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TECHNOLOGIES USING TELEPHONE APPLICATIONS IN EDO STATE, NIGERIA.

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ABSTRACT

The global crisis in Climate Change (CC) requires Climate Smart Agriculture (CSA) Information and Technologies (CSAITs) to address it. Mobile Phone Applications (MPAs) among other ICTs could be veritable tools for enhancing job performance of field staff by facilitating their generation and dissemination of relevant information to adapt, cope with and mitigate the effects of CC. This study examined access and dissemination of CSAITs using MPAs by field staff in Edo State Agricultural Development Programme (ADP). Specifically, it described the socio-economic characteristics, access and dissemination of CSA-related information, use of MPAs for CSAITs and the constraints to usage of MPAs among field workers. Data were collected from the 120 field staff comprising 78 Field Extension Workers and 42 Enumerators of Edo State Agricultural Development Programme (ADP), Nigeria. Data were analyzed using descriptive statistics and Pearson's Product Moment Correlation (PPMC). Results show that 55.8% of respondents were males and 40.8% were between 41-50 years of age, 54.2% were HND/B.Sc holders and 50.8% had between 11-20years working experience. The CSAITs mostly accessed (≥50%) using MPAs include irrigation and "*fadama"* farming, weather forecasts and zero or minimal tillage and non-burning while CSAITs mostly disseminated include manure application, mulching, and timely harvesting. The MPAs used for CSA-related tasks include voice calls ($\bar{x}$=2.78), Short Messaging Service (SMS) ($\bar{x}$=2.53), calculators ($\bar{x}$=2.46), camera ($\bar{x}$=2.46) and emails ($\bar{x}$=2.43). Constraints to using MPAs for CSAITs-related tasks included inadequate knowledge and skills in CSAITs ($\bar{x}$=3.72) and in the use of many MPAs and shortage of finance for airtime and data ($\bar{x}$=3.68) and erratic power supply ($\bar{x}$=3.53). Age (r=-0.281), grade level (r=-0.243), job experience (r=-0.211) and family size (r=-0.173) had significant but negative relationships with usage of MPAs for CSAITs at 5% level. It concludes that potentials in using MPAs to access and disseminate CSAITs-related tasks were not optimized and the younger field workers were more disposed to using MPAs for CSAITs related tasks. The study recommends that these constraints be addressed, particularly strengthening capacity of field workers to use MPAs.

Keywords: CSA Technologies, Telephone Applications usage, Field Workers, Nigeria

INTRODUCTION

The Agricultural Development Programme (ADP) is the extension arm of the State Ministry of Agriculture and Natural Resources (SMANR) in Nigeria. Field Workers (FEWs) of different cadres interact with farmers and other actors in the agricultural value chains with a view to influencing them to improve their practices. Extension and advisory services delivery involves information exchange between Extension Workers (EWs) and farmers as well as other actors in Agricultural Knowledge and Information/Innovation System (AKIS). Jones and Garforth (2011) noted that extension programmes have different goals but all fall into systems of communication that aim to change the behaviour, attitude, skill and knowledge of rural people. The use of conventional communication channels for agricultural information dissemination has left much to be desired due to shortage of Extension Agents. The Food and Agriculture Organization (FAO) recommended extension agents to farm families ratio of 1:250 (FAO, 2012) is far above the 1: 4,000 average for Nigeria. This reinforces the need for Extension Workers to use Information Communication Technologies (ICTs) to reach out to farmers and other actors.

The ICTs have potentials to reach a large audience, networking, searching, dissemination and management of information. They are also handy in dissemination of weather forecasts, market information, and early warning signals for diseases/pests outbreak and other disasters management. They are also useful in community learning, and peer to peer information exchange in extension, (CTA, 2003; Salau and Saingbe, 2008; Thomas and Laseinde, 2015; Umar *et al*, 2015). According to CTA, (2015), communication and information are fundamental building blocks of social and economic development. Advances in ICTs have potentials for revolutionizing development

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communication by ensuring wide spread and effective information dissemination by Extension and Advisory Service (EAS) providers to all actors in the agri-food system.

Telephone as a tool, system or process for transmission of sound or speech to a distant point, (Hayden, 2014), emerged from the making and successive improvement of electrical telegraph to be heard directly (Thomas, 2014). The Global Mobile System (GSM) is an improvement over the conventional phone. It has the capacity to reach a large audience globally through its applications such as internet, messages, e-mail, WhatsApp (Arokoyo, 2012). As GSM combines various applications that have audio, visual and audio-visual appeal to individual, group and even mass, it can readily be deployed for EAS provision. In their various designs and capabilities, mobile phones can be found in the pockets of both the rich and the poor. Even in rural areas, these devices are growing in number and sophistication (The Economist, 2010). Nyamba (2012) asserted that in Africa, the largest increase in the use of ICTs has been in mobile telephones. In Tanzania as well, the mobile phone market is growing in a steady manner. Its impact has been found to be strong and continues to grow as evident in EPINAV (Enhancing Pro-Poor Innovations in natural resources and Agricultural Value- Chain) project in Tanzania. In Nigeria, the e-wallet, the phone-based component of the of the Growth Enhancement Support Scheme (GESS), serves as avenue to educate, inform and communicate with farmers on best agricultural practices and commodity prices.

The use of mobile phone in the agricultural sector and other aspects of livelihood are due to its characteristics, (Donovan, 2012). Its right utilization can significantly enhance rural communication. They are beneficial as they enable people to access instant information; reliable and timely communication of market information and extension advice. It offers accessibility for illiterate users through videos and images. Mobile phones and their applications, like all technologies, face limitations including high cost.

To adequately explore the potentials in GSM for job performance, Ofolue, Adegbola and Egbokhare, (2013) designed mobile telephony for development in Nigeria with enabled application in local languages. However, Yakubu, (2013) and Agwu and Ogbonnah, (2015) identified poor ICT infrastructural development, erratic and unstable power supply, and weak technical know-how as some of the constraints to effective ICT use by EWs including their use in promotion of Climate Smart Agricultural (CSA) practices.

The FAO (2013) defines CSA as "agriculture that sustainably increases productivity, enhances resilience (adaptation), reduces/removes greenhouse gases (GHGs) (mitigation) where possible, and enhances achievement of national food security and development goals". This shows that CSA is an integrated approach that goes beyond technology / practice and also focuses on the totality of climate change. Papuso and Faraby (2013) assert that CSA has multiple entry points, ranging from the development of technologies and practices to the elaboration of climate change models and scenarios, information technologies, insurance schemes, value chains and the strengthening of institutional and political enabling environments. This shows that CSA if properly pursued will address food security and relevant development output. Information technologies constitute a vital component of CSA. However, the key to using these technologies to boost productivity requires complementary technologies such as data mining or mediation software and information dissemination technologies (such as mobile phones and radio) are essential to reaching smallholders effectively. Dissemination also includes the crucial human component: Extension Agents and farmers themselves must transmit and share knowledge (International Institute for Communication and Development (IICD), 2006).

The entire process requires appropriate capacities to optimize the potentials and ensure food security, poverty alleviation and development in general. This is especially so as the field of extension now encompasses a wider range of communication and learning activities organized for rural people by professionals from different disciplines, including agriculture, marketing, health and business studies as well as in Climate Smart Agriculture (CSA) in line with the "New Extensionist" initiative of the GFRAS. The availability of ICT tools is important, their accessibility by the field EWs is most crucial. Arokoyo (2014) asserted that the extent of application of telephone and computer as a tool in extension services depends mostly on the targeted audience. Therefore, EWs who facilitate the process of information exchange are expected to be aware, access and proficiently apply mobile telephone but it cannot be categorically stated that this is the situation.

Objective of the Study

The general objective of this study was to assess the access to and dissemination of CSA information and technologies among field extension workers (FEWs) using telephone applications in Edo State.

The specific objectives were to:

1 describe the personal characteristics of FEWs in the study area;
2 identify the CSA technologies/information accessed and disseminated using MPAs;
3 examine the extent of usage of MPAs for CSA related information and technologies; and
4 Identify the constraints faced by FEWs in the use of telephone applications for CSA information and technologies

1.5 Hypotheses of the Study

There is no significant relationship between the personal characteristics of FEWs (age, educational level, years of experience) and use of mobile phone applications (MPAs) for CSAIT-related tasks.

Materials And Methods

The study was conducted in Edo State, which is one of the States in the Southern part of Nigeria. The State has 18 Local Government Areas with the capital in Benin City. The population of the State is about 4 million people consisting of three major ethnic groups namely Binis, Esan and Afemais (Edo State Gov., 2014). It has a landmass of 19,794 km square and it is geographically located between $05^{0}44^{l}$N to $07^{0}34^{l}$N latitudes $05^{0}4^{l}$E to $06^{0}45^{l}$E longitude (www.Edostate.Gov/Geography). Edo State is low lying except towards the North where the Northern and Esan plateaus range from 183 metres in the

Kukuruku hills to 672 metres in the Somorika hills. It is so located that if forms the nucleus of the Niger Delta region. It is bordered by Kogi State to North and Delta State to the East and South, Ekiti and Ondo States to the West (www.Edostate.Gov.Ng/profile-Edo-state).

The climate is typically tropical with two major seasons. The wet season has about 2500 mm of rainfall while the dry season is hot with average temperature of about 25^{o}C). The wet season lasts from April to November and the dry season is between December and March. Edo state is blessed with two major vegetative zones; the forest to the south and central and the guinea savannah to the Northern parts. Apart from the wood products, the occupation of the majority of the people is farming and there is a high cultivation of crops such as cocoa, rubber, palm tree, vegetables, cotton, pineapple, mango, cashew, cassava and vegetables (Edo State Gov., 2014).

Sample Size and Sampling Technique. The population for this study consists of all the 78 Field Extension Workers and 42 Enumerators in the three zones of Edo State's Agricultural Development Programme. Primary data were collected with the aid of a structured questionnaire which sought to collect data to address the study objectives.

Measurement of Variables

The constraint to accessing telephone applications was measured by rating items on a 5 point scale of strongly agree= 5, agree = 4, undecided = 3, disagree = 2 and strongly disagree = 1.

Access and dissemination of CSAITs with mobile phone applications (MPAs) was obtained with Yes/No

Extent of using telephone applications (MPAs) for CSA was measured on a 3-points rating scale of highly used = 3, occasionally used= 2, not used = 1 point.

Data Analysis

Data were analyzed using descriptive statistics such as percentages, mean frequency counts and standard deviations. Inferential statistics- Pearson Product Moment Correlation was used to test the hypothesis.

Results and Discussion

Personal characteristics of respondents

As Table 1 shows, 55.8% of respondents were males and 40.8% were between 41-50 years of age with a mean age of 47 years, 54.2% were HND/B.Sc. holders and 50.8% had between 11-20years work experience. This agrees with findings of Adedoyin *et al.,* (1999) and Salau and Saingbe (2008) that males dominate the agricultural workforce in Nigeria.

Table 1: Personal characteristics of respondents

Description	Freq.	%	Mean
a) Sex			
Male	67	55.8	
Female	53	44.2	
b) Age			
≤30	10	8.3	
31 – 40	29	24.2	
41 – 50	49	40.8	
51-60	32	26.7	47.3
c) Marital status			
Single	26	21.7	
Married	94	78.3	
d) Education			
Cert/Diploma/OND	40	33.3	
HND/B.Sc.	65	54.2	
Post graduate	15	12.5	
e) Cadre			
Extension Agents	78	65.0	
Enumerators	42	35.0	
f) Family size			
≤3	26	21.7	
4 – 6	70	58.3	
7- 9	38	31.7	6
≥10	11	9.7	
g) Ownership of mobile phone	120	100.0	
h) Sophistication of mobile phone			
Low/regular	48	40.0	
Averagely sophisticated	58	48.3	

Sophisticated	14	16.7	

This trend has significant implication for telephone and computer utilization as elderly people might be less interested in the use of advanced technological innovations and agrees with the result of the study of Salau and Saingbe (2008). A majority of the field workers (78.3%) were married, 54.2% were HND/B.Sc. holders, 100%owned telephone but 40.0% has mobile phones with low sophistication, i.e. less than 5 applications. The educational level was high which could imply greater appreciation of the need for mobile phones.

Table 2: Field officers use of mobile phone applications to access and disseminate Climate smart agriculture-related information/technologies (N=120)

CSA Information and technologies	Frequency yes	% FEWs Access CSAITs with phone apps	Frequency Yes	% FEWs disseminate CSAITs with phone apps
Manuring	47	39.2	120	100.0*
Mulching	23	19.2	120	100.0*
Timely harvesting	16	13.3	120	100.0*
Mixed cropping	12	10.0	9	7.5
Intercropping	38	31.7	103	85.8*
Fallowing	17	14.2	14	11.7
Afforestation	41	34.2	120	100.0*
Irrigation and *fadama* farming	89	74.2*	120	100.0*
Terracing and ridging	35	29.2	12	10.0
Weather forecasts (scientific)	73	60.8*	78	65.0*
Agroforestry	34	28.3	103	85.8*
Biogas and use of efficient stoves	32	26.7	5	4.2
Composting	18	15.0	7	5.8
Crop rotation	3	2.5	4	3.3
Drought tolerant crop varieties fodder grasses	48	40.0	25	20.8
Disease tolerant crop varieties	64	53.3*	28	23.3
Drought and diseases tolerant animal breeds	58	48.3	11	9.2
Deep rooted fodder grasses and legumes production	2	1.6	4	3.3
Early or late planting/Planting date adjustment	31	25.8	106	88.3*
Use of early maturing crop varieties	39	32.5	47	39.2
Zero or Minimal tillage and non-burning	65	54.2*	73	60.8*
Shading and shelter for crops and animals	5	4.2	110	91.7*
Management of a tree nursery and tree planting	53	44.2	89	74.2*
Livelihood diversification	33	27.5	91	75.8*
Integrated and organic pest control	29	24.2	24	20.0
Fodder production/cut and carry feeding	12	10.0	5	4.2
Saving and thrift culture	36	30.0	117	97.5*

Source: Field Survey data 2017 * ≥ 50%

Field workers' use of mobile phone applications to access and disseminate Climate Smart Agriculture-related information/technologies

Table 2 shows the distribution of FEWs' access and dissemination of CSAITs with MPAs. CSAITs mostly accessed (≥50%) using MPAs were irrigation/*fadama* 74%, weather forecast 60.8%, zero/minimum tillage , disease tolerant crop varieties. CSAITs mostly disseminated by all (100%) were manuring, mulching, timely harvesting, afforestation and irrigation/*fadama* farming. Other CSAITs mostly disseminated were shading, saving and thrift culture, planting date adjustment, intercropping, agroforestry, livelihood diversification, tree nursery management and planting, weather forecast and zero/minimum tillage. It is expected that FEWs would access and disseminate all these technologies and information but, many did not despite the potentials of MPAs for information generation and dissemination. Those CSAITs accessed seem to be the technical or the most pressing information needs of the clients. Those not accessed seemed to be those that the FEWs were more knowledgeable e.g. mulching and manure application and thus might have wanted to conserve data and airtime. The highly disseminated messages on manuring, mulching may have been regarded as simple, common/familiar, and less risky while those poorly disseminated may have been seen as requiring higher level of technical skills/competence.

Extent of use of mobile phone applications for CSAIT related tasks

Table 3: Extent of use of mobile phone applications for climate smart related information and technologies by field workers

Applications	Not Accessed		Little Accessed		Highly Accessed		Mean
	Freq.	%	Freq.	%	Freq.	%	
Voice calls	0	0.0	26	21.7	94	78.3	2.78*
Short message service (SMS)	0	0.0	80	66.7	40	33.3	2.53*
Internet browsers	6	5.0	94	78.3	20	16.7	2.33*
Radio	5	4.2	76	63.3	39	32.5	2.12*
Instagram	35	29.2	63	52.5	22	18.3	1.82
Google search	46	38.3	50	41.7	24	20.0	2.14*
Planner/calendar	36	30.0	39	32.5	45	37.5	2.08*
Voice recorder	71	59.2	27	22.5	22	18.3	1.82
Maps	31	25.8	85	70.8	4	3.3	1.78
Memos	54	45.0	55	45.8	11	9.2	1.14
Calculator	9	7.5	65	54.2	55	45.8	2.46*
Camera	3	2.5	77	64.7	40	33.6	2.46*
Emails	45	37.5	63	52.5	56	46.7	2.43*
Gallery	49	40.8	61	50.8	55	45.8	2.32
Dropbox	111	92.5	9	7.5	00	0.0	1.03
Dictionary	69	57..5	45	37.5	24	20.0	2.28
Clock	63	52.5	38	31.7	26	21.7	2.05
Global positioning system (GPS)	90	45.0	19	15.8	11	9.2	1.34
Facebook	46	38.3	50	41.7	24	20.0	2.14*
WhatsApp	36	30.0	39	32.5	45	37.5	2.08*
Skype	63	52.5	43	35.8	14	11.7	1.59
Twitter	76	63.4	38	31.7	6	5.0	2.05
LinkedIn	39	32.5	57	47.5	24	20.0	1.48
Zoom	22	18.3	70	58.3	28	23.3	1.78
YouTube	34	28.3	55	45.8	31	25.8	1.75

*Used (Mean $\geq$ 2.0)

Table 3 above shows the extent to which the respondents used MPAs to CSA related tasks. The significantly used MPAs were voice calls ($\bar{x}$=2.78), short message services (SMS) ($\bar{x}$=2.33), internet browsers ($\bar{x}$=2.33), calculator ($\bar{x}$=2.46), camera ($\bar{x}$=2.46), Facebook ($\bar{x}$=2.14), and radio ($\bar{x}$=2.12). Some EWs (40%) do not even have phones that have most of these applications as shown in Table 1. These applications might not have been accessed for job performance. Various applications listed including GPS, google, drop box, planner and video could contribute to the realization of the goal of CSA if extension workers access them and are proficient in their usage to perform various tasks. They have the advantages of simplicity, cost effective, time saving and drudgery reduction. The use of MPA was high for only calls and SMS and about average for internet browsing, radio and Google. Sub-optimum usage of MPAs despite the advantages and available opportunities could be associated with complexity, connectivity and data requirement among other challenges.

Constraints to using mobile phone applications for climate smart agriculture related tasks

Table 4 shows the constraints facing EWs in the use of MPAs for CSAIT related tasks. Most of the constraints were found to be serious. They included inadequate technical knowledge of MPAs ($\bar{x}$=3.71), inadequate funds to regularly buy air-time/data ($\bar{x}$=3.68), epileptic supply of electricity to regularly charge phone battery ($\bar{x}$=3.53), poorly developed phone and computer facilities ($\bar{x}$=3.46), high cost of computer ($\bar{x}$=3.3), etc. The constraints that were found to be non-significant were affordability of mobile phones ($\bar{x}$=2.43) and low level of awareness (1.97), lack of training opportunities in the use of MPAs, inadequate ICT facilities and a lack of technical know-how in CSAITs. Awareness of most of the Apps and ability to afford mobile phone, even if they are less sophisticated are implied. Skills and knowledge to use these devices are important to ensuring maximum utilization of MPAs for CSA.

Table 4: Constraints to using mobile phone applications for CSAITs related tasks

Constraints	Mean	Std. dev.	Rank
I don't have technical knowledge of many applications	3.72*	.871	1st
Finance to buy enough airtime	3.68*	.580	2nd
Epileptic supply of electricity	3.53*	.777	3rd

Poorly developed telephone infrastructural Facilities	3.46*	.564	4th
Shortage of professionals to train on usage	3.39*	.714	5th
High cost of phone	3.30*	.866	6th
Poor communication network	3.23*	.827	7th
Frequent breakdown of telephone and computer facilities.	2.98*	.809	8th
Dearth of CSA information and technologies	2.60*	.982	9th
I cannot afford it	2.55*	.740	10th
Low level of awareness	1.97	.970	11th

***≥2.50= serious**

Table 5: Relationship between personal characteristics and access of mobile phone applications

Variable	Correlation coefficient (r)	p-value	Decision
Age	-.0.281*	.000	Significant
Family size	-0.173*	.044	S
Educational Qualification	.096	.258	NS
Grade Level	-0.243*	.000	S
Job Experience	-0.211*	.000	S

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

Relationship between FEWs socio-economic characteristics and use of mobile phone applications for CSA related tasks
Table 5 gives the multiple correlation values which at 0.05 level of significance, age (r= -0.281), family size (r = -0.173), grade level (r = -0.243) and job experience (r=-0.211) were found to be significant, while educational qualification was not significant; implying that the respondents were prone to owing a mobile phone.

Conclusion
The study concludes that all of the respondents owned mobile phones. However, various applications were not accessed and only voice calls, short messaging services (SMSs), calculator, time and date and emails were the mobile phone applications (MAPs) mostly put to use by the FEWs. Inadequate knowledge, lack of finance to purchase data, poor network connectivity, inadequate and erratic electricity supply, and dearth of technical information on CSA were among the major constraints to accessing MPAs for job performance.

Recommendations
Based on the findings of this study, the following are recommended;

1. Sensitization and training of FEWs by Edo State Agricultural Extension Service on the opportunities in MPA. This will provide them with technical knowhow to adequately access MPAs and use same to disseminate information about CSA. Such trainings could be organized or sponsored by the ADP management, service providers or self-development effort of FEWs for proficiency and effective job performance.
2. There should be provision of adequate CSA information and technologies in terms of benefits, evidences, success stories etc. for FEWs to access. In addition, availability of accurate weather information from Nigerian meteorological services and other development institutions should create platforms for CSA information dissemination for easy access by using phone based services;
3. Continuous review of mobile phone operations by National Communication Commission (NCC) to ensure moderate tariffs and encourage FEWs to use MPAs for CSA among others.
4. Public, private and community efforts should be harnessed to address the identified constraints especially in the area of improving network reception at the communities and addressing erratic power supply.
5. To achieve the adoption of CSA practices, awareness creation among farmers and other actors must be enhanced using MPAs; in addition to the use of training manuals,
6. Allowances for communication could be provided to FEWs to purchase credits to enhance their use of MPAs for effective interaction with their clients and other actors.

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