which could have implications on quality of extension service delivery. However, Unified Agricultural Extension System (UAES) being adopted by the public extension agencies in the country, especially the Fortnightly Training (FNT) it becomes convenient to fill skill deficiencies in information delivery to farmers by the extension personnel. Also, with adequate in-training and field experience gathered over time, the extension agents from other backgrounds may become more accustomed to the responsibilities associated with their roles. The submission agrees with that of Agwu *et al.* (2008) who reported that level of training

influenced use of electronic sources among extension agents.

All the respondents were married. This is not unexpected given the average age value earlier reported. Being married, it is anticipated the respondents will be responsible which might contribute positively to the discharge of their duty. Slightly above average (53.6%) had between 11 to 15 years of experience years of experience while 27.2% had between 6 to 10 years of experience. Mean year of work experience was 12.4 years with standard deviation of 3.61 years. This indicates that an average extension agent has spent appreciable number of years on the job. It is expected longer years of experience should translate to competency in discharge of responsibilities among extension agents. However, this might not necessarily be the case with respect to use of electronic resources for extension service delivery, given its being a relatively new trend among extension personnel in Nigeria.

Table 1: Distribution of respondents' by demographic attributes

Variable	Frequency (n =125)	Percentage (%)	
Sex			
Male	83	66.4	
Female	42	33.6	
Age (years)			
30 – 40	34	27.2	
41 – 50	85	68.0	
51 – 60	6	4.8	
Mean age	43.26		
Standard deviation	5.19		
Educational Level			
OND	26	20.8	
HND	74	59.2	
B. Agric/B.Sc.	25	20.0	
PGD/M.Sc	0	0	
Specialization			
Crop	42	33.6	
Animal	60	48.0	
Agricultural Economics	17	13.6	
Agricultural Extension	6	4.8	
Marital Status			
Single	0	0	
Married	125	100.0	
Divorced	0	0.0	
Separated	0	0.0	
Widowed	0	0.0	
Years of experience			
1 -5 years	2	1.6	12.4
6 – 10 years	34	27.2	3.61
11 – 15 years	67	53.6	
16 – 20 years	21	16.8	
21 and above	1	0.8	
Mean	12.4		
Standard deviation	3.61		

Source: Field survey, 2019

Results in Table 2 show that mobile phone (mean = 5.0) ranked highest as the most used e-resources for accessing or disseminating of agriculture related information by the extension agents. This was followed by use of audio-visual aids (4.61) and video camera (4.28). In the same vein, the extension personnel indicated good usage on internet (3.62), radio (3.15), computer (3.23) and audiovisual aids (3.95). Use of remote sensing equipment and global positioning system, GPS, were amongst the least used electronic resources, with mean scores of 2.69 and 1.98, respectively. Similar to findings of Umar *et al*. (2015) and Fadiji (2011) mobile phones, radio, internet was amongst highest ranking and most commonly used electronic resources amongst extension agents in some states of northwestern Nigeria. Additionally, geographic information system, GIS and storage device (CD ROM/flash drive) were equally amongst the least used modern and sophisticated electronic resources reported by Umar *et al*. (2015). It may be inferred from the findings that extension personnel in the study area had adopted good usage of both old and modern electronic resource for accessing and disseminating agricultural related information. While earlier studies, such as Kiplangot (2003)

reported minimal use and impact of ICTs on diffusion of agricultural information, later studies, like Elijah (2010) and Gelb *et al*. (2009) had reported them as invaluable resource for obtaining agricultural information, enhancing marketing of agricultural products and production efficiency and integration within the agricultural sector and beyond. Thus, it may be submitted that with continuous proliferation of digital literacy and pervasiveness of electronic gadgets in today's world, the use of electronic resources within the agricultural sector in general and particularly among extension personnel have been on the increase. In a somewhat different view, however, Birke *et al*. (2018) found that agricultural experts, who although, are favorably disposed to ICTs usage in Ethiopia, considered them less useful for obtaining agricultural information, because they thought printed agricultural knowledge resources at their offices are sufficient for their needs.

Table 2: Use of e-resources for accessing or disseminating of agricultural information among government extension personnel

Items	Always		Sometimes		Rarely		Mean
	F	%	F	%	F	%	
Mobile phone	125	100	0	0	0	0	5.00
Radio	14	11.2	111	88.8	0	0	3.15
Television	21	16.8	104	83.2	0	0	3.23
Computer	63	50.4	29	23.2	33	26.4	3.45
CD ROM/Flash drive	40	32.0	34	27.2	51	40.8	2.91
Internet	67	53.6	20	16.0	38	30.4	3.62
GPS	13	10.4	20	16.0	92	73.6	1.98
Video Camera	119	95.2	6	4.8	0	0	4.28
Audio player/recorder	94	75.2	31	24.8	0	0	3.95
Audio visual aids	120	96.0	5	4.0	0	0	4.61
Remote sensing equipment	11	8.8	74	59.2	40	32.0	2.69

Source: Field survey, 2019

The results in Table 3 show that the statements 'being empowered me to send text message to farmers in my areas of coverage or cell/extension circle' and 'provision of timely access of relevant agricultural messages capable of increasing farm output' recorded highest mean scores of 4.60 each amongst perceived benefits of e-resources amongst the extension personnel. Also, most other mean scores obtained pointed to the fact that extension personnel viewed positively the benefits of e-resources for agricultural extension delivery. In very few instances, however, mean scores below 3 were obtained indicating extension personnel were not favorably disposed to the opinion expressed in these sentences in relation to benefits of e-resources. These include statements such as electronic resources 'accelerates extension service delivery to large number of small farmers almost simultaneously' (1.90), 'offers better and faster opportunity to collect and respond to farmer's feedback (2.33), and 'facilitates adoption and continuous utilization of good agricultural practices' (2.07). These, notwithstanding, the results preponderantly indicate that extension personnel mostly had favorable perception about the benefits of electronic resources for agricultural extension service delivery in the study area. The findings are very similar to that of Prodhan and Afrad (2014) who reported that extension personnel in Bangladesh favorably perceived use of electronic resources as very beneficial. Specifically, the extension personnel in their study in Bangladesh favorably opined that 'extension work can be greatly enhanced by ICT', and that the 'benefits of ICT use outweigh the financial burden involved'. Also, they concurred that 'ICT usage has great significance in agricultural development' and it 'enhances rate of technology adoption'.

Table 3: Perception about benefits of e-resources for agricultural extension service delivery

Items	Agreed		M-agreed		Disagreed		Mean
Increase digital literacy of extension agents:	F	%	F	%	F	%	
Empower me to operate and use the digital tools in cell phone	55	44	63	50.4	7	5.6	3.47
Offers ability to source and download new information through the internet	43	34.4	80	64	2	1.6	3.38
Empower me to send text message to farmers in my areas of coverage or cell/extension circle	116	92.8	0	0	9	7.2	4.60
I am connected to Facebooks of many farmers and therefore able to exchange information on farming activities	44	35.2	79	63.2	2	1.6	3.39
Provides timely access of relevant agricultural messages capable of increasing farm output	116	92.8	0	0	9	7.2	4.60
Assists in regular access to/ dissemination of information on marketing outlets	97	77.6	26	20.8	2	1.6	3.81
Assists in regular access to/dissemination of information on better prices of farm produce	103	82.4	22	17.6	0	0	4.10
Assists in regular access to better prices on farm inputs	31	24.8	85	68	9	7.2	3.24
Provision of information on sources of credit	17	13.6	99	79.2	9	7.2	3.10
Provides timely information on disaster (flood, drought, pest, and diseases	110	88	13	10.4	2	1.6	3.87
Provides timely information on reliable sources of farm inputs	38	30.4	85	68	2	1.6	3.44
Assists in increasing farm productivity and hence food security	25	20	10	8	90	72	2.41
Accelerates extension service delivery to large number of small farmers almost simultaneously	23	18.4	0	0	102	81.6	1.90
Offers better and faster opportunity to collect and respond to farmers feedback	16	12.8	22	17.6	87	69.6	2.33
Facilitates adoption and continuous utilization of good agricultural practices	10	8	32	25.6	83	66.4	2.07

Source: Field survey, 2019

The results in Table 4 show that knowledge had significant relationship with skills (r= 0.360), perceived benefits (r= 2.51) and constraints (r= .183) at $p<0.05$. Similarly, skills had significant relationship (r = 0.317) with use of e-resources. The results presuppose that the more knowledgeable extension personnel are better skilled and adept at use of electronic resources, the higher the chances they make use of these resources for agricultural extension service delivery. The results also show that, more knowledgeable personnel had better perception

about benefits of e-resources, and equally encountered more constraints using them. This is plausible because the more one makes use of technological gadgets, the more they become conversant with them, and higher the likelihood that they encounter more constraints, upon which they might become more proficient in the use of such gadgets after overcoming encountered constraints. Heysung (2004) and Anandaraja *et al.* (2015) underscored the significance of requisite skills as critical to usage of ICT in achieving information literacy in agriculture. Also, Prodhan and Afrad (2014) emphasized the significance of requisite knowledge as essential to use of information sources among extension personnel in Bangladesh.

Table 4: Correlation matrix of relationship between key variables of the study

		Knowledge	Skill	Perceived Benefit	Constraints	Use
Knowledge	Pearson Correlation	1	.360**	251**	.183*	.084
	Sig. (2-tailed)		.000	.005	.041	.353
Skills	Pearson Correlation	.360**	1	.090	.140	.317**
	Sig. (2-tailed)	.000		.316	.120	.000
Perceived Benefits	Pearson Correlation	.251**	.090	1	-.023	.109
	Sig. (2-tailed)	.005	.316		.797	.226
Constraints	Pearson Correlation	.183*	.140	-.023	1	.118
	Sig. (2-tailed)	.041	.120	.797		.191
Use	Pearson Correlation	.084	.317**	.109	.118	1
	Sig. (2-tailed)	.353	.000	.226	.191	

**. Correlation is significant at the 0.01 level (2-tailed); Correlation is significant at the 0.05 level (2-tailed).

The results of factor analysis in Table 5 show that five main constraints (factors) were found to affect effective use of electronic resources among extension agents in the study area which cumulatively accounted for 85.792% variation. The individual factor as named with their respective Eigen values included 'psychomotor factor' (2.963) and 'cognitive related factor' (2.313) which singly accounted for 22.789% and 17.792% of the total variation, respectively. 'Internet related' (2.290) was the third most important constraint and singly accounted for 17.614% variation. Others, 'infrastructure related' (1.953) and 'affective' (1.634) factors, respectively, accounted for 15.024% and 12.572%.

The results further show that 'complexity in use of e-resources' (L= .740), 'insufficient technical know-how on utilization of e-resources to source/access information' (L= -7.38) and 'insufficient technical know-how on utilization of e-resources to disseminate information' (L= .152) were key variables under the 'psychomotor factor', that is skill related factor. The result emphasizes the significance of appropriate skill acquisition as critical to successful deployment and use of electronic resources among the extension agents. As for the 'cognitive factor' (i.e. knowledge related), key variables with high loading here are 'lack of awareness of e-resources among extension staff' (L=.865), 'awareness of e-extension opportunities for technical information delivery is absolutely low' (L = .837) and 'inadequate content development to meet farmers' needs (0.362). Similar to these findings, Ayanda and Subair (2016) identified inadequate content development amongst constraints to use of cell phones for extension service delivery in Kwara state, Nigeria. These indicate that inadequate requisite knowledge about e-resources and associated opportunities are critical constraints that inhibited use of electronic resources for obtaining and disseminating agricultural information among

extension personnel in the study area. This can be overcome through regular on the job training to update extension personnel. These again supported the submission of Heysung (2004), Prodhan and Afrad (2014) and Anandaraja *et al.* (2015) that underscored the significance of requisite skills and knowledge as necessary to successful deployment of electronic resources.

The variables with high loadings on the 'internet related' factor were 'lack of internet connectivity' (L = -110), 'weak internet connectivity' (L = 0.893) and 'high cost of internet' (L = -.906). Also, 'exorbitant cost of purchasing the smart phone' (L= 0.874) and 'erratic electricity supply' were two variables of highest loading on the 'infrastructure related' factor. The results indicate that poor internet facilities, high cost of phones, poor electricity supply play a major role in the use of electronic resources, absence of which could create bottlenecks to its successful deployment. These are similar to findings by Agwu *et al*. (2008) and Ayanda and Subair (2016) that identified internet access, fluctuating power supply and high cost of ICT hardware (e.g. smartphone), amongst others, as constraints to use of electronic resources in Abia and Enugu states of Southeastern and Kwara state on Northcentral Nigeria. Smart phones are indispensable electronic resources for accessing and disseminating agricultural information. Several useful apps need a functional smart phone for effective use. Also, lack of adequate power supply could inhibit proper functioning of the smart phones arising from inability to charge their phone batteries as at when due. The findings, thus, underscore that, to enhance effective use of electronic resources amongst extension personnel operating mostly in rural areas where infrastructure are inadequate, they should be provided with high quality smart phones with necessary power back up (e.g. power bank) for the phone batteries.

The 'affective' factor had 'poor attitude of extension workers towards use of e-resources (L =.666) as the main variable with highest loading. Good disposition of extension workers is very essential to their effective use of electronic resources. Favorable attitude has been documented as critical factor that could inhibit the effective use of electronic resources among extension workers in the Kingdom of Saudi Arabia (Afzal *et al*., 2016).

Table 5: Key constraints (factors) inhibiting use of e-resources among extension personnel

Perception Statements	Factors				
	Psychomotor factor	Cognitive factor	Internet factor	Infrastructure factor	Affective factor
Lack of awareness of e-resources among extension staff	-.173	.865	.070	.130	-.144
Awareness of e-extension opportunities for technical information delivery is low	.375	.837	.135	-.156	.094
Lack of internet connectivity	-.017	-.207	-.110	-.132	.902
Weak internet connectivity	-.041	.149	.893	-.132	-.304
High cost of internet	.205	.083	-.906	.087	-.182
Complexity in use of e-resources	.740	-.128	-.108	.047	-.370
Poor attitude of extension workers towards use of e-resources	-.384	.452	.199	.031	.666
Exorbitant cost of purchasing the smart phone	.136	.192	-.185	.874	-.174
Unavailability of e-resources extension services in our locality	-.873	.037	.042	-.152	-.008
Insufficient technical know-how on utilization of e-resources to source/access information	-.738	.164	.130	-.512	.157
Insufficient technical know-how on utilization of e-resources to disseminate information	.152	.337	.710	.527	.146
Erratic electricity supply	.175	-.511	.165	.734	.055
Inadequate content development to meet farmers' needs	.821	.362	.012	.010	.078
Eigen values	2.963	2.31	2.29	1.95	1.63
% variation	22.79	17.79	17.61	15.02	12.57
Cumulative % variation	22.79	40.58	58.20	73.22	85.79

Source: Field survey, 2019

CONCLUSION AND RECOMMENDATIONS

The extension personnel had basic foundational education and deemed literate enough to make use of electronic resources, given their educational qualification. They had good technical knowledge about use of electronic resources for accessing and disseminating agricultural information. The use of electronic resources within the agricultural sector among extension personnel was on the increase, owing to continuous proliferation of digital literacy and pervasiveness of electronic gadgets, globally, Nigeria inclusive. Also, more knowledgeable personnel had better perception about benefits of e-resources, and equally encountered more constraints using them. And finally, five main constraints' categories were associated with use of electronic resources among the extension personnel which included 'psychomotor', 'cognitive related' and 'internet related' factors, in order of their contribution to total percent variation. Others were 'infrastructure related' and 'affective' factors, respectively. The need to ensure the knowledge and skills of extension personnel about e-resources be sustained and improved upon through continuous regular on the job training is recommended, in addition to addressing the identified constraints of the study, in order to augment low extension farmer ratio prevalent in the study area.

REFERENCES

Abubakar BY (2011) Redirecting research agenda towards transformation of the Nigerian livestock industry. Keynote Address presented at the 16th Annual Conference of Animal Science Association of Nigeria (ASAN, ASANYIGBA 2011), Sept. 12 – 15, 2011, pp. 3

Adereti, F. O., Fapojuwo, O. E., & Onasanya, A. S. (2006). Information utilization on cocoa production techniques by framers in Oluyole Local Government Area of Oyo State, Nigeria. *European Journal of Social Science,* 3(1), 1–7.

Adedoyin, S.F., Fapojuwo O.E, & Torimiro, D. (1999). Educational communication materials in agric technology promotion: A survey of extension agents in Ijebu area of Ogun State. *Proceedings of the Fifth Annual National Conference of the Agricultural Extension Society of Nigeria (AESON)*. 12th – 14th April 1999.

Afzal, A., Al-Subaiee, F. S. & Mirza, A. A. (2016) The Attitudes of Agricultural Extension Workers towards the Use of E-Extension for Ensuring Sustainability in the Kingdom of Saudi Arabia. *Sustainability,* 8, 980: 1-10.

Agbamu, J.U. (2005). Problems and Prospects of Agricultural Extension Service in Developing Countries. In S. F. Adedoyin (Ed.), *Agricultural Extension in Nigeria* (pp.159-169). Ilorin: AESON.

Agwu, A. E. & J.M. Chah, (2007) Access and utilization of modern information communication technologies among extension personnel in Benue State of Nigeria. *Proceedings of the 12th Annual Conference of the Agricultural Extension Society of Nigeria (AESON)*. 4th – 7th July, 2007.

Agwu, A. E., Uche-Mba, U. C. & Akinnagbe, O. M. (2008) Use of Information Communication Technologies (ICTs) among Researchers, Extension Workers and Farmers in Abia and Enugu States: Implications for a national agricultural xtension policy on ICTs. *Journal of Agricultural Extension* 12(1), 37 – 49. DOI: 10.4314/jae.v12i1.47025

Akinwumi A. (2013). *Transforming Nigeria's Agriculture*. Speech delivered by Dr. Akinwumi Adesina, CON, Honourable Minister of Agriculture and Rural Development, Federal Republic of Nigeria, At the Inauguration of the Agriculture and Food Security Center of the Earth Institute of Columbia University, New York, USA, September 10, 2013.

Anandaraja, N, Swaminathan, B. & Sivabalan, K. C. (2015). Use of information and communication technology (ICT) to achieve information literacy in agriculture. *Int. J. Agr. Ext.* 03(2), 111-122.

Aromolaran, A. K., Alarima, C. I., Akerele, D., Oyekunle, O. & Leramo, G. A. (2016). Use of internet for innovation management by extension agents in Oyo State. *Journal of Agricultural Extension,* 20(1), 96-106. DOI: http://dx.doi.org/10.4314/jae.v20i1.8 .

Arokoyo, T. 2005. ICTs application in agricultural extension service delivery. *In*: S.F. Adedoyin (Ed.), *Agricultural Extension in Nigeria*. (pp. 245-251). llorin: AESON

Ayanda, I. F. & Subair, S. K. (2016) Assessment of cell phone for extension services delivery to small-scale farmers and prospects to sustainable agricultural production in Kwara State, Nigeria. *Journal of Global Communication,* 9(1), 45-51.

Birke, F. M., Lemma, M. & Knierim, A (2018). Perceptions towards information communication technologies and their use in agricultural extension: Case study from South Wollo, Ethiopia, *The Journal of Agricultural Education and Extension*, 2, 17 DOI: 10.1080/1389224X.2018.1524773

CBN (2018) Statistics Data Base accessed online January 10, 2018 from http://statistics.cbn.gov.ng/cbn-onlinestats/QueryResultWizard.aspx

ECA-OECD (2005) *African agricultural performance in perspective*. ECA-OECD Mutual review; Addis Ababa

Elijah, O.A. (2010). Effects of the emerging Information Communication Technologies (ICTs) on agricultural knowledge transfer to smallholder farmers in Nigeria. University of Agriculture, Abeokuta. 20:2

Fadairo, N. S. Olutegbe & Tijani, A. M. (2015): Attitude of crop farmers towards e-wallet platform of the growth enhancement support scheme for input delivery in Oke-Ogun area of Oyo state. *Journal of Agricultural Informatics,* 6(2), 62-71.

Fadiji, T. O. (2011). Factors influencing usage of information and communication technologies among village extension agents in three selected states of north-west, Nigeria. Unpublished Ph.D. Dissertation of Ahmadu Bello University, Nigeria.

Gelb, E., Gal, B. and Wolfson, D. (2009). Information and communication technologies (ICT) for agricultural extension – An Overtime Israeli Perspective.

Heysung, P. (2004). Factors that affect IT adoption by teachers. Unpublished Ph.D. (Ag. Ext. Ed.) Thesis, Department of Social Sciences, University of Nebraska, Lincoln.

Infogalactic (2018). Digital literacy. Accessed online on January 10, 2018 from https://infogalactic.com/info/Digital_literacy

Kiplangot, J. (2003). Does Agricultural extension have a new beginning because of ICTs? Reflections on experience in sub-saharan Africa. *Keynote paper presented at ICT observatory transforming agricultural extension.* Wageningen, 23–25 September 2003.

Nwagbugwu, T. S., Nwobodo, C. E. & Okoro, J. C. (2019) Awareness and useof e-resources among public extension personnel in Anambra State, Nigeria. *Journal of Agricultural Extension*. 23(1), 161-170. https://dx.doi.org/10.4314/jae.v23i1.14

Renee, H. (2010). Digital and media literacy: A plan of action. *A White Paper on the digital and media literacy recommendations of the Knight commission on the information needs of communities in a democracy.* A project of the Aspen Institute Communications and Society Program and the John S. and James L. Knight Foundation

Prodhan, F.A. & Afrad, M.S.I. (2014). Knowledge and perception of extension workers towards ICT Utilization in agricultural extension service delivery in Gazipur district of Bangladesh. *Int. J. Agril. Res. Innov. & Tech.* 4(2), 46-52.

Tilman, D., Cassman, K. G., Matson, P.A., Naylor, R. and Polasky, S (2002). Agricultural sustainability and intensive production practices. *Nature* 418(6898): 671-677. Insight review articles August 2002.

Umar, S. Musa, M. W. Olayemi, Y. T. & Suleiman, R. (2015) Awareness and use of information and communication technologies among Extension Agents in Kaduna State of Nigeria. *Journal of Agricultural Extension*. 19(1), 66 – 76. http://dx.doi.org/10.4314.jae.v19i1.6

World Development Indicators (2019). Accessed on 12th December, 2020 from https://knoema.com/atlas/Nigeria/Imports

Yusuf, O. J., Abdullahi, K. A. & Haruna, S. K. (2015) Effectiveness of e-wallet scheme towards curbing corrupt/sharp practices in agricultural input accessibility by smallholder farmers in Kano State, Nigeria. *Nigerian Journal of Rural Sociology*. 16(1), 67 – 72.

About SLIDEN AFRICA

SLIDEN AFRICA (Sustainable Livelihoods and Development Network for Africa) with its Secretariat at the Livelihoods Support and Development Centre is a non-governmental, non-profit making organization based in Nigeria with offices in Kenya and Ghana. It is made up of a network of partners that comprises knowledgeable and experienced professionals in the Agriculture, Development Studies and related fields.

SLIDEN AFRICA was established in 2000 against the philosophy of is the empowerment of poor people in Africa through poverty alleviation, livelihoods development, skill enhancement and gender parity in development, research and networking. It aims at contributing significantly to the attainment of increase in level of education, reducing poverty, ensuring gender equity and environmental sustainability in Africa.

Strategy and Programmes

In achieving this goal, SLIDEN AFRICA has a pro-poor strategy which encompasses educational development, community development, livelihoods development, capacity building and skill acquisition, among others. These strategies are embedded in our programmes which are:

Research and Development Programme: Consultancy; Business Development Support
Livelihood Development Support Programme: Capacity Building and Skill Acquisition; Microcredit and Livelihood Finance; Information for Development Project
Community Development Programme: Community-Assisted Development Initiatives; Community Development Consultancies
Educational Development Support Programme: SLIDEN and friend Educational Support Project; SLIDEN and U Educational Project

Contact Information

The Coordinator
Sustainable Livelihoods and Development Network for Africa (SLIDEN AFRICA)
Livelihoods Support and Development Centre
Alagbede, Off Alabata Road
PO Box 23, UNAAB Post Office,
Abeokuta
Nigeria
Tel: +234-706 921 9324
Web: slidenafrica.org
Email: adeuyibunmi@slidenafrica.org

The Editor, Prof. K. Adebayo, Journal of Sustainable Development,
Livelihoods Support and Development Centre, Alagbede, Off Alabata Road,
Abeokuta, Nigeria
Phone: 234-8034046873
Web: journals.slidenafrica.org
Email: adebayok@funaab.edu.ng