

Farmers' Use of Improved Practices in Potato Cultivation

ABSTRACT

The main purpose of the study was to determine the extent of use of the improved practices by the farmers in potato cultivation, and to explore the relationships between the selected characteristics of the farmers and their use of improved practices. The study was carried out in Nandigram Upazila of Bogura District. Data are collected via face-to-face interview from 94 randomly selected farmers by using structured interview schedule. Descriptive statistics as well as Pearson's product moment correlation co-efficient(r) were performed to describe and determine the relationships between the selected characteristics and use of improved practices. Findings indicated that majority (70.2%) of the farmers had medium use of improve practices compared to 16.0% low and 13.8% had high use of improve practices. Among the selected characteristics; education, farm size, organizational participation and extension media contact had positive significant relationship with their use of improved practices in potato cultivation, while age showed the negative significant relationship. This meant that these significant had a greater influence to the use of improved practices in potato cultivation. According to Use Index (UI), 'ridge and furrow method' and 'ploughing with power tiller' were the 1st or top ranked improved practices used by the farmers in potato cultivation having similar use index. On the other hand, the bottom ranked improved practices using by the farmers in potato cultivation was 'vermicomposting' which has been introduced recently in the study area. Further research on attitude and perception of the farmers towards improved practices in potato cultivation might be considered in same or other location of the country.

Keywords: Farmers, use, improved practices, and potato cultivation

INTRODUCTION

Bangladesh is mainly an agro-based country. Agriculture has an enceinte contribution to the Gross Domestic Product (GDP) of the country. Potato is one of the food-stuff of the most people

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of the world, and plays a vital role to meet the demand of food in Bangladesh. The climate of Bangladesh is favorable for the potato production. Cultivated plant potato is edible tuber plant of *Solanum tuberosum* of Solanaceae family. At present, potato is a popular and important edible vegetable in Bangladesh for consumption almost whole of the year. Various other food items (*Singara, Samucha, Chop, chips* etc.) are also made from potato. Adequate supply of potato is crucial to stabilize the vegetable market all around the year (Chowdhury and Chowdhury, 2015). According to BBS (2016), both area of and the production of potato cultivation are increasing not only in the whole country but also in the Bogura District (Table 1).

Table 1. Area and production of Potato in different districts of Bangladesh (2014-15 to 2015-16)

Name of Districts	Area (Acre)		Production (M. Tons)	
	2014-15	2015-16	2014-15	2015-16
Bogura	44132	38980	225684	211909
Dinajpur	16136	16615	75193	79242
Rajshahi	11383	11008	55662	51457
Rangpur	10983	8102	53025	42240
Mymensingh	3965	3911	19149	19048

Source: BBS, 2016

Recently, government has been trying to diversify food habits and encourage potato consumption to reduce pressure on rice. Considering population growth trend and consequently the increased demand for food in the country, potato is likely to play a vital role in the future, if the improved practices for potato cultivation are used properly by the farmers. The success of any practices depends on its dissemination among the potential users which ultimately is measured by the extent of usage of those practices. Generalization from studies conducted by home and abroad regarding the use of other practices may vary with technological attributes and for various others factors. Maximization of production, minimization of crop loss etc. can only be possible when use of improved technologies will take place at farm level (Bhuiyan *et al.*, 2002). Potato is the most potential crop in this transformation in Bogura District. Areas and production of Potato in Bogura District compared to Bangladesh (2015-16) is shown in Table 2.

Table 2. Areas and production of Potato in Bogura district compared to Bangladesh (2015-16)

Year	Bangladesh		Bogura	
	Area (Acre)	Production (M. Tons)	Area (Acre)	Production (M. Tons)
2015	172712	791500	141578	990012
2016	170439	798236	146604	1095760

Source: BBS, 2016

Various technical, environmental and socio-economic barriers are the main hindrances of technology transfer and use of improved agricultural practices, not exception of farmers of Bogura district. For wider use of improved practices of potato cultivation, it was necessary to have a clear understanding of the present status of using improved practices in potato cultivation. An understanding of the relationship of use behavior with their selected characteristics will be helpful to the planners and extension workers for the formulation of future policy and strategies. Hence, the specific objectives of the study were: a) to determine and describe the selected characteristics of the farmers; b) to determine the extent of use of improved practices in potato cultivation and their rank order; and c) to explore the relationships between selected characteristics of the farmers and their use of improved practices in potato cultivation.

REVIEW OF LITERATURE

Previous literatures indicated that socio-economic ~~characteristics~~ characteristics had a significant influence on the use of practices and technologies. Young and ~~middle-aged~~ middle-aged farmers are generally become more innovative, energetic and can decide their own decision easily (Sarmin and Hasan, 2019), and more receptive to new ideas and practices (Rahman *et al.*, 2020). Age of respondents had significant negative relationship with the use of technologies on various perspectives (Osman, 2014) and other researchers observed no significant relationship (Asaduzzaman, 2015; Akhter, 2011).

Education assists farmers to broaden their thinking and expand their horizon of knowledge (Sarmin and Hasan, 2019). Farmers need to acquire some education in order to use the various information sources for getting different improved practices (Rahman *et al.*, 2020). The education of the farmers had significant positive relationship with their use of mobile phone for vegetable cultivation (Asif, 2016), use of mass media in receiving technological information (Asaduzzaman, 2015), and use of homestead wastes (Akhter, 2011).

Asif (2016) mentioned that family size had not significant relationship with their use of mobile phone in receiving information on vegetable cultivation. In Bangladesh, due to increasing rate of population, land fragmentation is a very common phenomenon. Every year, lands are divided into small pieces through generation to generation (Sarmin and Hasan, 2019). Farm size of the farmers had significant positive relationship with the use of communication media in commercial fish culture (Sharmin, 2013); and use of homestead wastes (Akhter, 2011).

Generally higher income gives an individual better status in the society (Sarmin and Hasan, 2019), and make farmers more capable in bearing risks for adopting new practices (Karim and Thiel, 2017). Annual income had no significant relationship, but credit received had significant negative relationship with their use of mobile phone in receiving information on vegetable cultivation (Asif, 2016).

Training assists farmers to acquire practical knowledge and improve skills about the respected aspects (Ahmed *et al.*, 2021). Training might have influence in farming activities in response to acquiring technical know-how of improved practices. Osman (2014) found that training received of the farmers had significant and positive relationship, but Akhter (2011) mentioned that there was no significant relationship between training received of fish farmers and their use of information sources. Asif (2016) and Rahman (2010) found that organizational participation of the farmers had significant and positive relationship with the use of mobile phone for vegetable cultivation and aquaculture practices, respectively. The people who have more extension media

contact having more information towards improved practices and climatic variations (Rahman *et al.*, 2020). Existing literatures showed that extension media contact had significant relationship with the use of homestead wastes (Akhter, 2011), and selected crop technologies (Sarker, 2004).

MATERIALS AND METHODS

Location of the study

The study was conducted in Nandigram Upazila of Bogura District because it is very well-known district in northern Bangladesh for potato cultivation. The geographical location of the district is at 24°78' N and 89°35' E which has been shown in the map of Figure 1.

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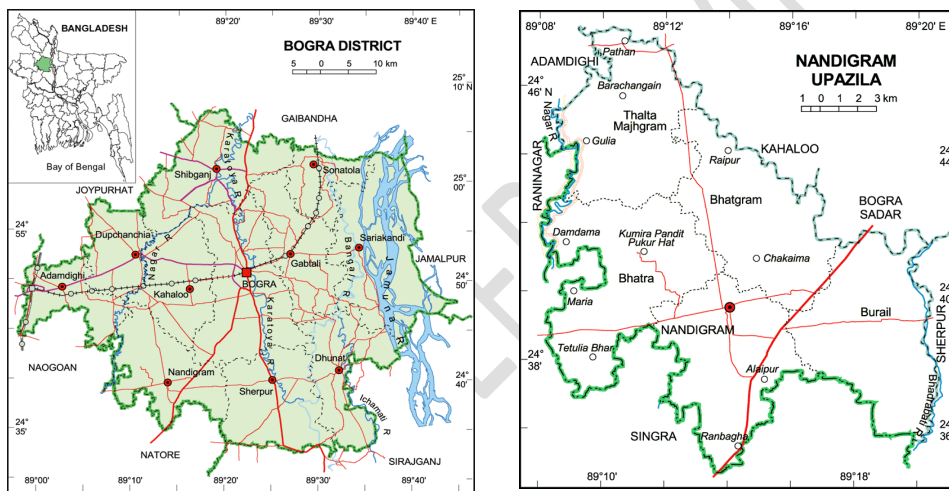


Figure 1. Map of Bogura district and Nandigram Upazila showing the study area

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Population and sample size

The potato farmers of Nandigram Upazila were the target population of the study. Multistage sampling technique was followed for selection of population and sample of the study. In first stage, out of five unions of Nandigram Upazila, three unions namely Vhatgram, Thalta Majhgram and Vhatra were selected purposively for data collection as these three unions are widely popular for potato production. In the second stage, six villages (two from each union) were selected randomly. The total numbers of potato farmers in these six villages were 627, constituted the population of the study. Finally, ninety-four farmers (15% of total population) were selected randomly as sample for data collection due to limitation of time and resources.

Measurement of the selected characteristics and use of improved practices

Socio-economic characteristics of farmers namely age, education, family size, farm size, potato growing area, annual income, credit received, training received, organizational participation, extension contact and knowledge on potato cultivation were measured by following appropriate techniques and scales. Use of improved practices by the farmers in potato cultivation was measured based on the 4 dimensions: pre-planting practices, soil fertility management practices, inter-cultural operations and pest management consisting of eighteen improved practices. Use of improved practices score was measured by 4-point rating scales i.e. 'frequently', 'occasionally', 'rarely' and 'not at all' with assigned scores 3, 2, 1, 0 respectively. The scale was adopted from [Akter \(2011\)](#). Overall score of the use of improved practices was computed by summing scores of all practices. So, possible improved practices usage score could range from 0 to 54, where '0' indicates 'no use' and '54' indicates 'high use'. Use Index (UI) was computed by using the following formula:

$$UI = U_f \times 3 + U_o \times 2 + U_r \times 1 + U_n \times 0$$

Where,

UI= Use Index

U_f = Number of farmers use improved practices as 'frequently'

U_o = Number of farmers use improved practices as 'occasionally'

U_r = Number of farmers use improved practices as 'rarely'

U_n = Number of farmers use improved practices as 'not at all'

Thus, Use Index (UI) of improved practices could range from 0 ($0 \times 94 = 0$) to 282 ($3 \times 94 = 282$), where 0 indicating no use and 282 indicating highest use of the particular improved practice.

Data collection, processing and analysis

Data were collected during the month of December 2018 through personal face-to-face interview using structured interview schedule. Then, data were compiled, tabulated and analyzed based on the objectives of the study. Data analysis was performed by following SPSS (Statistical Package for Social Science) software package. The descriptive statistics such as number and percentage were computed for describing the variables of the study. In order to determine the relationship of the characteristics with the use of improved practices, the Person's product moment correlation

was computed. At highest five percent (0.05) level of significance was used as the basis of rejecting any null hypotheses.

RESULTS AND DISCUSSION

Socioeconomic characteristics of the farmers

The descriptive statistics of the socioeconomic characteristics of the farmers are presented in Table 3. Majority of the respondents (42.6%) was found middle aged, while 24.4 % belonged under young aged and 33.0% under old aged category. Hence, most of the farmers were young to middle aged who are generally become more innovative and energetic to use the improved practices supported by [Rahman *et al.*, \(2020\)](#). Highest proportion (37.2%) of farmers could sign their name only, and 39.4% of farmers were illiterate or had no formal institutional education. Although education helps the farmers to expand their thinking and knowledge and it is one of the most important criterions in the usage of improved practices ([Rahman *et al.*, 2020](#); [Karim *et al.*, 2020](#)), but the literacy rate in the study area is not satisfactory. Near to half of the farmers (46.8%) had medium family size in comparison to 43.6% small family. The average family size of the respondents was 4.86 which is approximately close to the national average of 4.06 ([HIES, 2016](#)). Highest proportion (81.9%) of the farmers had small sized farm without having any large farmers. Because, in Bangladesh, farm size is being decreased generation to generation due to land fragmentation ([Sarmin and Hasan, 2019](#)). Generally, higher income makes the farmers more capable to bear risk for adopting innovative and improved practices ([Karim and Thiel, 2017](#)), but majority (84.4%) of the farmers had medium size potato growing area and medium income (84.0%) in the study area. Highest proportion (76.6%) of the farmers had not received any credit. More than two-thirds of the farmers (79.8%) had no reception any training while only 1.1% having long term training. This scenario indicates the lack of adequate training facilities and information support regarding aquaculture in the study area. Majority farmers (87.2%) had no different organizational participation. Therefore, organizational participation of the potato growers is dissatisfactory as majority of them have no participation in different organizations. Highest proportion (91.5%) of the farmers had low extension contact compared to 2.0% high extension contact. This might be due to the fact that majority of them have no organizational participation and lack of contact with agricultural extension services. Majority of the respondents (61.7%) had medium knowledge on potato cultivation, while 28.7 percent had low knowledge on

potato cultivation and 9.6 percent had high knowledge on potato cultivation. More knowledge on potato cultivation can help to enhance the use of improved practices.

Table 3. Selected characteristics profile of the respondents (n=94)

Characteristics (Measurement unit)	Respondents			Mean	SD
	Category	Frequency	Percent		
Age (year)	Young (up to 35)	23	24.4	44.43	12.49
	Middle aged (36-50)	40	42.6		
	Old aged (Above 50)	31	33.0		
Education (year of schooling)	Illiterate (0)	37	39.4	1.91	3.72
	Can sign (0.5)	35	37.2		
	Primary education (1-5)	10	10.6		
	Secondary education (6-10)	6	6.4		
	Above Secondary (above 10)	6	6.4		
Family size (number)	Small (up to 4)	41	43.6	4.86	1.53
	Medium (5-6)	44	46.8		
	Large (Above7)	9	9.6		
Farm size (hectare)	Landless farmer (< 0.02)	-	-	0.45	0.27
	Marginal farmer (0.02-0.20)	14	14.9		
	Small farmers (0.021-1)	77	81.9		
	Medium farmers (1.01-3)	3	3.2		
	Large farmers (<3)	-	-		
Potato growing area (hectare)	Low (up to 0.11)	6	6.4	0.35	0.23
	Medium (0.12-0.58)	79	84		
	High (above 0.58)	9	9.6		
Annual income (“000” Tk)	Low (up to 43)	3	3.2	167.96	124.72
	Medium (44-291)	79	84.0		
	High (above 291)	12	12.8		
Credit received (“000” Tk)	No credit received (0)	72	76.6	8.71	17.21
	Low (1-17)	2	2.1		
	Medium (18-34)	6	6.4		
	High (above 34)	14	14.9		
Training Received (Day)	No training received (0)	75	79.8	1.18	6.44
	Short term(1-20)	18	19.1		
	Medium (21-40)	-	-		
	Long term (above 40)	1	1.1		
Organizational participation (Score)	No participation (0)	82	87.2	0.40	1.94
	Low (1-6)	11	11.7		
	Medium (7-12)	-	-		
	High (above 12)	1	1.1		
Extension media Contact (Score)	Low (up to 11)	86	91.5	5.57	5.07
	Medium (12-22)	6	6.4		

	High (above 22)	2	2.1		
Knowledge on potato cultivation (Score)	Low (up to 17)	27	28.7	18.56	2.05
	Medium (18-21)	58	61.7		
	High (above 21)	9	9.6		

Use of the improve practices by the farmers in potato cultivation

Use of the improve practices by the farmers in potato cultivation ranged from 24 to 52 against the possible range of 0 to 54 with a mean of 39.40 and standard deviation of 5.68. Considering mean and standard deviation ways of quantitative classification (Hasan *et al.*, 2018), use of the improve practices by the farmers were classified into three categories namely, 'low' (up to 34), 'medium' (34-45) and 'high' (>45). The distribution of the farmers based on the use of the improve practices is given in Table 4.

Table 4. Use of the improve practices by the farmers in potato cultivation

Range		Categories	Farmers		Mean	SD
Possible	Observed		No.	%		
0-54	24-52	Low used (up to 34)	15	16.0	39.40	5.68
		Medium used (34-45)	66	70.2		
		High used (Above 45)	13	13.8		
		Total	94	100.0		

The findings showed in Table 4 that majority (70.2%) of the farmers had medium use of improve practices while 16% of them had low and 13.8% of them had high use of improve practices in potato cultivation. Nuruzzaman (2003) also found such categories of farmers which was similar to the findings of the present study. It could be interpreted that more than two-third proportion of the farmers had medium use of improve practices in potato cultivation in the study area. Thus, there is ample opportunity to increase the usage of improved practices in potato cultivation.

Rank order of use of improved practices by the farmers in potato cultivation

The observed Use Index (UI) of the 18 improves practices in potato cultivation ranged from 21 to 282 against the possible range of 0 to 282 (Table 5). According to Use Index (UI), the 1st ranked improved practices used by the farmers in potato cultivation was 'ridge and furrow method' and 'ploughing with power tiller' having similar use index of 282. The 2nd ranked improved practice by the farmers in potato cultivation was using 'chemical pesticides' followed

by chemical fertilizers as ranked 3rd and ‘compost’ ranked as 4th. On the other hand, the least ranked improved practice used by the farmers in potato cultivation was ‘vermicomposting’ which has been introduced recently in the study area.

Table 5. Rank order of improved practice used by the farmers in potato cultivation

Improved practices	Extent of Frequency				Use Index (UI)	Rank
	Frequently	Occasionally	Rarely	Not at all		
Ploughing with power tiller	94	0	0	0	282	1 st
Hybrid varieties	72	7	5	10	235	8 th
Cutting of seed potato	74	0	2	18	224	9 th
Ridge and furrow method	94	0	0	0	282	1 st
Compost	90	4	0	0	278	4 th
Vermicomposting	2	5	5	80	21	17 th
Poultry liter	1	0	21	72	23	16 th
Chemical fertilizers	92	1	1	0	279	3 rd
Growth hormone	10	22	20	42	94	15 th
Vitamin for health	23	41	18	12	169	12 th
Irrigation with deep tube well	39	9	14	32	149	13 th
Irrigation with shallow machine	52	9	4	29	178	11 th
Properly drainage	84	2	1	7	257	7 th
Earthing up	84	10	0	0	272	6 th
Chemical pesticides	92	2	0	0	280	2 nd
Soil treatment	39	32	6	17	187	10 th
Potato seed treatment	17	23	9	45	106	14 th
Crop rotation	90	3	1	0	277	5 th

Relationships between selected characteristics and use of improve practices

The relationships were computed by using the Pearson’s product moment correlation coefficient(r). The eleven characteristics were considered as selected characteristics for measuring relationship with the focus issue named use of improved practices in potato cultivation. Among eleven characteristics, education, farm size, organizational participation and extension media contact showed positive significant relationship with use of improved practices. Similar relationships were observed by the previous literatures of [Asaduzzaman \(2015\)](#), [Sharmin \(2013\)](#), [Akhter \(2011\)](#), [Rahman \(2010\)](#) and [Sarker \(2004\)](#). On the other hand, age showed significant negative relationship with use of improved practices, which is supported by [Asif \(2016\)](#), [Osman \(2014\)](#) and [Sharmin \(2013\)](#). But, the rest of the socio-economic characteristics of the farmers’

such as family size, potato growing area, annual income, credit received, training received, knowledge on potato cultivation in potato cultivation did not show any significant relationship with the use of improved practices (Table 6).

Table 6. Correlation between selected characteristics and use of improved practices (n=94)

Focus Issue	Selected characteristics	Coefficient (r) value
Use of improved practices in potato cultivation	Age	-0.401 ^{**}
	Education	0.587 ^{**}
	Family size	0.016
	Farm size	0.235 [*]
	Potato growing area	0.200
	Annual income	0.185
	Credit received	0.190
	Training received	-0.036
	Organizational participation	0.270 ^{**}
	Extension media contact	0.332 ^{**}
	Knowledge on potato cultivation	0.181

* Correlation is significant at 5% level of probability

**Correlation is significant at 1% level of probability

CONCLUSIONS

Majority of the farmers had medium use of improved practices. Hence, it could be ~~aeclaimed~~ argued that most of the farmers in the study area have not yet taken the improved practices to ~~the extent of~~ higher level. ~~Nevertheless, results showed that, and there~~ is an ample ~~scope + opportunity~~ opportunity to increase the extent of use of improved practices in potato cultivation. Age, farm size, education, organizational participation and extension media contact were the influential charectericties, while age was only negatively correlated. This means that with of increase educational level, organizational participation and extension media, the use of improved practices in potato cultivation might be enhanced. The negative significant relationship of age indicated that old aged farmers were failed in showing their interest to use the improved practices in potato cultivation. The findings of descriptive statistics indicated that more than two-third of the farmers had no adequate education, credit and training exposure as well as

organizational participation. Therefore, it is recommended that both government and non-government organizations should take necessary steps to enhance access of credit and training facilities as well as organization affiliation, so that farmers become more capable of being used the improved practices in potato cultivation.

REFERENCES

Ahmed-~~MS~~, M.S., Bagum, T., Mondal, T., ~~and~~& Das, D. (2021). Use of improved postharvest practices by the flower farmers: A study on some selected cut flowers. *International Journal of Agricultural Education and Extension*, 7(1):424-431.

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Aktar Y (2011). Use of Homestead Wastes by the Rural Women Towards Sustainable Vegetable Cultivation. *M.S. (Ag. Ext. Ed.) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

Akter S (2011). Information Sources Used by the Farmers in Small Scale Pond-Fish Culture. *M.S. (Ag. Ex. Ed.) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

Asaduzzaman M (2015). Use of Selected Mass Media by Fish Farmers in Receiving Technological Information. *M.S. (Ag. Ext. Ed.) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

Asif MAS (2016). Use of Mobile Phone by the Farmers in Receiving Information on Vegetable Cultivation. *M.S. (Ag. Ext. Ed.) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh, Bangladesh.

BBS (2016). *Statistical Yearbook of Bangladesh*. Bangladesh Bureau of Statistics, Statistics Division. Ministry of Planning, Government of the People's Republic Bangladesh.

Bhuiyan, NI, Paul DNR and Jabber MA (2002). Feeding the extra millions by 2025: Challenges for rice research and extension in Bangladesh. *A Keynote Paper Presented at National*

Workshop on Rice Research and Extension-2002. Bangladesh Rice Research Institute, Gazipur, 29-31 January 2002.

Chowdhury MD and Chowdhury AH (2015). Problems and Prospects of Potato Cultivation in Bangladesh. *Asian Business Review*, 5 (10): 28-32.

Hasan MF, Khatun F and Begum B (2018). *Research Methodology in Social Sciences*. Dhaka: Borno Prakash Ltd.

HIES (2016). Household Income & Expenditure Survey. Bangladesh Bureau of Statistics, Government of the People's Republic of Bangladesh, Dhaka.

Karim MR and Thiel A (2017). Role of Community Based Local Institution for Climate Change Adaptation in Teesta Riverine Area of Bangladesh. *Climate Risk Management*, 17: 92-103.

Karim MR, Meem MA, Rahman MS, Noman MRF and Huda S. (2020). Use and Role of Mobile Phone for Information Services in Agricultural Activities. *Asian Journal of Agricultural Extension, Economics & Sociology*, 38(2):102-110.

Nuruzzaman M (2003). Use and Preference of Mass Media in Receiving Agricultural Information by the Farmers. *M.S. (Ag. Ext. Ed.) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

Osman, MS (2014). Farmers' Use of ICT Based Media in Receiving Agricultural Information. *M.S. (Ag. Ext. Ed.) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh, Bangladesh

Rahman M (2010). Aquaculture Management Practices Followed By the Fish Farmers in Kishoregonj District. *M.S. (Ag. Ext. Ed.) Thesis*, Department of Agricultural Extension and Teachers' Training, Bangladesh Agricultural University, Mymensingh.

Rahman MS, Rahman ARMZ, Huda S and Noman MRF (2020). Use of Information Sources by the Farmers for Climate Change Adaptation in Northern Bangladesh. *Bangladesh Journal of Extension Education*, 31(1&2): 12-25.

Sarker MTAR (2004). Use of Selected Crop Technologies in Homestead Gardening by the Rural Women in a Selected Area of Mymensingh District. *M.S. (Ag. Ext. Ed.) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

Sarmin S and Hasan MF (2019). Farmers' Knowledge of Climate Change in Northern Bangladesh. *Bangladesh Journal of Extension Education*, 32(Special Issue): 95-106.

Sharmin F (2013). Use of Communication Media by the Fish Farmers in Commercial Fish Culture. *M.S. (Ag. Ext. Ed.) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

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