

Farmers' Perceptions of Information and Communication Technology (ICT) Use in Extension Service Delivery in Northern Region, Ghana

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Abstract

Extension methodologies for communicating technologies to farmers have evolved over the past 200 years from so-called traditional methodologies to more advanced and technology-based methodologies that enable extension staff to reach many people within the shortest possible time in a more effective and efficient way. Though traditional methods are still relevant and effective, current trends require the use of more innovative and cost-effective methodologies. This paper examined the perceptions of farmers on the use of ICTs in Extension Service delivery in the Northern Region of Ghana. Ninety farmers were randomly sampled from 6 communities in 6 districts in the region. Data was collected using semi-structured questionnaire. A 5-point Likert scale was used to determine farmers' perceived effects of ICT on extension delivery. Data were analysed using means, standard deviations, t-test, frequencies and percentages. The most widely used ICTs by farmers are radio, mobile phone and television. Farmers perceive the use of mobile phone to have resulted in timely delivery of information, increased interaction among farmers and between farmers and AEAs and effective use of time and energy by AEAs. The use of radio has improved adoption of technologies and enhanced farmers' awareness of innovations. It is concluded mobile phone, radio and television are used widely in the region and have very positive effects on extension service delivery.

Keywords: *Information Communication Technology, Agricultural Extension, Extension Methodologies, Mobile phone, Radio, Television*

INTRODUCTION

Extension has and continues to play key roles in increasing farm productivity through the advisory services rendered to farmers. The services include the dissemination of

innovations or improved technologies which when adopted, help in improving land productivity and ultimately increasing crop yields. Methodologies that have been used in

communicating innovations or improved technologies to farmers have evolved over the past 200 years from what can now be described as traditional methodologies (Eberle and Shroyer, 2000) to more advanced and technology-based methodologies that enable service providers reach many people within the shortest possible time in a more cost-effective and efficient way. Some of the traditional methodologies are result and method demonstrations, exhibitions, farm and home visits, meetings, printed material, newspapers and magazines (Rasmussen, 1989).

While these so-called traditional methodologies continue to be relevant and effective in extension service delivery, the CTA (2006) posited that governments and public extension institutions are challenged to adopt diversified and pluralistic national strategies to build dialogue and collaboration among a variety of public, private, non-governmental and community-based entities to promote extension to improve rural livelihoods. The use of more cost-effective methods in extension service delivery in recent time has become necessary because of the challenges service providers face in seeking to reach farmers through the traditional methods. The challenges include lack of funds, farmers' perception of technology, difficulties in transportation by extension agents, inadequate technical expertise of professionals, low literacy of farmers, inadequate logistical support and weak staff motivation (Asiedu-Darko, 2013). These challenges combine to make direct contact with farmers more difficult for extension staff.

To overcome these challenges and improve service delivery, extension has employed the use of information and communication technologies (ICTs). Asenso-Okyere and Mekonnen (2012) have stated that

one promising area that will enable agricultural extension to reach large number of farmers is using information and communication technologies (ICTs): mobile telephony, innovative community radio and television programs, mobile phones in combination with radio, video shows, information kiosks, web portals, rural tele-centers, farmer call centers, video-conference, offline multimedia CDs and open distance learning. ICT caters for the interest of a broad and evolving range of elements that includes the television (TV), radio, mobile phones and the policies and laws that govern the widespread use of these media and devices (Balaji, Meera and Dixit, 2007).

The agricultural sector has witnessed rapid introduction of Information Technology (IT) in the last three decades with the aim of ensuring its adoption by farmers. There have been high hopes about the role of IT as a tool for diffusing innovations in the agricultural sector because of its ability to provide rich information to a large number of people (Sudath, 2008). Ghana's industrially weak and subsistence agriculture-based economy can be transformed into an information and knowledge economy through the development and implementation of comprehensive integrated ICT-led socio-economic development policies, strategies and plans (ICT4AD, 2003).

Since 2003, the Government of Ghana has remained committed to pursuing an ICT for Accelerated Development (ICT4AD) with the aim of improving the quality of life of the people by significantly enriching their social, economic and cultural well-being through the rapid development and modernization of the economy and society using information and communication technologies as the main engine for accelerated and sustainable economic and social development. The

Government also acknowledges the role that ICTs can play in agricultural planning, development, promotion and marketing and is committed to the facilitation of the implementation of a reliable national agricultural information system (database) to facilitate planning, marketing and quality service delivery within the agricultural sector. This commitment has resulted in the formulation of ICT policy with the broad objective of promoting the deployment and exploitation of ICTs to support the activities of the agricultural sector in the areas of production, processing, marketing and distribution of agricultural products and services.

Despite the institutional policies and the huge investments in ICT infrastructural development and capacity building there is the perception that the use of ICTs by farmers in extension service delivery leaves much to be desired. This paper therefore examined farmers' perceptions on the use of and effects of ICT on extension service delivery in the Northern Region of Ghana.

MATERIALS AND METHODS

The study was conducted in the Northern region of Ghana with a land area of 70,383 square kilometres. The study design was descriptive and cross-sectional in nature. The populations comprised farmers in the Northern Region of Ghana. The multi-stage sampling technique was used in the selection of the study sample. To begin with six (6) districts were randomly selected from a total of 25 in the region. The districts were Tamale Metropolis, West Mamprusi, East Mamprusi, West Gonja, Central Gonja and Tolon-Kumbungu districts. One community was then selected randomly from each district. The communities were Zuo-Gbabshia (Tamale), Wulugu (West Mamprusi), Gambarana-Fong (East Mamprusi), Leeto (Central Gonja), Canteen Settlement (West Gonja) and Yaara-

Fong (Tolon-Kumbungu). Fifteen (15) farmers were randomly selected from each community to bring the total sample to 90.

Data was collected from the selected farmers using semi-structured questionnaire. The questionnaire covered the socio-demographic characteristics of respondents, ICT facilities farmers are using in the region, their perceptions of the effects of ICTs on extension service delivery and the constraints of ICT's use. Perceptions of farmers about the effects ICT on Extension service delivery in the northern region were determined using the 5-point Likert scale. Likert is a tool that is used in measuring people's perceptions and opinions about issues of interest to the researcher, in this case farmers' opinions about the use of ICT in the delivery of Extension Service. The farmers were asked to indicate their levels of agreement regarding some statements relating to the use of the more frequently used ICTs, namely, mobile phone, radio and television (TV). The scale ranged from 1 to 5, with 1 representing Strongly Disagree and 5 representing Strongly Agree. The complete scale is stated thus: 5 = Strongly Agree, 4 = Agree, 3 = Somewhat Agree, 2 = Disagree and 1 = Strongly Disagree

Data was analysed using descriptive statistics (frequencies, percentages, means and standard deviations). One-sample *t*-test was conducted to determine the representativeness of the sample means of the perceptive statements on the Likert scale as against the population mean.

RESULTS AND DISCUSSIONS

Socio-demographic Characteristics of Farmers in the Northern Region of Ghana.

The socio-demographic characteristics of the respondents are presented in table 1 below. The results indicate that 81.1% were males, while 18.9% were females. Despite the

several roles females play in agricultural production, their activities are often overshadowed by their spouses in the Northern Region of Ghana. MoFA (2006) have stated that women play vital roles in crop production and marketing in Ghana but much of what they do on the farm is often considered as family labour and this partly accounts for the small number of female farmers (18.9%) interviewed. The findings of MoFA (2006) further explained that by custom women are required to contribute labour for weeding and harvesting on their husband's farms even if they have their own farms.

Table 1: Socio-demographic characteristics of respondents

Characteristic	Frequency	%
Sex		
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
Education Status		
No Formal Education	52	50.0
Primary	9	10.0
Middle/JHS	8	8.8
Secondary/Technical	15	16.7
Tertiary	7	7.7
None Formal Education	6	6.7
Total	90	100
Marital Status		
Single	8	8.9
Married	82	91.1
Total	90	100

The majority (50%) of the farmers were 41 years and above with 35.6% between 31 and 40 years. 14.4% were between 21 and 30 years. Fifty percent 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 none formal education.

ICTs available in farming communities

Table 2 shows the ICT facilities farmers identified as available in the various communities. The results show multiple responses. The ICT facilities available are mobile phone, radio, computer, internet, television, video and satellite TV. The most available ICT facility is the radio. This was indicated by all the respondents (100%). Next to radio is mobile phone (97.8%), television (TV, 96.9%), video (86.7%), computer (83.3%) with satellite TV being the least available (42.2%). In their study of ICT use among farmers in Tanzania, Sanga, Kalungwizi and Msuya (2013) concluded that community radio stations, mobile phones, digital recorder and desktop computers were the ICTs available to farmers. It is not surprising that radio emerged as the most available ICT facility because of its versatility. There are portable transistor radio sets on the market that can easily be powered by dry cells. This implies that one does not necessarily need electricity to own a radio. These radios can be carried anywhere because of their portability.

Table 2: Availability and ownership of ICT facilities among farmers

ICT Facility	Availability		Ownership	
Mobile Phone	88	97.8	72	80.0
Radio	90	100.0	79	87.8
Computer	75	83.3	5	5.6
Internet	47	52.2	0	0
Television	87	96.7	42	46.7
Video	78	86.7	28	31.1
Satellite TV	38	42.2	0	0

In terms of ownership mobile phone, radio, television, video and computer were ICT facilities farmers owned with radio as the most common (87.7%). This is followed by mobile phone with 80%, television with

46.7%, video with 31.1% and computer with 5.6%. The pattern of ownership is similar to the pattern of availability.

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ICTs used by Farmers

The use of ICT facilities is limited to mainly television, radio and mobile phone. See table 3. The most widely used facility by farmers was found to be radio and was used by about 90% of the farmers. A considerable number of Frequency Modulation (FM) stations are located in various communities and have made communication through radio more convenient. Many of the FM stations have links with communication centers that have been established in communities. The centers help in broadcasting programmes aired by the FM stations and this helps in increasing listenership. The radio programmes are aired in both English and local languages and can thus be used effectively for extension service delivery. MoFA (nd) has stated that radio is a powerful communication tool that has potential for extension in terms of reach and relevance and local broadcasting can achieve a lot if done in a participative way with a focus on the use of FM stations. Sanga, Kalungwizi and Msuya (2013) found out from their work in Tanzania that not only does the majority of farmers have access to radio, they also listen to the Farmers' Voice Radio programmes which are agricultural programmes.

Next to the radio is the mobile phone which recorded about 86% use by farmers. The average price of ordinary mobile phones used for simple communication (about

GHC50.00) makes them relatively affordable and this has increased its use in rural communities. Mobile phone reception has improved tremendously even in remote areas because of the mounting of telephone masts all over the country by the various mobile telecommunication networks. Again the competition among the mobile network operators has helped to bring charges down to somewhat affordable levels. The use of mobile phones for making and receiving calls does not call for elaborate training. With little coaching farmers are able to use the phones. Assenso-Okyere and Mekonnen (2012) have said that the use of ICTs to improve information flow and to connect people within the rural areas has proved that illiteracy of farming communities may no longer be an excuse to deny them extension service.

Table 3: ICTs farmers are using

ICT facility	Frequency	%
Mobile phone	81	90
Radio	77	86
Computer	7	8
Television	40	44

The television (TV) is another ICT facility that is relatively popular among farmers. About 44% of the respondents indicated that they use TV in their homes. As an audio-visual equipment, the TV facilitates understanding of technologies that are demonstrated. It has advantage over radio and mobile phone because it uses the sense of sight in addition to hearing. Its use is only limited by the absence of electricity in some of the rural communities. Assenso-Okyere and Mekonnen (2012) have indicated that ICT-based agricultural extension brings incredible opportunities and has the potential of enabling the empowerment of farming communities.

Areas of application of ICTs by Farmers

The results in table 4 indicate that the mean values for the statements range from 1.41 for emailing friends to 4.83 for making and receiving calls. The 1.41 mean value for emailing friends corresponds to the strongly disagree response category and implies that farmers hardly use ICT for sending and receiving emails to and from friends. This is not surprising since only 5.6% of the farmers own computer, none of them own internet and the majority (50%) do not have any form of formal education and can neither read nor write. They, however, agree that the ICTs are used mainly for making and receiving calls (mean = 4.83; SD = 0.37). The mean value of 4.83 is approximately 5 and this is equivalent to Strongly Agree on the scale. This is followed by the use of ICT for entertainment (mean = 3.70; SD = 0.93) and for receiving agricultural information (mean = 3.64; SD = 1.08). The *t*-values are all positive and significant with $p < .01$ ($p = .000$). This implies there are statistically significant differences between the sample means of the perceptive statements and the population mean. The null hypothesis is thus rejected.

Table 4: Areas of ICT use by farmers

Area of ICT use	Mean	SD	<i>t</i>
Receiving agric. information	3.64	1.01	34.26***
Making and receiving calls	4.83	0.37	122.35***
Entertainment	3.70	0.93	37.76***
Emailing friends	1.41	0.78	17.22***

5 = Strongly Agree, 4 = Agree, 3 = Somewhat Agree, 2 = Disagree and 1 = Strongly Disagree
 $df = 89$, $p < .01$ ($p = 0.000$ for all statements).

Farmers' Perceived Effects of Mobile Phone on Extension Service Delivery

With respect to the effects of mobile phones on extension service delivery, farmers generally agreed that mobile phones have effect on extension service delivery. This is indicated by the mean of means value of 3.81, approximately 4, with an SD = 1.02 which falls within the "Agree" response category on the scale. With the exception of "Eased scheduling of meetings" with a mean of 3.06; SD = 1.11 and is equivalent to "Somewhat Agree" on the scale, the farmers agreed with all the remaining perceptive statements, namely, increased interaction (mean = 3.70; SD = 1.20), timely delivery of information (mean = 4.21; SD = 0.88) and saves cost, time and energy of visiting AEAs (mean = 4.26; SD = 0.89). The *t*-values for all the statements are positive and statistically significant at 1%. This is indicative of the fact that there are significant differences between the sample means of the statements and the population mean. The null hypothesis is therefore rejected. Table 5 below shows the effects of mobile phone use on extension service delivery.

Table 5: Farmers' Perceived Effects of Mobile Phone on Extension Service Delivery.

Effects of Mobile Phone	Mean	SD	<i>t</i>
Increased Interaction	3.70	1.20	29.17***
Timely Delivery of Information	4.21	0.88	45.38***
Saves Cost, Time and Energy of Visiting AEAs	4.26	0.89	45.16***
Eased Scheduling of Meeting	3.06	1.11	25.23***
Mean of means	3.81	1.02	

5 = Strongly Agree, 4 = Agree, 3 = Somewhat Agree, 2 = Disagree and 1 = Strongly Disagree
 $df = 89$, $p < .01$ ($p = 0.000$ for all statements).

The findings of this study on mobile phone use are in line with that of Fu and Akter (2012) who found out in their study to examine the impact of mobile phone technology-assisted agricultural service delivery system (KHETI) for poor and marginalised farmers in Madhya Pradesh of India that mobile phone assisted services were useful and faster in terms of information dissemination. The framers again admitted that the experience of using mobile phone technology-assisted extension services had made them feel more at ease with new technology and would help them to adapt to new things in the future (Fu and Akter (2012).

Farmers Perceived Effects of Radio on Extension Service Delivery

The results, as indicate in table 6 show that only one statement out of the four “Enhances Best Farm Practices” had a mean response that falls in the Somewhat Agree category (mean = 2.88; SD = 1.18). The remaining three statements had mean values of 3.69, 4.06 and 3.53 with standard deviation values of 0.92, 0.89 and 1.01 for “Improves technology adoption”, “Enhances awareness of agricultural innovation” and “Improves farmers bargaining power” respectively. All the means for the three statements are indicative of the fact that farmers agree with them. This implies that for many of the farmers radio plays a crucial role in assisting them to adopt technologies, enhancing their awareness of innovations and improving their bargaining power. The *t*-values for all the statements are statistically significant at 1%. The null hypothesis is thus rejected. Jones (1997) has stated that ICT can give a new impetus to the social organizations and productive activity of agriculture which, if nurtured effectively, could become transformational factors. Chapman, Blench, Kranjac-Berisavljevic and Zakariah (2003) realised in their study in Northern Ghana that Rural radio could be used to improve the sharing of agricultural information by remote

rural farming communities. Farm Radio International (FRI) (2007) is also of the opinion that radio is an excellent, cost-effective means of sharing knowledge, building awareness, facilitating informed decision-making and supporting the adoption of new practices by small-scale farmers.

Table 6: Farmers Perceived Effects of Radio on Extension Service Delivery

Perceived Effects of radio	Mean	SD	<i>t</i>
Improves Technology Adoption	3.59	0.92	38.05***
Enhances Awareness of Agricultural Innovation	4.06	0.89	43.16***
Improves Bargaining Power of Farmers	3.53	1.01	33.26***
Enhances Best Farm Practices	2.88	1.19	23.16***
Mean of Means	3.52	1.00	

5 = Strongly Agree, 4 = Agree, 3 = Somewhat Agree, 2 = Disagree and 1 = Strongly Disagree df = 89, p < .01 (p = 0.000 for all statements).

Farmers’ Perceived Effects of Television on Extension Service Delivery

From the results in table 7, famers were in agreement with only one of the statements; “learned to use some technologies” (Mean = 3.50; SD = 0.88). The mean values of the remaining two statements, “Enhanced application of technologies” (Mean = 3.49; SD = 0.99) and “I receive reliable information on weather for farming activities” (Mean = 2.9; SD = 1.01). The mean values put the perceptions of farmers in the Somewhat Agree response category. This implies that farmers do not agree fully with these statements. The *t*-values for all the statements are positive and statistically significant at 1% ($p < .01$). The null hypothesis is therefore rejected. The above discussion shows that majority of farmers used television as a learning tool.

Table 7: Farmers Perceived Effects of Television on Extension Service Delivery

Perceived Effect of Television	Mean	SD	t
I Learned to use some Technologies	3.50	0.88	37.85***
It has Enhanced Application of Technologies	3.49	0.99	33.19***
I receive reliable information on weather for farm activities	2.90	1.01	25.69***
Mean of Means	3.29	0.96	

5 = *Strongly Agree*, 4 = *Agree*, 3 = *Somewhat Agree*, 2 = *Disagree* and 1 = *Strongly Disagree* df = 89, $p < .01$ ($p = 0.000$ for all statements).

CONCLUSIONS

Mobile phone, radio, computer and video are the most available ICTs among the farmers. The ICTs used by farmers for extension are the mobile phone, radio, television and computer. Farmers use the ICTs mainly for entertainment, receiving agricultural information, making and receiving calls from AEAs and colleague farmers and, to a very limited extent sending emails to friends. The use of mobile phone has resulted in increased interaction among farmers and between farmers and extension workers, timely information delivery, and effective use of the AEAs time and energy during visits to farmers. Through the use of radio technology adoption has improved among farmers. It has also enhanced awareness of agricultural innovations and improved the bargaining power of farmers. Television use by farmers has enabled them learn how to use some technologies and enhanced their application of technologies.

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