



Effectiveness of Agricultural Information and Communication Center in Technology Transfer to the Farmers in Bangladesh

Md. Suzan Khan¹, M. Hammadur Rahman¹ and Mohammed Nasir Uddin^{1*}

¹Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh.

Authors' contributions

This work was carried out in collaboration between all authors. Author MSK is the primary author while he designed the field study, conducted the data collection, analyzed the data, selected and implemented the analytical methodology. The research work presented here is prepared based on his master thesis while author MSK successfully defended for the Master of Science in Agricultural Extension Education, Mymensingh, Bangladesh. Author MHR was the faculty staff and thesis supervisor of the first author. Author MHR contributed to develop the research concept, selected the methodological framework, prepared the questionnaire and reviewed the whole thesis document upon which this article was written. Author MNU was the faculty staff and co-supervisor of thesis of the first author. Author MNU contributed to research design, methodology approach writing and editing and responding to peer reviewers in various sections of this paper including introductory and concluding remarks and description and justification of the methodological framework. Author MNU gave his efforts on interpretations of the results of the study were also substantial. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJAEES/2017/34998

Editor(s):

(1) Muhammad Yaseen, Department of Agricultural Extension & Rural Development, University College of Agriculture, University of Sargodha, Pakistan.

Reviewers:

(1) Anonymous, The University of Agriculture, Peshawar, Pakistan.

(2) Anonymous, Assam Agricultural University, India.

Complete Peer review History: <http://www.sciencedomain.org/review-history/20298>

Original Research Article

Received 22nd June 2017
Accepted 22nd July 2017
Published 1st August 2017

ABSTRACT

Use of Information and Communication Technologies (ICT) in information dissemination in agriculture sector is getting popular day by day especially in technology transfer to the farmers. While various forms of ICT devices and centers abound in Bangladesh today. The recent innovation of agricultural information delivery developed by the government initiative started with 20 Agricultural

*Corresponding author: E-mail: nasirbau@gmail.com;

Information and Communication Center (AICC) and planned to increase the numbers to cover most of the Agro-Ecological Regions of the country. In connection to this issue, this study was undertaken to determine the effectiveness of Agricultural Information and Communication Centers (AICC) in technology transfer to farmers. Besides, important factors were identified those could contribute to farmers' understanding on effectiveness of AICC. The study was conducted in five sub-districts of Mymensingh district in Bangladesh. One hundred AICC users were interviewed using a pre-tested questionnaire to collect the data. Both descriptive and inferential statistics were used to analyze the collected data. More than one-third (37%) of the farmers perceived that effectiveness of AICC in technology transfer was high while 38% of the farmers perceived as "moderately effective" and 25% perceived as "low effective". Farmers' characteristics such as education, farm size, annual family income, organizational participation, extension contact, awareness on ICT facilities, access to ICT facilities, knowledge on ICT, and training received on ICT had significant positive relationship with their perceived effectiveness of AICC while age and household size had negative and insignificant relationship with effectiveness of AICC. The influential factors that affecting the effectiveness of AICC were education, annual family income and knowledge on ICT were confirmed by the multiple regression models. This model also explained that these three explanatory variables together explained 81.2% variation in perceived effectiveness of AICC while knowledge on ICT explained 70% variation in perceived effectiveness of AICC. Lack of operational knowledge of computer, lack of training facilities on ICT, low awareness among rural farmers were identified as the major constraints of using AICC facilities. However, extension policy makers should take into consideration above findings and provides ICT training to the users, developing ICT infrastructure, adequate maintenance of the center facilities etc. that influence to make AICC effective and sustainable.

Keywords: Effectiveness; AICC; flow of information; farmers; Bangladesh.

1. INTRODUCTION

Agriculture is one of the core sectors of the economy of Bangladesh since its independence in 1971 and still contributing 15.33 percent to Gross Domestic Product (GDP) [1]. Besides, providing employment to 48.1 percent labor force, this sector provides accommodation to 62 percent manpower of the nation, and 84 percent of the population of Bangladesh living in rural areas, directly or indirectly depends upon agriculture for their livelihood [2]. The agricultural system of Bangladesh has a long history of coping with the challenges. The rural level extension agents named Sub-Assistant Agricultural Officer (SAAO) are the responsible persons for who meet with farmers at their farm and or home to technology transfer. However, it is very difficult for a SAAO to reach to all farmers at each block, the working area of a SAAO with around 1500 farm households [3]. The system has experienced remarkable development over time. Inclusion of Information and Communication Technologies (ICTs) in agriculture enhanced the capacity of the system to face the challenges of the time [4]. ICT as an extension tool that could enhance the flow of information in the application of agricultural extension services [5]. But the history of ICT uses in the agriculture of Bangladesh was not so rich while ICTs based task force program was

launched by the Ministry of Agriculture (MoA) only in 2003. In Bangladesh, private sectors have been operating the main ICTs (mobile phones, computers and internet) based activities. In connection this issue, the government also formulates and implements ICT policy for agricultural development [6]. An important initiative was taken by the Ministry of Agriculture is the establishment of Agricultural Information and Communication Centers (AICC) at village level throughout the country. The AICC have been established and managed by Agricultural Information Services (AIS), an information management wing under the MoA. Managed by registered farmers' cooperative organizations, each center received a desktop computer, laptop computer, digital camera, internet modem, multimedia projector, scanner and other digital devices from AIS. Farmers have been receiving necessary information from this center using internet. AIS started with 10 AICCs in 2010 while currently a good numbers of 245 centers have been in operation throughout the country. The government took a decision to establish 87,000 AICCs by 2021 [7]. That means there will be an AICC in each village of the country. In Bangladesh, a number of studies have been conducted on use of ICT based media (mainly internet and mobile phone) in agricultural technology transfer [8,9,10,11]. Some studies also focused on availability and use of ICT based

information center for agricultural technology transfer [12,13,14,15,16,17]. Apart from AICC, some other modalities of ICT based technology transfer have been functioning in Bangladesh. However, no systematic study is available on their effectiveness in technology transfer to the farmers in Bangladesh. In particular, information about effectiveness of ICT based media in agricultural technology transfer in considering the farmers' perception is extremely limited in Bangladesh. Therefore, the study was conducted to fulfill the following objectives i. To determine the effectiveness of AICCs in agricultural technology transfer to the farmers in Bangladesh; ii. To describe the socioeconomic characteristics of the farmers in the study area; and iii. To identify significant variables that affecting the effectiveness of AICC in agricultural technology transfer.

2. METHODOLOGY

2.1 Study Area and Sample Selection

The study was conducted in five randomly selected AICCs from eleven in five sub-district of Mymensingh district where AICC have been working as information centers. The farmers (199) who received agricultural information from selected AICCs that situated in his/her village were considered as the population of the study. Of which farmers (100) who received agricultural information in the month of January and February, 2016 was considered as sample of the study. Data were collected using a pre-tested structured questionnaire by face-to-face interview during March 9 to April 17, 2016.

2.2 Variables Selection and Measurement of the Dependent Variable

There were eleven explanatory variables which were selected characteristics of AICC user farmers while farmers' perceived effectiveness of AICC in technology transfer was the focus variable of the study. Most of the explanatory variables were measured by developing scales based on the field scores. On the other hand, the focus variable was measured on the basis of opinion of the farmers who took AICC service in receiving agricultural information. While measuring effectiveness AICC, five important aspects of effectiveness were considered for the study. These aspects were: (i) message credibility; (ii) message adequateness; (iii) message understandability; (iv) message persuasiveness; and (v) message applicability.

This methodological approach has been drawn from the work of Majdyan [18]. Effectiveness of AICCs was measured using 4 - point rating scale while each aforesaid dimension, score of 3, 2, 1 and 0 were assigned to indicate the extent of effectiveness as 'highly effective', 'moderately effective', 'low effective', and 'not at all effective', respectively. A respondent's obtained scores of all five aspects were added to compute his/her total effectiveness score. A score of '0' indicated 'no effective' while '15' indicated 'highly effective'. Finally, the respondents were categorized into three categories according to their perceived effectiveness scores.

Both descriptive and inferential analyses were used to analyze the collected data. A co-efficient of correlation and multiple regression models were used to understand the relationship between explanatory variables and focus variable, and identify the important factors (the characteristics) affecting the focus variable respectively. Besides, stepwise multiple regressions were also used to determine the each variable contribution to the focus variable.

3. RESULTS AND DISCUSSION

3.1 Selected Characteristics of the Farmers

Characteristics profile of the respondent farmers includes age, education, household size, farm size, annual family income, organizational participation, extension contact, awareness on ICT facilities, access to ICT facilities, knowledge on ICT and training received on ICT. The salient features of the characteristics of the respondents and basic statistical values have been presented in Table 1.

Data presented in Table 1 shows that majority of the farmers (49 percent) were in the middle-aged while 37 percent of the farmers had secondary education in the study area. The highest proportions of the farmers (43 percent) were in the small-sized household but a significant numbers of the farmers (67%) had small farm size. The highest proportion of the farmers (71 percent) were in medium income category, where 17 percent and 12 percent of them were in low and high-income category, respectively may indicating the better condition in the study area. The majority (85 percent) of the respondents having low organizational participation while rest of 6 percent having no participation, 7 percent having medium and 2 percent having high organizational participation.

From the study, it could be said that most of the farmers had low contact with the change agent, which is encouraging for ICT extension service providers. Data reveals that the majority of the farmers in the study area were having low awareness about available ICT facilities. From the study area we can say most of the farmers have low access to ICT. It reveals that the majority of the farmers in the study area were having low knowledge about ICTs. Data contained in Table 1 indicate that the majority (92 percent) of the farmers had no training on ICT compared to 8 percent having low training.

Table 1. Descriptive statistics and salient features of respondents (n=100)

Characteristics	Scoring system	Range		Respondent categories	Respondent's percentage (n=100)
		Possible	Observed		
Age	Years	Unknown	22-75	Young (up to 30)	21
				Middle aged (31-50)	49
				Old (above 50)	30
Education	Years of schooling	Unknown	0-18	Illiterate (0)	9
				Can sign only (0.5)	14
				Primary (1-5)	21
				Secondary (6-10)	37
				Above secondary (above 10)	19
Household size	No. of members	Unknown	2-11	Small (2- 4)	43
				Medium (5-6)	37
				Large (above 6)	20
Farm size	Hectares	Unknown	0.23-3.70	Landless (<0.02 ha)	0
				Marginal (0.02-0.2 ha)	0
				Small (0.21-1.0 ha)	67
				Medium (1.01-3.0 ha)	29
				Large (>3.0 ha)	4
Annual family income	'000' Tk.	Unknown	78.92-680.00	Low (up to 153)	17
				Medium (154-305)	71
				High (above 305)	12
Organizational participation	Scale score	Unknown	0-54	Not at all (0)	6
				Low (1-18)	85
				Medium (19-36)	7
				High (above 36)	2
Extension contact	Scale score	0-36	0-26	Not at all (0)	2
				Low (1 to 12)	73
				Medium (13-24)	24
				High (above 24)	1
Awareness on ICT facilities	Scale score	1-9	1-9	Low (1-3)	63
				Medium (4-6)	26
				High (7-9)	11
Access to ICT facilities	Scale score	0-27	0-18	Not at all (0)	1
				Low (1 to 9)	77
				Medium (10-18)	22
				High (above 18)	0
Knowledge on ICT	Scale score	0-25	0-25	Not at all (0)	8
				Low (1-8)	55
				Medium (9-16)	27
				High (above 16)	10
Training received on ICT	Days of training	Unknown	0-3	No training (0 day)	92
				Low (up to 3)	8
				Medium (4-7)	0

SD = Standard Deviation

3.2 Effectiveness of AICC in Technology Transfer

There were five selected dimensions of effectiveness included in the effectiveness scale, which are considered essential for receiving information from any source. Summation of these dimensions can summarize about effectiveness of AICC from farmers' perspective. The farmers' categorization across five dimensions has been presented in Table 2.

Table 2 shows that more than half of the farmers (52 percent) believed that there were credibility of messages received from AICC, but 47 percent farmers perceived messages from AICC were had lower adequate to mitigate their farming problems. Remarkable numbers of farmers (48 percent) opined that the messages had no or low understandability, while 47 percent of them considered the received messages as low persuasive. Moreover, it is important to note that an overwhelming majority (63 percent) of the farmers termed the message as no or low applicable. Similar study was conducted by the Das (2015) and showed that 27.47% AICC respondents obtain information from AICC centers while 5.26% AICC farmers get from toll free call centre because they are aware of the services. About 34% of AICC farmers opined that AICCs influence average increase of crop production and about 26% of the farmers believe that their production has increased due to the use of modern technologies learnt from AICCs [19].

The farmers were further categorized based on their total effectiveness scores as obtained by summing up scores of in five dimensions of effectiveness. The respondents' categories based on the total effectiveness scores are shown in the Table 3.

Data presented in the Table 3 show that 37 percent farmers comprehended AICC as highly effective in receiving agricultural information, while 38 percent farmers comprehend as moderately effective and 25 percent of them comprehended as low effective. So, about two-third (63 percent) of the respondents belonged to categories that perceived AICCs as low to medium effective in receiving farm information. Therefore, this issue needs serious consideration while scaling up the AICCs to 87,000 villages in the next five years. It was assumed that level of education, knowledge, annual family income, training; extension contact

etc. may be the influencing factors behind the aforementioned results. Rahman et al. [20] concluded a study and found that few farmers were searching information in AICCs for their farm related issues. They also observed that in AICCs farmers looked for a wide range of information on different farm aspects which may be indicating the effectiveness of the AICC [20].

3.3 Relationship between Selected Characteristics of the Farmers and Their Opinion on Effectiveness of AICC in Technology Transfer

A total of eleven selected characteristics of the farmers were considered for understanding relationships between those characteristics and their opinion on effectiveness of AICC. To test the relationship, Pearson's correlation coefficients were computed as the results have been presented in Table 4.

Out of eleven characteristics (independent variables) education, farm size, annual family income, organizational participation, extension contact, awareness on ICT facilities, access to ICT facilities, knowledge on ICT and training received on ICT were positively correlated with the farmers' perceived effectiveness of AICC in technology transfer. With the aforementioned variables, a multiple regression model was deployed to identify the influencing factors (characteristics) affecting their perceived effectiveness of AICC in technology transfer and explained in the following section.

3.4 Factors Affecting Effectiveness of AICC in Technology Transfer

Linear multiple regression analysis was computed in order to identify the influential factors that affect the effectiveness of AICC in technology transfer. A general full model of linear multiple regression analysis was initially run with all correlated variables. The findings of the regression analysis are presented in Table 5.

The linear multiple regression model (Table 5) results explain that education is positive and significantly (at 5% level) related to effectiveness of AICC in technology transfer. This mean that the probability of understands of effectiveness of AICCs in technology transfer is higher for those who have higher educational attainment compared to less-educated or illiterate farmers. It is noticeable that educated farmers have more

knowledge, high access to AICC, a greater ability to understand and respond to any changes, are better able to predict future scenarios than others, which might stimulate them to make effective the AICC utilizations. Several studies found that education also positively and

Table 2. Distribution of farmers according to their opinion on effectiveness of AICC across five dimensions

Dimensions	Categories (Scale score)	Frequency and percent (n=100)	Mean	Standard deviation
Message credibility	Not at all (0)	0	2.27	0.839
	Low (1)	25		
	Moderate (2)	23		
	High (3)	52		
Message adequateness	Not at all (0)	2	1.63	0.747
	Low (1)	47		
	Moderate (2)	37		
	High (3)	14		
Message understandability	Not at all (0)	1	1.84	0.907
	Low (1)	47		
	Moderate (2)	19		
	High (3)	33		
Message persuasiveness	Not at all (0)	3	1.68	0.863
	Low (1)	49		
	Moderate (2)	25		
	High (3)	23		
Message applicability	Not at all (0)	11	1.41	0.877
	Low (1)	52		
	Moderate (2)	22		
	High (3)	15		

Table 3. The categories of farmers according to their perception on the Effectiveness of AICC

Categories of farmers (score range)	Number and percent	Mean	Standard deviation
Low effective (up to 5)	25	8.84	3.784
Moderately effective (6-10)	38		
Highly effective (above 10)	37		
Total	100		

Table 4. Correlation between farmers' characteristics and their perceived effectiveness of AICC

Selected personal characteristics	Correlation co-efficient (r) with perceived effectiveness (98 df)	Tabulated values (r) significant at (98 df)	
		0.05	0.01
Age	-.160		
Education	.795**		
Household size	-.131		
Farm size	.257**		
Annual family income	.215*		
Organizational participation	.209*	0.197	0.257
Extension contact	.426**		
Awareness on ICT facilities	.746**		
Access to ICT facilities	.587**		
Knowledge on ICT	.836**		
Training received on ICT	.385**		

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

significantly affect the effectiveness of the agricultural information sources. Similar results have also been observed in studies conducted by Rashid and Islam [21]; Kafura et al. [22].

The result of the linear regression model shows that there is a positive and significant (at 5% level) relationship between annual family income and farmers' perceived effectiveness of AICC in technology transfer. This indicates that farmers with high income are more possible to receive information related to agricultural technology from AICC than farmers having lower incomes. Farmers having high income investing more in their agricultural field and require more sophisticated technology and information, resulting go to AICC and receiving diversified information for their agricultural development. On the other hand, rich farmers also receiving information by using SMART phone rather than AICC while they may be learnt it also from their respective Upazila AICC. A good number of studies indicate the similar findings [23,24,25, 26].

The result of the linear regression model shows a positive and significant (at 5% level) relationship between knowledge on ICT and effectiveness of AICC in technology transfer. This may be explained that farmers having more knowledge that influencing to them to use the AICC in receiving information compared to farmers having low knowledge. While knowledgeable farmers having queries or problems regarding farm operations and understand that they need to get information from any agricultural information sources resulting go to respective AICC. Thus, knowledge of ICT stimulate them to use AICC as a source of agricultural information or and technology which might have significant contribution to higher production. Education, farming experiences, training received on ICTs, participation in different extension events like result demonstration, field day, group meeting, etc, using mass contact media may be increasing farmers' knowledge which also affecting use of AICC.

However, to understand the individual contribution of the aforesaid explanatory variables to the focus variable, step-wise multiple regressions were conducted and findings are placed in Table 6.

This 3rd model indicated (Table 6) that 81.2% of the total variation in their opinion was explained by these three variables, namely knowledge on

ICT, education and annual family income of which only knowledge on ICT have greatly (70%) influenced to effectiveness of AICC in technology transfer (see the model 1 in Table 6).

Some basic ICT knowledge on using the cell phone, smart phone, internet, computer etc might helpful for getting agricultural information expected to increase the interest of farmers towards AICC. Although an ICT trained service provider always serves required information but perception revealed that those farmers have some ICT knowledge they can understand information easily rather than poor ICT knowledge farmers. Step-wise multiple regressions models are also revealed that knowledge on ICT of farmers had highly significant and positive influence on their access to AICC. They got AICC more effective in receiving agricultural information rather than farmers having poor knowledge on ICT.

Therefore, the farmers who have good or moderate education level are supposed to have more access in AICC to make it effective. Besides, farmers having higher level of education are likely to able to receive agricultural information through ICT based media like AICC.

Farmers with large farms are likely to earn more income from farming. They are not only engaged with rice cultivation but also vegetable farming, poultry and duck farming, livestock rearing and fish farming and these have also greater contribution to their family income. The farmers who have more income are supposed to have more demand of information related to farming activities. So, they have greater access to AICC and perceived more effective rather than farmers having low family income.

3.5 Problem Faced by the Farmers in Receiving Agricultural Information from AICC

The farmers were also categorized based on their total scores on problems faced in receiving agricultural information as obtained by summing up scores of twelve problems. The respondents' categories based on the total problems score are shown in the Table 7. While the majority of the farmers (82 percent) of the study area faced medium problems with a mean value of 18.65 and standard deviation of 4.79. According to their overall problems faced score farmers were classified into three categories as shown in Table 7.

Table 5. Summary of the linear multiple regression analysis explaining the dependent variable

Explanatory variable	Unstandardized coefficients		Standardized coefficients	T	Sig.
	B	Std. error	Beta		
(Constant)	3.745	.462		8.100	.000
Education	.393	.055	.476	7.200	.000
Farm size	.332	.269	.062	1.232	.221
Annual family income	.003	.001	.153	2.921	.004
Organizational participation	-.004	.023	-.010	-.191	.849
Extension contact	.030	.040	.043	.760	.450
Awareness on available ICT facilities	-.054	.186	-.031	-.291	.772
Access to ICT facilities	-.072	.073	-.074	-.995	.323
Knowledge on ICT	.450	.065	.672	6.960	.000
Training received on ICT	-1.670	.849	-.120	-1.966	.052

n = 100, R² = .827, F-value = 47.940

Table 6. Summary of the step-wise multiple regression analysis models

Model	Variables entered	Multiple R	Multiple R ²	Variation explained (Percent)	Significance level
Constant + Knowledge on ICT	Knowledge on ICT	.836	.700	-	.000
Constant + Knowledge on ICT + Level of education	Level of education	.892	.796	9.60	.000
Constant + Knowledge on ICT + Level of education + annual family income	Annual family income	.901	.812	1.60	.000

Total observed score of a specific statement of the problems faced by farmers was calculated and rank order was made according to total observed score of a specific statement as shown in Table 8.

Table 8 indicates 'lack of operational knowledge of computer' was appeared as first ranked problem while cost of using ICT services from AICC was appeared as least one. To get agricultural information from AICC, farmers usually provided information by a technical person, so farmers individual education level not such a major problem but also not avoidable because education is a very necessary requirement to adopt e-agriculture. "poor level of education/ illiteracy" was ranked in 5th position. Respondents were frankly said that shyness among them also a major problem to receiving agricultural information from AICC. They always faced one type of fright or shyness about using ICTs. "shyness/scared of using ICT based media" was ranked as a problem in 6th position.

Internet speeds are very much slow in the rural area of the whole country, whereas most of the

districts of the country are now under coverage of 3G internet. So, the farmers though that "low bandwidth speed of internet in AICC" was one of the remarkable problems for getting agricultural information from AICC and it was ranked 7th position. Observation from data collection is that problems of internet speed only reported by educated farmers.

Technical problems of different ICT based media in AICC, limited availability of ICT tools and technology in AICC and lack of appropriate ICT based service offers to targeting rural farmers in AICC also some constrains to receive agricultural information from AICC. On the other hand farmers thought that, lack of management of AICC activities/services and cost of using ICT services from AICC aren't such a problem like above problems because AICC was established in a existing well arranged IPM or ICM club and agricultural information were provided as cost free service from AICC among the member or non-member farmers. Rashid and Islam (2016) identified the similar problems while farmers using the e-Agriculture.

Table 7. Categorization of farmers according to their overall problem faced in receiving agricultural information from AICC

Categories of farmers	Number	Percent	Mean	Standard deviation
Low problems (0-12)	8	8		
Medium problems (13-24)	82	82	18.65	4.79
High problems (25-36)	10	10		

Table 8. Problems faced by the farmers in receiving agricultural information form AICC

Problems	Mean	Rank order
Lack of operational knowledge on computer	2.85	1
Lack of training facilities on ICT among farmers	2.76	2
Low awareness among rural farmers about AICC	2.13	3
Lack of adequate skill among service providers in AICC	1.90	4
Poor level of education	1.86	5
Shyness/scared of using ICT based media	1.84	6
Low bandwidth speed of internet in AICC	1.77	7
Technical problems of different ICT based media in AICC	1.30	8
Limited availability of ICT tools and technology in AICC	1.00	9
Lack of appropriate ICT based service offers to targeting rural farmers in AICC	0.77	10
Lack of management of AICC activities/services	0.47	11
Cost of using ICT services from AICC	0.12	12

4. CONCLUSIONS

Major proportion of the farmers considered the AICCs as either low or moderately effective to disseminate agricultural information. Therefore, there should have ample scope to improve the quality of services to be provided for the farmers. So, it is recommended that necessary steps should be under taken by Government and Non-government organizations to increase the effectiveness of AICCs. The majority of the farmers thought that there was the high credibility of messages that are received from AICC. It may consider as a good sign of ICT-based extension media. But remarkable number of the respondents thought adequateness, understandability, persuasiveness and applicability of the messages from AICC was low. Therefore, it is concluded that the authority while taking initiatives to make AICC effective should consider such issues. So, several facilities such as ensuring the availability of the AICCs at local level, proper service to the farmers, ensure the feedback of the message made by the farmers, access to AICC for the farmers etc. should be improved by the respective authority like DAE.

Education, farm size, annual family income, organizational participation, extension contact, awareness on ICT facilities, access to ICT facilities, knowledge on ICT and training received on ICT had significant relationships with farmers'

opinion on the effectiveness of AICC. Among the significant variables knowledge on ICTs, education and annual family income did the farmers perceive influential factors to the effectiveness of AICC as. So, it leads to the conclusions that to increase effectiveness of AICC all of these factors should be considered. Therefore, it is recommended that policy makers should be emphasized these factors while undertaking the policy measures in this regard providing non-formal education, arraigning training, creating awareness on ICTs, subsidy etc. The major problems faced by the farmers in receiving agricultural information from AICC were lack of operational knowledge of computer, lack of training facilities on ICT among farmers, low awareness among rural farmers about AICC, lack of adequate skill among service providers in AICC, Poor level of education, low internet speed and so on. These findings lead to the conclusion that these problems may be the main reason having 'low' and 'medium' effective farmers opinion regarding AICC. Therefore, interventions should be adopted to minimize these problems resulting high effectiveness of the AICC at farmers' level.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Anonymous. Economy of Bangladesh; 2016.
Available:https://en.wikipedia.org/wiki/Economy_of_Bangladesh
(Accessed on 30th November, 2016)
2. Uddin MMM. Causal relationship between agriculture, industry and service sectors for gdp growth in Bangladesh: An econometric investigation. *Journal of Poverty, Investment and Development*. 2015;8(1): 124-129.
3. MEAS. Modernizing extension and advisory services; 2012.
Available:<http://www.meas-extension.org>
(Retrieved on 2, October 2015)
4. TCF. Role of information and communication technology (ICT) in agricultural extension of Bangladesh; 2015.
Available:<:///D:/RUNNING/RESEARCH/ICT%20AGRICULTURE/ICT%20in%20Agriculture/Day%202/role-of-information-communication-technology-ict-in-agricultural.htm>
(Retrieved on 2016-04-18)
5. Ballantyne P, Bokre D. ICTs: Transforming agricultural extension? Report of an iNARSe-discussion; 2003.
Available:<http://www.livelihoods.org/info/docs/inarsSupersummary.pdf>
(Retrieved October 15, 2007)
6. Islam MS. Use of ICTs in the agriculture of Bangladesh; 2013,
Available:<http://agricultureandfarming.wordpress.com/2013/10/05/use-of-icts-in-the-agriculture-of-bangladesh>
(Retrieved in August 17, 2014)
7. AIS. Agricultural information and communication centre; 2016.
Available:http://ais.gov.bd/View_Pahe ICT.aspx?articleId=+18+%20&TB_iframe=true&height=600&width=800
(Retrieved on 18 May, 2016)
8. Osman SM. Farmers' use of ICT based media in receiving agricultural information (master's thesis). Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh, Bangladesh; 2014.
9. Katalyst. Making ICT work for Bangladesh's farmers. The katalyst cases number 6, November 2012, Katalyst (a project under Ministry of Commerce, GoB), Dhaka; 2012.
10. Sife AS, Kiondo E, Lyimo-Macha JG. Contribution of mobile phones to rural livelihoods and poverty reduction in Morogoro region, Tanzania. *Electronic Journal of Information Systems in Developing Countries*. 2010;42(3):1-15.
11. Siraj M. A model for ICT based services for agriculture extension in Pakistan; 2011.
Available:<http://www.cabi.org>
(Retrieved from on 25 September, 2015)
12. Alam ZM. E-Agriculture: A new approach for agricultural development. *The Guardian*; 2015.
Available:<http://www.theguardianbd.com/file:///D:/RUNNING/RESEARCH/AICC/ict%20center/EAGriculture%20%20A%20new%20Approach%20for%20agricultural%20development%20%20The%20Guardian.htm>
(Retrieved on 12 April 2016)
13. Das S. The evolving role of information and communication technology in extension advisory services in Bangladesh. Paper presented in a symposium on strengthening extension and advisory services for lasting impacts, Washington, D.C. USA; 2015.
14. BIID. District resource center: Developing local support services for telecenters; 2015.
Available:<http://www.biid.org.bd>
(Searched Date: 15 April 2016)
15. MEAS. Report on the status of ICT for agricultural extension in Bangladesh, 2013, Following the MEAS symposium workshop at Rigs Inn, Dhaka; 2012.
16. a2i. Access to Information. Programme. Prime Minister Office, Dhaka, Bangladesh; 2013.
Available:<http://a2i.pmo.gov.bd/content/union-digital-center>
(Retrieved on 12 April, 2016)
17. Akbar MSU. Strategic planning for using ICT in extension, 5th conference on ICT4D, Accra, Ghana; 2013.
18. Majydyan R. Perception of the effectiveness of selected communication media used by the BAUEC farmers (unpublished master's thesis). Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh, Bangladesh; 1996.
19. Das S. The Impact of ICT on agricultural extension service delivery: Experience from agricultural information & communication center in Bangladesh. *Bangladesh Journal of Extension Education*. 2015;27(1-2):67-79.

20. Rahman MH, Hoque MJ, Osman MS. Farmers' use of ICT based media in receiving agricultural information: A farm level study. Bangladesh Journal of Extension Education. 2015;27(1-2):41-49.
21. Rashid SMM, Islam MR. Problems faced by farmers in application of e-Agriculture in Bangladesh. Journal of Agricultural Economics and Rural Development. 2016; 3(1):79-84.
22. Kafura RA, Afrad MSI, Proshan FA, Chakraborty DB. Use of ICT as extension tool by the farmers of Gazipur district in Bangladesh. Indian Research Journal of Extension Education. 2016;16(2).
23. Uddin MN, Bokelmann W, Entsminger JS. Factors affecting farmers' adaptation strategies to environmental degradation and climate change effects: A farm level study in Bangladesh. Climate. 2014;2:223-241.
24. Kim C, Jung H, Lee S, Park S, Takei A. An analysis on determinants of farmers' adaptation to climate change in Korea. Journal of Rural Development. 2012;35: 53-72.
25. Gbetibouo GA. Understanding farmers' perceptions and adaptations to climate change and variability: The case of the Limpopo Basin, South Africa. IFPRI Discussion Paper; 2009. Available:<http://www.ifpri.org/sites/default/files/publications/ifpridp00849.pdf> (Accessed on 13th July, 2016)
26. Nhemachena C, Hassan RH. Micro-level analysis of farmers' adaptation to climate change in Southern Africa; IFPRI Discussion Paper No. 00714. International Food Policy Research Institute: Washington, DC, USA; 2007, Available:<http://ageconsearch.umn.edu/handle/42399> (Accessed on 26 July 2013)

© 2017 Khan et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

*The peer review history for this paper can be accessed here:
<http://sciencedomain.org/review-history/20298>*