USE OF INFORMATION COMMUNICATION TECHNOLOGIES (ICTS) FOR EXTENSION DELIVERY IN SELECTED RESEARCH INSTITUTES AND AGRICULTURAL DEVELOPMENT PROGARMMMES (ADPS) IN SOUTHWESTERN NIGERIA

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Abstract
The potentials of Information Communication Technologies (ICTs) for information dissemination are limitless. Their use could enhance free flow of information from researchers to extension agents and consequently to farmers thereby engendering a virile extension system. Information on the use of this ICT by researchers and extension agents in information dissemination is still scanty. This study was conducted to ascertain the use of ICTs for extension delivery in research institutes and Agricultural Development Programmes (ADPs) in southwestern Nigeria. Thirty percent of population of clusters of extension agents in ADPs and researchers were randomly selected to obtain 110 respondents. Variables measured included available ICT devices, level of use of available ICTs and constraints faced in deploying available ICTs for agricultural information dissemination. Data were analyzed using both descriptive (frequenciesand percentages) and inferential (PPMC and T-test) statistics at p = 0.05. Results indicate that 81.8% were within the age range of 30-49years, male (57.3%) with more respondents (67.2%) from research institutes having Masters Degree compared to respondents from ADPs who had Bachelors degrees (51.2%). Most available ICT devices in both research and extension organisations were new ICTs like computers (98.2%) and mobile phones (97.3%) and old ICTs like printed materials (96.4%) and radio (91.0%). Majority used mobile phones (95.5%), radio/television (90.0%) and computer (86.4%) for extension delivery. Power supply (75.5%), limited access to ICTs (60.0%) and lack of incentive (58.2%) were severe constraints to the use of ICTs for agricultural extension delivery in both organisations. There was significant relationship between the availability of ICT devices and its usage for extension delivery (r = 0.645). It is recommended that improved electricity supply and unhindered access to ICTs be provided for extension agents and researchers to fully exploit the potentials of the ICTs devices for information generation and dissemination in research and extension organisations.

Keywords: Information Communication Technologies (ICTs), Available ICT, Level of use, constraints to use of ICT

1.0 Background information and problem statement

According to Yahaya (2008) the role of communication in extension services cannot be overemphasized as it forms the basis of reaching extension clientele. The ultimate aim of an extension system is to effectively and efficiently deliver information to end-users in a comprehensible and utilizable manner (Sanyaolu, 2008). Information Communication Technologies have the potentials to deliver the purpose and sole intention of agricultural extension delivery thereby boosting adoption and consequently contribute to the overall development the extension services seek. Information Communication Technologies (ICTs) is often viewed as the 'wheel' of economic activities since it facilitates the generation of economic growth. The term ICT as described by Arokoyo (2011) refers to electronic means of capturing, processing, storing and disseminating information. Food and Agriculture Organization

(FAO) (1993) refers to the ICT concept as technologies employed for the collection, processing, storage, retrieval, dissemination and implementation of data and information using the microelectronics, optics, telecommunication and computers. As indicated by Lawal-Adebowale (2009), these definitions technically apply to sophisticated technologies such as the satellite, computer, internet, Geographical Information Systems (GIS), Global Positioning Systems (GPS), remote sensing, which are designed for monitoring, gathering and displaying of geospatial information. Emphasizing the essence for which ICT is meant for agricultural communication, the Technical Center for Agriculture and Rural Cooperation (CTA)(2003) defined ICT as electronic technologies that facilitate communication, processing and transmission of information. It assumes that the concept embraces a multitude of other simple communication devices such as telephone (mobile or fixed line), television, radio, audio, compact disk or cassette recorder/player, video tape or compact disk (VCD/DVD) recorder/player, faxes and telex.The development of ICT in Nigeria can be traced to the policy of government on privatization and market liberalization of telecommunication sectors which include electronic broadcast stations, telephony services, internet services and computer applications. Its use has been deployed for all human endeavours including agriculture following government's liberal policy.

There is growing recognition that farmers and members of rural communities have needs for information and appropriate learning methods that are not being met (Omotayo, 2011 and Ndaghu, 2011). The emerging issue is how Information and Communication Technology (ICT) can be integrated into local knowledge and information networks to address locally identified knowledge gaps. It is doubtful if the traditional research extension linkage to farmers with the challenges of poor extension agent and farmers' ratio can keep pace with the current demand of teeming farmers. It is also an acknowledged fact that the bottleneck of transferring proven technologies from research centres to extension can be minimized with the use of Information Communication Technologies such as mobile phones, computers, internet facilities, multimedia projector, and CD Rom technology thus limiting the number of technologies on-shelf. Yekinni (2011) submitted that a major indicator of infrastructural requirement for ICT use is Teledensity. This can no longer be hindrance in the deployment of ICT for agricultural information spread as Nigeria's teledensity grew from near zero at the turn of the millennium to about 8% in just four years; whereas by 2009, it has grown to over 53% as direct benefit from the liberal policy of government in ICT. The Nigerian government recently exploited the potential of ICT in distributing vouchers for fertilizers to farmers through the Global System of Mobile (GSM) Communication and successfully fought the middlemen who had all along being the hindrance to smooth fertilizer distribution. To further strengthen this, government is contemplating distribution of telephone in the current agricultural transformation programme to extend frontier in the deployment of ICT for agricultural information dissemination.

Given the foregoing and based on the fact that appropriate use of ICTs have the potentials of enhancing free flow of information from the researchers to extension agents and vice-versa and consequently to farmers, it becomes imperative to assess the use of Information Communication Technologies for extension delivery among agricultural based research institutes and Agricultural Development Programmes. Therefore, the following research questions become pertinent in order to move toward a total deployment of ICT facilities for information generation, dissemination and use.

1. What ICT devices are available in the selected Agricultural Research Institutes and Agricultural Development Programmes?
2. What is the level of use of available ICTs in research institutes and Agricultural Development Programmes?

3. What constraints do researchers and extension officers face in the use of ICT in this organization?

2.0 Methodology

2.1 The study area

This study was conducted in Oyo and Lagos States. The two States belong to the southwest agricultural zone of Nigeria. Oyo State has the highest concentration of Agricultural research institutes in southwestern Nigeria while Lagos houses the National Institute of Oceanography and Marine Research.

2.2 Sampling procedure and sample size

The researchers and extension agents in the four selected national agricultural research institutes and the states Agricultural Development Programmes constituted the universe of this study. In order to avoid bias in selecting samples, each institute and Agricultural Development Programme was conceptualized as a cluster hence there were six clusters in this study. Within each cluster, a complete enumeration of the research and extension staff were carried out from research institutes and Agricultural Development Programmes respectively out of which 30% were randomly selected from each cluster. The population of the 6 clusters was 394 from which 118 respondents were randomly selected. Out of the 118 respondents, 110 returned useful questionnaires representing 93.2% return rate.

2.3 Data analysis

Data collected were analysed using descriptive statistics such as frequency counts, percentages, and inferential statistics such as Pearson's Product Moment Correlation (PPMC) and t-test at 5% level of significance.

3.0 Results and discussion

3.1 Personal characteristics of respondents

Data available in Table 1indicate that 81.8% were within the age range of 30-49years. Majority of respondents from the research institutes were 40years and above (70.1%) while majority of respondents from the ADPs (60.5%) were below 40years of age. This implies that most of the respondents were still in their active years. Therefore, effective linkage using ICTs like the mobile phones, internets and computers could be easily achieved between the research and extension personnel. Table 1 further shows that 57.3% of the respondents were males while 42.7% were females. This implies that agricultural research and extension personnel were male dominated. This is in line with the position of Fameso (1992) and Salawu and Saingbe (2008) that specialized agricultural profession involves more males than females.

Table 1 also shows that in total, less than one-fifth (16.0 %) had Doctor of Philosophy (Ph.D Degree). However, proportionately, more respondents (26.8%) had Ph.d degrees from research institutes compared to none in ADPs. Also, more respondents and majority (67.2%) from research institutes had Masters Degree compared to respondents from ADPs who had more Bachelors degrees (51.2%) or its equivalent of Higher National Diploma (27.9%). The picture from the sets of result of the educational attainment suggests that researchers attained higher educational qualification compared with the extension agents. This perhaps may be due to the extant law that compels researchers to attain the maximum educational qualification (doctoral degree) as a prerequisite to retain their positions in research institutes.

Information on years of experience reveals that 33.0% of the respondents had been on the job for more than 5years, 24.0% had between 11-15 years of professional experience and 20.0% had put in more than 16 years of professional experience. In essence, 55.0% of the respondents had just spent ten years on the job.Most respondents from research institutes (85.2%) had between 5-15years experience compared with respondents from ADPs (73.1%) that had the same years of experience. This suggests that most of the researchers and extension agents are vastly experienced in their respective trade. This may enhance the rate at which capacities of these

professionals can be built as many innovations like ICTs require training to bring potential beneficiaries up to date. Several opportunities for enhanced capacity crop up several times within a span of a career. The ICT advantage for an enhanced productivity is just one of such opportunities.

Table1: Distribution of respondents according to their personal characteristics

S/N	Characteristics	Classification	Research Institutes N = 67	ADPs N=43	Total Respondents N = 110
1	Age	<30 30-39 40-49 50-59	2(3.0) 18(26.9) 38(56.7) 9(13.4)	8(18.6) 18(41.9) 16(37.2) 1(0.9)	10(9.1) 36(32.7) 54(49.1) 10(9.1)
2	Sex	Male Female	39(58.2) 28(41.8)	24(55.8) 19(44.2)	63(57.3) 47(42.7)
3	Educational Qualification	HND BSC MSC PhD	- 4(6.0) 45(67.2) 18(26.8)	12(27.9) 22(51.2) 9(20.9) -	12(11.0) 26(24.0) 54(49.0) 18(16.0)
4	Grade level of extension Personnel	6-13 14-17	- -	37(86.0) 6(14.0)	37(86.0) 6(14.0)
5	Organization	Research institute Extension/ADP	(67(61.0)	43(39.0)	110 (100.0)
6	Years of experience	< 5years 5-10years 11-15years 16-20years >20years	18(26.7) 19(28.4) 20(29.9) 7(10.4) 3(4.5)	7(16.3) 17(39.5) 7(16.3) 10(23.25) 2(4.6)	25 (22.7) 36 (32.7) 27 (24.5) 17 (15.4) 5 (4.5)

Source: Field surveys, 2011 Figures in parentheses are percentages

3.2 Available ICT devices in the selected agricultural research institutes and agricultural development programmes

Table 2 shows that the most available ICT devices in both research and extension organisations in the study area were mostly new ICTs like computers (98.2%) and mobile phones (97.3%) as well as old ICTs like printed materials (96.4%) and radio (91.0%) for mass dissemination of research findings. The data also reveal that in research institutes, the most available ICT devices were computer (100%), mobile phones (97.0%),printed materials (98.5%) and internet(94.0%). In the .ADPs, the table reveals that radio (100.0%) was the most available ICT device. Other ICTs in ADP include mobile phones (97.7%) and computer (95.3%). From the data, it can be deduced that computer was the most available device in research institutes while radio was the most available device in extension organisations. The need for researchers to use computer laced with internet to save resources gathered online, submit manuscripts for journal publications and the traditional role of radio for message dissemination for extension organisations can not be overemphasized hence the trend observed in this result. Table 2 also reveals that telex (10.9%) and fax (9.1%) were the least available ICT devices in research and extension organisations. Telex and fax are technologies with the capacity for sending information usually in form of document, over a long distance. The reason why telex and fax were the least available ICT devices in research and

extension organisations may be due to the fact that the functions of these two devices have been taken over by computer laced with internet and mobile phones.

Table 2: Frequency distribution of availability of ICT devices in research and extension organisations

	Research institutes N = 67		ADPs N = 43		Total respondents N = 110	
ICT Devices	Available	Not available	Available	Not available	Available	Not available
Mobile phone	65(97.0)	2(3.0)	42(97.7)	1(2.3)	107(97.3)	3(1.7)
Television	59(88.1)	8(11.9)	40(93.0)	3(7.0)	99(90.9)	11(9.1)
Radio	57(85.1)	10(14.9)	43(100.0)	(0.0)	100(91.0)	10(9.0)
CD Rom	37(55.2)	30(44.8)	33(76.7)	10(23.3)	70(63.6)	40(36.4)
DVD	33(49.3)	34(50.7)	18(41.9)	25(58.1)	53(48.2)	57(51.8)
CD Rom Technology	28(41.8)	39(58.2)	17(39.5)	26(60.5)	45(40.9)	65(59.1)
Computer	67(100)	(0.0)	41(95.3)	2(4.7)	108(98.2)	2(1.8)
Internet	63(94.0)	4(6.0)	31(72.1)	12(27.9)	94(85.5)	16(14.5)
Camera	56(83.6)	11(16.4)	35(81.4)	8(18.6)	91(82.7)	19(17.3)
Fax	11(16.4)	56(83.6)	1(2.3)	42(97.7)	12(10.9)	98(89.1)
Telex	9(13.4)	58(86.6)	1(2.3)	42(97.7)	10(9.1)	100(90.9)
Printed materials	66(98.5)	1(1.5)	40(93.0)	3(7.0)	106(96.4)	4(3.6)

Source: Field surveys, 2012 Figures in parentheses are percentages

3.3 Level of usage of ICTs in research institutes and agricultural development programmes

Table 3 shows that majority of the respondents used mobile phones (95.5%), radio/television (90.0%) and computer (86.4%) for extension delivery. The high rate of mobile phones use for extension delivery is in line with Anaa (2002) that fifteen months after Nigeria got on to GSM bandwagon; about 1.11 million people acquired mobile phones. Ajala (2005) asserts that in Nigeria, the teledensity ratio had tripled in just one year of Global System of Mobile Communication (GSM) operation and by 2005; Nigeria with an estimated population of 128,771,988 had more than 9 million subscribers, making the country one of the fastest growing GSM markets in the world. Fawole and Olajide (2012) conclude in their study that it is evident that the mobile phoning craze in Nigeria among the general populace (researchers, extension agents and farmers inclusive) is real. Current estimate put Nigeria's GSM lines at 219 million with many individual carrying more than one and sometimes more than two GSM lines.

According to information in Table 3, the least used among the ICT tools listed were telex (7.0%) and fax (13.0%) for agricultural extension delivery. It is little wonder their use by farmers is rare in Nigeria (Fawole and Olajide, 2012). The low usage of telex/fax can be attributed to new inventions such as computer, internet, scanners which can perform the function of telex and fax in addition to other important functions necessary for smooth running and information dissemination in an organization (Lawal-Adebowale, 2009).

Table 3: Distribution of ICT tool usage in research and extension Organisations

ICT Tools	Research institutes (N = 67)		A DPs (N = 43)		Total respondents (N=110)	
	Used	Not used	Used	Not used	Used	Not used
Mobile phones	62(92.5)	5(7.5)	43(100)	(0.0)	105(95.5)	5(4.5)
Television	60(89.6)	7(10.4)	39(90.7)	4(9.3)	99(90.0)	11(10.0)
Radio	56(83.6)	11(16.4)	43(100)	(0.0)	99(90.0)	11(10.0)
CD Rom	30(44.8)	37(55.2)	30(69.8)	13(30.2)	60(54.5)	50(45.5)
DVD	31(46.3)	36(53.7)	18(41.9)	25(58.1)	49(44.5)	61(55.5)
CD Rom Technology	21(31.3)	46(68.7)	16(37.2)	27(62.8)	37(33.6)	73(66.4)
Computer	59(88.1)	8(11.9)	36(83.7)	7(16.3)	95(86.4)	15(13.6)
Internet	56(83.6)	11(16.4)	31(72.1)	12(27.9)	87(79.1)	23(20.9)
Camera	54(80.6)	13(19.4)	37(86.0)	6(14.0)	91(82.7)	19(17.3)
Fax	10(14.9)	57(85.1)	3(7.0)	40(93.0)	13(11.8)	97(88.2)
Telex	6(9.0)	61(91.0)	1(2.3)	42(97.7)	7(6.4)	103(93.6)
Printed materials	66(98.5)	1(1.5)	41(95.3)	2(4.7)	107(93.6)	3(2.7)

Source: Field surveys, 2011 *Figures in parentheses are percentages*

3.4 Constraints to the use of ICTs in research and extension organisations

The sets of result on Table 4 show that 75.5% of the total respondents considered problem of electric power supply as very severe while only 2.7% of the total respondents regarded problem of electric power supply as less severe. From this result, one can infer that electricity is a major problem for ICT development and usage in agricultural organisations in spite of the fact that the study was carried out in two major cities in southwestern Nigeria where electricity should ordinarily not be a hindrance. Limited access to ICTs (60.0%) and lack of incentive (58.2%) were considered by the total respondents to be severe constraints to the use of ICTs for agricultural extension delivery. This conforms to Sampong *et al* (2007) and Alemna and Joe (2006) who acknowledge an increase in the use of ICT applications in rural Ghana in response to the enhanced policy environment but reiterate constraints of availability of the ICTs, electricity, literacy, telecommunications and content as still prevalent.

Table 4: Frequency distribution of constraints to the use of ICTs by respondents for agricultural extension delivery

Constraints	Research institute N = 67			ADPs N = 43			Total N = 110		
	Very severe	Severe	Less severe	Very severe	Severe	Less severe	Very severe	Severe	Less severe
High cost of ICT materials	29(43.3)	32(47.8)	6(90.0)	3(7.0)	29(67.4)	11(25.6)	32(29.1)	61(55.5)	17(15.5)
Electric power supply	48(71.6)	17(25.4)	2(3.0)	35(81.4)	7 (16.3)	1(2.3)	83(75.5)	24(21.8)	3(2.7)
Lack of incentive	22(32.8)	40(59.7)	5(7.5)	3(7.0)	26(60.5)	14(32.6)	25(22.7)	64(58.2)	21(19.1)
Limited access to ICT materials	12(17.9)	36(53.7)	19(28.4)	4(9.3)	30(69.8)	9(20.9)	16(14.5)	66(60.0)	28(25.5)
Complicity of ICT tools	9(13.4)	34(50.7)	24(35.8)	4(9.3)	13(30.2)	26(60.5)	13(11.8)	47(42.7)	50(45.5)
Poor network coverage	21(31.3)	36(53.7)	10(14.9)	19(44.2)	7(16.3)	17(39.5)	40(36.4)	43(39.1)	27(24.5)

3.5 ICT availability and usage and difference in usage in research and extension organization

The result of the Pearson Product Moment Correlation (PPMC) in Table 5 shows that there was a significant relationship between the availability of ICT devices in research and extension organisations and their usage for extension delivery (r = 0.645; = 0.05). This implies that in research and extension organisations, the extent of deployment of ICT for extension delivery is limited by types, quantity and quality of ICTs available in these organisations. This is in line with Omotayo (2011) and CTA (2003) that availability of ICT in agricultural organisations could either encourage or limit their use for extension delivery.

In Table 6, the result of the t-test analysis shows that there was significant difference in the use of ICTs for extension delivery between the researchers and extension personnel (t = -3.1; = 0.05). The means comparison of both groups suggests that the extension personnel with the mean of 15.81 used ICTs for extension delivery more than the researchers with mean of 12.96. This may be due to the fact that extension personnel provide the vital link between researchers and farmers and that extension agency function as a conduit for bringing agricultural innovation to farmers as well as intimating researchers with farmers' problems (Sanyaolu, 2008).

Table 5: PPMC table showing the relationship between ICT availability and their usage

Variable	r-value	P-value	Decision
Availability	0.645	0.05	Significant

Table 6: T-test table showing the difference between researchers and extension personnel use of ICTs for extension delivery

	Mean	T-value	P-value	Decision
Researchers	12.96	-3.107	0.03	Significant
Extension personnel/ADP	15.81			

4.0 Conclusion and recommendations

Most respondents across extension and research organisations in the study area are in their active years, well qualified for various job positions they occupy and vastly experienced on the job. While computer was the most available ICTs device in research institutes, radio was the most available device in extension organisations. The two devices (radio and computer) with mobile telephoning are frequently used devices across the two organisations while the least patronised ICTs tools were telex and fax machines. The extent of deployment of ICT for extension delivery is limited by ICTs available in these organisations. Moreover, the use of ICTs devices were constrained by epileptic power supply, poor network coverage, limited access to ICT materials and lack of incentives. It is recommended that;

i. Improved electricity supply and unhindered access to ICTs be provided for extension agents and researchers to fully exploit the potentials of the ICTs devices for information generation and dissemination in research and extension organisations.

ii. Operators of the Global System of Mobile communication should be mobilized for effective service and rendering of free air time for extension and research organisations for agricultural related information dissemination as part of their corporate social responsibilities.

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