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APPROPRIATENESS OF INFORMATION AND COMMUNICATION TECHNOLOGIES' (ICTs) USE: A CASE STUDY OF AGRICULTURAL INFORMATION DISSEMINATION IN OGUN STATE, NIGERIA

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ABSTRACT

This study ascertained the appropriateness of ICTs' use in disseminating agricultural information. Farmers and extension agents totalling 159 respondents were sampled using multi-stage procedure for the study. Validated questionnaire/interview schedule were used for data collection. Data obtained were analysed using relevant descriptive and inferential statistics. Results show that phones, radio and television were the ICTs commonly employed by extension agents (74%, 54% and 49%) and farmers (96%, 94% and 49%) for agricultural information transmission and reception, respectively. Likewise, extension agents noted phones (74%), radio (64%), television (49%), newspapers (30%) and internet services (28%) as highly relevant for disseminating agricultural information. However, only phones (73%) and radio (72%) were indicated by farmers as highly relevant for the reception. Also, most farmers were dissatisfied with messages' channelling via use of CD-Roms (100%), internet services (98%) and newspapers (85%), despite satisfaction of some extension agents with use of newspapers (31%) and internet services (18%). Test of hypothesis revealed that at $p < 0.05$, use of ICTs is significantly related to age and cosmopolitanism of farmers ($r = -0.371$ and 0.213) and extension agents (0.365 and 0.511), respectively. It was concluded that mobile phones and radio are appropriate technologies that can be harnessed for augmenting agricultural information dissemination.

Keywords: Agricultural extension, appropriate technology, ICT's use, information dissemination.

INTRODUCTION

The change in global perceptions and direction to sustainable development entails the proper dissemination of improved and modern technologies to relevant users (Lucky & Achebe, 2013). In view of this, empowering the small-scale farmers who constitute the bulk of the agricultural producers makes information and knowledge indispensable in every form of their decision making process (Chisita, 2010). To address this need is the mandate of the agricultural extension agencies. In Nigeria precisely, Agricultural Development Programme is operated at every state of the federation as the implementation organ of the states' ministries of agriculture. They are thus saddled with the government powered and notably the main extension delivery

service to the farming populace.

Traditionally, the programme has used to a great depth, the interpersonal communication channels such as farm and home visits of farmers, demonstrations, and field days among others to equip rural farmers with requisite information needed for various farm activities. However, the extension mandate of introducing research outputs of improved farm practices and wide array of technologies demand variation in their medium of channelling to farmers. In other words, the mode of dissemination of information about farm practices or technologies as the case may be, is an important aspect to be adequately reckoned with in facilitating the adoption of such practices or technologies (Lucky & Achebe, 2013). Apart from this, the associated setbacks of the personal methods such as the limitation in scope and timeliness in addition to the loopholes in the extension system in terms of the shortages of extension

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staff in most ADPs of Nigerian states, necessitated the introduction of improved tools for augmenting the extension delivery to farmers. These improved tools are of varied forms and functions and are generally referred to as the Information Communication Technologies (ICTs). For a simple definition, an ICT is a tool which manages and delivers or transmits information (Gelb *et al.*, 2008).

With respect to this, Umar *et al.* (2015) broadly interpreted ICTs as technologies that facilitate communication and the processing and transition of information by electronic means. Objectively, it could be noted that ICTs are not only capable of passing on or delivering information, they equally process information for easy access and understanding by the users functioning as communicators (source and receiver). Thus, the potential of their use in agricultural information dissemination cannot be undermined. To underscore this, Levi *et al.* (2014) noted the widely affirmed finding that ICTs are potential effective information dissemination channels that facilitates sustainable relationships of farmers with relevant stakeholders in agricultural sector. In fact, filtering in literature is the notion that it is increasingly becoming difficult for countries to penetrate the competitive world of agricultural trade without the use of ICTs (InfoBridge Foundation, 2016). This is because they have been proven as a medium for communication of ideas and as a resource necessary for the sustenance and promotion of the progress in agriculture generally (Sharma, 2014). To substantiate this, Zhang *et al.* (2016) divulged that the transformation of China's agriculture sector from the traditional to modern one was achieved through the effective deployment of ICTs.

Given these however, the adoption of ICTs' use in agricultural information dissemination is constrained by a number of limiting factors which shapes their appropriateness in delivering required information to the target audience. Infrastructural, erratic power problem disabling technological use as obtained currently in most parts of Nigeria and technical know-how are among the prominently listed general factors or problems in the literature. To harp on this, Gelb *et al.* (2008) noted that all discussions at the ICT Adoption Conference workshop organized by the Global Forum on Agricultural Research (GFAR) pointed out that the People or community are the most important issue or factor in promoting or otherwise impeding ICT adoption

for agricultural purposes. Above these, the variation of different ICTs' features, uses and handling requirements portends diverse issues that determines their applicability. In essence, ICTs' use can be said to rests on a number of factors which if summed together can be described categorically to include the type of message to be transmitted, communicators' characteristics and the communication environment.

Following this, the various forms of ICTs are appropriate for different situations where each can function adequately and successfully. Succinctly, agricultural information dissemination entailing message transmission from extension system to farm families has unique quality of communication environment involving the interplay of extension agents and rural based clientele system. A cursory look at the clientele side for example, would reveal the relatively lower level of technological infrastructures that aids ICTs use and poor knowledge of it, high proportion of uneducated or poorly educated potential communicators (receivers of agricultural information) among other characteristics. In the realization of this and more, the appropriateness of ICTs in agricultural information dissemination cannot be generalised if they are to be used to their fullest potential. Thus, of fundamental importance is the assessment of the appropriateness of various ICTs available before a case can be made for a full fledge adoption in this wise. However, ICTs have been incorporated in varied depths in extension service system as evident in many studies amongst which are Aderinto *et al.* (2008), Egwu & Igwe (2013), Lucky & Achebe (2013) as well as Umar *et al.* (2015). This is without much empirical information on the appropriateness of each of the ICTs, specifically for agricultural information dissemination. It is to this end that this study is conceived to fill the gap existing in literature on the appropriateness of some of the available or commonly used ICTs for agricultural information dissemination from the view point of the communicating parties i.e farmers and extension agents. The specific objectives of the study were to:

- identify the ICTs in use by farmers and extension agents for agricultural information exchanges and their frequency of use;
- ascertain the degree of relevance of the ICTs for agricultural information dissemination; and
- assess the satisfaction of extension agents and farmers with use of ICTs

Hypothesis of the study: The hypothesis was set in a null form thus:

Ho: there is no significant relationship between extension agents' and farmers' personal and socio-economic characteristics and their use of ICTs in transmitting and receiving agricultural information, respectively.

MATERIALS AND METHODS

The study was carried out in Abeokuta, one of the four Ogun State Agricultural Development Programme (OGADEP) zones. A multi-stage sampling procedure was employed to select the respondents. First, two predominantly rural Local Government Areas (LGAs) namely Ado Odo and Ewekoro were chosen from Abeokuta agricultural zone. From these, purposive selection of four rural communities mainly covered by the extension agents namely Atan, Eruku, Itori and Agbon was done. A total of 39 extension agents covering these areas were selected for data collection. Likewise, a total of 110 farmers were randomly selected for interviewing for the study. Thus, a total of 149 respondents were sampled for the study.

Pre-tested interview schedule and questionnaire were used for data collection from the sampled farmers and extension agents, respectively. The instruments were equally validated prior to field work by some experts in agricultural extension field to ensure that the variables could adequately cater for the study objectives. Their comments were accommodated and employed for the review of the instrument before pretesting for reliability in Osun state using test-retest method. Notably, both the interview schedule and questionnaire were adjudged reliable prior to data collection in the study area as the reliability tests for the two instrument yielded correlation coefficients greater than 0.65. Data were collected on the extension agents and farmers personal and socio-economic characteristics, the type of ICTs used for agricultural information transmission and reception, respectively as well as the corresponding frequency of use, their view of the relevance of the ICTs for agricultural information dissemination and reception as well as their satisfaction with information relayed or received through each of the ICTs. The respondents' use of ICTs was measured on a 5point scale of never, quarterly, monthly, weekly and daily scored 0, 1, 2, 3 and 4, respectively. The relevance was measured at 3point level including not relevant scored 0, relevant 1 and highly relevant 2. Likewise, respondents' satisfaction

with messages transmission or reception through ICTs were operationalised on 3point scale of not satisfied, satisfied and highly satisfied scored 0, 1 and 2, respectively. From these, the appropriateness of the ICTs was determined. ICT that fulfils a bench mark of at least 60% from a combination of relevant and highly relevant alongside 60% also from the combination of satisfied and highly satisfied from the view of both farmers and extension agents each, is adjudged as appropriate for agricultural information dissemination. The analysis of data was done with Statistical Package for Social Sciences (SPSS) version 16 with the use of tools like frequency counts, percentages, means and standard deviation as well as correlation analysis for the test of hypothesis.

RESULTS AND DISCUSSION

Socio-economic attributes of the respondents

Age: the results show that majority of the farmers (68%) and extension agents (82%) were within the age range of 36 and 55 years as equally reflected by their mean ages of close to 43years and 42 years, respectively. About a fifth of the farmers (23%) and less than a tenth (9%) were below 36 years and above 55years of age, respectively. Only 5.2% of extension agents were above 55years, while 12.8% of them were below 36years in age. This result show that most of the extension agents as well as the farmers were middle aged. This is a reflection of the preoccupation of the farming populace by people in the productive age bracket. These results corroborate the findings of Agbelemoge *et al.* (2015) whose results affirmed that farmers in Ogun state were still highly productive and active to undertake the strenuous tasks of farm work as well as Aderinto *et al.* (2008) who pointed out that extension service delivery is in the hands of people within active and innovative age category. This is expected to underscore their prowess for utilising ICTs for sourcing and/or transmitting agricultural information.

Sex: most of the extension agents (84%) and farmers (74%) were found to be males, while quite less than a fifth (16%) of extension agents and about one fourth of the sampled farmers (26%) were females. The results show that extension service delivery is dominated by males which indicates a clear gender disproportion in the composition of the extension system. This finding is in line with that reported by Aderinto *et al.* (2008), Adedoyin *et al.* (1999) and Umar *et al.* (2015) all of whom revealed gender imbalance owing to male's domination of the agricultural workforce in Nigeria.

More so, the much less proportion of the female extension agents compared to the proportion of female farmers reflected in this study, could correspond to a relatively higher shortage of extension coverage of the females in the study area. In this regard, the deployment of appropriate ICTs could offer potential cover up to augment reaching out to women which is better done by the females alike.

Religion: about two thirds of farmers (68%) and extension agents (64.6%) indicated that they were Christians, while the other one thirds were found to be of Islamic faith. This shows that all the respondents' i.e farmers and extension agents likewise, have affiliation to religious or faith-based groups or organizations which could serve as avenue to be aware of, learn or experience the use of the ICTs.

Highest educational qualification: the results revealed that the highest educational qualification attained by most of the extension agents (92%) and 5.4% were Higher National Diploma (HND)/University first degree and Postgraduate degrees, respectively, while only 2.6% were found to hold secondary school certificate. This showed that nearly all the extension agents were well

educated as most of them had at least HND degree. This corresponds to the findings of Umar *et al.* (2015) who noted that all extension agents were literate and therefore capable of utilizing ICTs to improve their work. Conversely, only 6% of the farmers attained HND/University degree, while about half (49%) and a fourth (26%) possessed secondary school and primary school certificates, respectively. More so, about a fifth of the farmers had no formal education and only 1 attended adult literacy programme. This shows that most of the farmers who had some form of formal education did not go beyond secondary school level. This means the farmers were not well educated. In essence, the results cumulatively reflect a glaring difference in farmers and extension agents level of education and consequent literacy level which is an important factor indicated by Arokoyo (2005) for the utilization of Information Communication Technologies (ICTs).

In other words, the findings portend a difference in farmers and extension agents' knowledge and operational ability of ICTs. This could translate into a difference in farmers and extension agents' use or experience with ICTs.

Table 1. Personal and socio-economic characteristics of respondents.

Characters	Farmers (%)	Extension Agents (%)
Age		
≤35years	23	12.8
36-55years	68	82
Above 55years	9	5.2
Mean	42.56± 8.02	42.44±5.96
Sex		
Male	74	84
Female	26	16
Religion		
Christianity	68	64.6
Islam	32	36.4
Highest Educational Qualification		
No formal education	19	0
Adult literacy programme	01	0
Primary school certificate	26	0
Secondary school certificate	49	2.6
Politechnic/University degree	6	92
Postgraduate	0	5.4
ICTs owned		
Radio	80	80
Mobile phones	90	100
Television	38	79
Newspapers	19	28
Computers	0.9	39

Source: Field survey, 2016

ICTs owned: the results revealed that most (80% and 90%) of the farmers possessed radio and mobile phones, respectively. While only a farmer (0.9%) had computer, close to a fifth (18%) of them noted they do buy newspaper and above one third (38%) owned Television. Relatedly, majority (80% and 79%) of the extension agents owned radio and television, respectively, just as all of them had mobile phones. However, lower proportions (28% and 39%) of the extension agents' do buy newspaper and possessed personal computer, respectively. These results reveal that phones, radio and television were the commonest ICTs possessed by both extension agents and farmers. This means that these ICTs are available and extension agents and farmers would undoubtedly have access to employ them for agricultural information dissemination and reception, as appropriate. This reflects the basis for the results of Umar *et al.* (2015) that majority of extension agents were aware of radio, television and phones as ICT tools.

Cosmopolitanism: evidence presented in Figure 1 shows that the farthest place half and about one third (35%) of the farmers have travelled to is just outside their state and within the state respectively. About 13% have not travelled beyond their local government and only a negligible proportion (2%) have gone out of the country before. On the contrary, most of the extension agents (72%) have travelled beyond their state just as a quarter of them have gone out of the country before and only about 3% have not travelled beyond their state. The results depicts that as much as half of the farmers have never travelled beyond their state before, while most of the extension agents are well travelled beyond their state.

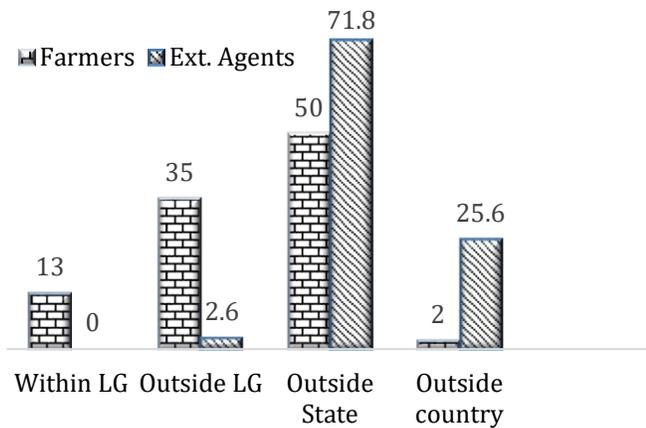


Figure 1. Farthest distance travelled by respondents.

This implies that the extension agents have quite higher degree of external orientation than their clientele. This result is expected owing to extension agents' education which may necessitate going out of the locality for its acquisition among other associated reasons. The disparity in farmers and extension agents' cosmopolitanism could be the factor in their access to ICTs and their use to meet information dissemination or reception need.

Frequency of ICTs' use: Results presented in Figure 2 reveal the mean scores of extension agents and farmers' frequency of use of the listed ICTs for agricultural information dissemination and reception, respectively. It was revealed that majority of the farmers' employ radio (2.65) and phones (2.25) for receiving agricultural information at least on weekly basis, while their use of television (0.89) and newspaper (0.46) in the same regard was limited to about quarterly. This reveals that radio and phone were the most frequently used ICTs for obtaining agricultural information.

As for the extension agents, majority employ phone (2.69) weekly, but radio (1.81) and television (1.56) monthly for transmitting agricultural information to farmers. Newspapers (0.947), internet (0.37) and CDs (0.153) were indicated as being used quarterly for transmitting information to farmers. This depicts that phones, radio and television were more frequently used by extension personnel than the other ICTs. This result is in line with that of other studies such as Agbelemoge *et al.* (2015), Umar *et al.* (2015) and Aderinto *et al.* (2008) who have reported extension agent's use of phones, radio, television among other tools. The finding on extension agents' low level of computer mediated tools i.e. CDs and internet could be explained by the results of Williams & Agbo (2013) who found that more than half (57.5%) of extension agents had no access to computer. Cumulatively, it is divulged here that even though television is frequently used by extension agents, its use for information reception by farmers is quite low. This could be pertinent to erratic power supply which is inevitable to switch television on as opposed to radio which can be powered with batteries or accessed on many mobile phones.

Relevance of ICTs: Results presented in Figure 3 reveal that phones and radio were indicated by majority of both extension agents (74% and 64%) and farmers (73% and 72%), respectively as highly relevant for agricultural information dissemination and

reception just as 23% and 22% of farmers as well as 18% and 36% of extension agents consented that they are relevant.

These results indicate a more or less consensus opinion amongst the respondents i.e. farmers and extension agents that radio and phones are at least relevant for agricultural information transmission and consequent reception. This is in line with the findings of Lucky & Achebe (2013) which underscored the relevance of radio as an ICT for facilitating effective communication of research outputs to farmers. In the case of television, more than half (58%) of farmers noted it is not relevant for receiving agricultural information, but the other 41% and 1% opined that it is relevant and highly relevant, respectively. Contrarily, high proportions (41% and 49%) of extension agents indicated television as relevant and highly relevant, respectively, for information dissemination. About (59 and 31%) of extension agents noted newspapers as relevant and highly relevant, respectively for passing on agricultural information, while most (85%) of the farmers indicated it is not relevant. Compact Discs (CDs) and internet services were also noted by most farmers (95% and 93%, respectively) as not relevant for agricultural information reception. It is thus revealed that only the extension agents observed television as relevant as this view was obviously negated by many of the farmers. More so, the other Information Communication Technologies, newspaper, internet and CDs were revealed as basically not relevant for farmers' reception of information. Of these, newspaper and internet emerged as relevant from the extension agents' view. In summary, a disparity exists in farmers and extension agents' opinion of the relevance of some Information Communication Technologies, especially television and newspapers for agricultural information dissemination.

Satisfaction with ICTs' use: Results in Figure 4 show that high proportion of farmers (72% and 62%) and many extension agents (49% and 28%) were highly satisfied with information reception and transmission through phones and radio, respectively just as 46 and 67 of extension agents and 25 and 32 of farmers indicated satisfaction with the ICTs, respectively. As for television use, many farmers (64%) were dissatisfied with their messages, 28% and 11% were satisfied and highly satisfied, respectively, while more than half (54%) and

26% of the extension agents were satisfied and highly satisfied, respectively.

For the other ICTs, newspaper, internet and CDs, most of the farmers (85%, 100% and 100%) as well as the extension agents (61%, 71% and 100%) were not satisfied with information reception or transmission through them, respectively. This result also show that most farmers and extension agents were mutually satisfied with use of radio and phones in agricultural information dissemination, while most of the farmers prompted dissatisfaction response about television use and the other ICTs. Notably, most of the respondents were dissatisfied with use of newspapers, internet and CDs for agricultural information dissemination.

Appropriateness of the ICTs: Cumulative results on the relevance of the ICTs and satisfaction of the respondents with their use reveal that radio and phones were the most appropriate ICTs for agricultural information dissemination. This position is pre-empted by the near consensus opinion of farmers and extension agents on their relevance and satisfaction with information transmission and reception through them. This result corroborates that of Sharma (2014) whose survey revealed that radio and television are two important and effective sources of information to farmers.

Contrarily, CDs and internet are revealed as inappropriate as most the respondents opined that they were irrelevant and not satisfied with messaging through them. The partitioned opinion on relevance and satisfaction with use of television and newspaper disqualify them from being adjudged as appropriate for agricultural information dissemination. These provide explanation for the results of Levi *et al.* (2014) who found that radio and phones are more effective as compared to television in agricultural information dissemination. Equally, these findings notably establish that proper consideration of the two sides of ICTs' use (the transmitting user and message receiver ends) are important in determining the choice of ICTs to adopt in varied situations. This finding, alongside with that established by Olanrewaju & Farinde (2014) that media users' characteristics greatly influence the choice of media to use in any situation and the needs satisfied consequently by the use, give factual evidence that media (including ICTs) appropriateness varies with circumstances largely depicted by factors closely associated with the communicating parties.

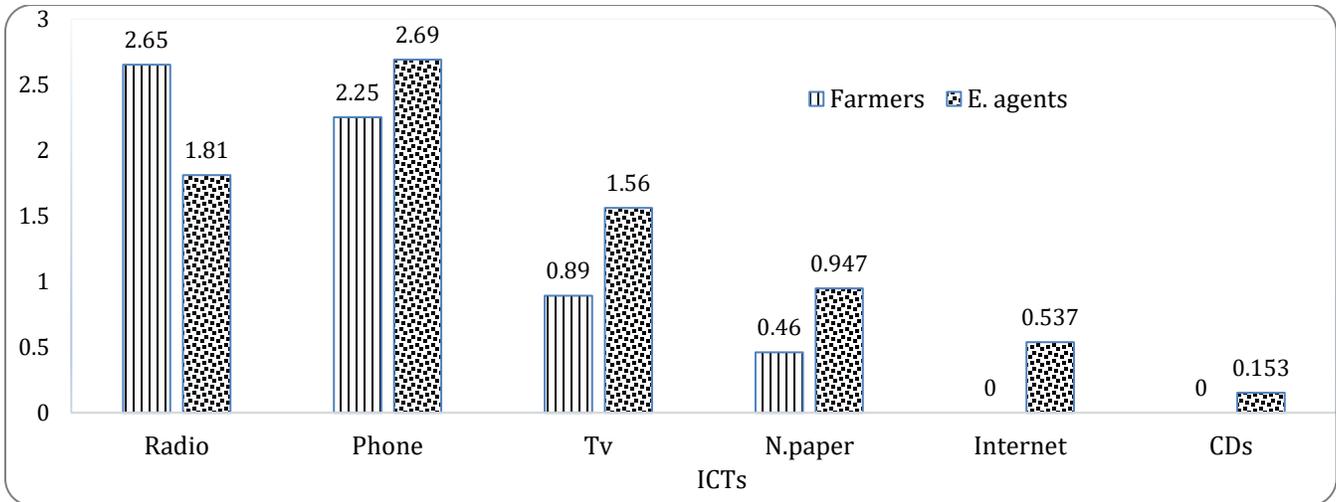


Figure 2. Frequency of ICTs use.

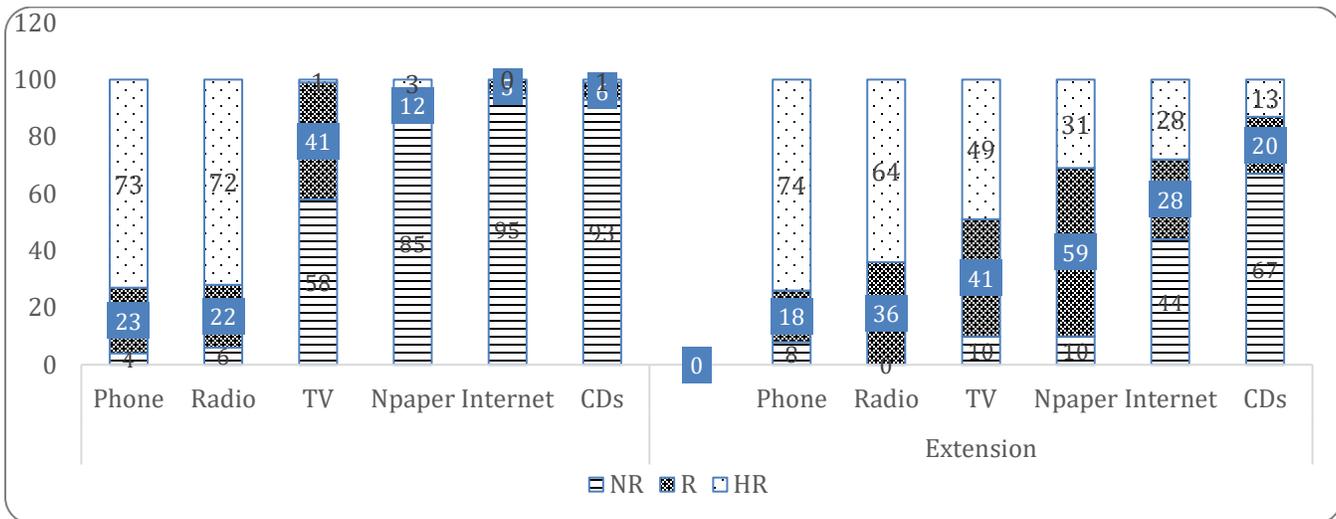


Figure 3. Distribution of respondents by their view of the relevance of ICTs for agricultural information dissemination.

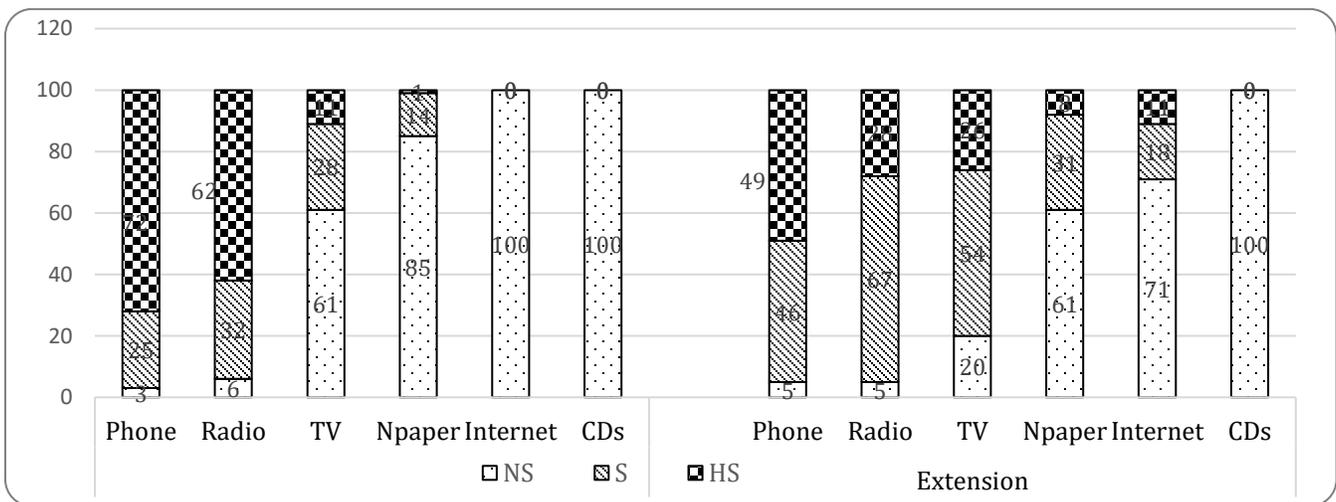


Figure 4. Satisfaction with ICTs mediated messages.

Hypothesis test result: Results given in Table 2 reveal that the same two variables were significantly related to the respondents' use of ICTs for information transmission and reception, correspondingly. For farmers, age ($r = -0.371$) was found to have a negative or inverse relationship with farmers use of ICTs in receiving agricultural information at the 0.01 level of significance. This reflects that as the farmers gets older, the level at which they use ICTs for receiving information declines. This could mean that as the farmer ages, their prowess to use technological based information sources would reduce. This could also be underscored by the fact that aged farmers' productivity would have become low and would consequently be less thirsty for productivity enhancing or improved technologies information. On the other hand, as youths are known for their innovativeness, the young farmers would be more willing to explore ICTs for timely information reception.

More so, the farmers traveling frequency ($r=0.213$) had direct relationship with their use of ICTs for receiving agricultural information. This shows that the higher the frequency at which a farmers' travels from his community, the higher the rate at which they employ the ICTs for receiving necessary agricultural information. It is depicted here that farmers Cosmopoliteness is related to their level of utilization of ICTs. In other words, high degree of external orientation favourably predisposes

farmers to adopt the use of ICTs for obtaining needed agricultural information. This is underscored by the increased exposure to the various ICTs, thereby creating awareness and increased access.

Regarding extension agents' use of ICTs for transmitting messages, their age and travelling frequency were equally found positively significantly related. The age of extension agent ($r=0.36$) was significant at $P \leq 0.05$, while the travelling frequency ($r = 0.511$) was significant at $P \leq 0.01$ significance level. This also show that that the more widely travelled an extension agent is, the higher their use of ICTs for information transmission to their farmers. High degree of external orientation or exposure as explained above corresponds to increased use of ICTs for reaching their clientele. Equally shown in the results is that the older the extension agent is, the higher the rate at which ICTs would be employed for information dissemination. This could be explained by the fact that the older the extension agent is, the higher would be the number of years spent on the job which would culminate in higher experience. The depth of experience as such might function in deciphering the length of standing relationship of mutual trust and openness with the farmers. Expectedly, this would facilitate the farmers' acceptance of their messages in any form it is presented. These findings are closely related to that of Umar *et al.* (2015) who indicated socio-economic characteristics as one of the factors influencing use of ICTs.

Table 2. Results of correlation analyses of farmers and extension agents' use of ICTs and their respective personal and socio-economic characteristics.

Variables	Farmers		Extension agents	
	r	r ²	r	r ²
Age	-0.371**	0.138	0.36*	0.133
Travelling frequency	0.213*	0.045	0.511**	0.261
Years of education	0.041	0.001	0.231	0.053
Income	0.090	0.008		

r = correlation coefficient r² = coefficient of determination ** Significant at 0.01 level * significant at 0.05 level

CONCLUSION AND RECOMMENDATION

The findings from these studies reveal that radio and phones were the significantly appropriate ICTs for agricultural information dissemination in the study area. Television is flagged as a potential appropriate tool necessitating drastic measures for combating infrastructural problems limiting farmers of its use. The technical development level in the country also highlight

the finding that CDs, internet and newspapers are not yet appropriate for agricultural information dissemination. Buttressing these, it is divulged that age and cosmopoliteness of the two end users of ICTs in agricultural information dissemination case (i.e. farmers and extension agents) are critical to their use of the ICTs. In other words, the degree of external orientation and exposure which often manifests in the awareness of the ICTs as well as the

knowledge or competency of the use, features in their use for meeting the information dissemination needs. Furthermore, the age brackets of farmers is noted as significant to the use of ICTs. This revealed that youth farmers are better targeted with ICTs than the aged farmers. In essence, this study showcased the influence of varied personal characteristics and exposure shaping technical ability and innovation receptivity cum with infrastructural facilities as underlining the appropriateness of ICTs for effective agricultural information dissemination. To this end, it is recommended that capacity building trainings on use of ICTs should be intensified to cover use of computer devices such as CDs and the internet. More so, infrastructural development needs to be stepped up in the rural areas and extension offices to enhance enabling environment for use of ICTs.

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