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Attitude and Level of Knowledge of Farmers on ICT based Farming

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Abstract:

Agriculture is one of the most important sectors in Bangladesh which could be benefited tremendously with the application of ICTs. In that regards, extensive use of modern information technologies need to be promoted to farm level for the transfer of technologies and information in a cost effective manner. The focus of this study was on the attitude and level of knowledge of farmers towards Information and Communication Technology as a source of information use in extension service delivery in some selected places of Mymensingh sadar Upazila. Validated interview schedule was used for data collection and appropriate statistical tools were used to analyze the collected data. Simple random sampling technique was used in the selection of ninety (90) farmers as the sample of the study. The results showed that the majority (37.8%) of the farmers considerate the information related to input service and availability is most appropriate information. It was also found that half of the farmers (50.0%) had medium level of knowledge on ICTs. Furthermore, they had highly favorable attitude (58.9%) towards the Information and Communication Technology. In addition, age of the respondents, level of education, farming experience, farmers' perception on their information need and farmers' knowledge were found to be the potential factors of enhancing their attitude towards ICTs. Moreover, lack of electricity (mean value=2.33) was the major constraints faced by the farmers associated with ICTs application. Finally, while planning programs for the development of ICTs sector, policy makers should consider the above mention factors

which could help towards conversion of traditional farming to ICT based farming and also for development in future Bangladesh.

Key words: ICT based farming, Attitude, Level of Knowledge

General Background

Agricultural Extension in the current scenario of rapidly changing world has been recognized as an essential mechanism for delivering knowledge (information) and advices as an input into modern farming (*Jones, 1997*). Present day agriculture and Bangladeshi farming community is facing a multitude of problems to maximize crop productivity. In spite of successful research on new agricultural practices related to crop cultivation, the majority of farmers are not getting upper bound yield due to several reasons. One of the reasons is expert/scientific advice regarding crop cultivation is not reaching farming community in a timely manner. Farmers need expert advice well on time to make them more productive and competitive. For this, extension agency plays a major role in bridging this gap to make available the latest technologies at the door step of the farmers.

Most smallholder farming systems are much less productive and profitable than they could be. The reasons include lack of access to inputs and credit, and the inability to bear risks. Another major contribution is the information and skills gap that constrains the adoption of available technologies and management practices, or reduces their technical efficiency when adopted (World Bank, 2007). Farming is becoming a more time-critical and information-intense business. A push towards higher productivity will require an information-based decision-making agricultural system. Farmers must be get information at the right time and place (De Silva and Ratnadiwakara, 2008). It is increasingly recognized that ICT is necessary for accessing required information and knowledge (Richardson

1997; Chapman et al. 2004; Anandajayasekeram et al. 2008; Mcnamara 2009; Aker 2010). E-agriculture helps in dissemination of gathered information to the farmers, mostly lived in rural areas, to use in their routine work (World Summit on the Information Society, Geneva 2003). In a country like Bangladesh farms are extremely small, cultivation is dependent on the uncertainties of variable rainfall and average output is generally low. Value addition in agriculture requires technological, institutional and price incentive changes designed to raise the productivity of the small farms (Todaro, 2000). Imperfect information and high transaction costs can constitute major impediments in the agricultural marketing process (Dao, 2004). Information helps the poor to avail of the opportunities and also reduce their vulnerability. Kiplang'at (1999).

Recent developments in information and communications technology (ICT) offer a great opportunity to facilitate the flow of information and technology services delivery especially to the farmers (*Maningas, 2006*). It is comprehensible that on the one hand agriculture is becoming highly science driven and knowledge intensive, but on the other hand the existing public extension system, has become less effective, more time consuming and costly and fails to meet the expectations of those involved in agricultural production (*Mruthunjaya and Adhiguru, 2005*). The role of public agricultural extension service has traditionally been to provide the important link between agricultural research and farming communities, especially for technology transfer in support of agricultural and rural development (FAO, 2004). Several authors (Anderson and Feder, 2004; Anandajayasekeram et al., 2008; Aker, 2010) posited that public agricultural extension service over the years has been working via different approaches, methodologies and programs to ensure farmers adoption of improved technologies with little success. The extensive use of modern information technology needs to be

promoted for communication between researchers, extension workers and farmers to transfer technologies and information in a cost effective manner. Moreover, at present, the ratio of the farm families to the extension agent is 1000:1, which is really very less (NAEP, 1996). ICT has many potential applications in agricultural extension (*Zijp, 1994*), most especially in accessing required information and knowledge (Richardson, 1997; Chapman et al., 2004; Mcnamara, 2009).

The use of ICT is an important pillar of agriculture extension and in the current scenario of a rapidly changing world, has been recognized as an essential mechanism for delivering knowledge (information) and advice as an input for modern farming (*Jones, 1997*). ICT covers any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form. For example, personal computers, digital television, email, mobile etc. As ICT's diffusion started to grow in many developing countries, the application of ICT to agricultural and rural development began to receive the attention of researchers and policy makers. A number of studies have suggested that ICT could play an important role in agricultural development.

Lio and Liu (2006) found that a microwave-radio telephone system installed in the remote region of Tumaca, Columbia, along with community access points resulted in better trade and market opportunities. James (2004) reported that rural telephone and community radio services initiated in India and Sri Lanka had received a positive response from farmer communities. Bayes (2001) has argued that the Village Phone Program (VPP) of Grameen Bank of Bangladesh can convert telephones into production goods by lowering transaction costs. Attitude is seen as an evaluative disposition based upon cognitions, affective reactions, behavioral intention and past behaviors and it provides the response of someone's like or dislike towards something (Shih, 2004; Luarn and Lin, 2004). Shiro (2008) for example, through his research, has

proved that rural community possess positive attitude towards ICT and they welcome any ICT project to be built in their areas. However, Shiro (2008) also found that their lack of ICT knowledge reduces their ICT usage.

Here, an attempt has been made to analyze the reaction and to know the level of knowledge of the farmers towards ICT as a source of reliable and timely information about best production practices, processing, marketing, input and output prices, financial and risk-covering institutions etc. The favorable attitude of farmers towards ICT as an effective and efficient information support tool would lead to stronger conviction and efficient extension program planning in changing agri-rural environment. The focus of this study was on the attitude of the farmers towards ICT based agricultural system, their present level of knowledge on ICT based agriculture, the present situation of the system, problem faced by the farmers to run-through this system, which will be very helpful for the improvement of the existing system as well as the development in e-agricultural sector of Bangladesh.

Methodology

Area and Sampling

Three villages of Mymensing Sadar Upazila namely Boyra, Bhabkhali and Muktigiddha Bazar were selected purposively for study location. Some ICT hub previously established under a project in those areas and as a result people have access to ICT. Lists of total 450 farmers were found from those hubs and through simple random sampling techniques 90 farmers (20% of the population) were selected for the study. Face to face personal interview method was used to collect data from the selected farmers. In order to collect qualitative data, two group discussion sessions were arranged in the study areas. Each group contained 12 participants. The qualitative data helped the researcher to design interview schedule for the study. A

personal interview was conducted with the 90 respondents through the interview schedule in January 2014.

Measuring Attitude and Level of Knowledge of farmers

For measuring attitude of the respondents a 5-point Likert scale was used. There were twelve (12) statements including both positive and negative against the 5-point scale to avoid the biasness of the respondents. The 5-ponit scale: 'strongly agree', 'agree', 'undecided', 'disagree' and 'strongly disagree' with assigned score 5, 4, 3, 2 and 1 respectively.

The level of knowledge was measure followed by Bloom's Taxonomy technique and by asking them 12 questions regarding ICTs. The correct answer for each question was given a score 2 and for each wrong answer o. Thus, the knowledge score was calculated from the responses to the 12 item.

Statistical Measure

A quantitative analysis using data gathered by the interview schedule and Likert scale was used. Data were analyzed using the Statistical Package for the Social Sciences (SPSS). To reach the research objectives, appropriate statistical procedures for description were used. Data analysis was carried out through data description and data inferential analysis. Statistics, such as percentages, standard deviations, and means, were used in the descriptive section.

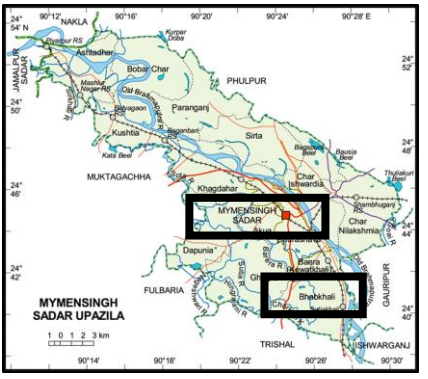

Figure 1: Map of Mymensingh District of Bangladesh showing the study area

Findings and Discussion

Socio-economic Profile of Respondents: Socio-economic characteristics of respondent farmers were analyzed and presented in Table 1.

Table 1: Salient Features of the Selected Characteristics of the Farmers

Socio-economic variable	Farmers (n=90)	
	Mean (Std. deviation)	(%)
Personal data		
Age (years)	33.31 (13.37)	-
Young (up to 30)	-	60
Middle Aged (31-50)	-	27.8
Old Aged (above 50)	-	12.2
Level of Education	10.23 (2.28)	-
Illiterate (0)	-	-
Primary Education (1-5)	-	3.3
Secondary Education (6-10)	-	54.4
Higher Education (above 10)	-	42.2
Farming Experience (years)	11.29 (10.43)	-
Farm Data		
Farm Size (ha)	0.529 (0.5150	-
Landless (0.02 ha)	-	-
Marginal (0.02-0.2 ha)	-	21.1
Small (0.21-1.0 ha)	-	68.9
Medium(1.01-3.0 ha)	-	8.9
Large (above 3 ha)	-	1.1
Annual Family Income (thousand taka)	77.15 (70.15)	
Low Income (up to 121)	-	82.2
Medium Income (122-242)	-	14.4
High (above 242)	-	3.3
Training Participation	0.89 (0.31)	-
0=no participation	-	11.1
1= Participation	-	88.9
Extension Contact (days) Possible Range (0-51)	19.54 (7.93)	-
Low Contact (up to 17)	-	40.0
Medium Contact (18-34)	-	58.9
High Contact (above 34)	-	1.1

Result in table 1 shows that majority (60.0%) of the respondent's belonged to young age group followed by middle age (27.8%) and old age (12.2%) group. The frequency distribution was highly skewed towards the younger

respondents. This means that more young people are getting involved in making use of ICT services for getting useful information.

While looking at the educational status of respondent, result revealed that majority (54.4%) of respondents had secondary education followed by higher education (42.2%) and primary education (3.3%) respectively. The study findings lead to conclude that future development program on ICTs will be helpful in the present study areas due to better educational qualification of the respondents.

The respondent farmers of the study areas had good farming experience with a mean score 11.29 and standard deviation 10.43.

Out of total 90 farmers under study, 68.9 percent had small farm land followed by 21.1 percent marginal, 8.9 percent medium and only 1.1 percent had large farm land. Moreover, it was observe that 82.2 percent of the respondents had low income followed by 14.4 percent medium and only 3.3 percent had high income from both agricultural and non-agricultural source. The results also show that 88.9 percent of the respondents participate in training program on ICTs and they had a medium contact (58.9%) with different information sources followed by 40.0 percent had low contact and only 1.1 percent had high contact with different extension source.

Appropriateness of Information:

The main focus of ICT application in agriculture is to meet the information need of farmers. Keeping this objective in mind, an attempt was made to explore the most appropriate information (based on their perceived information) on agricultural that were considered relevant to the need of the farmers regarding their socio-economic and biophysical circumstances.

Table 2: Appropriateness of Information Perceived by Farmers (n=90)

Items	Response					
	Most appropriate		Appropriate		Less appropriate	
	No	%	No	%	No	%
Question and answering service	13	14.4	28	31.1	49	54.4
Market Information	25	27.8	34	37.8	31	34.4
Input service and availability	34	37.8	34	37.8	22	24.4
Information on different agricultural program	07	7.8	31	34.4	52	57.8
General agricultural news	14	15.6	30	33.3	46	51.1
Post-harvest technology	02	2.2	28	31.1	60	66.7
Different agricultural program on TV	21	23.3	43	47.8	26	28.9

Information on input service and availability like sources of quality seed, fertilizer or different farm machineries etc. were considered most appropriate information by majority (37.8%) of the respondents while about the same percentage of respondents (37.8%) rated it as appropriate. Looking forward to the importance of different inputs on improved agricultural production and management practices farmers felt that information regarding input service and their availability was most appropriate and appropriate information perceived through ICTs.

The information relating to post-harvest technology was perceived as less appropriate by majority (66.7%) of the farmers. Giving due consideration to importance on market information, including daily updates on the prices of agricultural commodities in the local markets a sizeable portion (27.8%) of sample of farmers perceived “market information” as most appropriate information for their farming.

This was seen as most appropriate by 23.3 percent of farmers to get information by watching different agricultural program on TV. Majority of the respondent farmers were unaware about the importance of information regarding different post-harvest technologies. Moreover, question and answering, information regarding different agricultural news and program services through ICTs should be need based and updated covering different risk factors of the farmers.

Table 3: Distribution of Farmers on The Basis of Awareness on Various ICT Tools

List of ICTs	Heard		Seen		Uses		Have		Skills	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Television	90	100	90	100	85	94.4	84	93.3	84	93.3
Radio	90	100	90	100	87	96.7	31	34.4	50	55.6
Digital Camera	90	100	90	100	37	41.1	20	22.2	20	22.2
Video Player	90	100	90	100	50	55.6	35	38.9	35	38.9
Projector	71	78.9	61	67.8	28	31.1	0	0	20	22.2
Mobile Phone	90	100	90	100	89	98.9	86	95.6	86	95.6
Computer	90	100	90	100	65	72.2	0	0	62	68.9
Internet	90	100	71	78.9	65	72.2	0	0	62	68.9

Result in Table 3 shows that all of the farmers had heard of television while all of them had seen television. Also majority (84%) had television set while all had used a television set. Furthermore, 84.0% of the farmers had skills on how to operate television set. However, all of the farmers had heard of Radio while all had seen Radio. Furthermore, 87.0% farmers used Radio while 31.0% had Radio and 55.6% of the farmers had skill on how to operate Radio. Result on Table 3 also revealed that all of the farmers had heard and seen digital camera while only 41.1% had used digital camera, 22.2% had digital camera and the same percent farmers had the skill to operate the digital camera.

Most interesting part of the result from Table 3 was that all farmers had heard and seen about mobile phone respectively, 98.9% farmers had used mobile phone while 95.6% had the mobile phone and same percent farmers had skills on how to operate mobile phone finding will help further research on mobile phone and technology dissemination aspects on that respective study area. Furthermore, all of the farmers had heard about and seen computer respectively while 72.2% had used computer. Also 68.9% farmers had skills on how to operate computer but there were no farmer who had a computer in the study area. Finally, all of the farmers had heard about Internet, while 78.9% farmers had the opportunity to see and 72.2% farmers had the opportunity to use the internet. But unfortunately, none of the farmers had the access of internet in

their household. That's why they need to depend on the ICT hub for their necessary information. From training program arranging by the project authority of ICT hub they (68.9%) had the skills on how to use internet and collect necessary information.

Knowledge of Farmers on ICTs

The possible knowledge score of farmers on ICTs could range from 0-24, where 0 indicating no knowledge of farmers on ICTs and 24 indicating high knowledge of farmers on ICTs. The computed knowledge scores of the respondents ranged from 3-23 with a mean and standard deviation of 12.62 and 5.44 respectively. Based on the observed scores the distributions of the respondents have been presented in Table 4.

Table 4: Distribution of Farmers based on their Level of Knowledge

Possible Score	Observed Score	Classification of Farmers	Number	Percentage	Mean	Std.
0-24	3-23	Low (up to 8)	24	26.7	12.62	5.44
		Medium (9-16)	45	50.0		
		High (above 16)	21	23.3		
		Total	90	100		

Information presented in the table 4 leads to illustrate that half of the respondents (50.0%) belongs to medium category i.e. they had medium level of knowledge on ICTs while 26.7% and 23.3% had low and high level of knowledge respectively. Thus, the findings indicate that proper training program should be arranged to enrich the level of knowledge of the farmers regarding the use of different ICTs.

Constraints Faced by the Farmers associated with ICT application:

Though the farmers are highly favorable (58.9%) on ICTs, they faced different problem associated with ICTs application. For

having a clear understanding of the problems faced by the farmers 10 problems were selected through pre-testing with the farmers. Problems faced by the farmers which were identified in the project study areas which are presented below in table.

Table 5: Constraints faced by the farmers associated with ICT application

Constraints	Extent of Constraints					
	Severe (3)	Moderate (2)	Low (1)	Not at all (0)	Mean	Rank Order
Unavailability of electricity	49	30	03	08	2.33	1
Lack of knowledge on ICT	32	40	11	07	2.08	2
Insufficient availability of ICT service to rural farmers	35	30	16	09	2.01	3
Lack of training on specific aspects	31	38	10	11	1.99	4
Complex process on specific aspects	14	34	13	29	1.37	5.5
Affiliation of the farmers in less important topics	11	35	20	24	1.37	5.5
Less technical support from experts	13	29	19	29	1.29	7
Selling small amounts of products in the market	12	28	17	33	1.21	8
Biasness in enlisting farmers name for training	06	38	11	35	1.17	9
Social barrier of using internet	07	26	26	31	1.00	10

Mean value of each constraint was computed and according to the highest mean value of all constraints are arranged in rank order. The above table shows that majority of the farmers have opined that “unavailability of electricity” is the major problem related to ICT application in getting useful information and since the mean score value shows highest i.e. 2.33 and it is ranked in first place followed by “lack of knowledge on ICTs” and “insufficient availability of ICT service to rural farmers” is another constraints associated with availing ICT application and it is ranked second and third position and its mean score

value shows 2.08 and 2.01 respectively. Similarly the constraints such as "lack of training on specific aspects", "Complex process on specific aspects", "Affiliation of the farmers in less important topics", "Less technical support from experts" are also one of the problems associated with ICTs application in Agriculture and its mean value shows 1.99. 1, 37, 1.37 and 1.29 respectively. Further the problem such as "Selling small amount of product", "Biasness in enlisting farmers name for training" and "Social barrier of using internet" affect the accessing of ICTs application of farmers and ranked from eight to ten positions respectively under study.

Attitude of Farmers towards ICTs

The possible attitude score of farmers towards ICT could range from 12-60, 12 indicating highly unfavorable attitude and 60 indicating highly favorable attitude. The computed attitude scores of the pond owners range from 30-50, the mean being 41.42 with a standard deviation of 5.00.

Table 6: Classification of Farmers according to their attitude

Possible Score	Observe Score	Categories of Farmers	Number	Percentage	Mean	Std.
12-60	30-50	Slightly favorable (up to 20)	-	-	41.42	5.00
		Moderately favorable (21-40)	37	41.1		
		Highly favorable (above 40)	53	58.9		
		Total	90	100		

Based on the obtained scores, the respondents were classified in to three categories as presented in Table 6. Data indicated that 58.9 percent of the respondents had moderately favorable attitude, 41.1 percent had highly favorable attitude and there were no farmers in the study area that had slightly favorable attitude towards ICTs. This finding indicates that farmers of

that area were enthusiastic to perceive different ICTs tools to get their required information.

Factors Affecting Farmers' Attitude on ICTs:

The correlation analysis presented in Table 7 further shows that age of the respondents, level of education, farming experience, farmers perception on their information need and farmers' knowledge were found to be the potential factors of enhancing their attitude towards ICTs.

Table 7: Correlation between the selected characteristics of the farmers and their attitude on ICT.

Independent Variables	Correlation of Coefficients (r)
Age	-0.340**
Level of Education	.447**
Farming Experience	-.210*
Farm Size	.034
Annual Income	.082
Extension Media Contact	.131
Farmers' Perception on their Information Need	-.313**
Farmers' Knowledge on ICT	.390**
Constraints Faced by the Farmers	-.075

*Significant at the 0.05 level of probability (2-tailed)
** Significant at the 0.01 level of probability (2-tailed)

A significant but negative relationship was found between age and attitude of farmers on ICT use. This may be due to using of different ICT tools are complex matter and as a result old farmers are showing negative attitude on ICTs use. Dhaka (2010) also found same result. Furthermore, generally the old people have more farming experience and they are usually not interested to change their present condition. In addition, young people, who have less farming experiences but venturesome, want to adopt new things and have a keen interest to learn new things. May be for the above mention reason a significant but negative relationship was found between farming experience

and attitude of farmers on ICT use. Farmers' perception on their information need showed a negative significant relationship with the attitude of farmers on ICT based farming. Similar to the finding of Dhaka (2010) a positive significant relationship was found between level of education of farmers and their attitude on ICT based farming. This may be due to the fact that education changes the human behavior and using of different ICT tools are difficult for illiterate people. Finally, a significant positive relationship was found between farmers knowledge on ICT and their attitude on ICT based farming. Ajayi (2013) also found the same result in his study. This is to say that farmers attitude on ICT based farming are most likely to be positive if their level of knowledge are found satisfactory and relevant to their need.

Conclusion and Recommendation

The study revealed that the average age of the farmers in the study areas is 33.31 and most of the respondents were young aged. This established that farmers are still in their active years and can still cope with the different ICT tools.

Based on the results obtained it can be concluded that farmers of the study areas have a moderately favorable attitude and the most important finding is that there are no farmers in the study areas who less or slightly favorable attitude towards ICT based farming, Besides this, the findings of the study also revealed that majority of the farmers (54.4%) had secondary education and education is responsible for their favorable attitude towards ICT based farming. Therefore, this finding will enhance the future development of ICT tools use for getting extension service delivery in the study areas and government should take proper steps to make these areas as a potential ICT based farming zone.

Further analysis on appropriateness of information perceived by farmer indicates that information regarding

different inputs service and their availability were considered most important information by majority (37.8%) of the respondents and information on post-harvest technology was perceived as less appropriate by majority (66.7%) of the respondents. Therefore, further research may be conducted to explore why other information seems less appropriate to the farmers that they are getting through different ICT tools.

The study revealed that half of the respondents (50.0%) had medium level of knowledge on ICTs. Researcher and policy makers should take initiative so that their level of knowledge will increase.

Furthermore, unavailability of electricity, lack of proper knowledge on ICTs, insufficient availability of ICT services to rural farmers and lack of training on specific aspects are the prominent challenges encountered in having access to different ICT services in the study areas. In that case, efforts should be geared by the authority towards improving the situation and create a better environment for farmers to use different ICTs.

Finally, the study revealed that age, level of education, farming experience, farmers' perception on their information need and their level of knowledge have influence on farmers' attitude towards ICT based farming system. Therefore, researcher and policy makers should consider those factors in case of further research and policy making.

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