

Utilization of ICTs in Agricultural Extension Services of Bangladesh

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Authors' contributions

This work was carried out in collaboration between all authors. Author MSI designed the study, managed the literature searches, wrote the protocol, collected data, analyzed the data and wrote the first draft of the manuscript. Authors MEH, MSIA and HMA finalized the design, protocol and checked the draft report. Author MZH helped in protocol setting, performed the statistical analysis and their interpretation. All authors read and approved the final manuscript.

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ABSTRACT

Information and Communication Technology (ICT) has become the most influential means of disseminating information required by the people globally. Bangladesh has made remarkable progress to effectively start using ICT for agricultural extension services. Therefore, the present study was carried out to explore the extent of ICT's utilization by the field level extension personnel under agricultural extension service delivery system. A sample of 110 Sub Assistant Agriculture Officers (SAAOs), were selected as respondents from five upazilas of Manikganj district of Bangladesh following proportionate random sampling technique. Data were collected through face to face interview, case study and Focus Group Discussion (FGD) methods. Utilization level of ICTs was measured considering two aspects i) collecting information and ii) providing services. Statistics

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like range, mean, standard deviation, Chi-square and correlation analysis were used. Findings revealed that a total of 52.7 percent and 97.27 percent respondents used mobile phone regularly for collecting information and providing services, respectively. Considering the two perspectives, ICT was the most utilized for collecting information followed by providing service by the respondents. Among different ICT tools, mobile phone was highly used by the respondents both for official (93.64%) and personal purpose (100%). Overall utilization of ICT was very low. Only 12.7 percent and 5.5 percent respondents highly utilized ICTs for collecting information and providing services respectively. A total of 48.2 percent and 79 percent respondents had low level of utilization of ICTs for collecting information and providing service respectively. Positive and significant relationship was found between training exposure, source of information use by the respondent, job satisfaction and perception on ICT, with their utilization of ICT in agricultural extension services. As the respondents are solely depending on mobile, so other modern mobile based technology could be easily acceptable for them and it could be a vital solution for proper utilization of ICT in agricultural extension service.

Keywords: SAAO; ICTs; agricultural extension; Bangladesh.

1. INTRODUCTION

Bangladesh's economy largely depends on agriculture despite the top most vulnerable country in respect of experiencing bad consequences of climate change [1,2]. Agriculture alone contributes about 17.22 percent of total Gross Domestic Product (GDP) accommodating around 45.6 percent of labor forces [3]. Hence agriculture is a vital factor for sustainable development of Bangladesh. To attain economically profitable farming operation, farmers must go for technology based farming practices. But the farmers' knowledge about the modern technology on production, processing and storage are very limited, as they do not follow the appropriate techniques from the beginning of crop production to post-harvest processing [4]. DAE (Department of Agricultural Extension and Rural Development) is the only governmental body to disseminate required information and technology to the farmers. However, total number of extension workers (SAAOs) in each block is very few compared to the number of clients. Hence, the farmers are running their farming activities with deficit of necessary information [5]. In this situation, widespread use of ICTs by the extension service providers can be a noble solution. Moreover, the extension workers are facing different kinds of barriers [6] in providing services through ICTs like loadshedding, slow speed of internet and inadequate equipments [7].

In the era of globalization, Information and Communication Technology (ICTs) is the most powerful resource for the widespread transfer and sharing of information [8]. It is the convergence of media (print, audio, video,

multimedia etc.) made possible by a common digital platform [9] and it is perceived to have the potential to boost economic, social and political development, contributing toward the progress of humankind as a whole [10]. It can send fast, consistent and exact information in a user-friendly manner for practical application by the end user [11]. ICTs can be used to enable, strengthen or replace existing information systems and networks. Its utilization in agriculture can promote and distribute new and existing farming information for bringing social and economic changes [12].

It's vital that farmers should receive agricultural information as fast as possible so that they understand, interpret, accept and use the information to get desired benefit [13]. ICT could be the best solution for effective spread of agricultural information and technologies. Hence, Government of Bangladesh has recognized ICT as the mainstream development tool to lift the economic and social status of the citizens of Bangladesh under the vision 2021 [14]. ICTs can give a new impetus to the social organizations and productive activity of agriculture, which could become a major factor in the transformation stages of Bangladesh agriculture [15]. So, Bangladesh can foresee a remarkable progress in agricultural development ensuring ICT embodied service providers. However, there is dearth of information regarding the utilization level of ICTs by the extension service providers. This study investigates the utilization of ICT by extension workers in agricultural extension services. It is expected that the findings of this study will pose a shade on the ongoing flow of ICT based development program in agriculture sector and find out the existing manner of ICT

utilization by the agricultural extension workers in Bangladesh.

2. METHODOLOGY

The study was carried out in five upazila under the Manikganj district of Bangladesh viz. Manikganj Sadar, Harirampur, Singair, Satura and Sibalaya. Total number of Sub Assistant Agriculture Officers (SAAOs) in those five upazilas of Manikganj district were 144 which constitute the population of the study. Out of this population, a total of 110 SAAOs were selected as the sample of the study following proportionate random sampling technique. Primary, secondary, quantitative and qualitative data were collected for the present study. For collection of primary data from the respondents, a pre-tested interview schedule was used.

Utilization of ICT in agricultural extension service was the dependent variable of the study. The null hypothesis was “there is no significant

relationship between selected characteristics of agriculture extension workers and their utilization of ICT in agricultural extension service”. Extent of use of different ICT tools were measured on four-point scale and respective score were assigned against each scale viz. a) highly use (score 3), b) moderately use (score 2), c) rarely use (score 1) and d) never use (score 0). A total of 10 statements (both perspectives viz. collecting information and providing service) were considered under the utilization of ICT in agricultural extension service. To measure utilization of ICT, a 5-point rating scale ranging from 4 as ‘regularly use’ to 0 as ‘never’ was used. The respondents were asked to rate 10 statements based on a 5-point rating scale. The utilization score could range from 0 to 40, while 0 indicating no utilization and 40 indicating the highest level of utilization of ICT. After collecting all the score, the sum of score was calculated for each of the statements and ranking was done for identifying the prevalent utilization of ICT in agricultural extension service. Each individual respondent got a score in different perspectives.

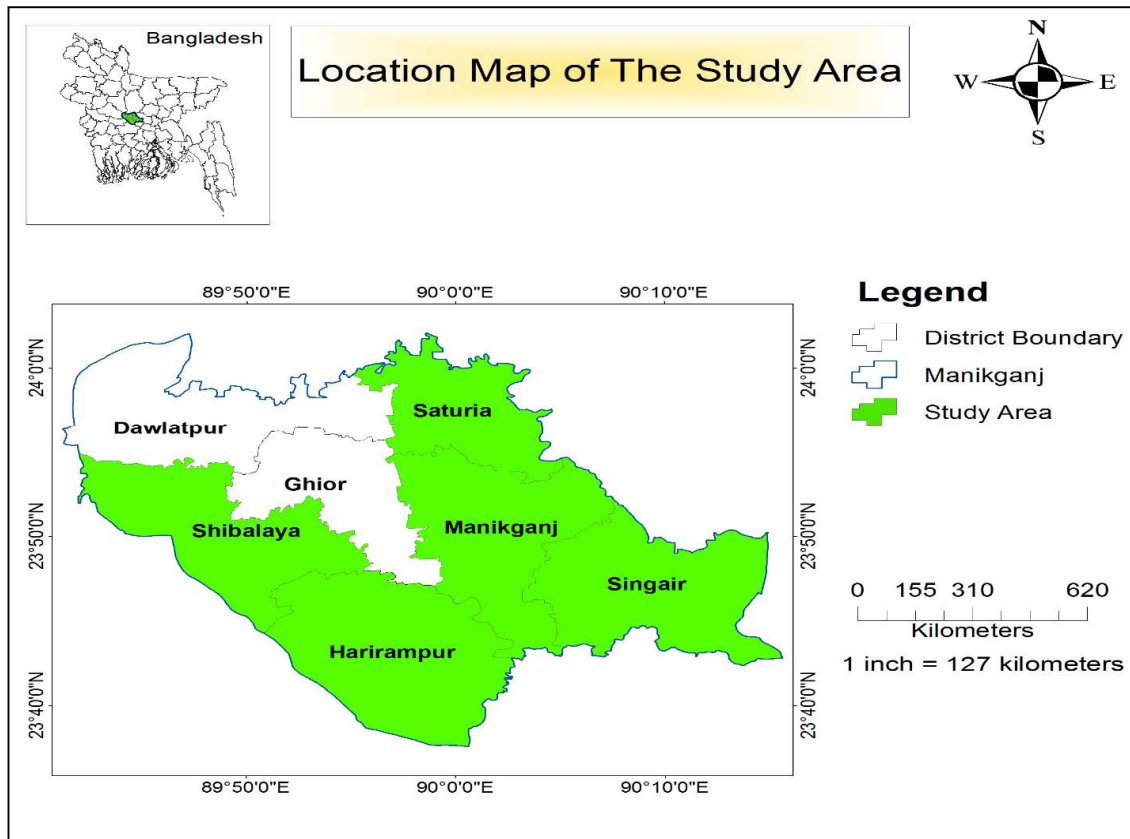


Fig. 1. Location map of the study area

The score of an individual in a perspective may range from minimum score 0 to height score 40. The scores were categorized to identify the utilization level of ICT by the respondents as low, medium and high. Statistics like range, mean, standard deviation, Chi-square test and co-efficient of correlation were used in the study. The SPSS/PC + computer program (Statistical Package for Social Sciences) and Microsoft Excel programs were used to perform data analysis.

3. RESULTS AND DISCUSSION

3.1 Selected Characteristics of the Respondents

The selected characteristics profile of the respondents is presented in Table 1. Results furnished in Table 1 exposed that majority of the extension workers were old aged (61.8%) with long service experience of more than 20 years (74.5%), had medium job satisfaction (90.0%) and medium level of use of information sources. Regarding educational qualification,

majority (67.3 percent) of the respondents had completed Secondary School Certificate exam and diploma in agriculture. They had undergone maximum of two training on ICT. But [6] found majority of the respondents were middle aged with medium service experience while conducting a study with extension officers of Gazipur district of Bangladesh. In case of educational qualification and training exposure, [6,16] found similar results, respectively.

3.2 Use of Different ICT Tools

The respondents use different ICT tools for their official purpose. Data presented in Fig. 2 represents the use of different ICT tools by the respondents in their official purpose.

About 94 percent of the respondents highly used mobile phone followed by smart phone (8%) and digital camera (6%) and other tools had very limited use. It's a major concern that only 3 percent and 1 percent respondents highly use internet and computer, respectively.

Table 1. Distribution of the respondents according to their socio-demographic characteristics

Characteristics	Number	%	Mean	SD
Age				
Young (up to 35)	10	9.1		
Middle aged (36-50)	32	29.1	48.7	8.8
Old (above 50)	68	61.8		
Service experiences				
Short term (up to 10)	10	9.1		
Medium term (11-20)	18	16.4	26.6	10.2
Long term (above 20)	82	74.5		
Job satisfaction				
Low (up to 22)	08	7.3		
Medium (23-34)	99	90.0	27.3	2.96
High (above 34)	3	2.7		
Perception on ICT				
Low (up to 35)	10	9.0		
Medium (36-50)	94	85.5	41.1	8.2
High (above 50)	6	5.5		
Use of information sources				
Low (up to 18)	14	12.7		
Medium (19-28)	72	65.5	24.7	5.23
High (above 28)	24	21.8		
Educational qualification				
Diploma & SSC	74	67.3		
Diploma & HSC	26	23.6		
Diploma & Bachelor	10	9.1		
Training on ICT				
No training	39	35.5		
Single training	49	44.5		
Two trainings	22	20		

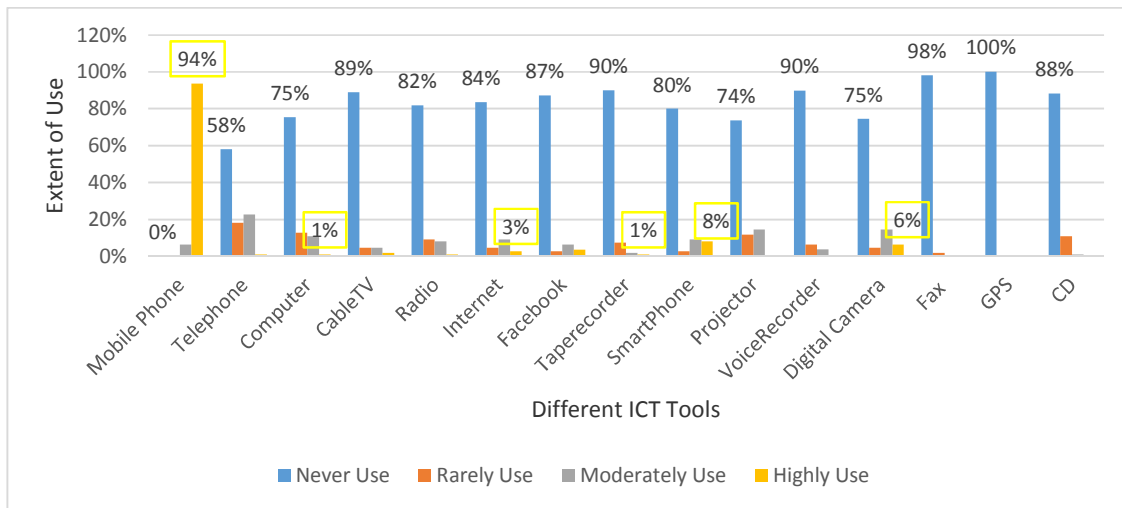


Fig. 2. Extent of use of different ICT tools for official purpose by the SAAOs

Majority of the respondents never used different ICT tools as shown in Fig. 2. Use of different ICT tools by the agriculture extension workers in their personal life is also mobile based. All 100 percent of them highly used mobile phone in their personal purpose. Fig. 3 represents the use of different ICT tools by the respondents in their personal purpose. All the agricultural extension workers highly use mobile phone followed by Cable TV (38%), Smart phone (12%), Computer and Facebook (7%), Internet and Digital Camera (6%).

Excluding mobile phone and cable TV, majority of the respondents never used different ICT tools and medium shown in Fig. 3. Use of different ICT tools for personal purpose by the agricultural extension workers are little bit higher than use of ICT tools for official purpose.

3.3 Use of Different Information Sources

The use of information source is one of the important components to create awareness among agricultural extension workers in respect of various agricultural development issues. Contact with the sources of information helps an individual to think about something clearly and also in acquiring knowledge which ultimately leads to solve problem more easily. Use of different information sources and extent of use by the respondents are presented in Table 2. Results in Table 2 exposed that majority of the respondents always get their agricultural information from demonstration (49.1%) followed by consultant (48.2%) and mobile call (39.1%). A total of 37.3 percent respondents use newspaper frequently as information source.

Seminar/ workshop/ conference and television were occasionally used as an information source by 49.1 percent and 44.5 percent respondents, respectively. Agricultural universities, different agricultural website, internet browsing and scientific paper/ thesis/ journal were never used as information source by 82.7 percent, 66.4 percent, 52.7 percent and 51.8 percent respondents, respectively.

Based on information sources used, respondents were classified into three categories such as, low use, medium use and high use as presented in Table 3. Information sources used by the respondents ranged from 12 to 38, with an average of 24.7. Highest proportion (65.5%) of the respondents were in medium use of information sources category followed by 21.8 percent in the high use of information sources category and 12.7 percent respondents were in low use of information sources category.

Respondents generally become aware of advanced agricultural technologies and ICT by different information sources. Only 21.8 percent respondents had high use of information sources. This might be due to the lack of awareness of modern information sources and ICT.

3.4 Utilization of ICTs for Collecting Information

Information is the basic need for any kinds of development. The main task of agriculture extension workers is to gather different kinds of advanced agricultural knowledge and disseminate to the farmers. Utilization level of ICT of the respondents is presented in Fig. 4.

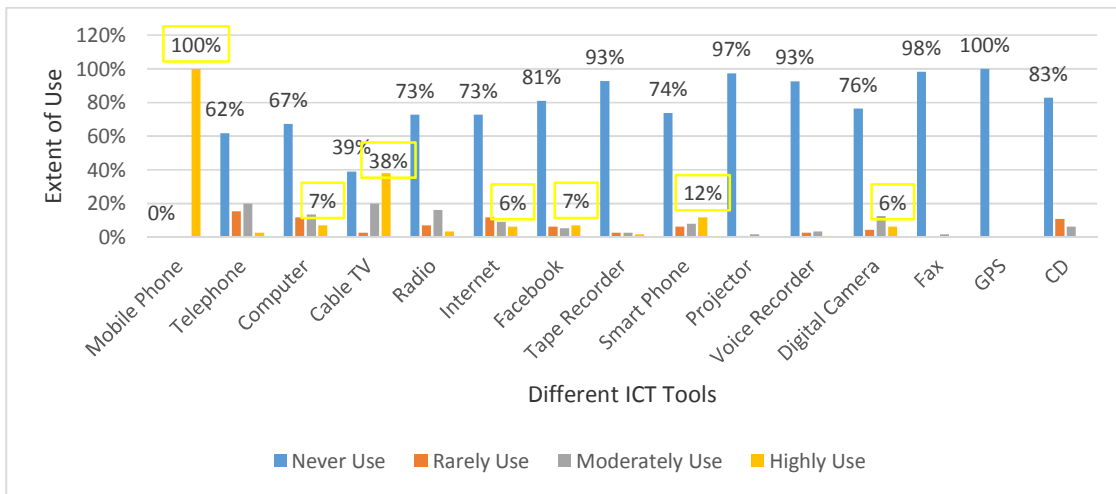


Fig. 3. Use of different ICT tools for personal purpose

Table 2. Use of information sources by the respondents

SI. no. #	Potential sources	Nature of use (% respondents)				
		N	R	O	F	A
1	Scientific paper/ thesis/ journal	51.8	32.7	15.5	0	0
2	Seminar/workshop/ conferences	0	20.9	49.1	18.2	11.8
3	Consultant (AEO)	0	1.8	11.8	38.2	48.2
4	Extension specialist	1.8	13.6	32.7	21.8	30
5	Agricultural Universities	82.7	14.5	0.9	0.9	0.9
6	Demonstration	0.9	2.7	29.1	17.3	49.1
7	Using mobile call	0.9	12.7	22.7	24.5	39.1
8	Television	0.9	10.9	44.5	22.7	20.9
9	Radio	15.5	32.7	27.3	15.5	9.1
10	Newspaper	3.6	9.1	30.9	37.3	19.1
11	Internet browsing	52.7	27.3	13.6	4.5	1.8
12	Agricultural website	66.4	13.6	18.2	0.9	0.9
13	Union Digital Centers	15.5	34.5	35.5	12.7	1.8

N= Never, R= Rarely, O= Occasionally, F= Frequently, A= Always

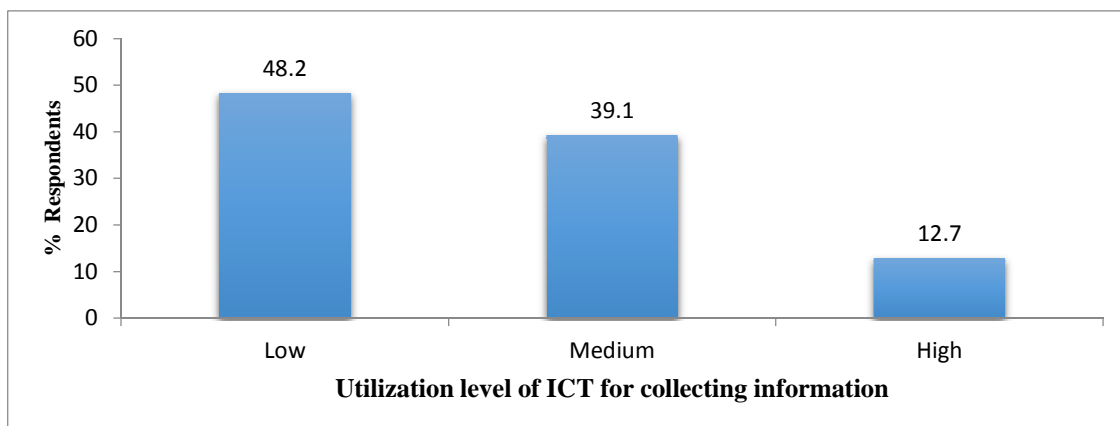


Fig. 4. Distribution of the respondents according to their utilization of ICT for collecting information

Table 3. Distribution of the respondents according to their use of information sources

Categories	Respondents		Mean	SD
	Number	Percentage		
Low use of information sources (up to 18)	14	12.7	24.70	5.23
Medium use of information sources (19-28)	72	65.5		
High use of information sources (above 28)	24	21.8		

Results presented in the Fig. 3 denote that major portion of the respondents (48.2%) were under low utilization category followed by 39.1 percent medium and 12.7 percent respondents were under high utilization category, respectively. Cumulative percentage of low and medium utilization was 87.73. Hence it can be said that majority of the respondents were not well adapted with high level of ICT utilization.

The respondents of this study utilized ICT in different ways. Results shown in Table 4 exposed that 'Contact with AEO through mobile phone to collect information' ranked on the top position on ICT utilization with a score of '371' out of '440' and chi square value of 121.73 at 1 percent level of significant. Majority of respondents (52.7%) use mobile phone regularly followed by often (37.2%), occasionally (5.5%), rarely (3.6%) and never (0.9%). Chi-square value showed significant difference among them, indicating regular use of mobile phone by the respondents to contact with AEO for collection of information. 'Use of mobile phone to contact with specialists for information' ranked in 2nd position. Most of the respondents (42.7%) use mobile phone regularly, occasionally (23.6%), often (18.2%), rarely (14.5%) and never (0.9%). Chi-square value (51.0) showed significant difference among them, indicating regular use of mobile phone to contact with specialists for collecting information. Hence, the respondents use mobile phone frequently for collecting information. Similar result reported [17] while working on 'Use of ICT in Agricultural Technology Delivery to Farmers in Ebonyi State, Nigeria'. 'Reading agricultural articles in newspaper' ranked on 3rd position. Majority of respondents (56.4%) read agricultural articles often and only 15.5 percent regularly, 14.5 percent rarely, 12.2 percent occasionally and 0.9 percent respondents never read newspaper for agricultural information. Chi-square value (98.46) showed significant difference among them, indicating respondents' often reading of agricultural articles in newspaper. 'Watching TV to get agricultural Information', 'Listening Radio program related to agriculture', 'Visiting different website and blogs related to agriculture', 'Browsing internet to collect different agricultural information' were

ranked as 4th, 5th, 6th and 7th position, respectively. The results indicate that mass media and print media have enough potentiality to provide agricultural information. SAAOs adopted those ICTs easily and they often use it for collecting agricultural information. 'Use of social media like facebook, twitter for agricultural information' ranked in 8th position. Majority of the respondents (70.9%) never used social media and only 2.7 percent respondents used social media regularly for agricultural information. Chi-square value (183.73) showed significant difference among them, indicating never use of social media like facebook, twitter for agricultural information by the respondents. 'Use of video call to collect information' ranked in 9th position. Majority of the respondents (77.3%) never used video calling for agricultural information.

Chi-square value (167.75) showed significant difference among them, indicating never use of video call to collect information. 'Use of GIS and Remote Sensing technology for agricultural information' ranked in 10th position with a very low score 2 out of 440. Majority of the respondents never used GIS and Remote Sensing technology followed by rarely (1.8%). Chi-square value (102.15) showed significant difference among them, indicating never use of GIS and Remote sensing technology for agricultural information.

3.5 Utilization of ICTs for Providing Services

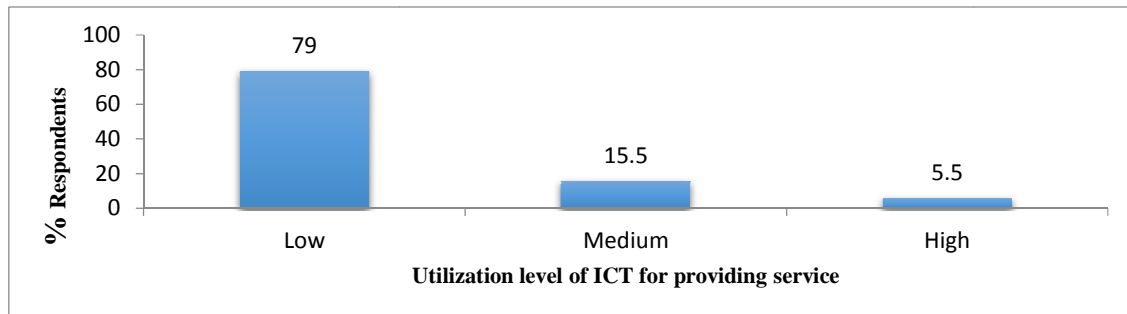
SAAOs are the field level extension workers who provide different types of agricultural information to the farmers in Bangladesh. The utilization level of ICT for providing service was categorized into three categories viz. low, medium and high, and is presented in Fig. 5.

Findings presented in Fig. 5 exposed that utilization level of ICT for providing services by majority of the respondents was low. A total of 79 percent respondents were under low utilization level category followed by 15.5 percent medium utilization category and only 5.5 percent of the respondents were under high utilization category.

Table 4. Rank order of utilization of ICT by the respondents for collecting information

Sl. no. #	Utilization of ICT in different ways	Frequency of the use n=110					Chi - square value	Score	Rank
		Re	Of	Oc	Ra	Ne			
1	Using mobile phone to contact specialists for information	47	20	26	16	1	51.0**	316	2 nd
2	Visiting different website and blogs related to agriculture	3	13	9	26	59	90.7**	95	6 th
3	Watching TV to get agricultural Information	20	50	23	15	2	56.3**	291	4 th
4	Listening radio program related to agriculture	7	23	18	38	24	22.8**	171	5 th
5	Reading agricultural articles in newspaper	17	62	14	16	1	98.5**	298	3 rd
6	Contact with AEO through mobile phone to collect information	58	41	6	4	1	121.7**	371	1 st
7	Browsing internet to collect different agricultural information	3	7	8	26	66	124.3**	75	7 th
8	Use social media like for agricultural information	3	13	2	14	78	183.7**	69	8 th
9	Use of video call to collect information	0	2	3	20	85	167.8**	32	9 th
10	Use of GIS and Remote Sensing technology for agricultural information	0	0	0	2	108	102.2**	2	10 th

Re = Regularly, Of = Often, Oc= Occasionally, Ra = Rarely, Ne = Never

**Fig. 5. Distribution of the respondents according to their utilization of ICT for providing service**

The results presented in Table 5 showed rank order of the utilization of ICT for providing services. 'Response on farmers call through mobile phone' ranked the first position with a score of 437 out of 440 and chi-square value 98.3 at 1 percent level of significant. Majority of the respondents (97.3%) use mobile phone regularly followed by often (2.7%). Chi-square value showed significant difference among them, indicating regular use of mobile phone to response on farmers call. 'Send SMS to clients about different dose of fertilizers, pesticides or any advice' was ranked in second position. Majority of the respondents (33.6%) send SMS regularly followed by often (30%), never (19.1%), rarely (12.7%) and occasionally (4.5%). Chi-square value (31.8) showed significant difference among them, indicating regular sending of SMS

to clients about different dose of fertilizers, pesticides or any advice by the respondents. 'Use of multimedia at the time of training' ranked third. Majority of the respondents (32.7%) use multimedia often followed by regularly (25.5%), never (18.2%) and in both cases rarely and occasionally (11.8%). Chi-square value (18.1) showed significant difference among them, indicating often use of multimedia at the time of training. 'Response on farmers MMS to solve problems', Use of different social media like Facebook, twitter to provide information', 'Use E-mail to send messages' and 'Write on blogs to disseminate information related to agriculture' ranked in 4th, 5th, 6th and 7th position, respectively. 'Using fax for sending messages' ranked eighth. Majority of the respondents (85.5%) never used fax followed by rarely

(7.3%), occasionally (6.4%) and often (1.8%). Chi-square value (208.8) showed significant difference among them, indicating that they never use fax for sending message by the respondents. 'Use video calling to share information and 'Participate in community radio talking to disseminate information' ranked in 9th and 10th position, respectively. Majority of the respondents (85.5%) never used video calling followed by rarely (7.3%), occasionally (4.5%) and often (2.7%). Chi-square value (214.9) showed significant difference among them, indicating never use of video calling to share information. In case of participation on community radio, majority of the respondents (91.8%) never participate followed by rarely (6.4%) and occasionally (1.8%). Chi-square value (169.7) showed significant difference among them, indicating that they never participate in community radio talking to disseminate information. However, 88.5 percent of female extension personnel were aware of ICT while 74.1 percent indicated that they know how to access Internet on their own in Nigeria [18]. The result was just opposite of the present result. Hence, government and other organizations have vast scope for improving in this sector for sustainable agricultural development in Bangladesh.

3.6 Relationship between Utilization of ICT and Selected Characteristics of the Respondents

Coefficient of correlation was computed in order to explore the relationships between the selected characteristics of the respondents and their utilization of ICT in agricultural extension service.

The co-efficient of correlation of training, job satisfaction and perception on ICT of the respondents with their utilization of ICT was found positive and significant at 1 percent level of probability ($r = 0.439^{**}$, 0.330^{**} and 0.59^{**} respectively). The co-efficient of correlation of use of information sources and utilization of ICT was found positive and significant at 1 percent level of significant ($r = 0.478^{**}$). Thus training exposure, service experiences, job satisfaction, perception on ICT and use of information sources of the respondent may have influence on their utilization of ICT in agricultural extension service. It indicates that the respondents who have training and good perception on ICT utilize ICT in agricultural extension service. Hence, proper emphasis should be given on training for increasing knowledge of the respondents on ICT. The respondents will be more interested on ICT utilization and their perception on ICT will be

Table 5. Rank order of the utilization of ICT by the respondents for providing service

SI. no.	Utilization of ICT in different ways	Nature of the use n =110					Chi square value	Score	Rank
		Re	Of	Oc	Ra	Ne			
1	Response on farmers call through mobile phone	107	3	0	0	0	98.3 ^{**}	437	1 st
2	Use of multimedia at the time of training	28	36	13	13	20	18.1 ^{**}	259	3 rd
3	Use e-mail to send messages	2	2	7	9	90	264.5 ^{**}	37	6 th
4	Send SMS to clients about different dose of fertilizers, pesticides or any advice	37	33	5	14	21	31.8 ^{**}	271	2 nd
5	Write on blogs to disseminate information related to agriculture	2	3	2	5	98	328.5 ^{**}	31	7 th
6	Using fax for sending messages	0	2	7	8	94	208.8 ^{**}	28	8 th
7	Use video calling to share information	0	3	5	8	94	214.9 ^{**}	27	9 th
8	Response on farmers MMS to solve problems	28	16	10	14	42	30.9 ^{**}	194	4 th
9	Use different social media like facebook, twitter to provide information	3	7	4	19	77	179.3 ^{**}	60	5 th
10	Participate in community radio talking to disseminate information	0	0	2	7	101	169.7 ^{**}	13	10 th

Re = Regularly, Of = Often, Oc= Occasionally, Ra = Rarely, Ne = Never

increased. However, positive and significant relationship of ICT utilization with training and awareness while working on use of information and communication technologies among extension agents were found in Kano State, Nigeria [19].

Table 6. Relationship between selected characteristics of the respondents and utilization of ICT in agricultural extension service

Selected personal attributes	Co-efficient of correlation (r)
Age	-0.086 ^{NS}
Service experience	-0.055 ^{NS}
Training exposure	0.493 ^{**}
Educational qualification	-0.164 ^{NS}
Job satisfaction	0.330 ^{**}
Perception on ICT	0.590 ^{**}
Source of information	0.478 ^{**}

^{**} Significant at 0.01 level of probability, NS = Non significant

4. CONCLUSION

Agricultural extension service providers of Bangladesh are working as a catalyst to uplift the socio-economic condition of the agrarian people. Success of this noble profession is now becoming more challenging to keep pace with global changing trend. Globally, agricultural practices are fully going to be information based and mechanized. However, findings of this study revealed that extension workers still lag behind adopting modern technology to disseminate latest information to the farmers. Extension workers are solely depending on mobile phone to collect and transfer information over phone calls only. They don't have frequent access to mobile apps, video calling and internet browsing by the mobile phone. A very limited use was found in the case of modern ICTs like computer, internet, E-mail and Facebook. So, it is clear that extension workers are not receiving the latest farming information due to limited access in ICT tools. Similarly, farmers are being deprived of their required farming information. However, difference of ICT utilization among the extension workers was influenced by training exposure, service experiences, job satisfaction, perception and access to information sources. Therefore, extension service provider needs proper training and access to ICTs on immediate basis to ensure effective dissemination of farming information and technology to the farmers. Proper initiatives must be taken for arranging ICT based training programs for SAAOs giving emphasis on perception of modern ICT tools,

their efficiency and effectiveness for disseminating agricultural information to the farmers.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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