

Original Research Article

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

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. No systematic study is available on their effectiveness in technology transfer to the farmers in Bangladesh. 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 per cent) of the farmers perceived that effectiveness of AICC in technology transfer was high while 38 per cent of the farmers perceived as "moderately effective" and 25 per cent 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 per cent variation in perceived effectiveness of AICC while knowledge on ICT explained 70 per cent 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.

Key words: ICT, information, communication, technology transfer, effectiveness, AICC, Bangladesh

1. Introduction

33 Agriculture is one of the core sectors of the economy of Bangladesh since its independence in
34 1971 and still contributing 15.33 per cent to GDP [1]. Besides, providing employment to 48.1
35 percent labor force, this sector provides accommodation to 62 per cent manpower of the
36 nation, and 84 per cent of the population of Bangladesh living in rural areas, directly or
37 indirectly depends upon agriculture for their livelihood [2]. The agricultural system of
38 Bangladesh has a long history of coping with the challenges. The rural level extension agents
39 named Sub-Assistant Agricultural Officer (SAAO) are the responsible persons for who meet
40 with farmers at their farm and or home to technology transfer. However, it is very difficult for
41 a SAAO to reach to all farmers at each block, the working area of a SAAO with around 1500
42 farm households [3]. The system has experienced remarkable development over time.
43 Inclusion of Information and Communication Technologies (ICTs) in agriculture enhanced
44 the capacity of the system to face the challenges of the time [4]. ICT as an extension tool that
45 could enhance the flow of information in the application of agricultural extension services
46 [5]. But the history of ICT uses in the agriculture of Bangladesh was not so rich while ICTs
47 based task force program was launched by the Ministry of Agriculture (MoA) only in 2003.
48 In Bangladesh, private sectors have been operating the main ICTs (mobile phones, computers
49 and internet) based activities. In connection this issue, the government also formulates and
50 implements ICT policy for agricultural development [6]. An important initiative was taken by
51 the Ministry of Agriculture is the establishment of Agricultural Information and
52 Communication Centers (AICC) at village level throughout the country. The AICC have been
53 established and managed by Agricultural Information Services (AIS), an information
54 management wing under the MoA. Managed by registered farmers' cooperative
55 organizations, each center received a desktop computer, laptop computer, digital camera,
56 internet modem, multimedia projector, scanner and other digital devices from AIS. Farmers
57 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 determine the effectiveness of AICCs in agricultural technology transfer to the farmers in Bangladesh. Additionally, the study describes the socioeconomic characteristics of the farmers in the study area, and utilizes a multiple regression model to identify significant variables associated with the effectiveness of AICC in agricultural technology transfer.

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74 **2.0 Methodology**

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76 **2.1 Study area and sample selection**

77 The study was conducted in five randomly selected AICCs from eleven in five sub-district of Mymensingh district. The farmers (199 registered) received information from AICCs in the month of January and February 2016 was constituted the population of the study. Finally, 100 farmers i.e., 50 per cent of the population, were randomly selected as the 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.

83 **2.2 Variables selection and measurement of the dependent variable**

84 There were eleven explanatory variables which were selected characteristics of AICC user
 85 farmers while farmers' perceived effectiveness of AICC in technology transfer was the focus
 86 variable of the study. Most of the explanatory variables were measured by developing scales
 87 based on the field scores. On the other hand, the focus variable was measured on the basis of
 88 opinion of the farmers who took AICC service in receiving agricultural information. While
 89 measuring effectiveness AICC, five important aspects of effectiveness was considered for the
 90 study. These aspects were: (i) message credibility, (ii) message adequateness, (iii) message
 91 understandability, (iv) message persuasiveness and (v) message applicability. This
 92 methodological approach has been drawn from the work of Majydyan (1996). Effectiveness
 93 of AICCs was measured using 4 - point rating scale while each aforesaid dimension, score of
 94 3, 2, 1 and 0 were assigned to indicate the extent of effectiveness as 'highly effective',
 95 'moderately effective', 'low effective', and 'not at all effective', respectively. A respondent's
 96 obtained scores of all five aspects were added to compute his/her total effectiveness score. A
 97 score of '0' indicated 'no effective' while '15' indicated 'highly effective'. Finally, the
 98 respondents were categorized into three categories according to their perceived effectiveness
 99 scores.

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

3.0 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.

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

Characteristics	Scoring system	Score range		Mean	SD*
		Possible	Obtained		
Age	Years	Unknown	22-75	43.08	12.86
Education	Years of schooling	Unknown	0-18	6.75	4.57
Household size	No. of members	Unknown	2-11	5.17	1.86
Farm size	Hectares	Unknown	0.23-3.70	0.91	0.71
Annual family income	'000' Tk.	Unknown	78.92-680.00	232.22	98.61
Organizational participation	Scale score	Unknown	0-54	9.83	8.15
Extension contact	Scale score	0-36	0-26	9.46	5.37
Awareness on ICT facilities	Scale score	1-9	1-9	3.46	2.14
Access to ICT facilities	Scale score	0-27	0-18	7.25	3.87
Knowledge on ICT	Scale score	0-25	0-25	7.56	5.65
Training received on ICT	Days of training	Unknown	0-3	0.24	0.82

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

Dimensions	Categories (scale score)	Frequency and per cent (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 2 shows that more than half of the farmers (52 per cent) believed that there were credibility of messages received from AICC, but 47 per cent farmers perceived messages from AICC were lowly adequate to mitigate their farming problems. Remarkable numbers of farmers (48 per cent) opined that the messages had no or low understandability, while 47 per cent of them considered the received messages as low persuasive. Moreover, it is important to note that an overwhelming majority (63 per cent) of the farmers termed the message as no or low applicable.

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.

Table 3 Effectiveness of AICC in technology transfer as perceived by the farmers

Categories of farmers (score range)	Number and per cent	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		

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 per cent) 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.

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.

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*	0.197	0.257
Organizational participation	.209*		
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)

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 indentify the influential factors that affecting 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.

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	-.054	.186	-.031	-.291	.772

ICT facilities					
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, R ² = .827 , F-value = 47.940					

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 significantly affect the effectiveness of the agricultural information sources. Similar results have also been observed in studies conducted by Rashid and Islam (2016); Kafura et al. 2016 [19, 20].

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 [21, 22, 23, 24].

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.

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

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 per cent) 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 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	18.65	4.79
Medium problems (13-24)	82	82		
High problems (25-36)	10	10		

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 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

Table 8 indicate '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 thought 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 constraints 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.

4. Conclusions and recommendations

A major proportion of the farmers perceived that AICCs as effective service provider in receiving agricultural information. Besides, majority of the farmers thought that there was high credibility of messages that are received from AICC. It may be considered 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 recommended that such issues should be considered by the authority while taking initiatives for increasing the effectiveness of AICCs. 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 effectiveness of AICC. Among the significant variables knowledge on ICT, education and family income were identified as determinants or influential factors to the effectiveness of AICC. So, it leads to the conclusions that to increase effectiveness of AICC all of these factors should be considered for further improvement of this service provider. 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. This findings lead to the conclusion that these problems may be the main reason having 'low' and 'medium' effective farmers opinion regarding AICC. Thus, respective authority such as Department of Agricultural Extension (DAE), Ministry of Agriculture etc. should take policy measures to minimize these identified problems in ensuring qualities services to the farmers.

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