

Farmers' Access to Agricultural Market Information Using ICTs: Bangladesh Perspectives

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Abstract:

The primary objectives of this study were i) to determine the extent of Information and Communication Technologies (ICTs) use by farmers for receiving agricultural market information, and ii) to identify the factors that influence farmers' choice of using ICTs for receiving agricultural market information. Attempt was also made to explore the influence of the selected factors to the extent of ICTs use for receiving agricultural market information. A cross-sectional survey methodology was employed. Two villages from Rajbari sadar upazila under Rajbari district were selected as the study area. A proportionate random sampling technique was used to determine the sample size (here, 127) drawn from 620 farm families. Data were collected by the 1st author using a well-structured interview schedule. A multiple regression analysis revealed that ICT ownership, ICT literacy, distance home to market and innovativeness had significant contribution to farmers' use of ICTs for receiving agricultural market information which explained 81.8% of the variance of ICTs use however perceived usefulness was found to be non-significant to ICTs use.



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INTRODUCTION

This study is farmed within the research area of Information and Communication Technologies (ICTs), which is concerned about understanding how ICTs can leverage farmers' access to agricultural market information, therefore, fostering farmers' better economic gain. It aims to investigate to what extent farmers use ICTs in rural Bangladesh particularly receiving time-sensitive agricultural marketing information. Also, it highlights some salient factors that seems to have an influence on farmers' choices of using ICTs in receiving agricultural information. There have been enormous attempts to develop Agricultural Market Information Systems (AIMS)'. Nonetheless, if AMIS is properly designed and implemented, it might induce more transparency in agriculture market price, reduce information asymmetry, increase farmers' bargaining power in negotiated deal and improve market access. Despite Department of Agricultural Marketing (DAM) (Website: <http://www.dam.gov.bd/damweb/jsp/index.jsp>) under the Ministry of Agriculture, Government of the People's Republic of Bangladesh launched a website listing Market- and district-wise daily retail prices, this has been proven ineffective for resource poor farmers who might have no access to that Website, yet their use of ICTs, particularly mobile phone seems to be impressive. Therefore, rather than investigating farmers' access to DAM's Website for agricultural market price, this study investigated farmers' overall use of ICTs for accessing agricultural market price. Agriculture is the most prominent employment sector of a country like Bangladesh where 63 percent of the population directly and indirectly involved in agriculture (BBS, 2012). While there are many prevailing factors, farmers' poor access to marketing facilities is found to be one of the important factors that limit rural farmers to reap the best harvest from agriculture. Information asymmetry and unfavorable policy matters of market prevent the farmers to get their real product price. Traditionally, small-scale farmers are dependent on the intermediaries such as wholesalers, retailers, and often deprived of fair pricing for their produce Furthermore, farmers' lack of education and proper training in agricultural commodities pricing, they are rarely in a position to bargain for their produce. Therefore, this study sheds light on a topic of growing interest to assess ICTs' roles in enabling resource poor farmers to market their produce in fair price.

Ubiquitous technologies like mobile phones are not only useful for communication but also creates opportunities in receiving time-sensitive pricing information. On the basis of the above mentioned problems, this study aims to: (i) identify the ICT-related factors that influence farmers' choice of using ICTs, (ii) determine the extent of ICTs use for receiving agricultural market information, and (iii) explore the contribution of the identified factors to the extent of ICTs use by the farmers.

REVIEW OF LITERATURE

Marketing is not simply an extension of the production process but it is a series of services involved in moving a product (or commodity) from the point of production to the point of consumption (Dixie, 1989). In other words, agricultural marketing is the performance of all business activities involved in the flow of food products and services from the point of initial agricultural production until they are in the hand of consumers (Kohls and Uhl, 1990). Traditionally in a supply chain, multiple parties involved from production to sell to the consumer. Due to several socio-demographic factors, for example low literacy, less mobility and accessibility to different markets, growers often deprived of fair price for their produce while the intermediaries like wholesalers reap the best out of the process. Structural and institutional features of intermediation

that tends to generate monopsony or oligopoly in the trade, resulting in depressed prices for producers or high consumer prices (Reardon & Timmer, 2005). Studies done by Harris (1979), Crow and Murshid (1994) also supported this thought. These works generally emphasis on the complexity in describing exchange relations and institutional arrangements between a large and diverse number of market actors (Olsen 1999, Crow 2001, Harriss-white, 2008). For example, crow (2001) concludes, “structure of grain and finance markets assists accumulation by the rich and the dispossession of the poor”. It found that within a month after the harvest, small farmers have to take two-thirds of their products to the market for sale. For small, medium and large farms it is 59%, 40% and 27%, respectively (Bayes & Hossain, 2007). It proves that small farmers are forced to sell their product in the market after the harvest to meet their necessary requirements rather than to get profit from the selling. Different studies on agricultural marketing of Bangladesh explores that farmers of this country are always deprived of fair price for their products due to plethora of middleman like beparis, farias, wholesalers, commission agents/aratdars, contract-buyers, cold storage operators, wholesaler-retailers, assembler-wholesalers, hawkers and retailers and they also force the farmers to sell their products to them by tying up some conditions (Sultana, 2012).

The middleman or intermediaries in the agricultural market create artificial shortage in the supply and increase the price of the product (Chowdhury, 2006). To overcome the unexpected interruptions by intermediaries in the market, an effective marketing system or structure is essential to ensure the proper distribution of agricultural products from growers to consumers and ensure the fair price for both parties. Imperfect information and high transaction costs were the major impediments in the agricultural marketing process (Dao, 2004). Kizilaslan (2006) argues that proper dissemination of information for agricultural and rural communities is a crucial tool to fight against poverty and deprivation. Information helps the poor to avail the opportunities and also reduce their vulnerability. Kiplang (1999) postulates that dissemination of relevant information to the farming communities can facilitate the effective adoption of agricultural inputs, decision making on markets and adoption of scientific methods. However, lack of dissemination of information across the agricultural supply chain is a major concern in the developing world. With the access to information, small-scale farmers are better able to compete with the big farmers thus increase their bargaining power. They can even develop knowledge regarding crop choices, develop products for the niche markets and even can market the products directly to the consumers. ICT-based solutions therefore might work well to reduce the inequalities in the supply chain of farm products and ensure fair price for small scale farmers. However, farmers’ ICTs use behavior might be influenced by many factors. Based on the understanding of the past studies, this study considered three ICT-related factors namely, ICT ownership, ICT literacy and perceived usefulness; one personal characteristic, innovativeness, and one situational or physical factor, distance from home to market while controlled the demographic related variables like age, education, farming and ICT use experience (Fig 1).

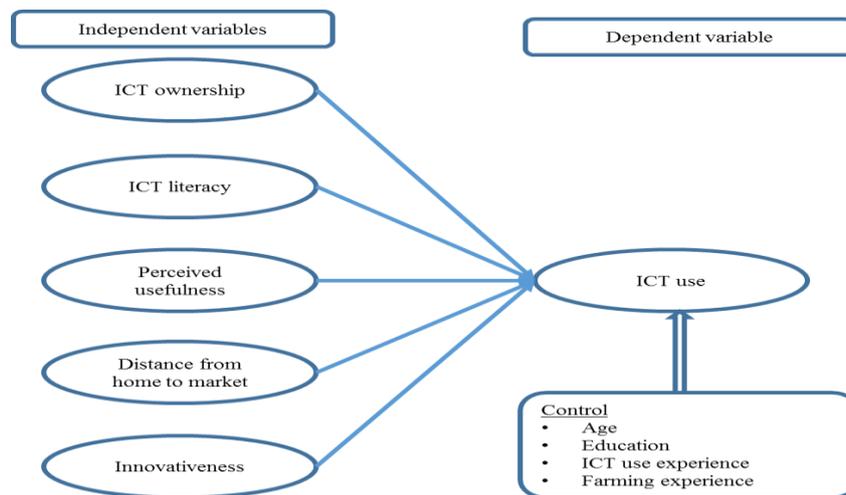


Figure.1 Conceptual framework of the study

ICT ownership enable farmers to keep them up to date with the nearest market and plan the best time to sell crops and livestock as they could get instant update about the market price (Ashraf et al. 2005). ICT literacy on the other hand provides confidence to use any ICT devices by their own without the help of others to complete their business deals (D' Silva *et. al.* 2010). Perceived usefulness refers to the degree to which users perceived that using ICTs would be beneficial for their farming activities. Prior studies have already proven that ICTs enhanced information flow between farmers and market and hence perceived usefulness and use of ICTs are highly associated (Dixon, 2009). Furthermore, innovativeness signifies unique characteristics of human that drive him to adopt a new technology or innovation faster compared to other members of a social system. Finally, distance to market was reported as a negative predictor of market participation since with the increase of distance between farm and market, farmers' participation to market decreases (Minten, 2003). Therefore, it is expected that farmers living far from the market use ICTs more compared to those who have easy access to market.

METHODOLOGY

A multi-stage sampling procedure was followed for the selection of the respondents. At first, Rajbari sadar upazila under Rajbari district of Bangladesh was purposively selected. Thereafter, two villages, Parshadipur and Mulghor from Mulghor union were randomly selected as the study area. The total number of farm families in these villages were 620; 280 family heads from Parshadipur and 340 family heads from Roshora village constituted the population of the study. The sample size (i.e., 127) was determine using a formula proposed by Kothari (2004).

$$n = \frac{z^2 p q n}{e^2 (N - 1) + z^2 P q}$$

The proportionate random sampling was used to determine the sample from each village (Table 1). A reserve list (10% of the sample) of the respondents was also determined in case of any respondent in the sample list was found not available during the data collection period (28th December, 2016 to 12th February, 2017).

Table 1. The Population and sampling of this study

Name of Villages	Population in each unit	Sample in each unit	Reserve list
Parshadipur	280	57	6
Roshora	340	70	7
Total	620	127	13

Nine (9) variables were selected including 4 control variables. Age and farming experience were measured by actual years and education was measured by completed year of schooling. ICT use experience was measured by scores computed using a formula as follows, where mobile phone use experience was expressed by 'a' and Internet and Internet-based media was expressed by 'b'.

$$\text{ICT Use Experience} = \frac{(1 \times a) + (2 \times b)}{2}$$

ICT ownership was measured based on respondents' nature of access to six selected ICT devices. ICT access was categorized into self, shared and no access and scores 1, 0.5 and 0, respectively were assigned against six ICT devices. All the scores were then added to compute the ICT ownership score. ICT literacy was measured to the extent respondents believe that they are capable of completing various tasks related to their agriculture using ICTs or ICT-based applications. Perceive usefulness refers to the extent respondents' perceived using ICTs would be beneficial to them for receiving farm-related market information. Innovativeness refers to an individual's willingness to use new technology once it is available to use. Appropriate scales were adopted from prior research to measure ICT literary, perceived usefulness and innovativeness while distance between farmers' homes to market was measured in kilometer. Farmers' access to agricultural market information using ICTs was the dependent variable of this study. Here, ICT use was measured to the extent of different ICT-based tools used by the respondents for receiving agricultural market information from various resources. Respondents' responses were captured in a 5-point scale (0-4) ranging from 'not at all' to 'frequently use'. Thus, the ICT use score could range from 0 to 28, where '0' means no use of ICT and '28' means frequent use of ICT to access agricultural market information.

RESULT AND DISCUSSION

This section organizes as follows. First, it discuss the respondents' characteristics. Second, selected factors that might influence respondents' use of ICTs are described followed by their extent of ICTs use for receiving agricultural market information. Fourth and finally, the contribution of selected factors to the extent of ICT use is presented.

Respondents' characteristics

The observed age of the farmers ranged from 26 to 58 having an average of 39.32 with a standard deviation of 9.53 (Table 2). Majority of the (46 percent) respondents were young compared to 38 and 16 percent were middle and old aged, respectively. Education ranged from 0 to 12 having an average of 5.24 with a standard deviation of 3.87. Majority (46 percent) of the farmers had secondary education compared to 16 and 4 percent having primary and higher secondary education, respectively. Besides, 4 percent of the farmers are illiterate and 34 percent of the farmers were could write their name only.

Table 2. Respondents' characteristics

Characteristics	Range	Categories	Frequency	Percent	Mean	Std.
Age	26-58	Young (up to 35)	58	46	39.32	9.53
		Middle (36-50)	49	38		
		Old (>50)	20	16		
Education	0-12	Illiterate (0)	5	4	5.24	3.87
		Can sign only (0.5)	42	33		
		Primary (1-5)	17	13		
		Secondary (6-10)	58	46		
		Higher Secondary (10-12)	5	4		
Farming Experience	11-45	Low (up to 16)	47	37	24.68	10.75
		Medium (17-30)	41	32		
		High (> 30)	39	31		
ICT Use Experience	1.5- 5.50	Low (up to 2.5)	59	46.5	7.25	1.06
		Medium (2.6-3.5)	33	26		
		High (>3.5)	35	27.5		

On an average respondents had 24.68 years of farming experience with a standard deviation of 10.75. Respondents were almost equally distributed in terms of their farming experience, 37 percent were low, 32 percent were medium and 31 percent were highly experienced in farming activities. The observed ICT use experience scores of the farmers ranged from 1.5 to 5.5 years. The average ICT use experience was 3.30 and the standard deviation was 1.06. Table 2 also shows that nearly half of the respondents (46.5 percent) had low while a little higher than one-fourth (26 & 27.5 percent) had medium and high ICTs use experience, respectively.

Factors contributing ICTs use in accessing agricultural market information

A summary of the descriptive statistics of the factors that influence users' ICT use behavior for receiving agricultural market information is given in Table 3.

Table 3. Descriptive statistics of the factors that influence users' ICT use for receiving agricultural market information

Characteristics	Possible Range	Observed Range	Categories	Frequency	Percentage	Mean	Std.
ICT ownership	0-7	2-5	Low (up to 2)	10	7.9	3.69	.94
			Medium (2.1 to 3)	52	40.9		
			High (>3)	65	51.2		
ICT literacy	0-16	3-16	Low (up to 11)	52	40.9	12.37	3.20
			Medium (12-13)	32	25.2		
			High (>13)	43	33.9		
Distance from home to market	Unknown	2-5	Short (up to 3)	56	44.1	3.57	1.16
			Moderate (3.1-4)	32	25.2		
			Long distance (>4)	39	30.7		
Perceived usefulness	0-16	10-16	Low (up to 12)	79	62.2	13.32	2.16
			Medium (13-15)	11	8.7		
			High (>15)	37	29.1		
Innovativeness	0-12	6-12	Low (up to 7)	38	29.9	9.52	2.30
			Medium (8-10)	32	25.2		
			High (>10)	57	44.9		

Five factors were considered which influence respondents' extent of ICTs use has been discussed and a summary profile is presented in Table 3. More than half of the respondents (51.2%) had high while less than one-tenth (7.9 percent) had low ICT ownership shows a moderately satisfactory possession of ICT devices to the respondents. Noteworthy here is that, mobile phone was found to be the most common ICT tool to the respondent group. Concerning the ICT literacy, Table 3 shows a mixed results as it is noticed that one-third of the respondents (33.9 percent) had high level of ICT literacy whereas a considerable number of the respondents (40.9 percent) had low literacy. This group could mostly operate mobile phone yet they were not found confident at other Web-based applications. More than half of the respondents (55.9 percent) lived at least 3 km far from the market delineates the importance of using ICTs for accessing market information for that respondent group. Regarding innovativeness, around 44.9 percent of the respondents were found highly innovative compared to one-fourth (25.2 percent) were medium and 29.9 percent were found less innovative. However, perceived usefulness scores reveals that an overwhelming majority of the respondents (62.2 percent) perceived ICT as low useful compared to a little higher than one-fourth (29.1 percent) of the respondents perceived it useful. This signifies that majority of the respondents could not able to utilize the full potential of ICT-based service for their access to market.

Extent of ICT use for accessing agricultural market information

Extent of ICT use for accessing agricultural market information is the dependent variable of this study. The observed ICT use scores ranged from 2 to 14 against a possible score of 0-24 (Table 4) with a mean 7.25 and standard deviation 3.95. More than half of the respondents (53.5 percent) had low compared to one-third (33.9 percent) had high and slightly more than one-tenth (12.6 percent) had moderate use of ICTs in accessing agricultural market information. This finding was in fact in line with other finding, particularly distance to market which says more than half of the respondents (55.9 percent) had moderate to long distance to market. Therefore, it assumes this group might be the moderate to high user (46.5 percent) of ICTs for receiving agricultural market information.

Table 0. Distribution of farmers according to their extent of use of ICTs

Category	Frequency	Percent	Mean	Standard Deviation
Low (up to 5)	68	53.5	7.25	3.95
Moderate (6-9 score)	16	12.6		
High (>9 score)	43	33.9		
Total	127	100		

Contribution of the selected factors to respondents' extent of ICT use for accessing agricultural market information

The purpose of this section is to examine the influence of five selected factors (as cited in the objectives) of the farmers with their use of ICTs for receiving agricultural market information. Multiple regression analysis was used to test the contribution of the selected variables to the extent of ICT use for receiving agricultural market information. Five percent, one percent and 0.1 percent level of significance were used as the basis for rejection of a hypothesis. The summary of the results of multiple regression coefficient indicate the contribution of each of the variables to the dependent variable as shown in Table 5.

Table 5. Multiple regression coefficients of the selected factors indicate their contribution to the extent of ICTs use for receiving agricultural market information

Independent Variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	R ²	F
	B	Std. Error	Beta				
(Constant)	-9.929	1.009		-9.844	.000	.818	114.566***
ICT ownership	2.380	.277	.566***	8.590	.000		
ICT literacy	.255	.074	.207***	3.432	.001		
Perceived usefulness	-.055	.126	-.030 ^{NS}	-.436	.664		
Distance from home to market	.901	.137	.264***	6.600	.000		
Innovativeness	.292	.119	.169**	2.449	.016		

^{NS}Non-significant, ***Significant at .1% level, **Significant at 1% level

Among the five hypothesized relationships, four were supported while unexpectedly perceived usefulness were found no significant contribution to the extent of ICTs use. This is however not a surprise as more than half of the respondents (62.2 percent) reported low perceived usefulness regarding ICTs use for agricultural market information. Nevertheless, the model shows a good-fit ($F=114.566$) and all the variables jointly contribution 81.8% of the variance of extent of ICT use ($R^2=.818$). ICT ownership was found the strongest predictor ($\beta=0.566$) followed by distance from home to market ($\beta=0.264$) and ICT literacy ($\beta=0.207$) while the contribution of innovativeness was found the lowest ($\beta=0.169$).

CONCLUSION

An efficient ICT-based pricing system may help in giving information to the farmers about price of different crops. It might also inform farmers to what to sell or store and what to plan for future agriculture. However, perceived usefulness was found no significant contribution to the extent of ICT which might be the cause of lack of any efficient ICT-based agricultural market information system. Considering the respondents' level of ICT literacy, it is pertinent that mobile-based solutions might be the better choice over Web-based applications. Moreover, this study once again proved the importance of ICT ownership for increased use of ICTs by its potential users. Therefore, a low-complexity mobile-based agricultural market information solutions would be highly effective and accepted to the rural community.

Since distance play an important role in determining respondents' ICT use frequency, sufficient IT-infrastructure should be developed and network coverage should be extended so that farmers living far from the market could make full use of ICTs for their farming purpose. Additionally, Ministry of Youth and Sports and ICT Division of Government of the People's Republic of Bangladesh along with private sectors should promote ICT training to the rural clientele. Therefore, rural farmers may upgrade their skills and enable them to minimize their economic loss due to market related inequalities. Furthermore, respondents' demographic related factors were controlled in this study however future studies should examine the direct and moderating effect to the model.

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