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ORIGINAL RESEARCH ARTICLE

Communication exposure of sub-assistant agriculture officers (SAAOs) towards e-agriculture in Khulna district of Bangladesh

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ABSTRACT

The purpose of this study was to determine the extent of communication exposure of the Sub-Assistant Agriculture Officers towards e-agriculture in Khulna district of Bangladesh. Study was conducted in the five selected upazilas of Khulna city *viz.*, Rupsa, Dighalia, Phultala, Dumuria and Batiaghata which consist of 108 agricultural blocks. A sample of 100 Sub-Assistant Agriculture Officers (SAAOs) was selected from these blocks. Data were collected following a structured pretested interview schedule. Findings revealed that most 60% of the SAAOs had low communication exposures to e-agriculture. Correlation analysis indicates that age, income and service experience had negative significant relationship with communication exposures of SAAOs to e-Agriculture. T raining exposure and knowledge on e-agriculture had positive significant relationship with their communication exposures towards e-agriculture. The enter method of regression analysis revealed that knowledge on e-agriculture, training exposure and monthly income described 77.5 percent variation in the communication exposure of SAAOs. The estimates indicated that knowledge on e-Agriculture had strongest (β=0.479) contribution to the variance of communication exposure to e-Agriculture. On the other hand, monthly income had contributed to the variance of communication exposure of SAAOs towards e-Agriculture in negative direction (β=-0.156). Mobile phone was the highest preferred device in using e-Agricultural media by the SAAOs. "Unfamiliarity of extension workers with e-agriculture application" was the main personal constraint and "lack of training on e-agriculture" was the main organizational constraint which might have led to low communication exposure of SAAOs towards e-agriculture.

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INTRODUCTION

Bangladesh is an agrarian country and agriculture is the backbone of its economy where more than 60% land is used for cultivation (Ahmed, 2007). The national economy of Bangladesh is primarily based on agriculture and more than 80% of the total populations are directly or indirectly engaged in a wide range of agricultural activities. Agriculture sector contributes about 15.89% of GDP for her national economy (BBS, 2014). As now-a-days decreasing availability of natural resources but the agricultural sector is confronted with the major challenge of increasing production to feed a huge population (Bhalekar *et al.*, 2015). However, the growing demand, including for higher quality products, also offers opportunities for improving the livelihoods of rural communities (Bhalekar *et al.*, 2015). But to enhance the livelihoods of the rural population, new approaches and technical innovations are required to cope with these challenges. In this regard information and communication

technology (ICT) plays a vital role in agricultural development by providing fast and relevant information to the end users (Reddy, 2012) and different government and non-government organizations that have been working in this field (Jensen, 2007) by practicing e-agriculture. E-Agriculture has been defined as an emerging field for enhancing sustainable agriculture and food security through technology dissemination and delivering information by using Internet and related technologies (Ghogare and Monga, 2015). More specifically, it involves the conceptualization, design, development, evaluation and application of new (innovative) ways to use existing or emerging information and communication technologies (ICTs) (Singh *et al*., 2015; Ghogare and Monga, 2015). ICTs can speed up agricultural technology transfer from research and development institutions to farmers (Joyous and Paul, 2016). ICTs improve adoption of agricultural technology by supporting farmer learning, problem solving and accessibility to profitable markets for their crops (World Bank, 2011). Asfaw *et al*. (2012) argue that development of agriculture can only be possible through the dissemination of improved agricultural technologies and information to the farmers in the rural area. In Bangladesh all agricultural information and recommended technologies are being disseminated to grass-root level by Department of Agricultural Extension (DAE) especially by the extension workers who are designated as Sub-Assistant Agriculture Officer (SAAO). The information needs of farmers will increase in the changing context of agriculture as they must make more and more complex decisions that impact the livelihoods of their families and society (FAO, 2015). Agricultural extension is a service or system which increases the knowledge of farmers through educational procedures, it helps to improve farming methods and techniques, increase farmer's income and raise the living standards of rural life. Agricultural extension could be considered as a connector between the information of scientists and Governmental bodies and agricultural practice or farming (Timmer, 1982). The farmer's desired agricultural information is required on urgent basis; the Sub-Assistant Agriculture Officer (SAAO) can access e-agriculture to obtain the necessary agricultural information from the concerned person or the authentic source in a short time. In past the extension agents face difficulties in facilitating direct contact with farmer clients and with researchers due to the physical distances involved and lack of transportation needed for their mobility, but now the use of Information and Communication Technologies offers excellent possibilities, for strengthening research extension systems. Agricultural extension is one of the most important sectors in which ICT have particularly significant impact because it is solely depending on information dissemination and technology transfer (Ballantyne and Bokre, 2003). The frontline extension workers have direct communication between farmers and other actors in the extension of agricultural knowledge and information systems; they have great scope to make use of ICT to access expert knowledge or other types of information that could facilitate the accomplishment of the farmer's routine activities (Fawole and Olajide, 2012). Making frequent access of e-agriculture by the agricultural extension workers, they will able to gather much needed agricultural information (i.e., pre-harvest and post-harvest information, pricing, weather conditions among others) that can boost agricultural productivity (Awuor *et al*., 2013). With limited SAAOs disseminating quality information to the farmers we need to adopt e-agriculture as an effective tool. As the Sub-Assistant Agriculture Officers (SAAOs) are the prime outlet of agricultural information for the farmers, so it is necessary to know to what extent the extension workers are using e-agriculture now.

The objectives of this study are: a) to determine and describe the extent of communication exposure of Sub-Assistant Agriculture Officers (SAAOs) towards e-Agriculture. b) to identify the factors contributing the extent of communication exposure of Sub-Assistant Agriculture Officers (SAAOs) towards e-agriculture. c) to identify some constraints of communication exposure towards e- agriculture. d) to identify the device preference in using e-agriculture by the SAAOs.

MATERIALS AND METHODS

The study was conducted in Khulna district which consist of nine upazilas such as Phultala, Terokhada, Dumuria, Rupsa, Dighalia, Paikgaccha, Batiaghata, Dacope and Koyra upazilas. From nine upazilas, five upazilas (Phultala, Dumuria, Rupsa, Dighalia, Batiaghata) were purposively selected as the locale of the study as these are close to city and may have greater access to e-agriculture.

Population and sample of the study

Total number of SAAOs in Dumuria, Rupsa, Dighalia, Batiaghata and Phultala upazilas of Khulna district were 108 which constitute the population of the study. Out of this population, several 100 (93%) respondents were selected as the sample of the study. With the consideration of population size=108, confidence interval=99, margin of error=5 the required number of sample size was 94. Selected sample size can exceed the required sample size. Distribution of population and sample are shown in Table 1.

Collection of data

In order to amass pertinent information, an interview schedule was prepared that contained both close and open type questions. Appropriate technique and measurement were applied to ensure correct responses of the variable concern. Data were collected from the respondents through personal contact by the researcher himself. The researcher made all possible efforts to establish rapport with the respondents so that they could feel easy to respond to the questions contained in the schedule. Data collected from the respondents were coded, compiled, tabulated, and analyzed in accordance with the objectives of the study. Qualitative data were converted into quantitative form by assigning suitable score whenever needed. The biasness of usage or uniformity of interview was prohibited.

Statistical tests

Descriptive statistical methods like range, mean, percentage distribution and standard deviation were used in describing the dependent and independent variables. For clarity of understanding, tables were used in presenting data. For exploring the relationship between the selected characteristics of the SAAOs with their communication exposure towards e-agriculture Pearson's Product Moment Coefficients of correlation (r) and regression analysis were used. Throughout the study $P<0.05$ as 95% of probability was used as a basis for rejecting or accepting the null hypothesis. The SPSS v16.0 (statistical package for social sciences) was used to perform data analysis.

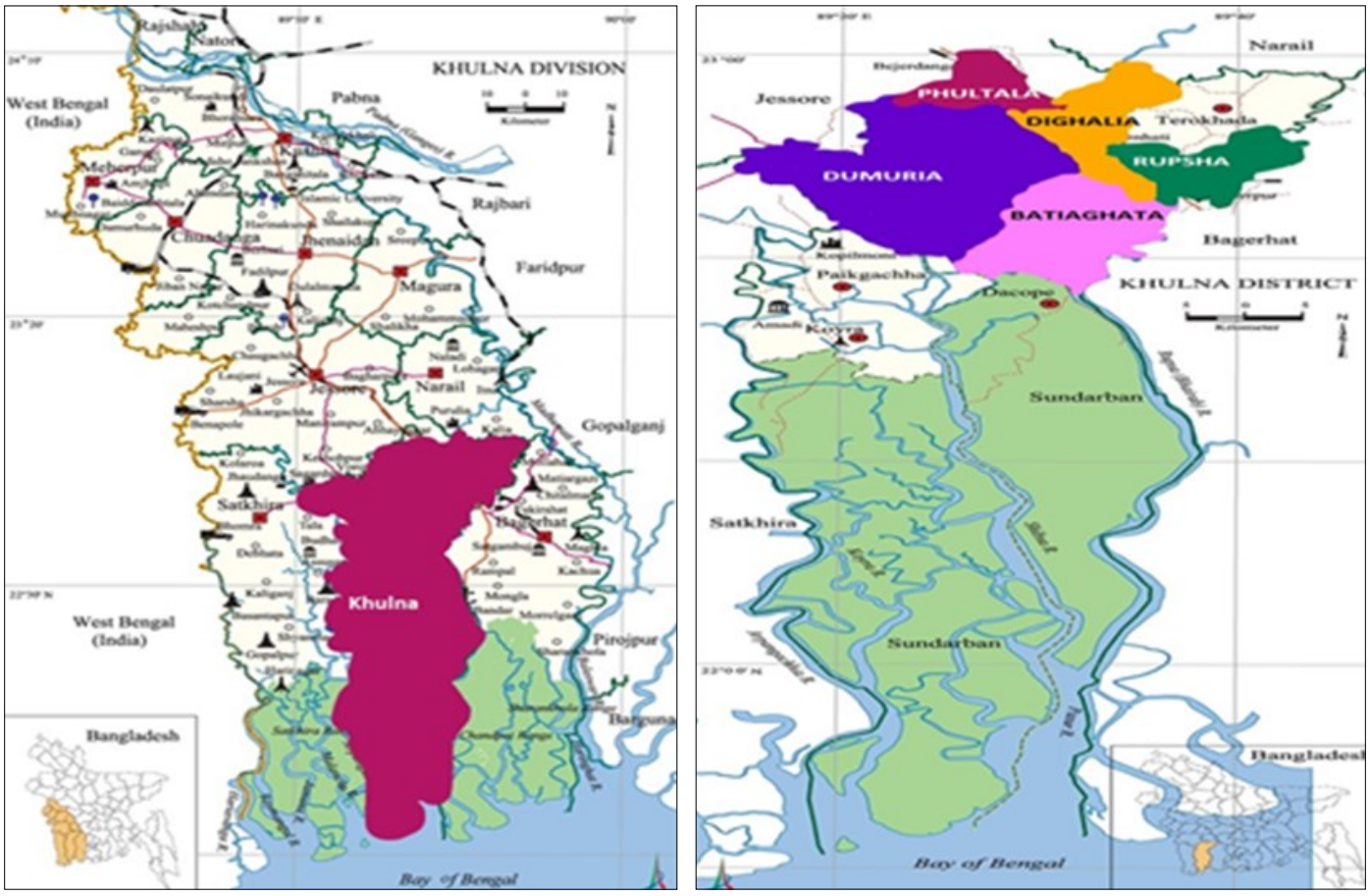

Figure 1. *The first map 1 (a) showing the location of Khulna division in Bangladesh (inset) and Khulna district in the division. Figure 1 (b) shows the five selected study areas (upazilas) in Khulna district (Source: Banglapedia, National Encyclopedia of Bangladesh, 2011).*

Table 1. Distribution of population and sample from Dumuria, Rupsa, Dighalia, Batiaghata and Phultala upazilas of Khulna district.

District	Upazilas	Population	Sample
Khulna	Dumuria,	42	38
	Rupsa,	15	14
	Dighalia,	17	16
	Batiaghata	22	21
	Phultala	12	11
Total		108	100

RESULTS AND DISCUSSION

Socio-economic characteristics of the SAAOs

In the present study, seven characteristics of SAAOs were selected for investigation. These characteristics were age, monthly income, service experience, training exposure, job satisfaction, knowledge on e-Agriculture and organizational technological support. The study revealed that maximum (88%) SAAOs of this area were middle to old aged. An old aged person usually showed reluctance to use e-agriculture related media. An investigation conducted by Salau and Singbe (2008) revealed that the elderly people might be less interested in the use of hi-tech innovations in field level work. As the SAAOs are middle to old aged so that highest portion (53%) of SAAOs has long service experience. Naturally with the increase of age, service experience is increased. As the age and service experience increased most of the SAAOs tend to become less active and does not show interest in adopting newer technologies regarding their professional field. This may have contributed to form negative relationship with service experience and their communication exposures towards e-agriculture. It has also a positive side because experience makes a person more skilled and competent in his own work. Surprisingly it was found that a one-third of (75%) SAAOs had no training on e-agriculture. DAE is still in introductory stage of e-agriculture. So, a very few projects addressed e-agriculture. That's why most of the SAAOs had no training on e-agriculture. It was also happened because of their aging condition; they showed unwillingness to get any relevant training. It is well known that training plays vital role for the development of knowledge, skill and attitude of a person, which makes him more capable and competent and helps an individual participate more in the development process more cheerfully with confidence. Maximum (41%) SAAOs had high income.

Because most of the SAAOs were old aged, so that according to increase their age SAAOs are become more experienced and well salaried. The job satisfactory level of maximum (67%) SAAOs were medium, because they are experienced in job but less competent in using ICTs for agricultural cultivation purpose. Knowledge and perception of any individual increases his/her awareness, mental alertness makes him/her familiar or acquaint with facts, objects, concepts, or practices and helps one to become rational which in turn increases his adoption rate of a new technology (Chen *et al*., 2018). But in this area majority (55%) of SAAOs has medium knowledge in e-agriculture, the main reason of this is e-agriculture is a newer concept in Bangladesh and DAE has a very few trainings on e-Agriculture (Table 2). According to Prodhan and Afrad (2014), more than 84.4% of the respondents had medium to high knowledge towards ICT utilization because most of the respondents be aware of that extension work can be greatly enhanced by ICT and Knowledge of ICT use has a great significance in agricultural development. Ahmadpour *et al.* (2016) indicated the knowledge on e-learning improves possibility to adopt e-learning training on the job in the extension workers of Iran. Arokoyo (2005) also identified high level of illiteracy as a serious constraint to ICT utilization by extension workers and farmers. However, it is observed that an overwhelming majority (80%) of respondents in the study area had less to moderate organizational technical support from different relevant GOs and NGOs, which is also a constraint for the SAAOs to develop their efficiency in e-agriculture sector.

Table 2. Socio-economic characteristics of the SAAOs (n= 100).

Characteristics	Categories	Percentage	Mean	SD
Age	Young aged (up to 35 years)	13	45.44	8.74
	Middle aged (36-45years)	34		
	Old aged (>45 years)	53		
Service experience	Short (up to 10 years)	22	21.36	11.10
	Medium (11-20 years)	25		
	Long (above 20 years)	53		
Training experience	No training (0 day)	75	2.04	5.11
	Low training (1-7 days)	19		
	Medium training (8-15 days)	4		
	High training (above 15 days)	2		
Monthly income	Low income (up to 25)	39	30.45	9.04
	Medium income (26-35)	20		
	High income (above>36)	41		
Job satisfaction	Low job satisfaction (up to 10)	10	13.75	2.37
	Medium job satisfaction (11-15)	67		
	High job satisfaction (above>16)	23		
Knowledge on e-agriculture	Low knowledge (up to 7)	36	8.52	4.76
	Medium knowledge (8-15)	55		
	High knowledge (above 15)	9		
Organizational support	Less support (up to 5)	9	9.01	3.05
	Moderate support (6-11)	71		
	High support (above>12)	20		

Table 3. Distribution of the respondents according to their communication exposure towards e-agriculture.

Categories	Respondents		Mean	SD
	Number	Percent		
Low communication exposure (up to 5)	60	60	5.74	3.49
Medium communication exposure (6-10)	28	28		
High communication exposure (above>1)	12	12		
Total	100	100		

Table 4. Regression coefficients between communication exposures towards e-agriculture of the respondents with their selected characteristics.

Independent variables	B	SE	B	t	P	VIF
Constant	4.164	1.090		3.822	0.000	
Training exposure	0.205	0.055	0.301	3.758	0.000	1,542
Knowledge on e-Agriculture	0.351	0.059	0.479	5.975	0.000	1.550
Income	-0.060	0.028	-0.156	-2.187	0.031	1.228
R^2=0.775 Adj. R^2=0.601		F=48.23			P<0.000	

Communication exposure of agricultural extension workers towards e-agriculture

The use of information and communication technology (ICT) is becoming progressively more widespread throughout various sectors including education, business as well as agriculture (Olowa, 2012). ICT as an extension tool could enhance the flow of information in the application of agricultural extension services. Communication exposure of SAAOs towards e-agriculture scores ranged from 3 to 17 against the possible range of 0 to 36. Based on observed maximum and minimum communication exposure score and number of categories, the following categories were formulated in the Table 3.

Results furnished in table 3 shows that an overwhelming majority (88%) of respondents in the study area had low to medium communication exposure towards e-agriculture. It indicates that majority of the SAAOs are out using rarely or often of e-agriculture in our agricultural extension services. Possible reasons for low communication exposure may be lack of organizational policy support, lack of training on e-agriculture and lack of knowledge of SAAOs in e-agriculture. Mugwisi *et al.* (2015) found that there was a high prevalence of ICTs to the extension workers in Zimbabwe (63% had computer in office) and they used online database, journals, internet, e-mails, data storage, video recorder, and information management. This finding suggests extension workers in Bangladesh are far behind the extension agents of Zimbabwe in terms using ICTs in agriculture. It is a wake-up call for government agricultural extension services in Bangladesh.

Regression coefficients between communication exposures of the respondents with their selected characteristics

For predicting the contribution of the factors in the communication exposure of the respondents towards e-agriculture the enter regression method was applied. Among the seven characteristics, five characteristics namely age, income, service experience, training exposure, knowledge on e-agriculture were selected for regression analysis which had shown significance relationship with the communication exposure (dependent variable) in correlation coefficients. Regression coefficients of communication exposure of the respondents with their selected characteristics are shown in the Table 4.

Results furnished in Table 4, shows that the R^2 value is 0.775 and corresponding F value is 48.23 which were significant at 0.000 levels. The R^2 value indicating that 77.5 percent of the total variation in the communication exposure of SAAOs towards e-agriculture were explained by three variables included in the regression analysis. Age and service experience could not be explained in regression analysis because these two factors were showing co linearity in regression analysis. The results show that the communication exposure of the respondents towards e-agriculture is the function of Training exposure (β=0.301), knowledge on e-agriculture (β=0.479) and Income (β=-0.156). The estimates revealed that knowledge on e-agriculture has the strongest contribution to the communication exposure of the respondents towards e-Agriculture. It was therefore, concluded that with the increase of knowledge on e-agriculture and training exposure, the communication exposure of the respondents will be positively influenced. Use of ICT enables extension workers to play complimentary roles of accessing and transferring relevant and pertinent information to farmers (Meera *et al.*, 2004). Considering the urgency of training, there is strong suggestion for providing training to the extension workers and officers on the use of ICT (Leary and Berge, 2006; Mugwisi *et al.*, 2015). Extension agents must have knowledge on e-agriculture and need to understand the importance of these technologies for increasing their efficiency and productivity in relation to technology transfer (Sife *et al.*, 2007). The results also indicated that income had negative contribution to the communication exposure. It is expected as those who had higher income (from salary mainly), were the old extension workers. This result is quite opposite to the findings of Yakubu *et al.* (2013) where with the increase of age and income, extension workers tend to use ICTs more than others. Again this finding is supported by Fawole and Olajide (2012), who found young-aged farmers tend to adopt ICTs than the old one which confirms the general disposition to ICT use that older people are generally least user of ICTs.

Table 5. Distribution of the respondents according to their device preference score.

S.N.	Digital communication media	Name of preferred devices						
		Mobile (%)	Laptop (%)	PC (%)	Tablet (%)	Net book (%)	Television (%)	Radio (%)
1	Website	16	12	4	2	2	NA	NA
2	E-mail	8	9	4	1	2	NA	NA
3	Video chatting	11	3	1	0	0	NA	NA
4	Phone call	95	0	0	5	0	NA	NA
5	Social media	43	4	1	0	0	NA	NA
6	Television program	3	0	5	1	0	17%	NA
7	Radio program	7	0	0	0	0	NA	9%
8	Application (Apps)	15	0	0	0	0	NA	NA
9	Documentary	2	0	3	0	0	0	NA
10	Online newspaper	19	5	1	0	0	NA	NA
11	SMS	33	0	0	0	0	NA	NA
12	MMS	11	0	0	0	0	NA	NA

NA= Not applicable.

Table 6. Constrains of communication exposure towards e-agriculture as faced by the respondents (n=100).

Personal constraints	Percent of respondents	Rank
Unfamiliarity of extension worker with e-agriculture application	79	1
Lack of skill to use e-agriculture	71	2
Lack of knowledge on e-agriculture application	53	3
Lack of interest to use e-agriculture	44	4
Language problem for old aged extension worker to use e-Agriculture	41	5
Organizational constraints	**Percent of respondents**	**Rank**
Lack of training on e-agriculture	89	1
Lack of instrument (laptop, computer, tab)	81	2
Poor internet facility	51	3
Weak mobile networking system	49	4
Lack of ICT related communication in DAE	32	5

Preferred devices in using e-agriculture by the respondents

Agriculture is one of the vital sectors in which ICT can be used reasonably in transferring the modern agricultural technologies to the farmers (Prodhan and Afrad, 2014). Information and communication technology in agriculture includes internet, e-mail, cell phone, computers, radio, television, wireless communication tools, audio visuals, digital camera, CD-ROM, printer, fax which helps in timely communication at agricultural extension services (Fawole and Olajide, 2012; Mugwisi *et al*., 2015). To know the device preference by the SAAOs in using e-agriculture twelve media were selected against 7 devices. Device preference by the agricultural extension worker in using selected e-agriculture media is presented in Table 5.

From data furnished in the Table 5, it was very clear that among those media mobile was mostly used device for making phone call (95%), using social media (43%) and for sending SMS (33%). Mobile phone was also considered effective ICT device by the extension workers and researchers in Zimbabwe and around half of the agents used mobile phone for communicating agricultural information (Mugwisi *et al*., 2015). The 2nd most preferred device by the SAAOs was laptop and it was mostly used in browsing website (12%) and sending e-mail (9%). PC was less preferred device than laptop. Tablet computer was mostly used in making phone call (5%) and website browsing (2%). Net book was the least preferred device and used for only browsing website and email. However, television and radio program were also enjoyed from mobile phone and PC. It was surprising to note that only 15 percent agents used mobile apps to gather agricultural information. Now-a-days, there are a good number of apps available in Google play store for android phones. Lack of introduction and training may be responsible for such poor exposure. Less use of website, documentary, apps, e-mail and high use of phone call suggest that extension agents are comfortable with readily available information from one to one communication either from peers or from experts rather than self-quest for new information.

Constraints of communication exposure towards e-agriculture as faced by the respondents

The major constrains faces by the SAAOs were classified into two categories such as personal constrains and organizational constraints. Constraints faced by the SAAOs in respect of, "communication exposure towards e-agriculture" were constructed in Table 6.

Constraints furnished in Table 6, indicate that "unfamiliarity of extension worker with e-agriculture application", "lack of skill to use e-agriculture" and "lack of knowledge on e-agriculture application" were the most cited personal constraints of communication exposure towards e-agriculture. On the other hand, "lack of training on e-agriculture", "lack of ICT instrument", and "poor internet facility" were the most crucial organizational constraint of using e-agriculture. Lack of skill was not a constraint for Nigerian extension officers rather poor infrastructure, poor connectivity, poor electricity, high price of ICT, and lack of ICTs hindered access to ICT (Akpabio *et al*., 2007). Another study with farmers by Fawole and Olajide (2012), from Nigeria confirmed farmers' illiteracy constrained them to use ICT. Overall, it can be said that extension agents in study area still struggles with very basic access, knowledge and use related problems in implementing e-agriculture.

Conclusion

Despite inevitable future, e-agriculture has not gained much land in government extension service in Bangladesh. Still a good number of extension agents in this study are not well acquainted with e-agriculture and possess insufficient knowledge in ICTs. The situation even worse when we consider two third of the extension agents have no training on e-agriculture. Most of the agents were middle to old aged who generally prefer mobile phone to have interpersonal communication rather than sophisticated use of smart phones like using agricultural applications. Government agricultural extension service provider in Bangladesh, the DAE needs periodic recruitment to inject new ideas, skills, and spirit in the service. Devices preference for using e-agriculture shows the agents are a very basic user of ICT devices. Lack of skill, training, knowledge and availability of ICT devices hindered agents' exposure to e-agriculture. Organizational support through training on e-agriculture and providing more ICT devices along with introduction of digital library, creating digital contents and documentaries may help in increasing use of ICTs in agriculture by the extension agents.

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