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THE USEFULNESS OF CELL PHONES FOR CROP FARMERS IN SELECTED REGIONS OF BANGLADESH

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ABSTRACT

This research endeavours the usefulness of cell phones for crop farmers in selected region of Bangladesh. For adequate findings and to achieve its purpose, structured interview schedule was adopted to collect data from 281 randomly selected farmers and it was revealed that a little over 60% of them found cell phones very useful, while only 5.3% respondents found the cell phone as less useful. Based on average talk time hours spend in the last six months, top three sources of agricultural information were friends and relatives, distributors and middlemen, and farmers in advanced categories. The results of the ordered logit model showed that their usefulness was significantly determined by age, farm size, per month call charges, and experience in using cell phones. Higher call rates, lack of awareness and paucity of mobile-based information sources were major bottlenecks in using cell phones for agricultural information. The recommendations suggested therein lead to connecting farmers with reliable and rich information sources, use of MMS and SMS, voice call activities, providing subsidized SIM cards, and ultimately undertake widespread campaigns for training of aged farmers to persuade their interest towards the use of cell phones and mobile-based information sources.

Contribution/ Originality
To the best of authors' knowledge other researches did not consider the types of services provided to farmers for receiving sufficient agricultural information. Moreover, this study is quite in contrast with other researches undertaken earlier on the use of cell-phones in Bangladesh, since it considers the concrete and appropriate usefulness, and also able to provide a holistic scenario of use of cell-phones along with its extended and vast informative benefits to the farmers.

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1. INTRODUCTION

Despite of apparent self-sufficiency in rice production, its yield is still considered to be very low in Bangladesh (Shelley *et al*., 2016). For instance, being the fourth largest rice producer in the world, productivity (4.42 ton/ ha) in Bangladesh is significantly lower than Vietnam (5.75 ton/ha) although placed in the fifth position (GRiSP, 2013). Credit constraints, lack in insurance markets, and poor infrastructure could be described as causes of some of this disparity, while a variety of observers have pointed out the possibility that sub-optimal agricultural practices and poor management may also be the contributors of these slackness (Jack, 2013).

There are mostly small and family operated farms amongst the more than 570 million farmers worldwide, (Lowder *et al*., 2016). A similar trend is also characterized by the prevalence of small and fragmented landholdings in the agricultural sector in Bangladesh (Haque and Jinan, 2017). Unexpectedly, farming systems pertaining to small-holding farmers are remarkably less productive and less profitable than their capacity for reasons encompassing the lack of access to credit and input, and inability to withstand risks. Information and skill gaps regarding adoption of modern technologies and management practices also contribute to productive growth and technical efficiency (World Bank, 2007).

Since farming is gradually and progressively becoming time-critical and information-intense business, and hence, improved information flows have positive effects on the agricultural sector and individual producers, but gathering and distribution of information are quite difficult and expensive activities (Milovanović, 2014). Similarly, agricultural extension system in Bangladesh is historically suffering from many inherent problems and often unable to meet the information needs of most farmers (Nippard, 2014; Rashid and Gao, 2016). The service is operating with limited manpower in constraining resources. For instance, Department of Agricultural Extension (DAE) - the largest crop extension organization - employs 14,092 field-level extension agents, where each agent is liable and responsible to provide services to 900-2,000 farm families (Miah, 2015). In this context, Information and Communication Technology (ICT), particularly mobile phones could be effective medium to link farmers with necessary information. Mobile phone sector in Bangladesh is experiencing a rapid growth from its inception since 1993. To be more precise, till March, 2019 the number of total mobile subscribers was 158.44 million, which includes almost 97.02% of the total population standing at 163.288 million (BTRC, 2019). Not only had there been an increase in the number of subscribers, the coverage of mobile network reached almost at its highest limits for almost 99% residents (GlobalEconomy.com, 2019). However, successful application of cell phones need to know the type of information, which is being sought by the farmers, various sources used accordingly, and appropriate usefulness of mobile phones for the farmers.

1.1. Study objectives

The general objective of this research was to explore the usefulness of mobile telephony in receiving agricultural information in the study area. However the specific objectives were:

1. To reveal the present situation of mobile use by the respondents.
2. To explore the usefulness of mobile phone for the crop farmers in the study area.
3. To identify the determinants of cell phone usefulness in the study area.

1.2. Conceptual framework

A cell phone is a portable telephone, which embraces cellular network technology to make and receive calls. The names originated from the cell like structure of these networks (Ware, 2016). The term cell phone is interchangeable with cellular phone or mobile phone. Usefulness, on the other hand, is something (service or device) that represents its benefit. Usefulness is the quality of having utility and especially practical worth or applicability. So, usefulness of mobile phone in agriculture means the utility of mobile phone in enhancing benefit from crop production.

Mobile phone based information delivery assists smallholder farmers to address the economic development challenges to deal with extreme poverty and increasing food security as well (Wyche and Steinfield, 2016). Along with reduction of communication and information cost, cell phone provide rural peasants with information on market, weather, transport, and agricultural techniques, and helps to maintain contact with concerned agencies and departments (Aker, 2011). As stated by McNamara (2009), the list of benefits of mobile phone use in extension and agricultural development are numerous, which encompasses - increasing small-holder productivity and incomes; turning agricultural markets more efficient and transparent; connecting poor farmers to urban, regional, and global market; improving services and governance for the rural poor; promoting and engaging smallholder in agricultural innovation; assisting farmers in managing a range of risks; efficient management of land, natural resources, and environmental pressure; enhancing participation of poor farmers in high-value agriculture; supporting the emergence of a more diverse rural economy and assisting rural families decisions about their integration of productive activities.. However, consulting several number of literatures (Aker, 2011; Baumüller, 2012; Bayes *et al*., 1999; Donner, 2006; Goggin and Clark, 2009; Goodman, 2005; Kyem *et al*., 2006; Martin and Abbott, 2010; Mittal and Mehar, 2012, Singh and Issac, 2018; Qiang *et al*., 2011; Vodafone Group and Accenture, 2011) around the globe a list of benefits of usefulness of cell-phone in agriculture is displayed in Table 1.

Table 1: Usefulness of cell phone in agriculture

Area of information	Usefulness
Input related	Better input and equipment; optimum use of input; real price; less chance of being cheated; better delivery; better environment
Financial	Quick payment; increased access to credit; better management of bank account
Weather	Better management of climate change effect; reduction of risk; better water management
Production	Better selection of crop varieties; efficient management of land, irrigation, fertilizer, disease, pest, natural resources, etc.; better harvest, processing, & storage
Market	Better market links and distribution networks; enhanced access to markets and value chain; reduction of fraud; latest market rates
Training & Education	Better knowledge & skill; positive attitude; improved literacy
Social networking	Improved cohesion and better interpersonal relationship; enhanced group efficiency; better mobility and security; more empowerment

Multiple social issues effect on the use of ICTs, such as literacy, socio-economic status, willingness, as well as conditions to participate in ICT training (Manalo and Eligio, 2011). Katengeza *et al*. (2011) identified literacy, distance to local market, land size, current value of assets, crop income, and regional variations positively affect mobile use by smallholder farmers for agricultural marketing. Demographic variables, such as age, sex, educational level, experience and size of holdings were found influential determinants in the use of mobile phone among small-scale poultry farmers in Ghana (Folitse *et al*., 2019). In Tanzania Urassa and Mvina (2016) identified distance from home to the nearest cattle market; the variety of information demands; income earned per year; level of local network coverage and access to mobile financial services in using cell phones in access to beef cattle market information. Farmers' decision to patronize mobile phone-based weather and market information was found significantly influenced by contact with agricultural extension agents and farmer-to-farmer extension services (Etwire *et al*., 2017). Factors, such as, age and social participation was identified as influential in mobile phone use by the farmers in receiving information on vegetable cultivation in Bangladesh (Asif *et al*., 2017).

Use of cell phone for agricultural information is often constrained by several factors. Primary obstacle identified by most of the studies was high call charge (Asif *et al*., 2017; Stephane, 2017; Warthi and Bhanotra, 2017). Several studies conducted in diversified locations also cited network failure as a crucial constraint (Folitse *et al*., 2019; Navinkumar *et al*., 2018; Warthi and Bhanotra, 2017). Lack of electric power supply emerged as a conspicuous constrains in cell phone use in the agriculture sector (Asif *et al*., 2017; Falola and Adewumi, 2012; Mukadasi, 2018; Navinkumar *et al*., 2018; Warthi and Bhanotra, 2017). Other constraints limit the use of mobile phone in agriculture identified in various studies were non-membership of agricultural society, inadequate extension services, fluctuating telecommunication services, inadequate access to mobile services, lack of mobile servicing centre, language barrier, lack of knowledge and confidence, complex technology, incomplete messages, lack of locally relevant information, and high cost of mobile phone set (Asif *et al*., 2017; Falola and Adewumi, 2012, Navinkumar *et al*., 2018; Warthi and Bhanotra, 2017). There are also debates and issues on the mode of information delivery via mobile phone. For instance, SMS is preferred over the voice message or vice-versa. For text SMS, there are issues of language conversion, maintaining character constraints, compatibility of farmer's handset to local language, literacy of subscribers, etc. Voice message, on the other hand, have constraints like more costly, efficiency of receiving the messages at pre-defined time is poor and there is a cost of retrieving the information in the message (Aker, 2011; Mittal *et al*., 2010; Mittal, 2012).

2. METHODOLOGY

2.1. Study area

The study was carried out in Barisal division under Bangladesh. This division is situated in the southern part of the country and bears a land area equivalent to 13,295 km^2. The total number of the population resides in Barisal is 8,173,818 and the division is renowned for rice and pulse production. In recent years some areas of the division become advanced in vegetable production also. People (54.72%) of this division predominantly depend upon agriculture as a major source of income (Banglapedia, 2015).

2.2. Study approach

This study adopted a quantitative method for reaching research objectives. As stated by Creswell (1994), quantitative research is a type of research that is explaining a phenomenon by collecting numerical data that are analyzed using mathematically based methods (in particular statistics).

2.3. Population and sampling

This study adopted a multistage random sampling method for the selection of sample. Barisal division is composed of six districts of which three districts (Barisal, Patuakhali, and Jhalokathi) were purposefully selected for the study. From each of the selected districts one sub-district was randomly selected. One union from each of the selected sub-district (Babugonj, Dumki, and Nalchity) was selected randomly followed by the selection of two villages randomly from each of the selected unions (Chandpasa, Angaria, and Dopdobia). Hence, the total number of selected villages was six namely Dumki Satani, Jhatra, Chandpasa, Bailakhali, Bhorotkathi, and Jurkathi. The farmers of these selected villages, who use a cell phone for agricultural information at least once in the last six months, constitute the population of the study. The total number of such farmers in the study area was 1150. Based on the sample size calculator at 95% confidence level and 5% margin of error the required sample size was 289. Hence, this research took face-to-face interview of 289 farmers. Due to inconsistency of information 8 interviews were dropped and finally 281 respondents constituted the sample of the study.

2.4. Data collecting instruments

This study used a structured interview schedule as data collecting instrument. The interview schedule was pre-tested upon forty similar respondents as considered in the study for ensuring validity and reliability and executing necessary correction and adjustments. Test-retest method was applied to ensure the reliability of usefulness scale. The score of test and retest showed significant correlation which represents the reliability of usefulness scale.

2.5. Measurement of variables

Usefulness of mobile phone is the dependent variable of the study which was measured based on a single-item 5 point rating scale (Very useful=5, Useful = 4, Moderately useful = 3, Less useful = 2, Very less useful = 1). Usefulness can be measured based on both single and multiple items. As usefulness holistically represents one concept, and judged to be concrete, so single item measurement can be considered as reasonable (Sackett and Larson, 1990; Rossiter, 2002). Nonetheless, single-item measures are flexible, easy to administer (Pomeroy *et al.*, 2001), less time consuming and not monotonous (Gardner *et al.*, 1998) thus reducing response biases (Drolet and Morrison, 2001). However, measurement techniques of other variables of the study are provided in Appendix 1.

2.6. Statistical tests

This study used descriptive statistics like mean, median, mode, standard deviation, frequency, range, etc., for describing the variables. However, to identify the determinants of usefulness of mobile phone, this study deployed order logistic regression. When a criterion variable has more than two categories and the values of each category have a meaningful sequential order i.e. a value is higher than the previous value then an ordinal logit model can be deployed (Torres-Reyna, 2012). The model is based on the assumption that there is a latent continuous outcome variable and the observed ordinal outcome arises from discretizing the underlying continuum into j-ordered groups. The thresholds estimate these cut-off values. The basic form of the generalized linear model is

$$link\ (\gamma_j) = \frac{\theta_j - [\beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k]}{\exp(\tau_1 z_1 + \tau_2 z_2 + \cdots + \tau_m z_m)}$$

Where, γ_j is the cumulative probability for the j^{th} category, θ_j is the threshold for the j^{th} category, $\beta_{1\ldots\ldots}\beta_k$ are the regression coefficients, $x_1 \ldots . x_k$ are the predictor variables, and k is the number of predictors.

The numerator on the right side determines the location of the model. The denominator of the equation specifies the scale. The $\tau_1 \ldots \tau_m$ are coefficients for the scale component and $z_1 \ldots z_m$ are m predictor variables for the scale component (chosen from the same set of variables as the x's).

3. RESULTS AND DISCUSSIONS

3.1. Personal characteristics of the respondents

Participants in this study were 214 males and 67 females. Mean age of the respondents were 42.69. In terms of educational background, almost half (46.9%) of the respondents had Secondary School Certificate (SSC) level education. More than one third (37.7%) of the respondents were placed in marginal farmers category. In case of objectives of farming, 89.7 percent of the respondents had both commercial and family consumption motive, while mean annual income of the respondents was 129.94 thousand taka. However, a detail of personal characteristics of the respondents are presented in Table 2.

Table 2: Personal characteristics of the respondents (n = 281)

Variable	Scaling	Category	Freq.	%	Mean	Med.	SD
Age	Year				42.69	40	11.37
Gender	Nominal	Male	214	76.2			
		Female	67	23.8			
Education	Category	Primary (1-5)	105	37.4			
		SSC(6-10)	132	46.9			
		Above SSC(<10)	44	15.7			
Farm size	Category	Landless	35	12.5			
		Marginal	106	37.7			
		Small	66	23.5			
		Medium	68	24.2			
		Large	6	2.1			
Objective of farming	Nominal	Commercial	3	1.1			
		Family consumption	26	9.3			
		Both	252	89.7			
Annual income	'000' Tk*				129.94	100	118.30

Note: *The short name of currency of Bangladesh called Taka (1 USD = 83 Tk)
Source: Field Data, 2016

3.2. A profile of cell phone use by the respondents

Data arranged in Table 3 shows that 80.15% of the respondents use only one operator for mobile telephony. On an average, respondents spend 380 Taka per month as mobile toll and majority of them were using mobile phone for almost six years.

Table 3: Status of cell phone use by the respondents (n = 281)

Variable	Scale	Category	Freq.	%	Mean	Med.	SD
Number of operator(s) use	Score 1 for each operator	One	229	80.15	1.19	1	0.04
		Two	49	17.39			
		>2	3	1.06			
Monthly expenditure	'00' Taka				3.80	3	6.39
Tenure of mobile use	Years				5.78	5.25	2.71

Source: Field Data, 2016

Mobile operators in Bangladesh cater different services for their clients. Grossly, these services include voice call, text message, picture message, voice message, and internet service. However, farmers' use of these services varies abruptly. According to the data presented in Table 4, all the respondents use the voice call service to a varying degree. Although a negligible section of the farmers use the text message, but none of the farmers use the voice message service for receiving agricultural information. Similar to voice message user group, a puny section of farmers uses the internet service in the last six months. However, detail of farmer's extent of used for different service is presented in Table 4. Supporting to our findings, Wyche and Steinfield (2016) in their study rural Kenya also found limited use of texting as SMS requires multiple sub-skills - in putting letters, spaces, and symbols, and switching between upper and lower cases – which involve a significant degree of learning, especially, when menus involve only English words. Martin and Abbott (2010), in a study in Uganda on the use of mobile phones in agricultural development found limited use of SMS what is supposed to be linked with a high illiteracy rate.

Table 4: Distribution of respondents based on extent of use of different types of services

S. No.	Type of service	Extent of use				
		Regular	Frequent	Occasionally	Rarely	Never
1	Voice call	166	41	56	18	0
2	Text message	0	2	1	4	274
3	Voice message	0	0	0	0	281
4	Internet	5	0	1	2	273

Note: Regular = every week; Frequent: every 15 days; occasionally = every month; rarely = every six months, never = no use in last six months
Source: Field Data, 2016

Mobile phone operators in Bangladesh offer different kinds of service to their customers. These services include voice call, text message, MMS, voice message, internet service, etc. Among these services voice calls are more expensive and most transient in terms of future preservation. On the other hand, text messages, MMS, voice message, etc. are long lasting and at the same time less expensive. They can reach the receiver in case of his absence at the other end of the mobile phone. Nonetheless, information received via text message, MMS, voice message, etc., can easily be shared repeatedly with the peers at any time.

3.3. Usefulness of cell phone

As presented in Table 5 for little more than two third (35.2%) of the farmers found mobile phone useful for receiving agricultural information, while 31.3% of the respondents found mobile phone moderately useful. Among the rest of the respondents 28.1% found mobile phone very useful, while rest 5.3% of the farmers identified mobile phone as less to very less useful.

Table 5: Distribution of the respondents based on the level of their mobile phone usefulness

S. No.	Level of usefulness	Frequency	Percentage
1	Very useful	79	28.1
2	Useful	99	35.2
3	Moderately useful	88	31.3
4	Less useful	11	3.9
5	Very less useful	04	1.4
	Total	281	100

Source: Field Data, 2016

The following table shows the average minutes used in last six months, the top source for agricultural information for respondents is peers and relatives. On average, farmers spent 135.85 minutes/six months with peers and relatives in agricultural information. The other dominated source of information based on average minutes in the last six months via mobile was distributer/middle man, advanced farmers, input dealers, NGO extension worker, public extension worker, private company representative, and mobile company call centers. It is important to note that a negligible proportion (2.8%) of farmers surfed website via mobile for agricultural information. Fashina and Odefadehan (2014) also confirmed that the friends are the top ranked agricultural information sources in the case of Ondo state of Nigeria.

Cell phone can be a very effective device for securing farm information, however, Bangladesh still has significant room for improving the usefulness of the cell phone. If we have a critical observation, majority of farmers mostly use less reliable sources like relatives and peers, advanced farmers, middlemen, input dealers, etc. for getting information. Their use of reliable and rich sources like public and private extension workers seemed to be very limited.

Table 6: Use of different information sources for acquiring agricultural information (n = 281)

Information source	Use*	Freq. (%)	Mean	Med.	Std.	OR*	Rank*
Public extension officer	Yes	135(48)	18.71	0.00	40.27	0-240	6
	No	146(52)					
NGO extension worker	Yes	131(46.6)	25.36	0.00	58.78	0-360	5
	No	150(53.4)					
Seed/fertilizer/pesticide dealer	Yes	205(73)	35.61	15.0	53.73	0-240	4
	No	76(27)					
Private company representative	Yes	37(17.2)	6.50	0.00	42.33	0-480	7
	No	244(86.8)					
Advanced farmers	Yes	160(56.9)	37.26	6.0	63.69	0-480	3
	No	121(43.1)					
Mobile company call center	Yes	25(8.9)	2.46	0.00	18.98	0-280	8
	No	256(91.1)					
Distributer/middle man	Yes	137(48.8)	42.56	00	97.06	0-720	2
	No	144(51.2)					
Friends and relatives	Yes	217(77.2)	135.85	60.0	193.66	0-960	1
	No	64(22.8)					
Websites	Yes	8(2.8)	1.89	00	16.63	0-240	9
	No	273(97.2)					

Note: *Use in last six month; *Ranked based on mean (Minutes/6 month); *OR = Observed range
Source: Field Data, 2016

3.4. Type of information sought

Farmer sought varieties of information via mobile phone. Based on weighted mean, information related to crop protection occupies the first position. The other crucial subjects of information search according to rank order are fertilizer management, selection co crop varieties, marketing of agricultural products, seed processing and treatment, etc. However, other aspects of information search are presented in Table 7. Similar to the respondents of the study area, Kenyan farmers also sought information about seed, fertilizers and pesticides for growing crops against bad weather (Kashem, 2010). Studying the case of Morocco Ilahiane (2007) found that farmers exchange marketing, weather, and business information among each other via cell phone.

Table 7: Extent of information search by the respondents (n = 281)

S. No.	Subject of information	Extent of search				WM*	Rank
		OF	OC	RA	NE		
1	Pest and disease control information	107	109	41	24	2.06	1
2	Fertilizer management	66	112	44	59	1.65	2
3	Selection of crop and/or vegetables species	53	94	77	57	1.50	3
4	Marketing of crop/vegetables	73	58	34	116	1.31	4
5	Seed processing and treatment	24	54	58	145	0.84	5
6	Irrigation and water management	26	35	52	168	0.71	6
7	Purchase of equipment and their use	16	21	90	154	0.64	7
8	Land preparation	16	42	45	178	0.62	8
9	Weather information	27	18	38	198	0.55	9
10	Crop/vegetable processing	12	31	56	182	0.54	10

Note: Often (OF) = Search information at least once/month, Occasionally (OC) = At least once/three months, Rarely (RA) = Once/six months, Never (NE) = Don't search information in last six months, *Weighted mean= oftenX3+ ocassionallyX2+ rarelyX1+ NeverX0/ Total respondents
Source: Field Data, 2016

3.5. Constraints of cell phone usefulness

Farmers encountered numerous problems in using cell phone for agricultural information (Table 8). Among the confronted problems, high call charge is placed at the top of the list. Based on weighted mean other major problems encompass lack of awareness about mobile based information sources, scarcity of mobile based information sources, unavailability of skilled mobile mechanic, lack of skill in operating cell-phone, etc. Similar to this study, a research conducted in Ethiopia, Ruanda, and Bangladesh concluded that the cost of purchasing and using mobile devices can become a momentous deterrent to the success of mobile device system for marketing (Cho and Tobias, 2012). Reviewing several studies, Chhachhar and Hassan (2013) claimed that there is a lack of signal of uses of mobile phone and infrastructure in many developing countries. The lack of knowledge is also a profound problem among rural communities and families in use of ICT. A study in Malaysia also claimed that use level of ICT among rural community especially farmers remain low as a result of lack of knowledge and skill (Musa, 2008).

Table 8: Problem confrontation in using mobile phone for agricultural information (n = 281)

S. No.	Problem	Incidence of problem					WM*	Rank
		VH	HI	MO	LO	VL		
1	High call charge	62	126	72	15	6	3.79	1
2	Unaware about mobile based information sources	95	83	47	35	21	3.77	2
3	Paucity of mobile based information sources	65	91	73	29	23	3.52	3
4	Scarcity of skilled mobile mechanic	48	70	95	47	21	3.27	4
5	Lack of skill in operating cell phone	52	83	60	45	41	3.21	5
6	Weak network	54	56	78	60	33	3.13	6
7	Don't find relevant information	61	48	72	59	41	3.10	7
8	Balance shortage during phone call	31	53	90	80	27	2.93	8
9	High price of mobile handset	6	36	151	72	16	2.80	9
10	Inadequacy of electricity for mobile charging	49	38	57	61	76	2.72	10

***Weighted Mean** = Very high (VH)X5 + High (HI)X4 + Moderate (MO)X3 + Low(LO)X2 + Very low (VL)X1/ Total respondents
Source: Field Data, 2016

Bangladesh is one of the resource poor populous countries in south Asia. Contrasting other sectors, cell phone sector is experiencing a rapid progress in last one and half decades. Cell phone can improve proximity between service providers and clients which can enhance better farmer access to quality information. Deplorably, mobile based information service for agricultural development in Bangladesh is still minimal. Grossly, none of the important extension service provider either public or private do not have well-structured sustainable communication with farmers via cell phone.

3.6. Ways to improve cell phone usefulness

Bangladesh is one of the top countries experiencing massive growth of the mobile network. Common improvement of customer service may not be fully useful for improving farmer access to agricultural information as most of the farmers in Bangladesh are subsistence farmers and don't have enough money to invest for cell phone based information collection. According to the respondents reduction of call toll and strengthening cell phone network can certainly increase farmers' access to mobile based agricultural service. However, a detail of suggestions proposed by the respondents for improving cell phone usefulness is displayed in Table 9.

Table 9: Suggestions for improving usefulness of mobile phone

S. No.	Suggestions	Frequency
1	Reduction of mobile call charge	189
2	Strengthening mobile network facilities	100
3	Toll free facilities for agricultural calls	33
4	Training for developing mobile operating skill	28
5	Inspiring farmers in using mobile based information sources	26
6	Ensuring accuracy of information	24
7	Ensuring regular supply of electricity	21
8	Increasing number of mobile based information sources	20
9	Reducing price of mobile phone set	20
10	Supplying need based easily understandable information	19

Note: Respondents enjoyed the opportunity of providing more than one suggestions
Source: Field Data, 2016

3.7. Determinants of mobile usefulness

This study used ordered logistic model to reveal the determinants of usefulness of mobile phone for retrieving agricultural information. In the process of analysis, different models were run combining explanatory variables to find out the most suitable combination. Model 1 can best explain the usefulness of the cell phone with the highest number of explanatory variables at lower p value than Model 2. OLM results presented in Table 10 show that among the selected variables age, farm size, experience in mobile use, mobile expenditure per month, etc., have significant association with the usefulness of the cell phone. It is important to note that age has a negative contribution on farmer usefulness of mobile phone i.e. probability of usefulness of cell phone decreased with the increase of farmers' age. In line with our findings Nyamba and Mlozi (2012) also found age as a variable significantly negatively associated with cell phone use in the case of Tanzania.

Table 10: Contribution of different selected variables on the farmers' usefulness of mobile phone (n = 281)

X^i	Model 1				Model 2			
	β	SE	Z	p> |z|	β	SE	Z	p> |z|
Age	-0.0242	0.010	-2.422	0.015	-0.022	0.009	-2.296	0.021
Education	0.0360	0.042	-0.853	0.393				
Annual income	-0.0008	0.001	0.782	0.433				
Objectives of farming	0.3346	0.354	0.943	0.345				
Farm size	0.3701	0.122	3.017	0.002	0.324	0.112	2.881	0.004
Length of mobile use	0.1244	0.046	2.654	0.008	0.116	0.044	2.608	0.009
Mobile expenditure/month	0.1066	0.052	2.037	0.041	0.111	0.051	2.143	0.032
Frequency of mobile use	0.0003	0.0004	0.805	0.420				
Extent of information search	0.0316	0.0178	1.778	.0766	0.031	0.017	1.842	0.065
Y^i= Usefulness of mobile phone (Ordered*)	LL=-334.37, LR static = 45.390, p>LR= 0.000001, Pseudo R^2= 0.0635				LL=-335.68, LR static = 42.77, p>LR= 0.00000, Pseudo R^2= 0.0598			

*Ordered (5: Very useful, 4: useful, 3: moderate, 2: less useful, 1: very less useful)
Source: Field Data, 2016

In Bangladesh, most of the farm families are either marginal or small, possessed a very small piece of land. Eventually, they are not well off to spend much money as mobile toll. Mobile operators in Bangladesh have almost similar call rate. They also have different low call charge packages but inured with so many rules and regulation that can't easily be understood by an ordinary client like farmer. In Bangladesh a major section of the farmers are aged and illiterate. Progress in agricultural can't be achieved without incorporating this section with modern information communication technology like a cell phone. Negative association between age and usefulness can be explained from a different angle. Firstly, aged farmers are normally less innovative and have less interest in modern information communication media. Secondly, they are interested but don't know how to secure information via cell phone.

4. CONCLUSION & RECOMMENDATIONS

The findings of this research revealed that a large section of farmers in Bangladesh found mobile phones from useful to very useful for the various crops farming. Deplorably, farmers predominantly used less reliable and less efficient informal sources, such as friends, relatives, dealers, etc., for accumulating various crop farming information. The respondents mostly sought information about crop diseases and pest control followed by fertilizer management suggestions, selection of appropriate crops and/or adequate vegetable species, and crop marketing related information. Despite the availability of low-cost services, such as SMS, MMS, voice message, etc., the peasants mostly used high costs in voice call service. Major deterrents of using a cell phone for crop related information were high call rates, lack of awareness about mobile based information sources, scarcity of mobile based information sources, and lack of skills among farmers in operating mobile phones. However, in light of the findings of this research, recommendations are being proposed to enhance the usefulness of mobile phones for crop farmers.

1. It is essential to link farmers with rich and reliable agricultural information sources, such as public extension services, NGOs' extension service, etc.
2. At present the respondents are predominantly using voice call service which is expensive and short-lived. It is therefore essentially necessary to engage farmers with other comparatively cheap services, such as SMS, MMS, and voice message, etc., so that they can store, share and use information repeatedly.
3. To provide relief in mobile expenditure burden and assist in enhanced use of cell phones for crops production, special kind of SIM with subsidized call rate should be supplied to them.
4. Aged farmers are less inclined to use mobile based agricultural information sources. It is therefore necessary to launch widespread awareness campaigns for their training for keen interest and to connect them with mobile phone based information sources.

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Appendix

Appendix 1: Measurement and coding of the variables of the study

Var. no.	Variable Name	Coding system	Level of Measurement
1	Age	Score 1 for each year	Scale
2	Gender	1= Male, 0= Female	Nominal
3	Education	Score 1 for each year of schooling	Scale
4	Annual income	Score 1 for each thousand Taka*	Scale
5	Objective of farming	1= Commercial, 2= Family consumption, 3= Both	Nominal
6	Farm size	1= Landless farmer, 2= Marginal farmer, 3= Small farmer, 4= Medium farmer, 5= Large farmer	Ordinal
7	Length of mobile use	Total number of months/12	scale
8	Mobile expenditure per month	Score 1 for each 100 Taka	scale
9	Number of mobile operators used	Score 1 for each operator	scale
10	Frequency of mobile use for agricultural purposes	Minutes/ six months (Against 8 selected sources of information)	Scale
11	Extent of information search	Scoring against 13 selected information subject (3= Very often, 2= often, 1= seldom, 0=never)	Scale
12	Problem confrontation in using mobile for information	Scoring against 11 selected problems (5= very high, 4= high, 3=moderate, 2=low, 1=very low	Scale
13	Usefulness of mobile phone	5= Very useful, 4= useful, 3=moderately useful, 2= less useful, 1= very less useful	Ordinal

Note: *Taka is the national currency of Bangladesh (1$ = 83 Taka