



Research Article

Accessibility and utilization of ICT facilities by extension agents and farmers in the Northern region of Ghana

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This study principally assessed the availability, accessibility and utilization of ICT facilities by Extension Agents and Farmers in the Northern Region of Ghana. A sample size of 180 respondents consisting of ninety (90) Agricultural Extension Agents (AEAs) and ninety (90) farmers were interviewed and the results analyzed. Simple random and stratified sampling techniques were used in selecting respondents. The data were analyzed using appropriate descriptive statistics. The results of the study revealed that phone and radio were the most available, accessible and commonly used ICTs by AEAs and farmers for extension service delivery in the Northern Region of Ghana. The result of the study also indicated a direct relationship between the level of education of AEAs and the use of ICTs in providing extension service to farmers. This relationship calls for the Ministry of Food and Agriculture (MoFA) to put into action its existing ICT policy which includes training of AEAs in the use of ICTs. The study recommended that AEAs should be given phone card units to ensure its effective utilization.

Keywords: ICT, farmers, extension agents, utilization, accessibility.

INTRODUCTION

A nation's capability to accelerate its socio-economic development process and gain global competitiveness and improve the wellbeing of its people depends very much on the extent to which it can develop, use, exploit and sell information, knowledge and technology in one form or another (ICT4AD, 2003). Extension reforms are underway and integration of the new Information and Communication Technologies (ICTs) are rapidly transforming the agricultural extension. The ICT enabled extension systems are acting as a key agent for changing agrarian situation and farmers' lives by improving access to information and sharing knowledge. ICT based agricultural extension brings credible opportunities and has the potential of enabling the empowerment of farming communities (Saravanan, 2010). Extension can play a

role in helping catalyze and support this voice; In this role, they must be able to examine the appropriateness of the various agricultural related ICTs, accessibility of ICTs in rural and remote areas, how best to reconcile costs and benefits, and how to ensure that ICT access includes a diversity of culture, languages, social strata and age groups and gender sensitive (Saravanan, 2010).

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Frontline extension workers, who are the direct link between farmers and other actors in the agricultural knowledge and information system, are well positioned to make use of ICT to access expert knowledge or other types of information that could be beneficial to the farmers (Salau and Saingbe, 2008). Over the years, several initiatives have been made by the government of Ghana and other agencies to develop the ICT-infrastructure so as to bridge the digital divide between Ghana and the developed world. Prominent among these initiatives is the development of a national fiber optic network (VOLTACOM) by the nation's electricity provider, the Volta River Authority (VRA). The use of ICT in agricultural extension and rural development is significant especially now that its use has witnessed an upsurge in almost all areas of rural life in several African countries where it has provided a medium to adequate access to agricultural information, despite the persisting problems of access, connectivity, literacy, content and costs (CTA, 2003). In this respect Arokoyo (2005) reported that to date, the radio and television have been the major ICTs used in agricultural extension delivery in Nigeria. Despite the important role that information and communication technologies (ICTs) has on agricultural extension service and governments effort in the development of ICT infrastructure for purposes including communication of agricultural innovation to farmers, there is still an information gap between agricultural extension agents and farmers. Rivera et al (2001) stated that "rural development commentators in recent times have expressed concerns over the fact that there are frequent manifestations of unsatisfactory extension performance". This study therefore seeks to assess the availability, access and utilization of ICTs by agricultural extension agents and farmers in the Northern Region.

METHODOLOGY

Northern Region of Ghana, the study area which occupies an area of about 70,383 square kilometers is the largest region in terms of land area. The climate of the region is relatively dry, with a single rainy season that begins in May and ends in October. The amount of rainfall recorded annually varies between 750 mm and 1050 mm. This investigation used a non-experimental design. The design of the survey was descriptive and cross-sectional in nature. This design was used to assess the effects of information and communication technology on extension service delivery in the Northern region of Ghana. The target populations for this study were farmers and Agricultural Extension Agents (AEAs) of Ministry of Food and Agriculture (MoFA) in the Northern Region of Ghana. The survey employed simple random, stratified and purposive sampling techniques in selecting the sample for the study in selecting the districts for the

study, simple random sampling technique was employed and six (6) districts out of 20 districts in the Northern Region were selected. These districts were, namely, East Mamprusi, West Mamprusi, Central Gonja, West Gonja, Tolon-Kumbungu and Tamale. Respondents were stratified into AEAs of MoFA and Farmers based on their occupations in each districts in the Northern Region of Ghana. Fifteen (15) each of farmers and AEAs in each of the districts mentioned above were purposively selected on the basis of those working on MoFA projects. In all ninety (90) each of farmers and AEAs were selected for the study in the Northern Region of Ghana. A combination of data collection tools were employed to collect qualitative and quantitative data on AEAs and farmers for the survey. These included the administration of structured and semi-structured questionnaire to respondents to collect primary data. SPSS and Microsoft Excel were used as the software for data input and analysis. Each objective of the research was analyzed by using appropriate statistical measures. Descriptive statistics were employed in the analysis of the data to address the objective.

RESULTS AND DISCUSSION

Demographic Profile of Agricultural Extension Agents

The survey results (table 1) show that majority of AEAs (87.8 %) were males; with 12.2 percent of AEAs were females. This situation of gender imbalances is attributed to the fact that extension services has for ages, been a male dominated profession since very few females attend Agricultural Colleges where AEAs are first trained. According to MoFA (2009) out of a total of 2,128 AEAs only 273 were females. This represented just 12.8% of AEAs in 2009. Ashanti Region reported the highest number of female AEAs (55) whereas the Upper East Region had the lowest number of female AEAs (10).

The study also revealed that 53.3% of the AEAs were aged between 31 and 40 years with 33.3 percent aged 41 and above (see table 1 below). Also 12 percent of AEAs were within the ages of 21 and 30 years. The majority of the AEAs (81.1%) were married, 17.8% were single and 1.1% were divorced as indicated in table 4.1 above. The higher percentage of married AEAs (81.1%) indicates that they are more likely to stay on the job. A positive relationship has been established between marriage and employee turnover, absenteeism and job satisfaction and it has been established that married employees have fewer absences, undergo fewer turnovers and are more satisfied with their jobs (Robbins, 1993). With regards to educational status, 65.6% of AEAs have had tertiary education, while 34.4% have Agriculture College education with a Certificate or Diploma in extension.

Table 1. Demographic Profile of Agricultural Extension Agents

Characteristics	AEAs of MoFA	
	Frequency	%
Gender:		
Male	79	87.8
Female	11	12.2
Total	90	100
Age:		
21-30	12	13.3
31-40	48	53.3
41 and above	30	33.3
Total	90	100
Level of Education:		
Tertiary Education (Degree)	31	34.4
Agriculture College	59	65.6
Total	90	100
Marital Status:		
Single	16	17.8
Married	73	81.1
Divorced	1	1.1
Total	90	100

Source: Field survey, 2010

Table 2. Demographic Profile of Farmers

Characteristics	Farmers	
	Frequency	%
Gender:		
Male	73	81.1
Female	17	18.9
Total	90	100
Age:		
21-30	13	14.4
31-40	32	35.6
41 and above	45	50.0
Total	90	100
Level of Education:		
No formal Education	45	50.0
Primary Education	9	10.0
Middle/JHS Education	8	8.9
Secondary/Technical	15	16.7
Non Formal Education	6	6.7
Total	90	100
Marital Status:		
Single	8	8.9
Married	82	91.1
Total	90	100

Source: Field survey, 2010

Demographic Profile of Farmers

On the side of the farmers, 81.1% were males, while 18.9% were females as indicated in table 2 above. Although females form the minority they play several roles in all aspects of agricultural production in the Northern Region of Ghana. This finding is line with the findings in MoFA (2006) that women play vital roles in crop production and marketing in Ghana. Much of what

the women do on the farm is, however, often considered as family labour and this partly accounts for the small number of female farmers (18.9%) interviewed.

The few female farmers interviewed is also partly attributed to the fact that majority of them (91.1%) were married and were therefore represented by their husbands who were the household heads. Only a few of them (8.9%) were household heads who owned some

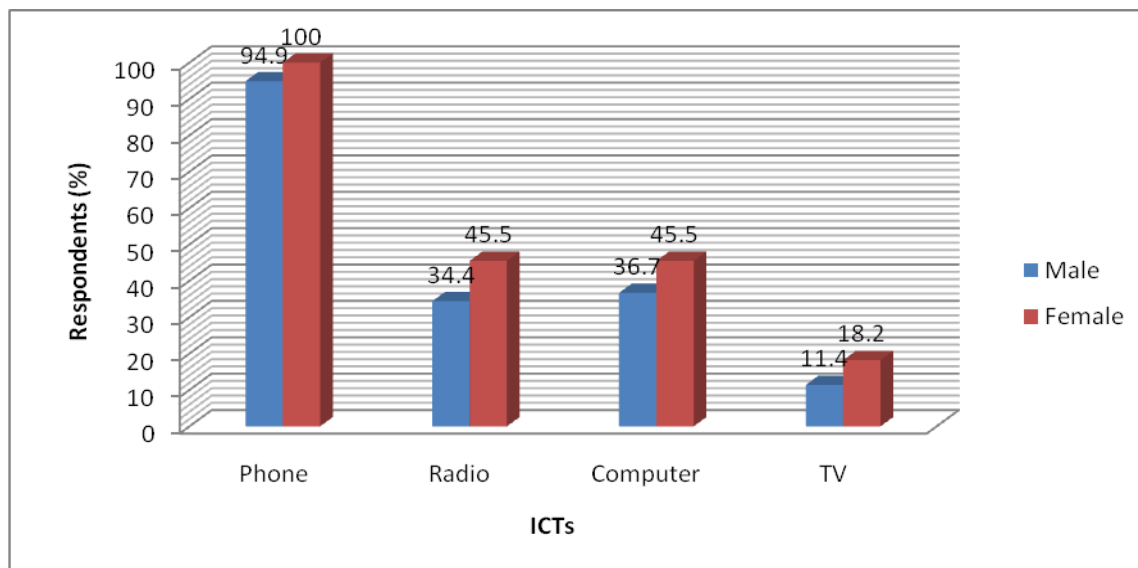


Figure 1. Cross Tabulation between Gender of AEAs and use of Phone, Radio, Computer and Television.
Source: Field Survey, 2010

farms. The findings indicate that women make up 95% of the actors in the field of agro-processing and constitute about 90% of the labour force involved in marketing of farm produce (GLSS, 2000).

Generally, 50% of the farmers were aged 41 years and above with 35.6% aged between 31 and 40 years (table 2 above). 14.4% of farmers were within the ages of 21 and 30 years. 50% of farmers had no formal education. Few farmers had primary education (8.9%), middle school (10%) and 16.7% had secondary education. 6.7 percent had tertiary and 7.7% had non-formal education. The results indicate that majority of the farmers were illiterates.

Cross Tabulation of Gender of AEAs versus use of Phone, Radio, Computer and Television.

Figure 1 shows the results of a cross tabulation between gender of AEAs and the use of ICTs in extension service delivery. It can be seen from the table that in relative terms female AEAs used ICTs more than their male counterparts. All female AEAs (100%) used phone as against 94.9% male AEAs for making and receiving calls from friends and family and occasionally for extension service delivery. Again, 45.5% and 34.4% female and male AEAs respectively listened to radio programmes. With respect to the use of computer, 45.5% of female AEAs as against 36.7% males used it occasionally for processing their field data. 18.2% of female AEAs received agricultural information for extension services through the television as compared to 11.4% males. The high percentage use of phone is due to the ready availability of mobile phone and better network coverage that makes it possible for their use in almost every part of

the country. Majority of the AEAs scarcely used internet, video, scanners and digital camera in extension service delivery. Generally these are normally unavailable in the rural areas where they usually ply their trade. Figure 1 below illustrates the distribution of gender of AEA and the use of ICTs in the Northern Region.

Cross Tabulation of Gender of Farmers and use of Phone, Radio, Computer and Television.

This section examines the relationships between Gender of Farmers and the use of ICTs such as phone, radio, computer and television. It describes in relative terms the influence of gender on the use of the above mentioned ICTs and the results are presented in figure 2.

It is evident from figure 2 that the extent of use of phone by both female and male farmers is about the same, 70.6% for female farmers and 69.9% for males. There was a marginal difference between female farmers (23.5%) and male farmers (27.4%) in the use television for receiving agricultural information. The difference between male and female farmers in the use of radio is, however, very significant. 73.9% of male farmers used radio as against 41.2% female farmers. None of the female farmers used computer, internet and video. Few male farmers (5.5%) used computer for extension related purposes.

Availability, Ownership and Utilization of ICTs by AEAs

The results of the study revealed that phone, radio, computer internet connection and television were available in all the districts studied. Table 3 below shows

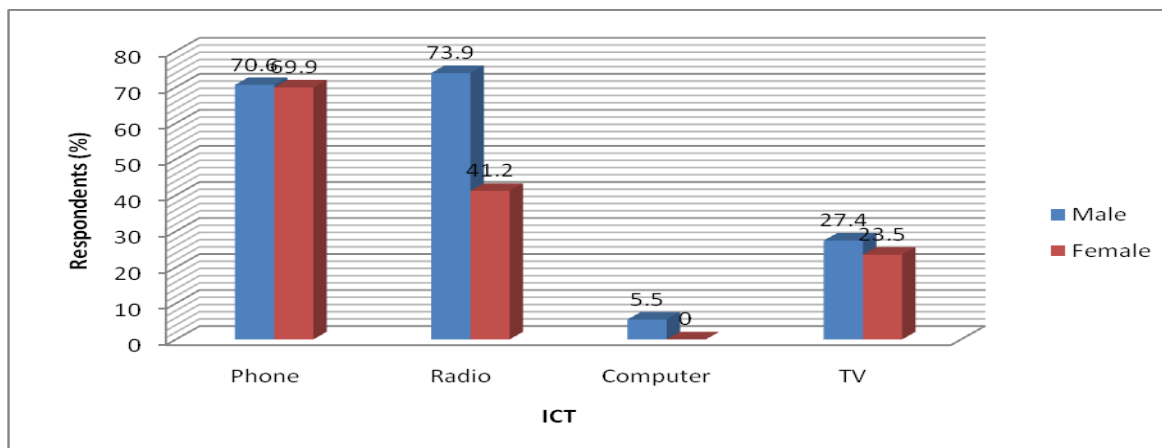


Figure 2. Cross Tabulation between Gender of Farmers and use of Phone, Radio, Computer and Television.
Source: Field Survey, 2010

Table 3. Availability, Ownership and Utilization of ICTs by AEs

ICT Facility	Availability		Ownership		Utilization	
	Frequency	%	Frequency	%	Frequency	%
Phone	90	100	90	100	89	98.9
Radio	87	96.7	86	95.6	31	34.4
Computer	90	100	31	34.4	43	47.8
Internet	74	82.2	4	4.4	6	6.7
Television	89	98.9	85	94.4	11	12.2
Videos	82	91.1	74	82.2	4	4.4
Scanners	9	10.0	2	2.2	-	-
Video Camera	9	10.0	-	-	1	1.1
Fax Machine	7	7.8	-	-	-	-
Digital Camera	7	7.8	-	-	1	1.1
Pendrives	10	11.2	5	5.6	-	-

Source: Field Survey, 2010

clearly that the most available ICTs for AEs in their various districts are phone (100%), radio (96.7%), computer (100%), internet (82.2%), television (98.9%) and video (91.1%). Scanners, video camera, fax machine, digital camera and pen drives were rarely available. These findings are in line with the findings of Odame et al. (2002:22) and Arokoyo (2005:22) that ICTs in agriculture extension includes phone, radio, computers, video and internet facilities. Although all AEs owned phone (100%), radio (95.6%), television (94.4%) and video (82.2%), not all of them use these gadgets for extension services. 98.9%, 47.8% and 34.4% occasionally use their personal mobile phones; computer and radio respectively for extension related service. This finding is in contrast to the findings of Arokoyo (2005:59) that radio and television has been the major ICTs used in agricultural extension delivery in Nigeria.

Availability, Ownership and Utilization of ICTs by Farmers

On the side of the farmers the most available ICTs in the districts were found to be phone (97.8%), radio (100%),

computer (83.3%) internet (52.2%), television (97.7%), video (86.7%) and satellite (42.2%). This is indicated in table 4 below. Majority of the farmers who owned phone (80.0%), radio (87.8%) and television (46.7%) also used these facilities for extension purposes. The phone is used for receiving extension information from AEs and colleague farmers and for giving feedback as well. The TV and radio enable them to view and listen to agriculture related programmes that are aired.

Cross tabulation between Farmers' Level of Education and the Use of Phone and Radio

A cross tabulation of farmers' level of education against the use of phone for agricultural related communication reveals that a farmer's level of education does not necessarily influence the use of phone for agriculture related communication. The results (table 5) showed that 31.1% of farmers with no formal education used phone compared to farmers with Junior High School education (13.3%), secondary education (7.8%), non formal education (5.6%) and primary school education (4.4%) and tertiary (7.8%) for agriculture related communication,

Table 4. Availability, Ownership and Utilization of ICTs by Farmers

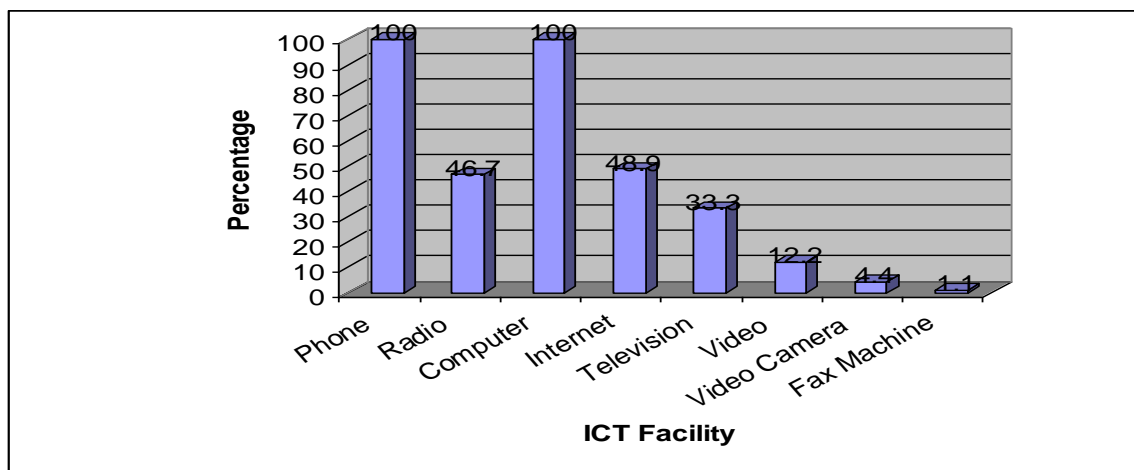
ICT Facility	Availability		Ownership		Utilization	
	Frequency	%	Frequency	%	Frequency	%
Phone	88	97.8	72	80	63	70
Radio	90	100	79	87.8	61	67.8
Computer	75	83.3	5	5.6	1	1.1
Internet	47	52.2	-	-	2	2.2
Television	87	96.7	42	46.7	66	73.3
Video	78	86.7	28	31.1	4	4.4
Satellite	38	42.2	-	-	-	-

Source: Field Survey, 2010

Table 5. Cross Tabulation between Farmer's Level of Education and the use of Radio and Phone for Agricultural Communication.

Level of Education of Farmer	Agricultural Communication	
	Phone	Radio
No Formal Education	28 (31.1%)	28 (31.1%)
Non-formal Education	5 (5.6%)	5 (5.6%)
Primary	4 (4.4%)	4 (4.4%)
Middle/JHS	12 (13.3%)	13 (14.4%)
Secondary/Technical	7 (7.8%)	5 (5.6%)
Tertiary	7 (7.8%)	5 (5.6%)

Source: Field Survey, 2010.

**Figure 3.** ICT Facilities in AEAs District Offices in Northern Region

Source: Field Survey, 2010

as indicated in table 5.

Similarly, a cross tabulation of farmer's level of education against the use of radio for agricultural related communication revealed no significant relationship between the level of education and the use of radio for agricultural communication. See table 5. The results (table 5) also showed that 31.1% of farmers with no formal educational used radio. They are followed by farmers with JHS education (14.4%), then those with secondary education (5.6%), tertiary (5.6%), non-formal education (5.6%) and farmers with primary school education (4.4%).

Farmers' level of education had no relationship with the use of computer, internet, and television for agricultural communication. This is a clear indication that one does not need to be highly educated in order to use ICTs for extension purposes, especially phone, radio and TV. Table 4 above shows the cross tabulation of farmer's level of education against the use of phone and radio for agricultural communication.

ICT Facilities Available at District Offices of AEAs

Figure 3 below shows that the most available ICTs in the district offices of AEAs are phone and computer.

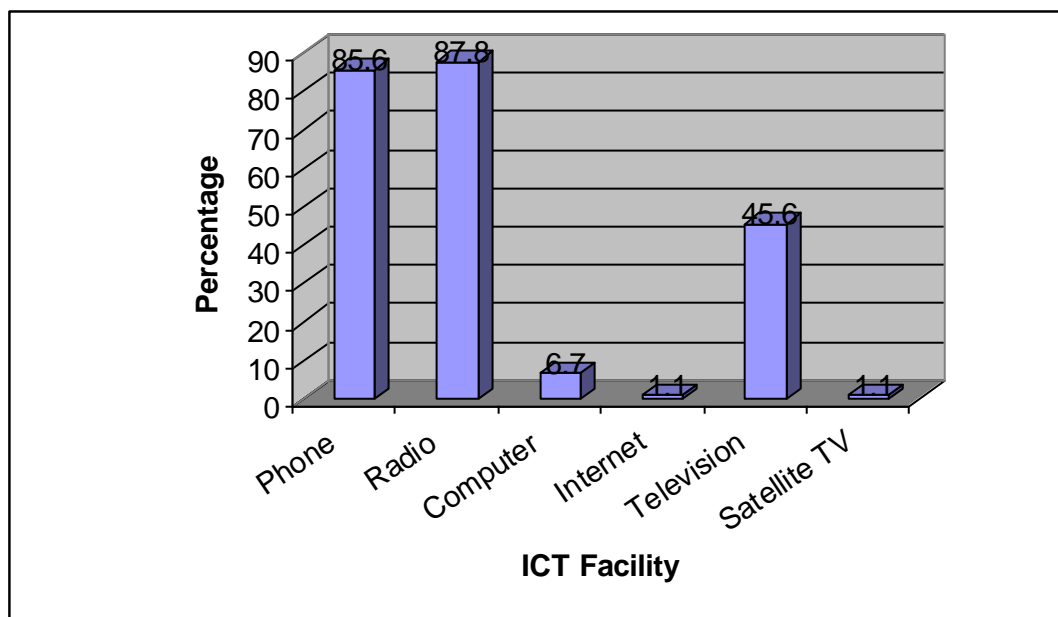


Figure 4. ICTs Available for Farmers' Use in their Homes
Source: Field survey, 2010

Table 6. AEAs application of ICTs

Characteristics	Frequency	Percentage
Education	60	66.7
Processing data	60	66.7
Making and Receiving Calls	89	98.9
Sending E-mails	24	26.7
Browsing Internet for Solution	24	26.7

Source: Field Survey, 2010

Television, radio sets, video, video camera and fax machine were rarely available.

ICTs Available for use by Farmers in their Homes

Figure 4 above shows that phone and radio sets are the most available ICTs for use in farmers' homes followed by television. Computer, internet and satellite television were rarely available for use by farmers. The most widely used ICT by farmers was found to be radio. The high use of phones and radio by farmers is not too surprising. The availability of mobile phones at relatively good prices coupled with good reception as a result of the mounting of telephone masts has combined to make this facility user friendly. The phones are used mainly for making and receiving calls.

The suitability of the radio in rural areas cannot be overemphasized. Many of the radio sets use simple dry cells and do not necessarily require electricity. The portable sets are easily carried around by bicycle and motor bike riders. The advent of the numerous Frequency Modulation (FM) stations in various communities has

made communication through radio more convenient. Many of the FM stations have programmes in the local languages and can be used effectively for extension service delivery.

AEAs Application of ICTs

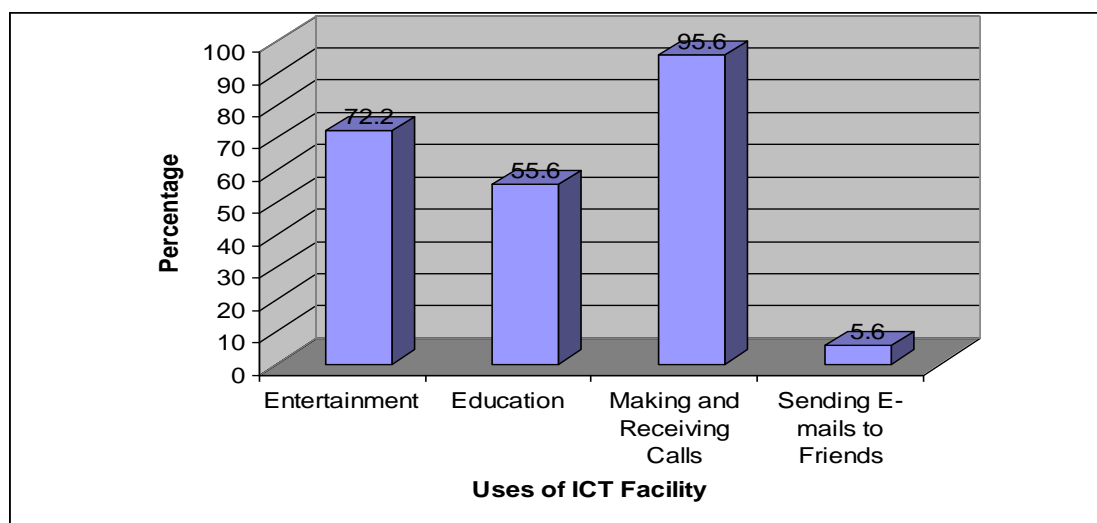
It was found out that AEAs use ICT facilities occasionally for educating farmers, data processing, making calls to farmers, sending electronic mails (e-mails) to friends and family members and browsing the internet to find solutions to farmers' problems. The main facility for educating farmers is the phone.

It is observed from table 6 above that making and receiving calls by AEAs takes precedence over all other uses to which ICT is be put. The survey results show that 60 respondents representing 66.7 percent of AEAs use ICTs (phone) for educating farmers, whilst 66.7% and 98.9% use ICT facilities for processing data and making and receiving calls to and from farmers, family and friends respectively. Again 26.7% of AEAs use ICTs to send E-mails to family and friends and also browse the

Table 7. Cross Tabulation of AEA's Level of education versus Application of ICTs

Application of ICT	AEA's Level of Education	
	Tertiary Education	Agriculture College
Education	28(90.3%)	20 (33.9%)
Processing of Data	18 (58.1%)	12 (20.3%)
Make and Receive Calls	21 (67.7%)	19 (32.2%)
Send and Receive E-mails	8 (25.8%)	6 (10.1%)
Browsing Internet for Solution	5 (16.1%)	3 (5.0%)
Report Writing	19 (61.3%)	17 (28.9%)
Disseminating Innovation to Farmers	9 (29.0%)	4 (6.7%)

Source: Field Survey, 2010

**Figure 6.** Farmers Application of ICT
Source: Field Survey, 2010

internet to find solutions to farmers' problems. Findings by the CTA (1999) indicate that e-mail is the most commonly used among the ICTs for interaction and also for bringing about change. Next to e-mail is the internet (WWW).

A cross tabulation of AEA's level of education against the use of ICTs for educating farmers revealed a direct relationship between the level of education and the use of ICTs for educating farmers. EAs with tertiary level education use ICTs to educate farmers more than those with Agriculture College level education (table 7). Whilst 90.3% of AEAs with tertiary education used ICTs for educating farmers, only 33.9% of AEAs with Agriculture College education do same. With respect to the individual ICT facilities the results indicate that 51.8 % of AEAs with tertiary education as against 20.3% of those with Agriculture College education used ICTs for processing field data as indicated in table 4.8 below. In the same vein 67.7%, 25.8% and 16.1% of AEAs with tertiary education as against 32.2%, 10.1% and 5.0% of AEAs with agriculture college education used ICTs for making and receiving calls from farmers, sending e-mails and browsing the internet for solution to farmers' queries respectively (see table 7 above). 61.3% of AEAs with

tertiary education used the computer in report writing as against 6.7% of those with Agriculture College education.

Despite the fact that large numbers of AEAs have been trained in the use of radio to disseminate innovations, only 29.0% and 6.7% of those with tertiary education and Agriculture College education respectively used radio in disseminating innovation to farmers as indicated in table 7 above.

Farmers Application of ICTs

The survey results show that 65 respondents representing 72.2 percent of farmers used ICTs for entertainments. Also 55.6% of farmers used radio for receiving agricultural education and 95.6% for making and receiving calls from AEAs and colleague farmers. Only 5.6 percent of farmers used the internet for sending E-mails to friends. The discussions above reveal that majority of farmers used ICTs for entertainment, receiving agricultural education and making and receiving calls to and from AEAs and colleague farmers.

Figure 6 above shows the application of ICTs by farmers in the Northern Region.

Table 8. Frequently used ICTs by AEAs for Communicating with Farmers

Frequently used ICTs by AEAs	Frequency	Percentage
Phone	90	(100%)
Radio	58	(64.4%)

Source: Field Survey, 2010

Table 9. Frequently used ICTs by Farmers for Communication

Frequently used ICTs by Farmer	Frequency	Percentage
Use Phone Frequently	90	100
Use Radio Frequently	34	37.8

Source: Field Survey, 2010

Frequently used ICT by AEAs for Communicating with Farmers.

The results of the study indicate that phone and radio are the most frequently used ICT facilities by AEAs (See table 8). All (100%) AEAs said phone was the most frequently used ICT for communicating with farmers, followed by radio with 64.4 percent. Sixty nine respondents, representing 76.7 percent of AEAs, said they communicated with farmers' all year round using phone.

Frequently used ICTs by Farmers for Communicating to AEAs.

The most frequently used ICT facilities among farmers were phone and radio. The results, as indicated in table 9 show all the farmers (100%) said phone was the most frequently used ICT facility in extension service delivery. This is followed by radio with 37.8 percent. Also all the farmers (100%) said they communicated with AEAs and colleague farmers all year round using the phone. This clearly indicates that the phone can be a very effective and efficient ICT tool for extension communication.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

Generally, there are more males than females AEAs in the Northern Region of Ghana. Majority of them are in their Middle Ages and married. Most AEAs had significant experience in extension service delivery due to skills they have acquired over the years on the job. Females AEAs used phone for extension service delivery more than their male's counterparts. Also more AEAs had tertiary education compared to those with Agriculture college education. There are also more males than females farmers in the Northern Region. However females played key roles in agricultural activities such planting, harvesting and agro-processing. Majority of the farmers

had no formal education and were also above their middle ages with few in their middle ages.

The most available ICTs for AEAs in the districts are phone, computer, internet, television and video. On the side of farmers, phone, radio, computer and video are the most available ICTs. Farmers level's of education did not influence their use of phones, radios, computers, televisions and videos. All district offices of MoFA had phones and computers and in some places there are radios and internet facilities. Phones and computers are available for use by AEAs in their district offices. On the side of farmers, phone and radio are the most available ICTs for them to use.

All the AEAs in the Northern Region owned at least one phone. Majority of them owned radio, television and video. AEAs use ICTs for educating farmers, processing data and making and receiving calls to and from farmers. On the side of farmers, majority of them used ICTs for entertainment, receiving agricultural education and making and receiving calls from AEAs and colleagues farmers respectively. The most frequently used ICT by AEAs and farmers are the phones. AEAs used phone to communicate to farmers. Similarly, farmers also used phone to communicate with AEAs.

The most commonly and frequently used ICT facility for extension service delivery by AEAs and farmers were found to be phones.

Recommendations

In view of the fact that radio plays an important role in extension service delivery in the Northern Region, the extension directorate of MoFA should liaise with existing FM stations for slots to have AEAs broadcast agricultural innovations in various local languages to farmers. Also the Human Resource Development and Management Directorate (HRDMD) of MoFA should identify and train community volunteers on radio broadcasting to assist AEAs reach out to farmers living in the rural area with information using the local languages.

MoFA should organize workshop and seminars to train farmers in the use of phone and radio for extension communication. In furtherance to the above, the government of Ghana should accelerate the building of more information centres close to markets to enable farmer access information on market prices of inputs and outputs. The national communication authority (NCA) should continue to insist and ensure that network service providers render quality services especially to those living in the rural communities to which Northern Region is inclusive.

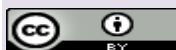
The result of the study showed that there is a direct relationship between the level of education of AEAs and the use of ICTs in providing extension services to farmers. This relationship calls for MoFA to put into action its existing ICT policy which includes training of AEAs in the use of ICTs. In view of the fact that majority of AEAs and farmers owned and frequently used phones for extension service delivery, the Ministry of Food and Agriculture (MoFA) should use part of its budgetary allocation to supply phone card units to AEAs to communicate with farmers living in remote and unmotorable areas. This will increase utilization of mobile phone and hence facilitate information exchange between AEAs and farmers and among farmers in the Northern Region of Ghana.

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