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Mobile Phone as a Communication Device for Seeking Agricultural Information by the Rural Farm Women in Bangladesh

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Authors' contributions

This research work was carried out in association with all authors. Author MSR designed the study by searching relevant literature, wrote the protocol, collected and processed data, performed the statistical analysis and wrote the first draft of the manuscript. Authors MEH and MSIA assisted in designing the study, sampling procedure and made the appropriate suggestions and modifications in the manuscript. Authors SSH and MAR helped in analyzing data and editing the final draft of the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Mobile phone helps in communication and thus, lead to accessing information is gaining popularity in Bangladesh along with many developing countries. In the remote rural areas where mobile network is not up to the expectation yet and scarcity of information is a stark, rural farm women entrepreneur trying to seek information through mobile phone. The focus of the study was to determine the extent and types of information seeking through mobile phones by the rural farm

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women and explore the contribution of selected characteristics of the rural farm women on the extent of information seeking through mobile phones. The study was conducted in two geographic locations, in the Northern part of Bangladesh Doholpara, and Dakkhinkharibari village under Dimla Upazila, and in the Southern part Borokupot village of Shyamnagar Upazila. A multi-stage sampling technique was followed in conducting the study. The present study was conducted on 150 sampled rural farm women which comprised of 50 from each farm enterprise's crop, fisheries, and livestock. Data were collected by a pre-tested interview schedule that was prepared with simple and direct questions with different appropriate scales from September to December 2020. Along with descriptive statistics, correlation and multiple regression analysis were also performed. The major findings revealed that the majority of the rural farm women of each three farm enterprises (crop, fisheries, and livestock) in the study area were found in a category of those who seek agricultural information through mobile phone at a medium to a higher level. Findings also revealed that in all three agricultural farm enterprises, rural farm women mostly seek market information i.e. calling market centers, traders, and dealers for checking market price followed by collecting weather forecast and contact with experts during an emergency like information regarding diseases of fish, selection fish fries and contact with the veterinary surgeon or quack doctor regarding domestics animal. Among profile characteristics, family size, experience in managing the farm, attitude towards the mobile phone, and organizational participation were identified as the important contributing factors of the rural farm women in seeking information through mobile phone.

Keywords: Rural farm woman; agricultural enterprises; mobile phone; information seeking.

1. INTRODUCTION

Information is regarded as one of the most valuable resources in agricultural and rural development programs. It helps in decision making and the individuals who have proper and convenient information will settle on a more reasonable choice than the individuals who don't. Hence, it is viewed as one of the key inputs in agriculture [1]. Information use is a behavior that leads an individual to use a collection of factual knowledge about something to meet his or her information needs [2]. Along with the rest of the world, Bangladesh is also victimized by the deadliest pandemic COVID-19 that curbs rural women's access to farm information in the last one and half years. In this perspective, along with Bangladesh in many developing countries, the mobile phone as an enabling device is gaining popularity for communication and accessing information. The different uses of mobile phones have brought revolutionary changes in agricultural communication [3]. Expanding infiltration of mobile networks and broad utilization of mobile phones which is an indispensable communication medium could be an opportunity for connecting experts (agriculture, fisheries, and livestock-related officials) to make the necessary information available at the rural farm women's doorstep.

However, agriculture requires new ways of working not only to meet the basic needs but also to make sustainable the status of rural populations who are engaged in subsistence farming. Specifically, producing crops, fish farming, and rearing livestock, rural farm women need a significant amount of information. On the other hand, building timely effective new business plans and improving yields and profitability rural farm women need to learn innovative production and natural resource management practices and developing their group organization and financial and marketing skills required to link to markets in justifiable ways. They also need timely and precise information to optimize their farming operations and respond to changes in their environment. Another important thing is that information plays a crucial role for agricultural enterprise flourishment through minimizing loss by natural hazards which become possible by giving weather forecast in advance through mobile phone sms services. Rural farm women can tap these resources and accessing the necessary information using mobile phone devices. Using this device one can rapidly collect and process information to detect changes in agricultural produce growing conditions and modify their operations to reply with the right amount of action at the right time to the right place within a field. Hence, this device is a medium of connecting with the information powerhouse, and access to that source of power is easily available, reliable, and accessible by this communication device for rural women.

Mobile phone devices can be a useful medium to provide farm women with access to relevant and

reliable agricultural information for making critical farming decisions. For example, apparently through mobile phone rural farm women can easily contact with Upazila Agriculture Office and other concerned for taking suggestions regarding right and proper variety selection of crops. Otherwise they have to depend on neighbors' information in this regards which might not be reliable in some cases. Besides this by using mobile phone they can now easily sensed for what types of information which stakeholders or offices need to be contacted. Mobile phone-based services pave the path to access price and market information and coordinate input/output resources including transport and logistics, finance, and production techniques [4-6]. Personal use of it has also enabled rural producers to interact directly with end-user markets, traders, suppliers, extension services, and each other [7].

It is evident from the above discussion that information dissemination in agriculture is immensely important for farm women's development and in turn community. As the study area is extremely remote government officials regarding agriculture are not able to visit the area often enough. Despite the call from governments to different initiatives to improve the situation of rural women in farm-related activities, rural women remain underrepresented. Along with this rural farm, women do not have adequate information regarding agriculture because of less freedom of movement. In this regard, the mobile phone has been changing significantly the landscape of information dissemination. But yet there is still a gap in the study on how extent farm rural women seeking agricultural information through mobile phones in the selected area. Hence, there is a need to participate, understand, intervene and assess mobile phone usage by rural women in farm enterprises for filling the knowledge gap on the usage of mobile phones for seeking agricultural information. Therefore, the present study is an endeavor to determine the extent of information seeking through mobile phones by the rural farm women and explore the contribution of selected characteristics of the rural farm women on the extent of information seeking through mobile phones.

2. METHODOLOGY

Multi-stage sampling was followed in the study. The study was conducted in two geographical location, Nilphamari and Shatkhira districts which were selected purposively because the rural farm women of the selected areas have gradually become active in the use of mobile phones related services and mobile phone ownership has been growing over time especially due to NGOs mobile phone intervention In the study area a project entitled PROTIC (Participatory Research Ownership with Technology, Information and Change) has been implemented by two local NGOs as implementing partners, named Pollisree in the nothern part and Shushilan in the southern part with the collaboration of Monash University, Australia and Oxfam Bangladesh since 2015. Pollisree formed Community Based Organizations (CBOs) by rural farm women who are mainly involved in crop related activities in Tepa Kharibari union and in Khoga Kharibari union formed CBOs by rural farm women who are mainly involved in livestock farming related issues. Similarly, Shushilan formed CBOs who were involved actively in fisheries farming related activities. The project participants were rural farm women who were equipped with smart mobile phone. Local agricultural information on crop farming, homestead gardening, fisheries, livestock, horticulture and poultry and agro metrological were being provided to them through SMS, Out Bound Dialler (OBD), Interactive Voice Response (IVR) and Call Centre support under this project. In this way, they were used to use mobile device for collecting information due to their agricultural farm necessity. By looking their activities, other community rural women were also inspired for having a mobile phone and used it for their farm information also. In this way, social innovations have been disseminated in the study areas. Therefore, in the northern part of Bangladesh, for rural women of crop enterprise Dakkhin kharibari village of Tepa Kharibari union and Doholpara village of Khoga Kharibari union for rural women of livestock enterprise under Dimla Upazila of Nilphamari district was selected as the locale of the study. Whereas in the southern part of Bangladesh, for rural women of fisheries enterprise Borokupot village of Atulia union under Shyamnagar Upazila of Satkhira district was selected as the study area. The other reasons for selection of the study areas were the socio-economic context are more or less alike and livelihood mostly depends on agriculture though they are geographically different. Both regions are on the embankment of Teesta and Khulpetua river, respectively having climate vulnerable ecosystem of Bangladesh (Fig. 1). The north is velnerable because of the constantly changing nature of the river banks, leading to erosion and

frequent flooding. Communities face land loss, especially during strong storms. Whereas, the south is facing is facing increasing salinity intrusion, leading to loss of crop production, fisheries rearing and lack of access to fresh drinking water [8]. During disasters, information is as much a necessity as water, food and medicine. In this regards, ICTs especially mobile phone device has become an integral part of operations for disaster preparedness which cannot stop disaster but can minimize risks.

The study targeted rural farm women who use the mobile phone as a contemporary tool at different stages of their farm enterprises from preparation to harvesting, post-harvesting and marketing as well as weather forecast, consulting with extension workers, pest and disease information, access to market information, financial transactions etc. As the rural farm women are involved in farm enterprise activities, they are considered as individual farm entrepreneurs in the study. This is considered as the criteria for the inclusion of the target rural farm women for the present study. The concept of enterprise in the present study was adopted from Jahan [9] who regarded enterprising work by the poorer as *chhoto khato babsha* (small business). *Chhoto khato babsha* includes raising livestock, rice husking, vegetable gardening and fisheries on a small scale. Her finding also showed that, though poor women do many of these activities as part of their ghorer kaaj (household work) when these are done for the market, they turn into babsha (business). Along with this, Parvin et al*.* [10] indicates that with the combined efforts of government and non-government organizations (NGOs) of Bangladesh, rural women's come forward to set up micro and small enterprises such as dairy raising, poultry rearing, petty business, handicrafts, daily hawker and so on. A list of the total population was first prepared in consultation with concerned officials' i.e. Upazila Agriculture Office, Upazila Fisheries Office, Upazila Livestock Office,Upazila ICT Officee and NGOs namely Pollisree and Shushilan of Dimla and Shyamnagar Upazila under Nilphamari and Satkhira districts, respectively. This population selection technique was used by following the technique of Thakur and Chander [11]. The total number of rural farm women entrepreneurs who use mobile phone devices for communication with various stakeholders for their farm enterprise-related information was 335, 290, and 296 regarding crop, livestock, and fisheries enterprises, respectively. Fifty (50) rural farm women from each enterprise, approximately equivalent to 15, 17, and 17 percent of the total rural farm women were selected following a disproportionate stratified sampling technique as the sample of the study. Thus, the present study sample comprised 150 rural farm women.

Data were collected from September to December 2020 using a structured interview schedule by following the personal interview technique which was also pre-tested. The extent of information seeking through using a mobile phone was the dependent variable of the study and seven selected characteristics of the rural farm women were selected by reviewing previously published articles as explanatory variables namely age, family size, educational status, experience in managing farm, family farm size, attitude towards the mobile phone and organizational participation which was measured following proper statistical techniques.

The extent of information seeking through mobile phones in different farming activities was measured by a 4-point rating scale as never, rarely, occasionally, and regularly and the score was assigned 0, 1, 2, and 3, respectively [2]. Thus, the information-seeking score for a respondent in crop and fisheries-related issues could range from 0-60 where 0 indicated never information seek and 60 indicated high information seek. Similarly, the information-seeking score for a respondent in livestock-related issues could range from 0-33. The extent of information-seeking through the mobile phone was categorized into the following for crop and fisheries enterprises:

Categories	Score (s)
Low	up to 20
Medium	21– 40
High	> 40

A similar technique was also followed for categorization of extent of information seeking through mobile phone in livestock enterprise but score was different because the items of information seeking in livestock enterprise was different compare to the other two enterprises.

For making rank order of different types of information on agricultural farm activities, Information Seeking Score (ISS) was also computed. The ISS was computed by using the following formula [2] as follows:

$$ISS= (N_m\times3)+(N_s\times2)+(N_r\times1)+(N_n\times0)$$

Where,

ISS= Information Seeking Score
N_m= Number of rural farm women entrepreneur seek information 'mostly'
N_s= Number of rural farm women entrepreneur seek information 'sometimes'
N_r= Number of rural farm women entrepreneur seek information 'rarely'
N_n= Number of rural farm women entrepreneur 'never' seek information.

The data collected through face-to-face interview were subjected to processing and analysis. Statistical Packages for Social Sciences (SPSS) 22.0 version was used to perform the quantitative data analysis. Statistics like frequency count, percent and mean were calculated for the descriptive analysis. Pearson's Product Moment Correlation Coefficient analysis was used to test the relationship between dependent and independent variables. Multiple regression was also done for measuring the contribution of selected characteristics of the rural women entrepreneur to the extent of information seeking through mobile phone.

3. RESULTS AND DISCUSSION

Findings of the study and interpretations of results are presented below:

3.1 Profile Characteristics of the Rural Farm Women

The profile characteristics of the rural farm women of the study include age, family size, educational status, experience in managing the farm, family farm size, attitude towards the mobile phone, and organizational participation.

3.1.1 Age

The age of the selected rural farm women of crop enterprise considered for this study ranged from 19 to 52, the mean being 30.8 whereas the age of the rural farm women of fisheries enterprise ranged from 18 to 55, the mean is 31.42. In the case of rural farm women of livestock enterprise, age ranged from 23 to 60, the mean is 35.86. Fig. 2 shows the distribution of rural farm women according to their age categories.

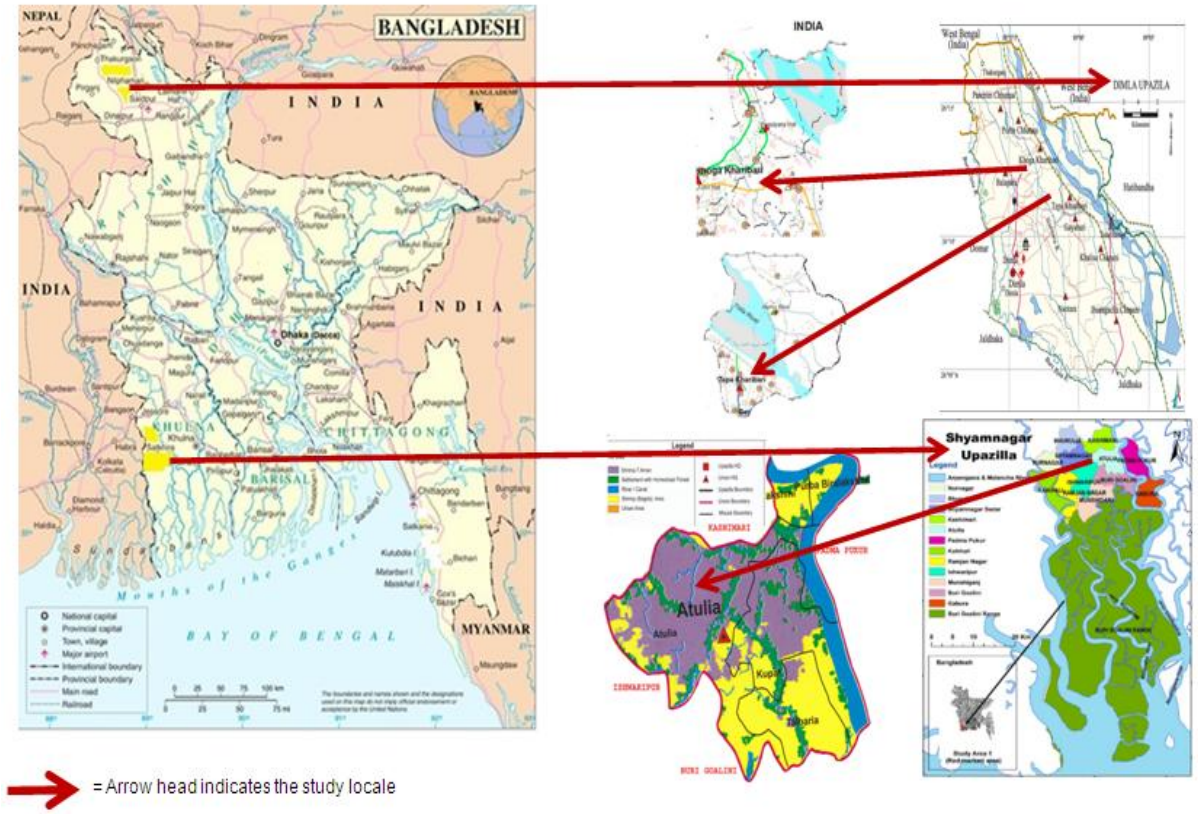

Fig. 1. Geographical location of the study area

In crop enterprise, it is found that the highest proportion of the rural farm women (82 percent) belonged to the young-aged category (18 to 35 years) followed by 14 percent middle-aged category and only a negligible proportion (4 percent) found under the old-aged category. In the case of fisheries enterprise, slightly more than three-fourths (76.0 percent) of the rural farm women found under young aged category, 18 percent and 6 percent for the middle and old aged category, respectively whereas exactly four-fifths (60 percent) of the rural farm women belonged to young aged category followed by 30 percent middle-aged and only 10 percent under the old aged category for livestock enterprise. Therefore, it might be said that in the case of all three enterprises majority of the rural farm women were young and under the active age group.

This finding is consistent with the findings of Sarker [12] who conducted a study on effect of crop land transformation into maize in Dimla upazila under Nilphamari district on rural farm women and found that most of the rural farm women (92 percent) were young aged. According to Kaskekacharo [2] young age group is more receptive to new technologies and information such as the use of mobile phone technology. On the other hand, youngers are believed to be taken more or less risk in case of seeking and adopting new technologies. Consequently, as most of the respondents in all three farm enterprises are under young aged category, they are using mobile phone device as communication tools during necessity of information for farm enterprises.

3.1.2 Family size

Family size is the actual number of people living in a family unit, whether nuclear or extended [13]. Family size of the selected rural farm women under crop enterprise ranged from 3 to 8, the mean is approx. 7. Family size of the sampled rural farm women of fisheries enterprise ranged from 3 to 10, the mean being approx. 6 whereas in case of the livestock enterprise family size ranged from 2 to 7, the mean being approx. 5. The rural farm women entrepreneurs' families were classified into three categories as ‘small’, ‘medium’ and ‘large’ according to the social standard of Bangladesh Hasan et al. [14] as shown in Fig. 3.

In the case of all three enterprises i.e. crop, fisheries, and livestock, most of the family were medium-sized 52 percent, 40 percent, and 50 percent respectively. In case of crop enterprise, 44 percent of the respondents belonged to a small family-sized group and only 4 percent under a large family-sized group. In the case of fisheries enterprise equally, 30 percent of the rural farm women had small family size and 30 percent had large family size whereas 38 percent of the rural farm women belonged to the small family-sized group followed by 12 percent large family size group. Therefore, it specifies that most of the rural farm women who sought information through mobile phone for their farm in the study area are the member of small and medium sized family. This finding is consistent with the findings of Gunawardana and Sharma [15] who reported that most of the respondents (62 from 120) who sought information on improved agricultural practices are from nuclear family. Contrary with this finding Kaskekacharo [2] revealed that those households that had more number of mobile phones in the family were expected to have better access to agricultural information. Therefore, it might be mentioned that the selected rural farm women who are from large family size might have more number of mobile phone could expected to have more access to agricultural information. Thus, family size might be an important factor in case of information seeking.

3.1.3 Educational status

Education creates opportunities for rural farm women to explore as well as contribute to the growth of society. The educational status i.e. completed year of schooling of the selected rural farm women of crop enterprise ranged from 0 to 16, the mean is 7.3. The educational status of the rural farm women of fisheries enterprise ranged from 0.5 to 15, the mean being 10.46 whereas in the case of livestock enterprise educational status ranged from 0 to 14 and the mean being 6.05. Results in Table 1 display the educational status of the rural farm women.

All the respondents of fisheries enterprise were found literate whereas, in case of other two enterprises (crop and livestock), literacy percentage is 96 percent. Therefore, it is observed that the literacy percentage is much higher than the national average of 73.2 percent [10]. In all three enterprises, most of the respondents having the secondary level of education i.e. 46, 44 and 52 percent in the crop, fisheries, and livestock enterprises, respectively.

The Bangladesh Govt. take several initiatives for education especially the girl's education and the scenario also reflect in the study area were the achievement of that the effective measure taken by the People's Republic of Bangladesh. The result of the study was found similar to the finding of Kaskekacharo [2].

3.1.4 Experience in managing farm

According to the findings, in a crop farm enterprise, experience in managing farm enterprise was ranged from 2 to 15 years whereas in livestock enterprise it varies from 4 to 15 and in fisheries enterprise ranges from 2 to 9 which is less than the other two enterprises.

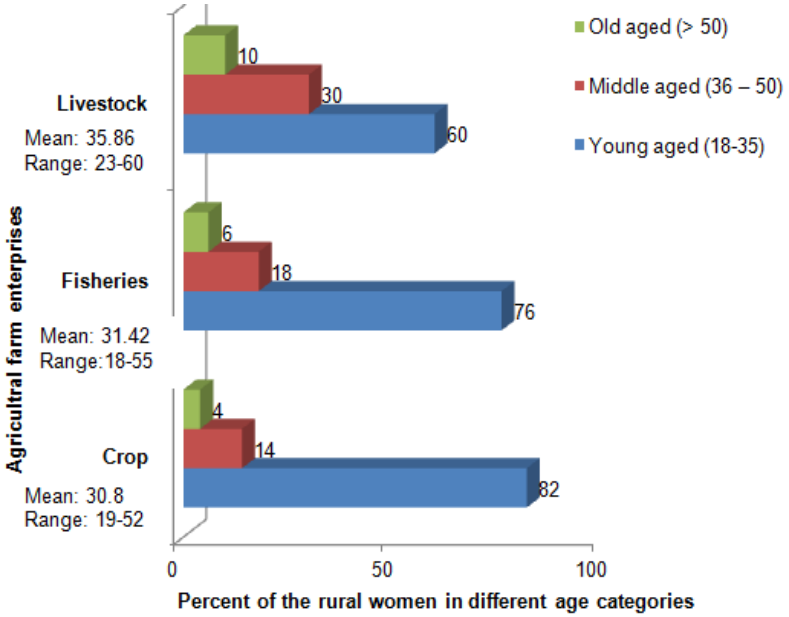

Fig. 2. Age of the rural farm women entrepreneurs'

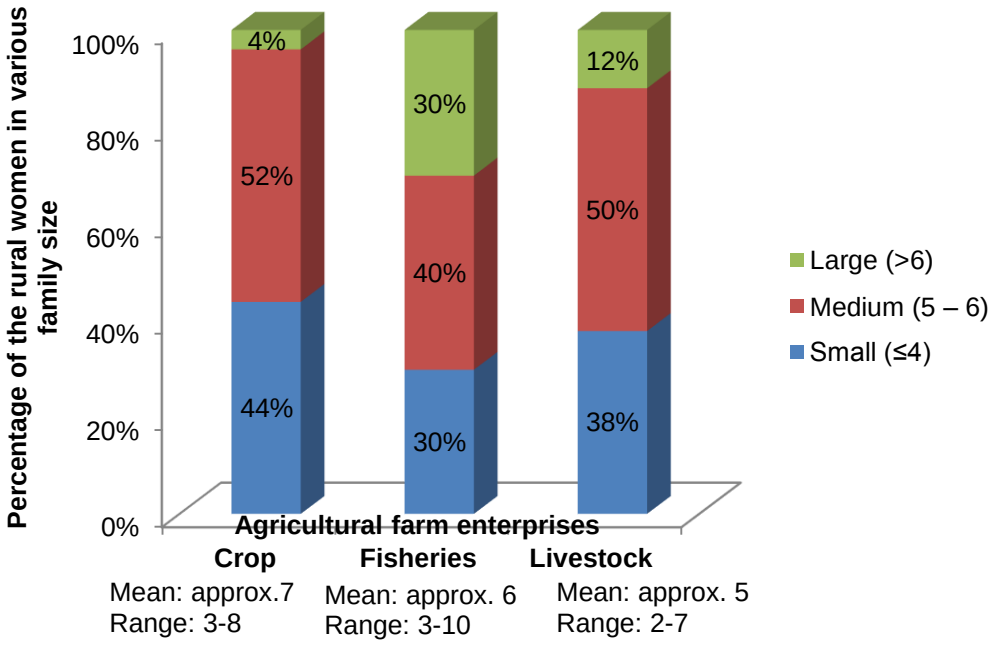

Fig. 3. Family size of the rural farm women entrepreneurs'

On average, rural farm women of the crop, livestock, and fisheries enterprise have 7.6, 9.5, and 4.8 years of experience, respectively. According to experience in managing farm, the rural farm women entrepreneur was categorized as shown in Fig. 4.

The study results indicate that about three-fourths (72.0 %) of the respondents had 10 years to more than 10 years of experience in crop farming, while it was 90 percent in livestock enterprise (Table 6). These findings support the finding of Kaskekacharo [2] who revealed that more than half (52.2 %) of the respondents had above 10 years of experience in farming. Contrary to these results, in fisheries enterprise, slightly less than three-fourths (74 percent) of the respondents had less than 5 years of experience. Farmers having more years of farming experience might tend to use mobile phones for accessing agricultural information. According to Adegbidi et al. [16] the farmers' experience in agriculture is expected to have a positive relationship with ICT use. Those farmers with more farming experience tend to use technology than those with less experience [17]. This might be that longer experience in farming increases exposure to use mobile phones for seeking information that uses in agricultural activities.

3.1.5 Family farm size

In crop enterprise, the family farm size was ranged from 0.02 to 1.72 whereas in fisheries enterprise family farm size ranges from .04 to 2.69, and in livestock enterprise, it varies from 0.154 to 0.970. On average, rural farm women of the crop, fisheries, and livestock enterprise have 0.45, 0.55, and 0.49 hectares of land, respectively. According to family farm size, the rural farm women were categorized as shown in Table 2.

Findings revealed that in the case of crop enterprise, the overwhelming majority (94.0 percent) of the respondents reported owning less than one hectare of farmland (Table 2) while it was just 6 percent having medium farm size i. e. 1 to 3 hectares of land. In fisheries enterprise slightly more than four-fifths (84 percent) of the rural farm women have below one hectare of land while only 16 percent having medium family farm size wherein livestock enterprise all the farm women have below one hectare of land. In the study area, the land is scarce mainly due to the river erosion of the Teesta river. However, natural disaster frequently occurs in that area, therefore, this scarcity of farmland might have led to lower incomes and in turn to less access to technologies use such as mobile phones for communication regarding information seeking. Some studies have reported that farmers with larger farm sizes have more income and that the larger the farm, the better access to technologies [18-19].

3.1.6 Attitude towards mobile phone

Attitude towards mobile phone score ranges from 11 to 43 in crop farm enterprise while in fisheries enterprise it was 12 to 40 and in livestock enterprise, it was 10 to 37 against the possible range of 9 to 45. The distribution of rural farm women entrepreneurs according to their score on attitude towards mobile phones is shown in Fig. 5.

From Fig. 5, it is revealed that a greater part (94.0 percent) of the rural farm women entrepreneurs in crop farm enterprise had favorable to highly favorable attitude towards mobile phone while just six percent had unfavorable attitude. In the case of fisheries and livestock enterprises, equally 88.0 percent of the rural farm women had favorable to highly favorable attitude towards mobile phone while 12.0 percent had an unfavorable attitude towards the mobile phone. Therefore, the majority of the rural farm women had a positive attitude towards mobile phones which might be on supporting their farm activities. The possible explanation might be that though the study areas are far away from the upazila town i.e. extremely remote and vulnerable to various natural calamities like flood, different GOs and NGOs working in that areas gives support to them for using the innovative communication device mobile phone to minimize these crisis. Moreover, mobile phone helps them to cope up with unexpected situation through providing instant necessary information for their farm. So, most of them are showing a favorable to highly favorable attitude towards mobile phones. This result agrees with the findings of Kaskekacharo [2] who revealed that the respondents' attitude toward mobile phones on supporting farm activities was shown to be positive. This means farmer's positive attitude in the study area could have positive association with the use of mobile phones for accessing agricultural information.

3.1.7 Organizational participation

Organizational participation refers to the involvement of rural farm women in different GOs, NGOs, cooperatives, peer groups in the study areas as member to executive member till the data collection period. In crop enterprise, organizational participation score of the sampled rural farm women entrepreneurs ranged from 9 to 25 against the possible score of 0 to 36 with a mean value of 13.56 whereas In fisheries enterprise, which was 9 to 28 with a mean score of 17.12. In case of livestock enterprise, the range of organizational participation score of the sampled rural farm women entrepreneurs was 8 to 26 with a mean value of 14.96. The distribution of rural farm women according to their organizational participation score is shown in Table 3.

In case of all three agricultural enterprises, rural farm women's participation in the different organizations was medium to high. In crop enterprise exactly four-fifths (60 percent) of the rural farm women entrepreneurs had medium participation in the various organization followed by 34 percent less participation and only 6 percent had high participation. In case of fisheries enterprise, exactly three-fifths (60 percent) of the rural farm women had medium participation, 28 percent had less participation and only 12 percent had high participation in the diverse organization working in the study area. Whereas in case of livestock enterprise, near about three-fourths (70 percent) of the rural farm women entrepreneurs had medium participation in the several organizations followed by 30 percent had less participation. Therefore, it could be said that majority of the respondents under study of all three enterprises (crop, fisheries and livestock) had medium to high organizational participation. Consequently, organizational participation enhances their exposure level in the society which increases their confidence for using mobile phone in seeking agricultural information and use these in their farm enterprises activities.

3.2 Information Seeking Through Mobile Phone on Agricultural Farm Enterprises

3.2.1 Seeking information on different crop farming-related issues

3.2.1.1 Types of information seeking

The findings of the study revealed that the twenty different types of crop farming-related information, which was sought by rural farm women through using the mobile phone is illustrated in Fig. 5. Accordingly, the first three most important types of information that rural farm women preferred and need to seek were 'Collecting weather information', 'Calling market centers, traders, dealers and check prices' and jointly 'Coordinating information and deliveries of pesticides' and 'Checking the price of fertilizer with the neighboring markets' obtaining the Information Seeking Score (ISS) of 105, 97, 96 and 96, respectively.

Table 1. Educational status of the rural farm women entrepreneurs'

Categories (Year of Schooling)	Rural farm women entrepreneur (Crop)		Rural farm women entrepreneur (Fisheries)		Rural farm women entrepreneur (Livestock)	
	No.	%	No.	%	No.	%
Illiterate (0)	2	4	0	0	2	4
Can sign only (0.5)	6	12	2	4	9	18
Primary (1 –5)	10	20	5	10	7	14
Secondary (6-10)	23	46	22	44	26	52
Higher secondary (11-120	4	8	10	20	4	8
Above higher secondary (>12)	5	10	11	22	2	4
Total=	50	100	50	100	50	100
Range	0 to 16		0.5 to 15		0 to 14	
Mean	7.3		10.46		6.05	

Table 2. Family farm size of the rural farm women entrepreneurs'

Categories (hectare)	Rural farm women entrepreneur (Crop)		Rural farm women entrepreneur (Fisheries)		Rural farm women entrepreneur (Livestock)	
	No.	%	No.	%	No.	%
Landless (<0.02)	0	0	0	0	0	0
Marginal (0.02-0.20)	19	38	15	30	6	12
Small (0.20-1.0)	28	56	27	54	44	88
Medium (1.0-3.0)	3	6	8	16	0	0
Large (>3.0)	0	0	0	0	0	0
Total=	50	100	50	100	50	100
Range	0.02 to 1.72		.04 to 2.69		.154 to .970	
Mean	0.45		0.554		0.49	
SD	0.37		0.634		0.289	

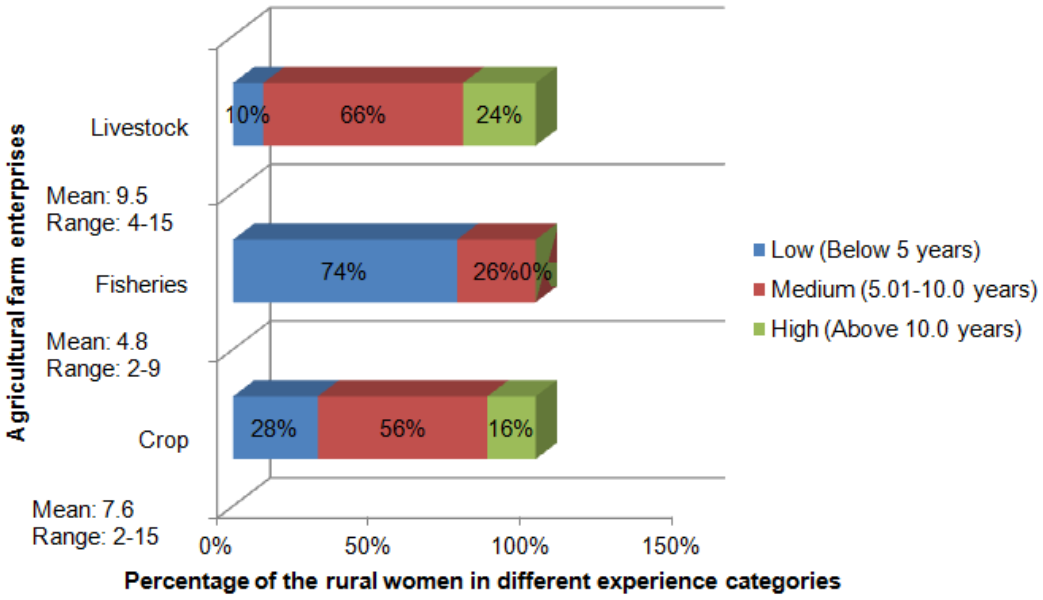

Fig. 4. Experience in managing the farm of rural women entrepreneur

3.2.1.2 Extent of information seeking by the selected rural farm women in crop enterprise

Scores of the overall information seeking of the rural farm women varied from 15 to 52 against a possible range of 0 to 60. The mean and standard deviation were 30.14 and 12.39, respectively. Based on the overall information-seeking scores, the rural farm women were classified into three categories viz. low (up to 20), medium (21-40), and high (>40) as shown in Table 4.

The findings explored that majority (42.0 percent) of the respondents had medium information seeking; whereas 30.0 percent had high and 28.0 percent had low information-seeking through mobile phone (Table 4). Therefore, it might be said that all the information is relevant to the rural farm women but seek by them to a different extent as per their need and priority.

3.2.2 Seeking information on different fisheries farming-related issues

3.2.2.1 Types of information seeking

The findings explored that the twenty different types of fisheries farming-related information, which was sought by rural farm women through using the mobile phone and ranked as per ISS score is illustrated in Fig. 6.

Table 3. Organizational participation scenario of rural farm women entrepreneur

Categories (Score)	Rural farm women entrepreneur (Crop)		Rural farm women entrepreneur (Livestock)		Rural farm women entrepreneur (Fisheries)	
	No.	%	No.	%	No.	%
Less participation (<12)	17	34	15	30	14	28
Medium participation (12-24)	30	60	35	70	30	60
High participation (>24)	3	6	0	0	6	12
Total=	50	100	50	100	50	100
Range	9 to 25		8 to 26		9 to 28	
Mean	13.56		14.96		17.12	

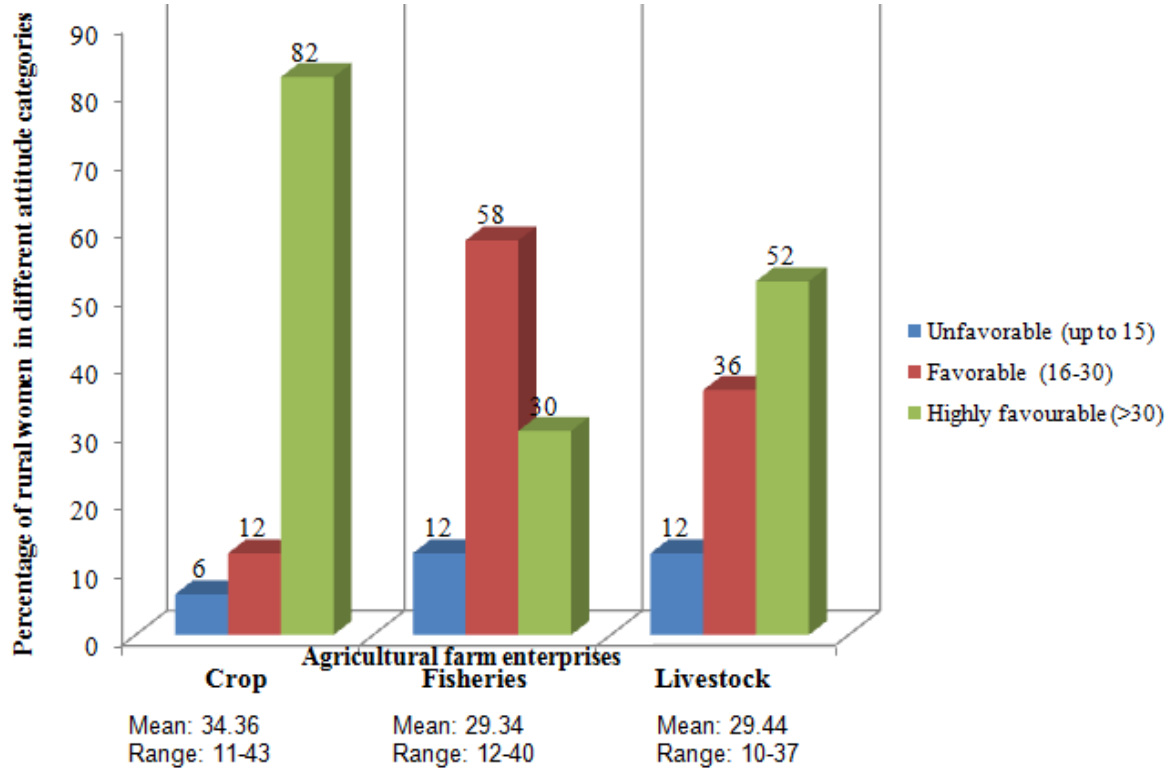

Fig. 5. Rural farm women entrepreneurs' attitude towards mobile phone

For instance, among the twenty different types of fisheries farming-related information that the respondents sought, 'Price checking in nearest and far markets traders', 'Information related to culture species' and 'Collecting weather information for the precautionary measure to protect the *gher* and pond' was most frequently sought through mobile phone obtaining highest Information Seeking Score (ISS) of 132, 129 and 127, respectively and ranked as first, second and third (Fig. 7). Thus, the result indicates that such information has a higher level of importance hence these are sought mostly by the rural farm women through mobile phone.

3.2.2.2 Extent of information seeking by the selected rural farm women of fisheries enterprise

Scores of the overall information seeking of the rural farm women varied from 20 to 52 against a possible range of 0 to 60. The mean and standard deviation were 41.48 and 8.16, respectively. Based on the overall information-seeking scores, the rural farm women were classified into three categories viz. low (up to 20), medium (21-40), and high (>40) as shown in Table 4.

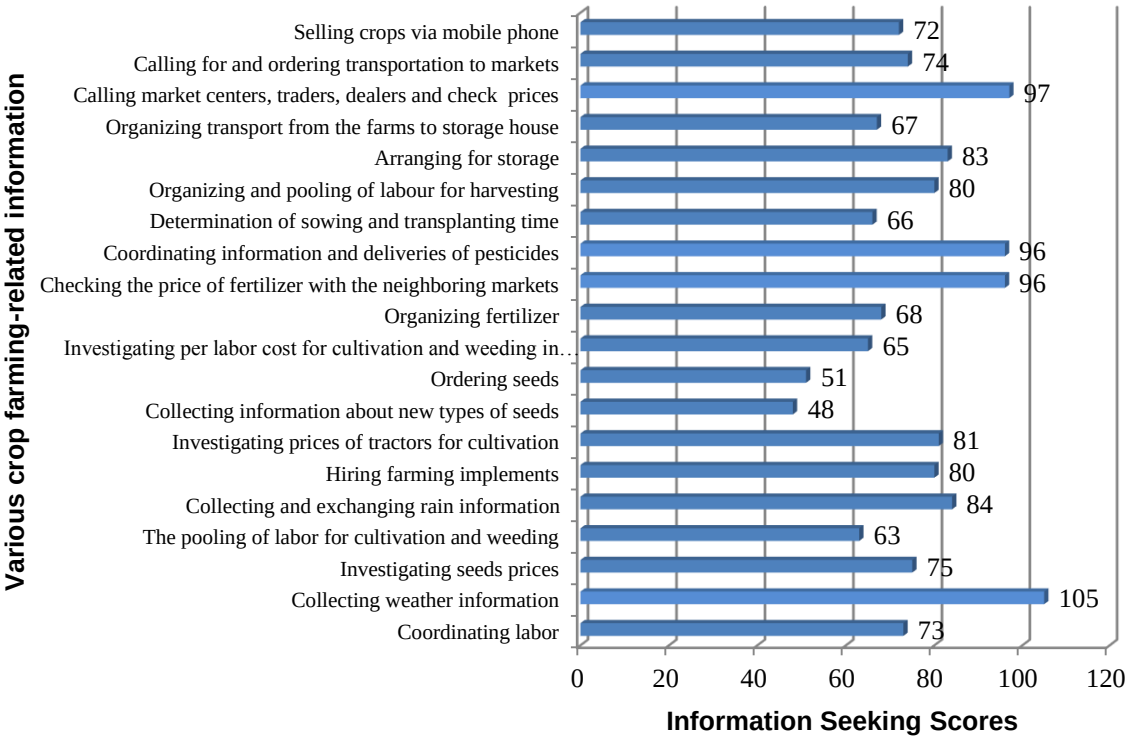

Fig. 6. Important crop farming-related information seeking by the women of *Tepa Kharibari Union*

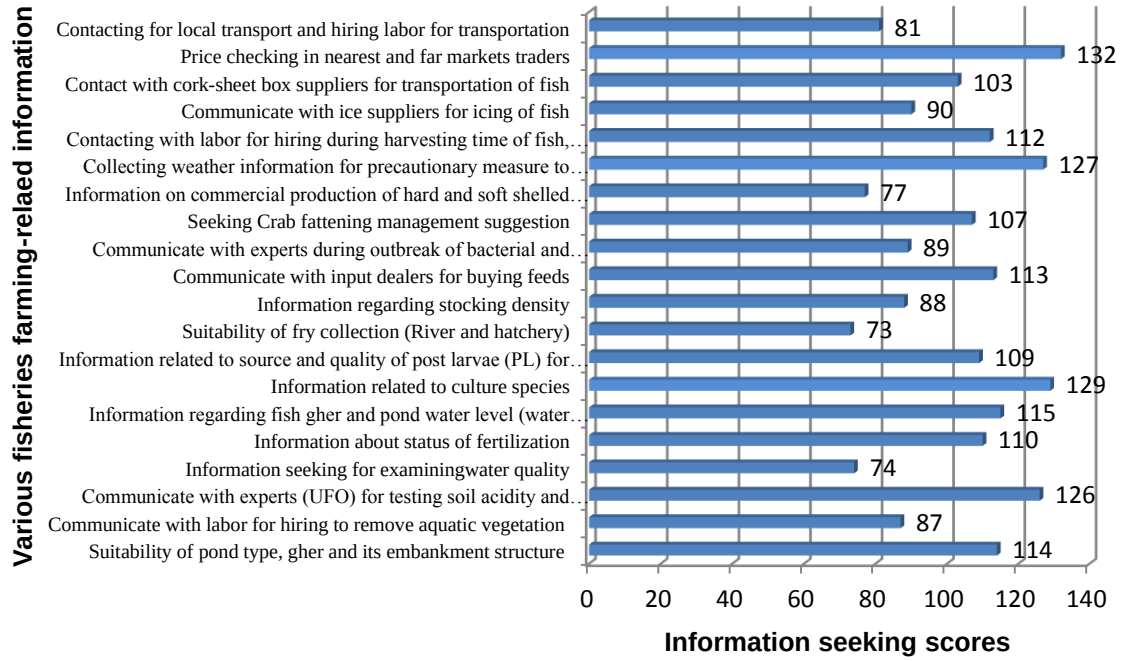

Fig. 7. Important fisheries farming-related information seeking by the women of *Atulia Union*

The result of the study revealed that slightly more than half (52.0 percent) of the respondents had medium information seeking, whereas 42.0 percent had high and only 6.0 percent were under the low information-seeking category (Table 5). Thus, it could be said that all the information regarding fisheries farming which is included in the questionnaire is pertinent to the rural farm women but they sought this information through mobile phone to a variant extent.

3.2.3 Information seeking on different livestock farm-related issues

3.2.3.1 Types of information seeking

The findings showed that different livestock farm-related information was sought with the help of mobile phones by the rural farm women which is presented in Fig. 8.

Among the eleven various types of livestock farm-related information that the rural farm women sought, 'Checking the price of livestock in different markets', 'Communicating with VS (Veterinary surgeon) or quack for treatment of animal' and 'Availability of good breeds and AI (Artificial Insemination)' were most frequently sought information through mobile phone obtaining highest Information Seeking Score (ISS) of 139, 133 and 120, respectively and ranked as first, second and third as per opined by the rural farm women (Fig. 8).

3.2.3.2 Extent of information seeking by the selected rural farm women of fisheries enterprise

Scores of the overall information seeking of the rural farm women varied from 10 to 29 against a possible range of 0 to 33. The mean and standard deviation were 22.16 and 4.55, respectively. Based on the overall information-seeking scores, the rural farm women were classified into three categories viz. low (up to 11), medium (12-22), and high (>22) as shown in Table 6.

Table 4. Information-seeking through the mobile phone by women crop entrepreneur

Categories (Score)	Rural farm women (50)		Range		Mean	SD
	Number	Percent	Possible	Observed		
Low (up to 20)	14	28.0	0-60	15-52	30.14	12.39
Medium (21-40)	21	42.0				
High (>40)	15	30.0				
Total=	**50**	**100**				

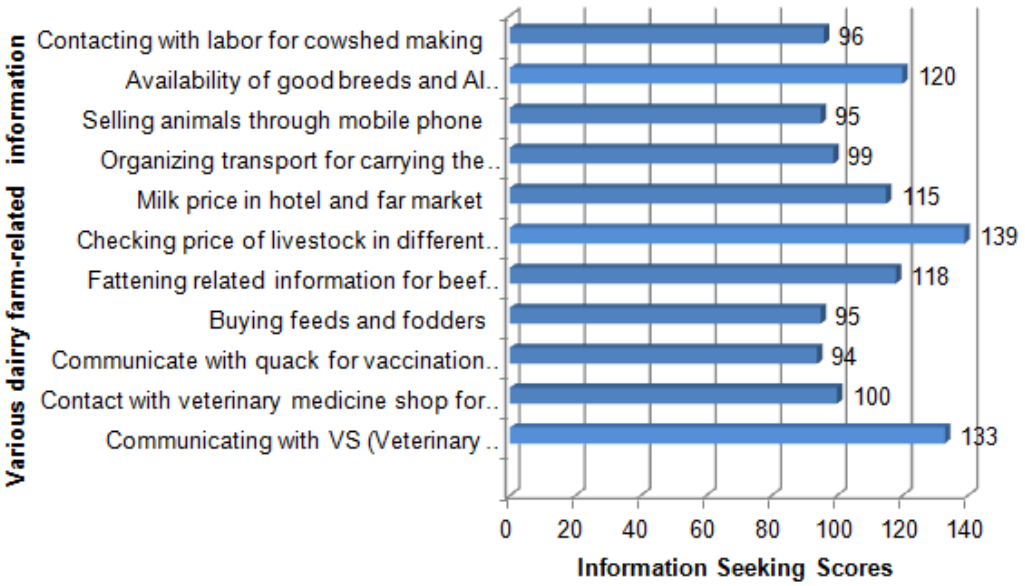

Fig. 8. Important livestock farm-related information seeking by the women of *Khoga Kharibari Union*

Table 5. Information-seeking through the mobile phone by women fisheries entrepreneur

Categories (Score)	Rural farm women (50)		Range		Mean	SD
	Number	Percent	Possible	Observed		
Low (up to 20)	3	6.0	0-60	20-52	41.48	8.16
Medium (21-40)	26	52.0				
High (>40)	21	42.0				
Total=	**50**	**100**				

The findings explored that more than fifty percent (54.0 percent) of the respondents had high information seeking; whereas 38.0 percent had medium and only 8.0 percent had low information seeking via mobile phone (Table 6). Hence, it might be said that the overwhelming majority (92.0 percent) of the rural farm women had medium to high information seeking regarding various agricultural farm information-related activities.

3.2.4 Discussions on the major findings

The results regarding types of information sought through mobile phone revealed that the interviewed rural farm women of crop enterprise mostly seek daily weather information among the different types of information. This might be due to the feeling of the importance of daily weather information because of their geographical location i.e. beside the Teesta river. Weather information is very much important for preparing farmland and harvesting the crop as well. So, creating their awareness about the importance of weather forecast is formed through the initiatives of concerned government offices like Upazila agriculture office and non-government office working in the study area like “Pollisree”. This office in partnership with mobile operators uses mobile phone voice call and text services to provide agrometeorological information for early warning of weather and climatological vulnerability. They tried to provide real-time and accurate weather information with the help of the Bangladesh meteorological department. Based on the weather information rural farm women can take the decision which farming activities they should perform. For instance, if they got the weather forecast like natural precipitation will be delayed then they decide to irrigate their agricultural farm artificially with the shallow or deep tube well without depending on nature. In line with the present study findings Karim et al. [20] in a study on the use and role of mobile phone for information services in agricultural activities by women, farmers revealed that ‘Weather and climate warning’ (Role Playing Index=215) obtained 2nd position based on the role of information played by mobile phone. Technology firms such as climate *corp*, based in Silicon Valley, are pioneering the provision of agrometeorological services for early warning of weather and climate risks [21]. Likewise, a Chilean farming cooperative (*Coopeumo*) uses text messages to help small-scale farmers increase productivity, especially by providing targeted planting advice and weather updates that are particularly useful to farmers at critical points such as sowing and harvesting the crop [22]. The result of the present study is also consistent with Das et al. [23] who were revealed that weather information was found to be crucial for most small farmers. Being a resident of rainfed areas, many of these farmers were highly dependent on weather conditions, rainfall in particular, for the successful harvest of their crop. It was critical at certain key junctures of the cropping period like during planting, application of agricultural inputs like fertilizer and pesticides, harvesting, and storage.

As per the opinion of the rural farm women of fisheries and livestock farm enterprise, the prime information regarding which farm women seek information is ‘Calling market centers, traders, dealers, and check prices. This might be due to that with the help of mobile phones rural farm women can easily sell their product over a phone call by checking the price of the product in all the potential markets. Thus, they can sell their product at the highest price by cutting off middlemen. But before having a mobile phone by the rural farm women, the scenario was different. They were often unaware of agricultural product prices and had to rely on information face to face situation with middlemen, traders, and agents to determine whether, when, where, or for how much to sell their crops. Delays in obtaining or misinterpretation of second-hand pricing information have serious consequences for them. ‘Information asymmetry’ often results in price dispersion drastically different prices for the same products in markets only short distances apart and thus lost income for some farmers and higher prices for consumers [24]. Therefore, it might be concluded that market price

transparency is enhanced among rural farm women with the help of a mobile phone. The finding is consistent with the Deichmann et al. [21] study outcome who revealed that increases in farm-gate prices from improvements in bargaining power with middlemen, greater market participation in remote areas through more efficient coordination through the impact of digital technology like mobile phone and the internet interventions. The supportive finding was also observed in a study conducted by Huda et al. [25] who revealed that the highest farm productivity improvement was observed on 'receiving product price' in target groups of women farmers. Another supportive result was observed in the study of Githahi [26] who showed that 45 respondents, accounting for 90% said that mobile applications and services have helped them have great access to market information. This is in regard to market prices and demand. Baumüller [27] also revealed that better access to information, markets and financial services are among the most commonly cited uses of mobile phones in agriculture sector. A study by Meem [28] has been observed that majority of the women farmers uses the mobile phone to contact with extension worker and a specialist to take advise about climate, disease and insect control measures related suggestion in Dimla upazila under Nilphamari district of Bangladesh. In regards to how much time rural farm women spent per day for seeking agricultural information regarding their farm enterprises necessity, there were no questions were asked to the targeted rural farm women. But during interviewing period, the researcher observed that time spent by the rural farm women for information seeking varied in regard to day to day and season to season of agricultural farming. It's simply expected that when information necessity become more will spent more time and vice-versa. Based on the researchers personal observation it was assumed that rural farm women spent on an average 0 to 10 minutes per day. During peak time of agricultural farm enterprise, they spent highest time for seeking information and in some cases a single moment is not spent by them for seeking information with the help of mobile phone.

In regard to extent of information seeking through mobile phone, the study revealed that the majority of the rural farm women in the study area were found in a category that seeks agricultural information at a medium to a higher level. These findings are consistent with Martin & Abbott [29] who revealed in their research that more than half of the farmers were using their mobile phones for coordinating the access to agricultural inputs, getting market information, and monitoring the financial transaction. A recent study of farmers conducted in Bangladesh, China, India, and Vietnam found that 80% of farmers in these countries owned a mobile phone and used them to connect with agents and traders to estimate market demand and the selling price [30]. Nearly 98.0 percent of the farmers in Cyprus were using the cell phone as the medium to seek information on innovations in agriculture [31]. Another finding by Asif et al. [32] indicated that the majority of the respondents (70 percent) belonged low use of mobile phone category followed by the rest 30 percent belonged to the moderate use category while none of the farmers are found under the high use of mobile phone category in receiving information on vegetable cultivation in Bangladesh.

3.3 Relationship between Selected Characteristics of the Rural Farm Women and their Information-Seeking through Mobile Phone

To explore the relationship between the selected characteristics of the rural farm women and their information-seeking through mobile phone Pearson's product moment correlation analysis was conducted. The results of the correlation analysis have been shown in Table 7.

Table 6. Information seeking through mobile phone by women livestock entrepreneur

Categories (Score)	Rural farm women (50)		Range		Mean	SD
	Number	Percent	Possible	Observed		
Low (up to 11)	4	8.0	0-33	10-29	22.16	4.55
Medium (12-22)	19	38.0				
High (>22)	27	54.0				
Total=	**50**	**100**				

From Table 7, it is revealed that there is a negative significant relationship between the age of the rural farm women and their information-seeking through mobile phones. This implies that the rural farm women's age and information seeking are negatively related. This means that as they get older the probability of information seeking through mobile phone for agricultural farm enterprise purposes decrease. The supportive result was observed in Kaskekacharo [2], Alvarez and Nuthall [33], and Tembo [13] study. The positive significant correlation of family size with information-seeking through using a mobile phone was pointed out. The educational status of the rural farm women had a positive significant correlation with information-seeking through mobile phones. Thus, it could be opined that education level increases rural farm women's ability to get access to information. The possible explanation is that educated farm women can better recognize the importance of communication and information.

Experience in managing farms had a positive significant relationship with information-seeking at a 1 percent level of probability. This might be due to that experienced rural farm women can easily sensing the importance of information. Therefore, with the increase of experience in managing the farm, information seeking increases. Attitude towards mobile phone had a positive significant relationship with information-seeking through mobile phone at 1 percent level of significance. Therefore, it could be told that with the increase of attitude towards mobile phones, information seeking with it would be increased. There is a positive significant relationship of organizational participation with seeking of information through mobile phone at 1 percent level of significance. The possible explanation might be organizational participation increase their exposure level in the society which leads to propel their interest to seek information for their agricultural farm enterprise.

3.4 Factors Contributing to Rural Farm Women Entrepreneur's Information-Seeking through Mobile Phone

Based on Pearson's product moment correlation analysis six significant variables (age, family size, educational status, experience in managing farm, attitude towards mobile phone, and organizational participation) were selected and analyzed using the Multiple Linear Regression (MLR) model. Before conducting MLR, a multicollinearity test was conducted using VIF (Variance Inflation Factor). A VIF for selected independent variables was computed to check the existence of the multicollinearity problem. The results revealed that VIF values of all variables were less than five which means there were no significant problems of multicollinearity and a high degree of association among the variables was detected. Out of these variables entered into the MLR model, six variables showed statistically significant contributory factors in the seeking of information through mobile phones (Table 8).

3.4.1 Multiple regression model with significant independent variables

The model summary (Table 8) for the regression analysis output shows the adjusted R-square value is 0.39 meaning 39.0% of the variation of the extent of information seeking through mobile phone in farm enterprises can be explained by variation in independent variables in the model. The multiple correlation coefficient measures (R= 0.412) indicate that the relationship between information-seeking through mobile phones and independent variables is strong and positive.

Table 7. Relationship between selected characteristics of the rural farm women and their information-seeking through mobile phone (n=150)

Dependent variable	Selected Characteristics	Calculated Co-efficient of correlation (r)
Information seeking through mobile phone	Age	-0.185*
	Family size	0.220**
	Educational status	0.433**
	Experience in managing farm	0.299**
	Family farm size	0.117
	Attitude towards mobile phone	0.370**
	Organizational participation	0.374**
df=148, Tabulated value= (0.219)1% level and (0.168) 5% level		

***, Correlation is significant at the 0.01 level and *, Correlation is significant at the 0.05 level*

Table 8. Multiple regression analysis of the significant variables of rural farm women with information-seeking through mobile phone

Model	Dependent variable: Information seeking through mobile phone			t-value	Sig.	VIF	Adjusted R^2
	Unstandardized Coefficients		Standardized Coefficients				
	B	Std. Error	Beta				
(Constant)	-8.737	7.766		-1.125	.000		
X_1. Age	-0.239	-.129	-.143	-1.846	.067	1.47	
X_2. Family size	0.593	.279	.188	2.130	.035	1.12	
X_3. Educational status	0.937	.630	.101	1.488	.139	1.89	0.39
X_4. Experience in managing farm	1.667	.344	.367	4.843	.000	1.39	
X_6. Attitude towards mobile phone	0.738	.138	.391	5.344	.000	1.30	
X_7. Organizational participation	0.600	.208	.215	2.887	.004	1.35	
n= 150, df= 149, R^2 = 0.412, Standard error of estimation= 11.33, F= 16.69 (Sig. at 1% level)							

Model formula

$$Y=a + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_6X_6 + \beta_7X_7$$

Where

Y= Information seeking through mobile phone
a= Intercept parameter
X_1 = Age
X_2 = Family size
X_3 = Educational status
X4 = Experience in managing farm
X_6 = Attitude towards mobile phone
X_7 = Organizational participation

Information seeking through mobile phone = $-8.737 + (-0.239)X_1 + (0.593)X_2 + (0.937)X_3 + (1.667)X_4 + ()0.738X_6 + (0.600)X_7$

Information seeking through mobile phone = -8.737+ (-0.239)Age + (0.593) Family size + (0.937) Educational status + (1.667) Experience in managing farm + (0.738) Attitude towards mobile phone + (0.600) Organizational participation.

3.4.1.1 Age

According to the model results, the coefficient of model output (X_1 = -0.239) indicates age had negative and insignificant effect on information-seeking through mobile phones for agricultural farm enterprise. From this finding it is clear that age of the rural women entrepreneurs had no significant contribution on information-seeking through mobile phones.

3.4.1.2 Family size

The regression model result revealed that the coefficient of model output (X_2 = 0.593) indicates family size was positively and significantly related to information-seeking through mobile phones for agricultural farm enterprises. The results of the model analysis showed that, as the family size of the rural farm women entrepreneurs increased by 1 unit, information seeking through mobile phone would increase by 0.593 units.

3.4.1.3 Educational status

According to the model results, the coefficient of model output (X_1 = 0.937) indicates educational status had positive and insignificant effect on information-seeking through mobile phones for agricultural farm enterprise. From this finding it is clear that educational status of the rural women entrepreneurs had no significant contribution on information-seeking through mobile phones.

3.4.1.4 Experience in managing farm

According to the model results, the coefficient of model output (X_1 = 1.667) indicates experience in managing farm was positively and significantly related to information seeking through mobile phone for agricultural farm enterprise. The results of the model analysis showed that as experience in managing a farm of the rural farm women entrepreneurs increased by 1 unit, information seeking through mobile phone would increase by 1.667 units.

3.4.1.5 Attitude towards mobile phone

Based on the regression result, the coefficient of model output (X_1 = 0.738) indicates attitude towards mobile phone was positively and significantly related with information-seeking through mobile phone for agricultural farm enterprise. The results of the model analysis showed that, as the attitude towards mobile phones of the rural farm women entrepreneurs increased by 1 unit, information seeking through mobile phones would increase by 0.738 units.

3.4.1.6 Organizational participation

According to the model results, the coefficient of model output (X_1 = 0.600) indicates organizational participation was positively and significantly related to information-seeking through mobile phones for agricultural farm enterprises. The results of the model analysis showed that as organizational participation of the rural farm women entrepreneurs increased by 1 unit, information seeking through mobile phone would increase by 0.600 units.

4. CONCLUSION

Based on the findings it might be concluded that the extent of information seeking by rural farm women varies from enterprise to enterprise and one farm women to another in different agricultural enterprises namely crop, fisheries, and livestock. The majority of the rural farm women in the study area were found in a category of those who seek agricultural information at a medium to a higher level. In this regard, the mobile phone helps them for accessing agricultural information promptly and conveniently. Findings also revealed that in all

three agricultural farm enterprises, rural farm women first and foremost seek information regarding the market i.e. calling market centers, traders, and dealers for checking market price followed by collecting weather forecast and contact with experts during an emergency like information regarding culture species and communicate with VS or quack doctor. This might be due to that mobile phone raises the possibilities of rural farm women to access to accurate and timely information regarding technical and agricultural market which leads to making better production decisions and fair market price through market transparency and eliminating middlemen. Rural farm women can get information regarding better culture species of fish and communicate with veterinary surgeons or quack doctors (village doctor of animal) through more efficient coordination. As family size, experience in managing the farm, attitude towards the mobile phone, and organizational participation were identified as the important contributing factors of the rural farm women for seeking agricultural information. Therefore, it might be concluded that these factors should be taken under consideration with special care by the concerned GOs and NGOs before taking any program for the rural farm women development in the study area. Another thing is that concern offices who are the ultimate providers of agricultural information in the study areas should focus their priority on market information, weather trends, information regarding culture species of fish and verterinary surgeon services during emergency if rural farm women aspire for improving farm enterprises.

CONSENT

As per international standard or university standard, respondents' and concerned institutions' consent has been collected and preserved by the author.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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