OPEN ACCESS Int. J. Agr. Ext. 09 (03) 2021. 373-388 DOI: 10.33687/ijae.009.03.3606

Check for updates

Available Online at EScience Press

International Journal of Agricultural Extension

ISSN: 2311-6110 (Online), 2311-8547 (Print)

https://esciencepress.net/journals/IJAE

PROBLEMS FACED BY THE CROP FARMERS RELATED TO EXTENSION SERVICES PROVIDED BY DEPARTMENT OF AGRICULTURAL EXTENSION IN BANGLADESH

Saifur Rahman*, Mohammad J. Hoque, Mohammed N. Uddin

Department of Agricultural Extension Education, Bangladesh Agricultural University, Bangladesh.

ARTICLE INFO

Article History

Received: May 06, 2021

Revised: August 28, 2021

Accepted: September 30, 2021

Keywords

Agriculture

Advisory service

Constraints

Factors

Extension contacts

ABSTRACT

The Department of Agricultural Extension (DAE) has a long history of providing extension services to Bangladesh's crop farmers. This study attempted to explore the extent of problems that crop farmers faced regarding acquiring the extension services provided by DAE. This study was conducted in three villages of Gauripur Upazila (sub-district) in Mymensingh district, Bangladesh. A face-to-face interview was conducted with 100 sampled farmers for data collection on a pre-tested and structured interview schedule. The key variable, named as extent of problems was measured using a 4-point rating scale. Both enter and step-wise regression models were employed on the data. Results indicated that half of the respondents faced a moderate level of problems while 40% faced a high level of problems. The extension workers' poor communication skill was the most critical issue, followed by insufficient resources and maintaining contact with resource-rich farmers as perceived by the respondents. Crop farmers' education, perceived economic return, the experience of participating in extension activities, training, and fatalism were significantly associated with the problems faced by them. Education, perceived economic return, the experience of participating in extension activities, and training were discovered to be essential determinants of the degree of problems related to extension services. The study identified several chances for the policymakers to address influential factors for improving crop extension services of DAE. Furthermore, improved coordination and providing crop farmers with need-based training and resources may help mitigate the identified issues.

Corresponding Author: Saifur Rahman

Email: saifurgext41486@bau.edu.bd

INTRODUCTION

Agriculture is still an effective tool for sustainable development and poverty alleviation in the twenty-first century, particularly in developing countries like Bangladesh (World Bank, 2010; Agbarevo, 2013). The agricultural expansion will boost farm incomes, strengthen ties between agricultural and non-farm poverty reduction efforts, and boost productivity. Research suggests that about 86 percent (2.5 billion people) of the rural population rely directly on the agricultural sector. Agricultural extension, which plays a critical role in agricultural production and rural development programs, is one of the most important components of this growth facilitation (Bonye *et al.*, 2012). An adequate number of extension agents, frequent visits of the extension agents, and valuable, high-quality advice are all indicators of a suitable extension service (Ragasa *et al.*, 2013; Thuo *et al.*, 2014). The functioning of agricultural extension, now known as agricultural (or rural) advisory programs, in many

countries has sparked researchers' and policymakers' interest (Klerkx *et al.*, 2016). To meet their national food safety goals, some countries, such as China and India, have developed agricultural extension networks (Hu *et al.*, 2009). Again, a crucial role is played by agrarian extension in facilitating technology transfer for poor rural farmers.

China's approach to public agricultural extension is top-down (Hu *et al.*, 2012). Furthermore, Hu *et al.* (2012) discovered that in China, targeting all farmers for public extension services and taking a systemic approach to defining farmer needs are important criteria for an inclusive public extension because these features have improved service providers' (extension agents') understanding of what services farmers want.

One of the world's leading expertise and information dissemination organizations is India's public agricultural extension network (Sontakki *et al.*, 2010). In the public sector, many attempts have been made to improve this system's organizational performance over the last decade. The issue of enhancing the value, performance, and efficacy of the public extension and advisory scheme, on the other hand, remains unsolved (Desai *et al.*, 2011). Due to numerous restrictions, Pakistan's public advisory services cannot offer appropriate and satisfactory services to farmers (Abid *et al.*, 2016). Asfaw *et al.* (2012) found that rural farmers farming on limited hectares of land in Tanzania and Ethiopia may be due to insufficient credit, lack of access to the commodity market, and insufficient extension contacts.

Australia and New Zealand have used participatory extension programs in place of the linear top-down "technology transfer" paradigm since 1960 (Braun and Duveskog, 2011), which is a proven success so far due to its connection to high rates of adoption of practice; a positive impact on production and earnings; improved capabilities and expertise; and high provision of peer reinforcement (Davis *et al.*, 2012).

With a population of 161.4 million people, Bangladesh is an agrarian republic (World Bank, 2019). Agriculture is vital to the life of millions of Bangladeshis (USAID, 2017). Even though agriculture's economic significance has steadily dropped over the last four decades, the agriculture sector accounted for over 14 percent of its GDP in 2015–2016. From 46.7 percent in 1980–81 to 24.1 percent in 2000–2001, this percentage has decreased (BBS, 2015). But the agricultural sector still plays a crucial function in driving Bangladesh's expansion of the economy (Bangladesh Bureau of Statistics, 2017). Agriculture employs about 40.06 percent of the workforce (Bangladesh Bureau of Statistics, 2019). So, the agriculture extension's productive function is urgently needed and should be used and utilized in a precise and effective manner (Fiaz *et al.*, 2018). However, in Bangladesh, the Department of Agricultural Extension (DAE), the country's largest extension service provider, among others such as the Department of Livestock Services (DLS), the Department of Fisheries (DoF), several NGOs, and providing extension services for crop farmers.

As a key agency within the Ministry of Agriculture, the Department of Agricultural Extension (DAE) contributes significantly to rural people's livelihoods by providing crop extension services. DAE's mission is to provide extension services that are effective, efficient, decentralized, location-specific, demand-responsive and integrated so that all farmers can utilize tools and access the information to increase sustainable and profitable crop production (USAID, 2017). The New Agricultural Extension Policy (NAEP) prompted a transition in DAE's crop extension services to a project-based approach. This approach seeks to address complex issues by providing group-based crop extension programs and forming multi-organizational alliances and decentralizing support structures to ensure marginalized social groups' needs are met (Chowdhury et al., 2013).

As shown in Figure 1, DAE is headed by a Director General (DG), assisted by eight Directors, forty-five Additional Directors, thirty-five Deputy Directors. There is a 486 Upazila agriculture office, in which 6818 employees are present. The Upazilla level is the basic unit for preparing, executing, monitoring, and assessing the effectiveness of local extension programs. DAE's Extension service's success relies heavily on the Upazila Agricultural Extension staff (Arifullah *et al.*, 2014). Besides, there are three Sub-Assistant Agricultural Officers (SAAO) in each union, and in each pourosova, there is one SAAO. They connect directly with rural residents and provide resources in support of the DAE's mission and vision.

But, DAE is constantly being criticized for delivering a subpar, outdated extension facility (Uddin and Qijie, 2013). DAE has mainly project-based funding (USAID, 2017). According to Miah (2015), "the only drawback to this project reliance is that some locations seem to draw

repetitive projects while others do not; duplicated endeavours; while similar methods can be tried again and again with no results; and the extension's content may be determined by the project's specifications rather than by local needs.

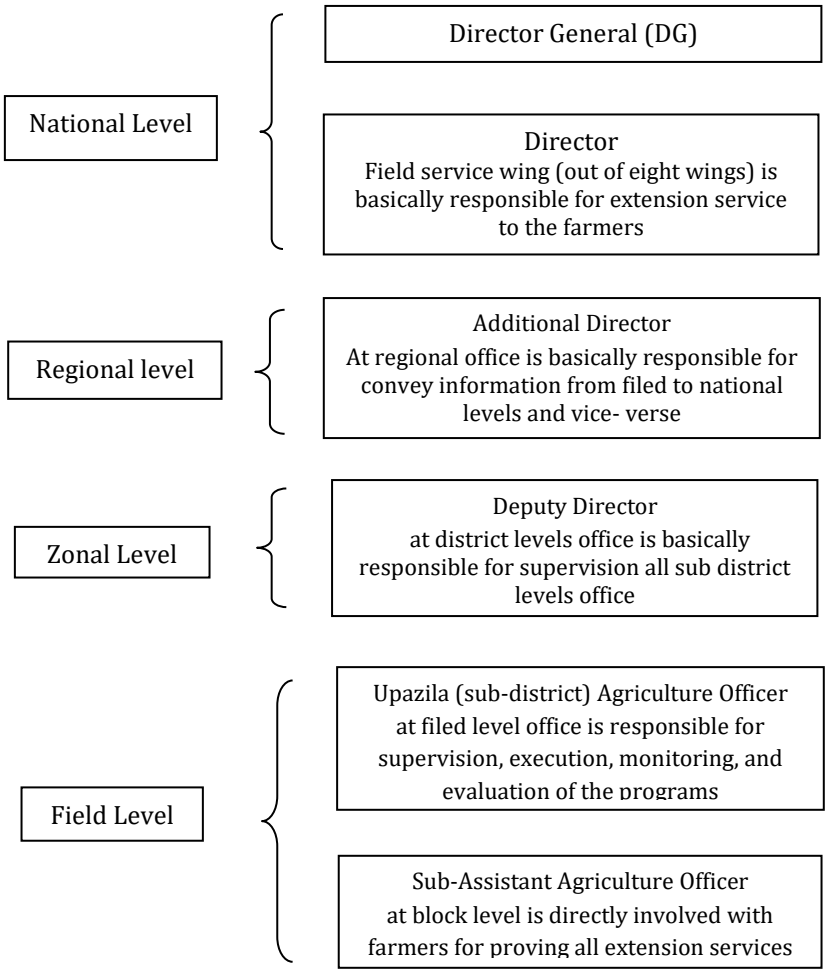

Figure 1. Flow of extension service under the umbrella of DAE for crop farmers (DAE Manual, 2018).

Despite this, about 84 percent of the extension's costs are for compensation, leaving no funds for travel, curriculum development, or in-service training. Extension programs such as demonstrations and farmer training receive just 1.5 percent of the budget (Birner *et al.*, 2010). Catalyst III (2015) reported that agencies responsible for agricultural, livestock, and fisheries extension services in Bangladesh face resource constraints, both in human resources and finance. Sub-district (Upazila) level officers and their field workers are often unable to satisfy the majority of farmers' primary information needs within their jurisdiction. Uddin (2008) Several problems with agricultural extension services in Bangladesh have been found, including lack of definite farmer group development requirements, Sub Assistant Agricultural Officers' (SAAOs) unavailability, and inefficiency, socio-political barriers. Again, the government extension service seems to be more concentrated on large farmers than on small farmers Mengal *et al.* (2012); Rashid and Q. Gao (2016). Baig and Aldosari (2013) identified that in Asian countries like Bangladesh and India, there is a shortage of extension workers in rural, underdeveloped, and marginalized areas, and most of the extension officers are compelled to work overtime, commit non-extension practices and tasks, putting advisory work at risk and, in some situations, rendering it ineffective. Afrad *et al.* (2019) reported that the agricultural extension service scheme in Bangladesh has undergone significant changes in recent years. The research also identified a

few problems like farmers' inability to reap the rewards of extension programs due to their lack of knowledge, extension sector personnel's hesitation, and lack of technical competency. Haq (2011) found that farmers of villages that are close to the DAE office get more service than farmers of distant villages. On the other hand, Swanson (2011) established some shortcomings relating to public extension agency management challenges, including a lack of funding. This suggests that still now DAE's crop extension programs in Bangladesh are unable to achieve their ultimate aim of improving farmers' socio-economic status through providing effective extension service (Haq, 2013). In Bangladesh, research work on problems in fish culture, crop production, and livestock rearing is available. However, no research was done on issues faced by crop farmers in receiving extension services provided by DAE. As a result, investigating specific issues of various problems faced by crop farmers in obtaining the desired extension services offered by DAE is critical to this study.

Therefore, the researchers conducted this study with the following objectives in mind: (i) to have an overview of the crop farmers' socio-economic characteristics (ii) to identify the problems and measure the extent of problems that crop farmers face regarding extension services provided by DAE (iii) to identify factors associated with problems in getting desired extension service.

METHODOLOGY

Study Area

Three villages (Chandersatia, Chorail, and Salihor) of the Gauripur under the Mymensingh district of Bangladesh were chosen for conducting the research (Figure 2). Mymensingh is Bangladesh's largest rice-producing district, accounting for 5.12 percent of total rice production (BBS, 2019). Besides, about 66.9 percent of the people of Gauripur Upazila are involved in agricultural activity. Again, since most people in this region are engaged in various crop production practices, they must have used DAE's agricultural extension services.

Population and Sampling Design

The research population comprises farm households who depend on crop cultivation for a living in the study area. According to the Upazila Agriculture Extension Office, there were 500 households engaged in crop farming, and to gather data from them, a 20% sample size was calculated. As a result, 100 households were chosen at random, giving each household an equal chance of being chosen for the survey.

Methods of data collection

First, two focus group discussions (FGDs) were conducted with 20 crop farmers (10 in each session) to develop a basic understanding of the challenges they face in obtaining extension resources and related fields. Second, we used the data from the focus group discussions to create a formal interview plan. Finally, by conducting primary interviews with twenty (20) crop farmers, the interview schedule was refined further. The regular interview schedule was revised after the preliminary interview. Finally, sampled farmers were interviewed. During October and November of 2019, data were collected via face-to-face interviews.

Measurement of the variables and analysis of data

Problems faced by the crop farmers were the dependent variable of this study. Twelve problems were identified through FGD and using available literature. Each problem had four possible responses: highly severe, moderately severe, less severe, and not at all, with ratings of 3, 2, 1, and 0 corresponding to each. As a result, the theoretical score varied from 0 to 36, with 36 denoting a severe problem and 0 indicating no problem. Based on the score, the respondents were categorized into three groups namely low, medium, and high.

On the other hand, the socioeconomic characteristics of the farmers were recognized as the independent variables of the study. There was age, education, household size, farm size, annual family income, organizational participation, social mobility, credit received, extension media contact, perceived economic return, participation in extension program, input distribution by DAE, the experience of participating in extension activities, knowledge on agricultural extension service, attitude towards extension service providers, training and fatalism. These independent variables were measures using scores and developed scales.

The second objective of the study, identifying the extent of problems faced by crop farmers in getting crop extension services, was measured by using a problem-facing index (PFI). PFI helps to identify the most critical problems and make a rank order of them (Eq. (1)) (Hamid *et al.*, 2020).

PFI=(Ph×3)+(Pm×2)+(Pl×1)+(Pn×0) ……………………..(1)

Where;

PFI = Problem Facing Index, Ph = number of farmers with serious problems, Pm = number of farmers with medium problems, Pl = number of farmers with low problems, and Pn = Number of farmers with no problem. The PFI of a single issue could be somewhere between 0 and 300, where 0 indicates no difficulty and 300 denotes a significant problem in farmers accessing agricultural extension services.

Figure 2. Map of Gauripur Upazila under Mymensingh district.

The third objective of the study, factors associated with problems in getting desired extension service, was measured by using correlation and regression analysis. For the analysis, the data were cleaned, coded, and analyzed with the statistical package for social science (SPSS) version 20. Different charts and graphs were prepared using Microsoft Excel 16. The Pearson product-moment correlation coefficient was calculated to investigate the relationship between the independent and focus variable (Equation 2).

$$r_{xy} = \frac{\sum(x_i-\bar{x})(y_i-\bar{y})}{\sqrt{\sum(x_i-\bar{x})^2 \sum(y_i-\bar{y})^2}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(2)}$$

Where;

r_{xy} = Pearson's product-moment correlation coefficient

$\bar{x}$ and $\bar{y}$ = Means of the variables x and y, respectively

The factors leading to crop farmers' difficulties in obtaining agricultural extension services were determined using multiple regression analysis (both enter and step-wise methods). Step-wise regression analysis helps to measure the individual input of factor variables by extracting irrelevant variables from the model (Quddus and Kropp, 2020). The equations for multiple regression analysis are as follows (Equation 3):

$$y_i = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \beta_{10}X_{10} + \beta_{11}X_{11} + \beta_{12}X_{12} + \beta_{13}X_{13} + \beta_{14}X_{14} + \beta_{15}X_{15} + \beta_{16}X_{16} + \beta_{17}X_{17} + \in_i \ldots\ldots \text{(3)}$$

Where;

yi = problems in getting agricultural extension services, β_0 = constant, X_1= age, X_2= education, X_3 = household size, X_4 = farm size, X_5 = annual family income, X_6 = organizational participation, X_7 = social mobility, X_8 = credit received, X_9 = extension media contact, X_{10} = perceived economic return, X_{11} = participation in extension program, X_{12}=input distribution by DAE, X_{13} =

experience of participating in extension activities, X_{14}=knowledge on agricultural extension service,X_{15} =attitude towards extension service providers, X_{16} = training, X_{17}= fatalism,∈i= Error term

RESULTS AND DISCUSSION

Socio-economic characteristics of the respondents

Table 1 indicates that 83% of farmers fall into the old to middle-aged group. This is probably because the younger generation is getting more and more engaged in education and non-agricultural activities. The results are similar to those of Uddin *et al.* (2017); Hasibuan *et al.* (2020). The literacy rate of the respondents was 80% which is perceived to be higher than the national literacy rate of 72.3 percent (Bangladesh Statistics, 2018). Uddin *et al.* (2017) and Hasibuan *et al.* (2020) discovered a similar literacy rate among their surveyed farmers. Farmers had an average family size of 4.86, which was higher than the national average of 4.06 (HIES, 2016). Wossen *et al.* (2017) reported a similar household size. The farmers had an average farm size of 0.39 hectares. It was less than that of the national average (0.6 ha) (Uddin *et al.*, 2017). Farmers in the study area earned an average of 0.2102 million Bangladeshi taka per year (2478.49 US$), which is more than the national average of 0.142056 million Bangladeshi taka (1675 USD)(BBS, 2019). Arifullah *et al.* (2014) found a common trend among farmer family income in their research. Most (93%) of the respondents had no to low organizational participation. Karim *et al.* (2016) also found low organizational involvement among the respondents in their study. Almost 85% of respondents were found to have medium social mobility compared to 15 percent having high social mobility. None of the respondents belong to the low social mobility category. A related outcome was observed by Hasan et al. (2017). Though a good percentage (46%) of the farmers did not receive any credit, however majority (54%) of them received low to high credit. All farmers (100%) had low to medium extension media touch, and Karim *et al.* (2016) observed a similar finding. The respondents with the lowest perceived economic return (95%) were considered the most numerous.

Table 1. Socio-economic characteristics of the farmers (n = 100).

Characteristics	Range		Respondents (N=100)		Mean	SD*
(Measuring units)	Possible	Observed	Category	(%)		
Age (Years)	-	22-70	Young (18-35)	17	45.64	11.69
			Middle-aged (36-50)	53		
			Old (above 50)	30		
Level of education (Years of schooling)	-	0-17	Illiterate (0)	20	5.23	5.10
			Can sign only (0.5)	22		
			Primary (1-5)	16		
			Secondary (6-10)	28		
			Above Secondary (>10)	14		
Household size (No. of members)	-	2-8	Small (up to 4)	41	4.86	1.23
			Medium (5-6)	49		
			Large (above 6)	10		
Farm size (Hectares)	-	0.09-1.94	Landless (upto0.02)	0	0.39	0.35
			Marginal (0.02-0.2)	39		
			Small (0.21-.99)	56		
			Medium (1.0-2.99)	5		
			Large (3 and more)	0		
Annual family income ('000' Tk.)	-	53-500	Low (up to 200)	42	210.2	101.2
			Medium (201-400)	48		
			High (above 400)	10		
Organizational participation (Scale score)			No participation (0)	48	0.84	1.22
			Low (1-10)	45		

	0-30	0-6	Medium (11-20)	7		
			High (above 20)	0		
Social mobility			Low (up to 6)	0		
(Scale score)	0-18	7-15	Medium (7-12)	85	10.5	1.91
			High (above 12)	15		
Credit received			No credit (0)	46		
('000' Tk)	-	0-100	Low (1-33)	45	11.82	19.0
			Medium (34-67)	5		
			High (above 67)	4		
Extension media contact			Low (up to 19)	50		
(Scale score)	0-57	10-26	Medium (20-38)	50	19.12	3.66
			High (above 38)	0		
Perceived economic return (Scale			Low (upto 3)	95		
score)	0-10	0-4	Medium (4-6)	5	1.60	.91
			High (above 6)	0		
Participation in extension			Low (10-20)	84		
program (Scale score)	10-40	12-24	Medium (21-30)	16	17.72	2.83
			High (above 30)	0		
Input distribution by DAE			Poor (upto 13)	100		
(Scale score)	7-28	7-12	Moderate (14-20)	0	8.40	1.24
			Good (above 20)	0		
Experience of participating in			Low (upto 14)	31		
extension activities	-	4-43	Medium (15-29)	54	18.18	9.16
(Years of participation)			High (above 29)	15		
Knowledge on agricultural extension			Low (upto 10)	25		
service (Scale score)	0-29	7-19	Medium (11-20)	75	12.04	2.99
			High (above 21)	0		
Attitude towards extension service			Less favorable (upto 16)	73		
provider (Scale score)			Moderately favorable	27	15.30	1.99
	8-32	10-21	(16-24)			
			Highly favorable (above	0		
			24)			
Training			No training (0)	74		
(Days)	-	0-3	Short (upto 7)	26	0.50	0.91
			Medium (8-30)	0		
			Long (above 30)	0		
Fatalism			Low (upto 18)	1		
(Scale score)	8-40	18-33	Medium (19-29)	82	26.05	3.25
			High (above 29)	17		

SD* = Standard Deviation, Source: Field survey, 2019

Most of the respondents (84%) were classified as having a low level of participation in the extension program. All the respondents were found to mention poor input distribution by DAE in the study area. The highest proportion (54%) of the respondents were found to have medium experience of participating in extension activities. Karim *et al.* (2016); Dev *et al.* (2017) and Hasibuan *et al.* (2020) discovered a parallel pattern of events. All of the respondents had low to medium knowledge of the agricultural extension service.

Farmers' viewpoints have traditionally been limited to "informal" information sources (Šūmane *et al.*, 2018). According to Karim *et al.* (2016), sufficient knowledge of agricultural extension services reduces different cultivation problems. Karim *et al.* (2016) and Farouque and Sarker (2018) found identical results in their studies. Around 73% had a less favorable attitude towards agricultural extension services. The majority of crop farmers (74%) had no prior training experience. Lack of training makes it difficult for farmers to understand the working procedures of DAE. Karim *et al.* (2016), Dev *et al.* (2017), and Farouque and Sarker (2018) had reported similar findings in their studies. Most (82%) of respondents had a moderate degree of fatalism, while 17 percent had a strong fatalism level. It means that the farmers of the study area are fatalistic.

Extent of problems in receiving crop extension services

Figure 3 indicates that half of the respondents (50%) had moderate problems getting agricultural extension services, followed by 40 percent having a high level of issues. In comparison, only a few farmers (10%) reported low problems with getting crop extension services in the research area. Findings suggest that the crop farmers in the study area experienced difficulty in getting desired agricultural extension services provided by DAE. Issues like poor communication skills of both farmers and extension agents, the influence of local leaders, and an insufficient number of extension agents were the prominent contributing factors as previously explored by Hasan *et al.* (2017) and Dev *et al.* (2017).

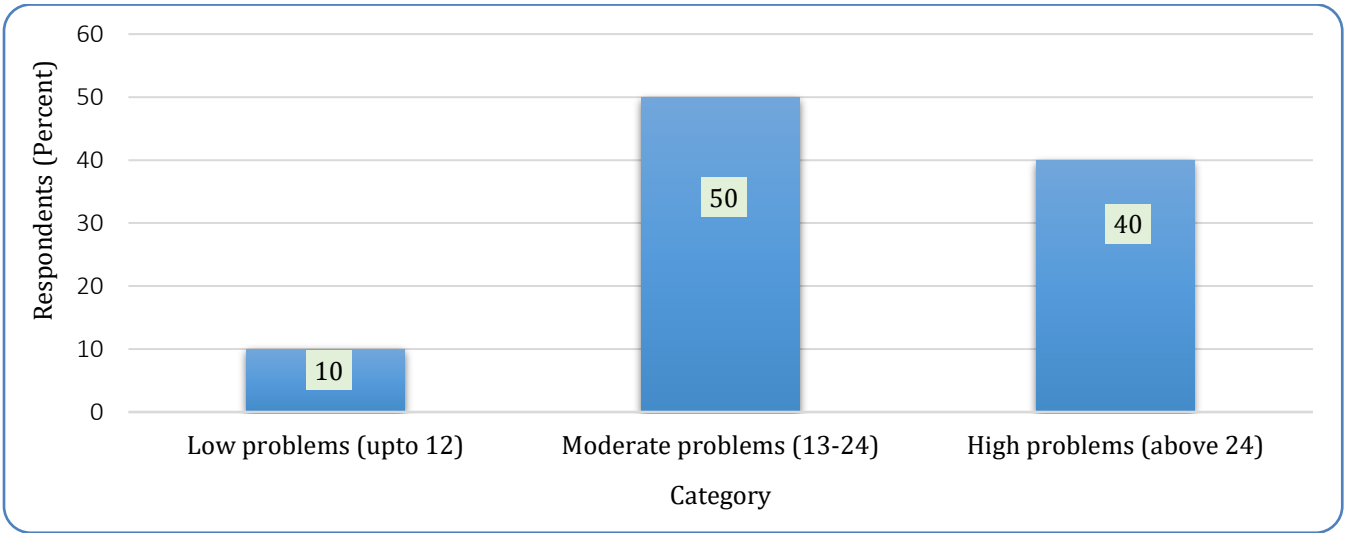

Figure 3. The extent of crop farmers' difficulties in accessing DAE's crop extension services (n = 100).

Identification of Problems related to Agricultural Extension Services of the DAE

A PFI was calculated and shown in rank order (Table 2). The results indicate that the most severe issue for crop farmers was the poor communication skill of extension workers, with a PFI score of 292 (97.33%) if follow the formula adopted by Hamid *et al.* (2020). This problem was also identified in the study of Moyo and Salawu (2018) as they concluded that good connection and advice increase agricultural knowledge and skills, and therefore production. Petros *et al.* (2018) also found poor communication skills among the extension workers of North-Western Ethiopia. Insufficient resources for the extension program with a PFI score of 283 (94.33%) was the second critical problem identified by the respondents. In 2018-19 FY budget allocation for the Ministry of Agriculture (MoA) was 1,641,374.66US$ and among this 245,762.23US$ was allocated for DAE and within this 77,807.33 US$ (31%) Was allocated for development activity (MoA, 2019). Again, according to USAID (2017), DAE has project-based funding. When the project ends, there is no more service on related aspects, which shows that lack of budget or sufficient funds is still a big problem. In several developing countries, farmers' technological abilities were not effectively enhanced, technology and expertise were not effectively disseminated by extension programs mainly due to inadequate resources, including insufficient budget.

Shalaby *et al.* (2011); Moyo and Salawu (2018) also identified poor budget allocation. Extension workers maintain frequent contact with only resource-rich farmers was the third problem with a PFI score of 276. A participant during the FGD mentioned that "Rich farmers have good houses and they can also arrange refreshments for the extension personnel, that is why extension workers visit the house of rich farmers only whenever they come to the village." In this way, small crop farmers are refrained from getting desired extension services. According to Taylor and Bhasme (2018), extension agencies in the first place are attracted by the influence of potential model farmers. This problem was also identified by Moyo and Salawu (2018) and Hamid *et al.* (2020). The limited number of extension workers (PFI=268) was the fourth major issue that the sampled farmers had to deal with. According to Miah (2015), the Department of Agricultural Extension (DAE) is the leading authority, with 14,092 field-level extension agents overseeing 900-2,000 farm families each. In Pakistan, the total number of households in each union council is 2000–2400 (Baloch and Thapa, 2018). In most cases, only two field assistants and two local assistants are assigned to provide extension services. As a result, the number of farm households to be served by each assistant is very high at the union council level (Baloch and Thapa, 2018). As a result, extension personnel faces difficulties in delivering services to such a large number of crop growers (Baloch and Thapa, 2018). Akinnagbe *et al.* (2018); Moyo and Salawu (2018) identified this poor extension-worker-farmer ratio in Zimbabwe and Nigeria, respectively. The lack of appropriate information (PFI=72) was a less, severe issue for crop farmers. The majority of the respondents agreed that the information provided by the extension workers is more or less updated. Therefore, the lack of updated data is the least critical problem.

Correlation between crop farmers' socio-economic characteristics and problems in accessing crop extension services provided by DAE

The relationship between explanatory and focus variables is summarized in Table 3. Five (5) of the seventeen (17) explanatory variables were shown to be substantially correlated with the focus variable (Table 3). Among the five explanatory variables, education, perceived economic return, the experience of participating in extension activities, and training had a negative but statistically significant relationship with the focus variable. It implies that the higher the level of education, perceived economic return, the experience of participating in extension activities and training, the lower the problems related to extension services. Fatalism was the only variable with a positive but significant relationship with the focus variable, which implies that the higher the fatalistic behavior, the higher the problem level. According to Pandit and Basak (2014), educational standards have a significant impact on farmers' perception of problems. Farmers who are educated have a greater amount of experience, are more capable of understanding and adapting to situations, and have more access to information (Mulinya, 2017), and are more likely to have fewer issues. Hossain and Miah (2011) and Rashid and Gao (2016), discovered a similar relationship between the variables in question. Karim *et al.* (2016) also found education and farming experience to be important in reducing problems. According to Amin *et al.* (2016), education, training, and experience all help reduce the severity of issues. Elias *et al.* (2017) found that perceived economic return increases farmers' satisfaction, thus reducing problems. In the case of farmers' experience of participation in extension activities, similar results were found by Islam *et al.* (2013); Roy *et al.* (2014). Fatalism has a huge impact on farmers' ability to respond to climate change (Mahmood *et al.*, 2020).

Factors related to the problems of the crop farmers in receiving crop extension services

The summary of the linear regression analysis is given in Table 4. The multicollinearity test among the model's variables was performed using the Variance Inflation Factor (VIF). Since the maximum VIF value was 2.153, multicollinearity was not a problem, and the variables also had high tolerance values. The model's F-test statistic value was 7.26 with a statistical significance of $p < 0.01$ and 0.518 as the adjusted R-squared value. This indicates that the projected model adequately fits the results and that none of the parameters had statistically meaningful zero significance.

Four out of seventeen variables were significant, according to the results. The coefficient of education is seen in Table 4 ($t= -2.869$; $p = 0.05$), perceived economic return ($t = -3.586$; $p = 0.05$), experience of participating in extension activities ($t = -3.118$; $p = 0.05$) and training ($t = -2.616$; $p = 0.05$) had significant influences on

forecasting the problems faced by crop farmers in receiving DAE's agricultural extension services. According to the findings, the education of farmers had a negative coefficient, i.e., crop farmers in the research area were less likely to have trouble accessing extension services as their educational level increased. In other words, for every unit of increased education, the farmers' constraints would be reduced by 0.180. Farming knowledge or education enables crop farmers to understand the working mode of the extension service. It also enables them to communicate better with the extension agents. A similar finding was reported by Ganpat *et al.* (2014), Elahi *et al.* (2018) and Olorunfemi *et al.* (2020). The perceived economic return coefficient was negative and significant in forecasting the range of issues encountered when receiving agricultural extension services. This indicates that farmers with higher economic returns experienced fewer problems in the study area, i.e., the problems faced decreased by 1.091 with every unit rise in perceived economic return.

A similar result was stated by Elias *et al.* (2017), where the perceived economic return was significantly associated with farmers' satisfaction. The experience of taking part in extension work was negative and important in the prediction of the problems. The finding implies that with one unit increase in crop farmers' experience of participating in extension activities, the difficulties faced in receiving extension services decrease by 0.122. This may be because the increased understanding of participation in extension activities increases knowledge about extension programs and considers different problem options/alternatives. Thus, reduces the impact or seriousness of the issues. According to Karim *et al.* (2016), experience allows farmers to consider the state of farming and various agricultural problems.

The results of Danso-Abbeam *et al.* (2018) are consistent with the findings of this study. Lastly, the training coefficient was negative and significant in the prediction of difficulties related to agricultural extension services. This indicates that the higher the training facilities provided to crop farmers, the fewer will be the problems in the study area, i.e. the problems were reduced by 0.727 as one unit increased training. Caffaro *et al.* (2020) stated that training is the most successful way to improve farmers' intention to mitigate their problems. Lobley *et al.* (2013) found that farmers who received specialized group training were more likely to learn and developed a more professional attitude which could help them to overcome all sorts of obstacles. Sattaka *et al.* (2017) also found training as a significant variable in their study.

Table 2. The priority list of selected issues encountered by crop farmers while providing crop extension services.

No.	Problems	Extent of problems				PFI	PFI (%)	Rank order
		Highly severe	Moderately severe	Less severe	Not at all			
1.	Poor communication skill of extension worker	93	6	1	0	292	97.33	1
2.	Insufficient resource	90	3	7	0	283	94.33	2
3.	Frequent contact with only resource-rich farmers	81	14	5	0	276	92.00	3
4.	Limited number of extension worker	74	21	4	1	268	89.33	4
5.	Inability to provide instant solution	72	22	2	4	262	87.33	5
6.	Influenced by local leaders	61	30	2	7	245	81.66	6
7.	Irregular visit by extension workers	54	36	6	4	240	80.00	7
8.	Extension workers are overburdened with their responsibilities	56	30	11	4	239	79.66	8
9.	Poor program planning	41	43	16	0	225	75.00	9
10.	Ignoring farmers opinion	29	60	9	2	216	72.00	10
11.	Poor behavior of extension worker	13	27	25	35	118	39.33	11
12.	Lack of updated information	4	15	30	51	72	24.00	12

Notes: Highly severe= 3, Moderately severe= 2, less severe= 1 and not at all = 0; PFI = Problems Facing Index.

Table 3. Relationship between socio-economic characteristics and crop farmers' problems in receiving crop extension services provided by DAE (n = 100).

Focus Variable	Socio-economic characteristics	Correlation of coefficient (r) with 98 df	Table value (r) with 98 df	
			0.05	0.01
Problems faced by the farmers in receiving agricultural extension services	Age	-0.150	0.197	0.256
	Level of Education	-0.384**		
	Household size	0.129		
	Farm size	-0.118		
	Annual family income	0.031		
	Organizational participation	-0.093		
	Social mobility	-0.078		
	Credit received	0.047		
	Extension media contact	-0.053		
	Perceived economic return	-0.517**		
	Participation in the agricultural extension program	0.134		
	Input distribution by DAE	0.037		
	Experience of participating in extension activities	-0.379**		
	Knowledge of agricultural extension services	0.013		
	Attitude towards extension service providers	0.039		
	Training	-0.501**		
	Fatalism	0.499**		

Notes: * The correlation is statistically significant at the 0.05 mark (2-tailed)
** The correlation is statistically significant at the 0.01 mark (2-tailed)

Table 4. Summary of multiple linear regression explaining the focus variable (n = 100).

Independent variable	Unstandardized coefficients		Standardized coefficients	t	Sig. B	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	22.132	4.867		4.548	0.000		
Age	0.015	0.030	0.049	0.482	0.631	.475	2.105
Level of Education	-0.180	0.063	-0.259	-2.869	0.005	.599	1.670
Household size	0.247	0.224	0.086	1.102	0.274	.794	1.260
Farm size	-1.114	0.935	-0.108	-1.191	0.237	.588	1.701
Annual family income	0.006	0.003	0.168	1.682	0.096	.489	2.044
Organizational participation	0.254	0.283	0.088	0.898	0.372	.505	1.979
Social mobility	0.040	0.135	0.022	0.296	0.768	.895	1.117
Credit received	0.012	0.014	0.067	0.886	0.378	.863	1.158
Extension media contact	-0.006	0.075	-0.006	-0.079	0.937	.805	1.242
Perceived economic return	-1.091	0.304	-0.298	-3.586	0.001	.704	1.420
Participation in extension program	0.109	0.095	0.088	1.152	0.253	.834	1.199
Input distribution	0.025	0.206	0.009	0.119	0.906	.909	1.101
Experience of participating in extension activities	-0.122	0.039	-0.319	-3.118	0.003	.465	2.153
Knowledge on agricultural extension services	0.052	0.117	0.034	0.443	0.659	.834	1.199
Attitude towards extension service providers	-0.178	0.157	-0.098	-1.131	0.261	.648	1.543
Training	-0.727	0.278	-0.252	-2.616	0.011	.526	1.901
Fatalism	0.190	0.112	0.153	1.866	0.095	.595	1.680

n=100, R=0.775, R^2 = 0.601, Adjusted R^2= 0.518, F-value = 7.260

Significant if p< 0.05, The importance level is set at 95%.

Step-wise multiple regression analysis

A step-wise multiple regression analysis was used to explain how the explanatory variables perceived variations in the problem related to agricultural

extension services. Table 5 sums up the step-by-step multiple regression analysis. The results show that the model comprises all four explanatory variables-education, perceived economic return, the experience of participating in extension activities, and training obtained from the multiple linear regression sample. Table 5 shows that these four variables (R^2 = 51) account for 51 percent of the variation in the problems related to agricultural extension services. The findings indicate that perceived economic return (R^2 = 0.267) was the first in the model that explained the most prominent variation (26.7%) in receiving agricultural extension services. The results suggest that farmers who perceive a better economic gain face fewer difficulty.

According to Elias *et al.* (2017), economic benefits allow for financial success and a sustainable competitive edge. The greater the economic benefit of using extension services, the more likely farmers are to experience absolute satisfaction. Thus, reducing the problem of farmers. Cakirli Akyüz and Theuvsen (2020) found perceived output as an essential variable in reducing farmers' issues regarding extension service. The second variable in the model was the training of farmers depending on their needs. Training accounted for 15.1 percent of the variation in the focus variable. The model's third aspect was the farmers' level of education. Farmers' level of education explained a 2.9 percent variation in the problems related to agricultural extension services.

Farmers' viewpoints and thoughts are enlightened by education, which helps them to adapt to issues. The importance of education in obtaining knowledge cannot be overstated Mardy *et al.* (2018) and, thus, aids in the exploration of various alternatives when responding to a challenge. A similar result was reported in the study by Uddin *et al.* (2021). Crop farmers' experience with extension practices was the final variable in the model. The experience was responsible for 6.3 percent of the difference in the focus variable. According to the results, farmers with more crop farming experience have fewer issues. Farmers with a lot of experience would be able to forecast their farm's progress, create unique scenarios and gain access to more information about farming (Mulinya, 2017).

Table 5. The results of the step-by-step multiple regression analysis are summarized below

Model	Variables Entered	Multiple R	Multiple R^2	Variation Explained (percent)	Significance Level
Constant + X_{11}	Perceived economic return (X11)	0.517	0.267	26.7	0.000
Constant + X_{11} + X_{16}	Training (X16)	0.647	0.418	15.1	0.000
Constant + X_{11} + X_{16} + X_{02}	Level of education (X02)	0.669	0.447	2.9	0.028
Constant + X_{11} + X_{16}+X_{02}+ X_{13}	Experience of participating in extension activities (X13)	0.715	0.511	6.3	0.001

CONCLUSIONS AND RECOMMENDATIONS

It is evident from the findings of the study that crop farmers are still facing problems in getting crop extension services of DAE, of which, poor communication skills of extension workers, insufficient resources, frequent contact with only resource-rich farmers, and a limited number of extension workers were significant. The socio-economic characteristics of the respondents further determine the extent of problems. Low participation in extension programs and poor credit facilities are likely to be the crucial determinants that were addressed by the respondents during the survey. Besides, interviewed crop farmers seemed to be deprived of necessary farm information due to having low extension media contact. However, appropriate attempts from the extension officials could limit this shortcoming. Several factors like perceived economic return, training, level of education, and experience of participating in extension activities were identified as influential to the problems. This suggests a window of opportunity to work on these issues to diminish the extent of problems and contributing to the income of the crop farmers. Therefore, it is highly recommended that the concerned authority like the Department of Agricultural Extension (DAE) should take necessary steps to arrange necessary training facilities for the crop farmers so that they can access the services in a better way. In addition, to curb the ratio of extension

workers to crop farmers it is necessary to allocate more budget for the agricultural extension service. On the other hand, DAE needs to lobby for upgrading extension workers' knowledge and skills through providing technological updates, particularly skill training. Devising motivation and reward mechanisms can also help them to become valuable assets in agricultural production. Finally, the extension workers should regularly visit the crop farmers to boost up the crop production as well as profitability within the study area and other areas with a similar socio-economic and geographic conditions.

ACKNOWLEDGMENTS

We are grateful to the respondents of the study area for their assistance in providing information. In addition, I'd like to thank Jobayer Aride for his assistance in helping in the data processing.

REFERENCES

Abid, M., J. Schilling, J. Scheffran and F. Zulfiqar. 2016. Climate change vulnerability, adaptation and risk perceptions at farm level in Punjab, Pakistan. Science of The Total Environment, 547: 447-60.

Afrad, S. I., F. Wadud and S. C. Babu. 2019. Reforms in agricultural extension service system in Bangladesh. Elsevier. Place Published. pp.13-40.

Agbarevo, A. 2013. Farmers' Perception of Effectiveness of Agricultural Extension Delivery in Cross-River State, Nigeria. IOSR Journal of Agriculture and Veterinary Science, 2: 1-7.

Akinnagbe, O. M., O. P. Ezeuzo and E. A. Onwubuya. 2018. Challenges of extension workers in reaching rural women farmers in Enugu State Nigeria. Journal of Agricultural Extension, 21: 22.

Amin, M. A., M. A. Bashar, N. Akhter, M. Afroj, M. Z. Islam, M. M. Rahman and M. A. Baque. 2016. Constraints faced by the farmers in IPM practices in rice cultivation. Journal of Science Technology and Environment Informatics, 4: 245-50.

Arifullah, M., A. Zahan, M. M. Rana, M. Adil and S. Shamsunnaher. 2014. Attitude of the Rural Elite Farmers towards Extension Activities Performed by Personnel of Department of Agricultural Extension. The Agriculturists, 12: 96-102.

Asfaw, S., B. Shiferaw, F. Simtowe and L. Lipper. 2012. Impact of modern agricultural technologies on smallholder welfare: Evidence from Tanzania and Ethiopia. Food Policy, 37: 283-95.

Baig, M. and F. Aldosari. 2013. Agricultural extension in Asia: Constraints and options for improvement. Journal of Animal and Plant Sciences, 23: 619-32.

Baloch, M. A. and G. B. Thapa. 2018. The effect of agricultural extension services: Date farmers' case in Balochistan, Pakistan. Journal of the Saudi Society of Agricultural Sciences, 17: 282-89.

Bangladesh Bureau of Statistics. 2017. Yearbook of agricultural statistics, Statistics and Informatics Division, Ministry of Planning, Government of the People's Republic of Bangladesh. Dhaka, Bangladesh. Place Published.

———. 2019. Bangladesh population census. Bangladesh Bureau of Statistics, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

BBS. 2015. Changing pattern of urbanisation in Bangladesh: An analysis of census data. Bangladesh Bureau of Statistics (BBS), Ministry of Planning, Dhaka. Place Published.

———. 2019. Yearbook of Agricultural Statistics-2018. Bangladesh Bureau of Statistics (BBS), Statistics and Informatics Division(SID), Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka. . Place Published.

Birner, R., A. R. Quisumbing and N. Ahmed. 2010. Cross-cutting issues: Governance and gender. Place Published. pp.26-27.

Bonye, S. Z., K. B. Alfred and G. S. Jasaw. 2012. Promoting community-based extension agents as an alternative approach to formal agricultural extension service delivery in Northern Ghana. Asian Journal of Agriculture and Rural Development, 2: 76-95.

Braun, A. and D. Duveskog. 2011. The Farmer Field School approach–History, global assessment and success stories. Background paper for the IFAD Rural poverty report.

Caffaro, F., M. Micheletti Cremasco, M. Roccato and E. Cavallo. 2020. Drivers of farmers' intention to adopt technological innovations in Italy: The role of information sources, perceived usefulness, and perceived ease of use. Journal of Rural Studies, 76: 264-71.

Cakirli Akyüz, N. and L. Theuvsen. 2020. The Impact of Behavioral Drivers on Adoption of Sustainable Agricultural Practices: The Case of Organic

Farming in Turkey. Sustainability, 12: 6875.

Catalyst III. 2015. Catalyst III Agriculture for growth in Bangladesh, 2015. Annual review, Dhaka, Bangladesh. Place Published.

DAE Manual. 2018. Retrieved from:http://katalyst.com.bd/wp-content/uploads/2018/03/DAE-Manual-English.pdf(Accessed on August 10, 2020). Place Published.

Danso-Abbeam, G., D. S. Ehiakpor and R. Aidoo. 2018. Agricultural extension and its effects on farm productivity and income: insight from Northern Ghana. Agriculture & Food Security, 7.

Davis, K., E. Nkonya, E. Kato, D. A. Mekonnen, M. Odendo, R. Miiro and J. Nkuba. 2012. Impact of Farmer Field Schools on Agricultural Productivity and Poverty in East Africa. World Development, 40: 402-13.

Desai, B. M., E. D'souza, J. W. Mellor, V. P. Sharma and P. Tamboli. 2011. Agricultural policy strategy, instruments and implementation: A review and the road ahead. Economic and Political Weekly: 42-50.

Dev, D. S., M. J. Hoque and A. M. Miah. 2017. Problems Faced by the Participant Farmers in the Training Process: A Case of Climate Risk Management Training in Agriculture. International Journal of Social Sciences, 6: 143.

Elahi, E., M. Abid, L. Zhang, S. ul Haq and J. G. M. Sahito. 2018. Agricultural advisory and financial services; farm level access, outreach and impact in a mixed cropping district of Punjab, Pakistan. Land Use Policy, 71: 249-60.

Elias, A., M. Nohmi and K. Yasunobu. 2017. Cost-Benefit Analysis of Cultivating Three Major Crops and Its Implication to Agricultural Extension Service: A Case Study in North-West Ethiopia. Japanese Journal of Agricultural Economics, 19: 31-36.

Farouque, M. G. and M. A. Sarker. 2018. Farmers knowledge and practice of organic vegetable cultivation: A field level study of two villages from Bangladesh. Journal of Agricultural Extension and Rural Development, 10: 99-107.

Fiaz, S., M. A. Noor and F. O. Aldosri. 2018. Achieving food security in the Kingdom of Saudi Arabia through innovation: Potential role of agricultural extension. Journal of the Saudi Society of Agricultural Sciences, 17: 365-75.

Ganpat, W., N. Webster and L. Narine. 2014. Farmers' Satisfaction with Extension Services in the Organization of Eastern Caribbean States. Journal of International Agricultural and Extension Education, 21: 49-62.

Hamid, M. I., S. Datta and M. M. Islam. 2020. Problems faced by the sub-assistant agriculture officers (SAAOs) working in department of agricultural extension. Research in Agriculture Livestock and Fisheries, 7: 61-73.

Haq, A. 2011. Some issues of extension contact on rice productivity in Bangladesh. Place Published. pp.16-17.

Haq, A. Z. M. 2013. The Impact Of Agricultural Extension Contact On Crop Income In Bangladesh. Bangladesh Journal of Agricultural Research, 38: 321-34.

Hasan, S., M. Turin, M. Ghosh and M. Khalil. 2017. Assessing Agricultural Extension Professionals Opinion towards Sustainable Agriculture in Bangladesh. Asian Journal of Agricultural Extension, Economics & Sociology, 17: 1-13.

Hasibuan, A. M., D. Gregg and R. Stringer. 2020. Accounting for diverse risk attitudes in measures of risk perceptions: A case study of climate change risk for small-scale citrus farmers in Indonesia. Land Use Policy, 95: 104252.

Hossain, M. and M. Miah. 2011. Poor farmers' problem confrontation in using manure towards integrated plant nutrition system. Bangladesh Journal of Extension Education, 23: 139-47.

Hu, R., Y. Cai, K. Z. Chen and J. Huang. 2012. Effects of inclusive public agricultural extension service: Results from a policy reform experiment in western China. China Economic Review, 23: 962-74.

Hu, R., Z. Yang, P. Kelly and J. Huang. 2009. Agricultural extension system reform and agent time allocation in China. China Economic Review, 20: 303-15.

Islam, A., M. Farouque and D. Roy. 2013. Problem Confronted by the Fish Farmers in Practicing Semi-intensive Climbing Perch (Anabus testubineus) Farming. Bangladesh Journal of Extension Education ISSN, 1011: 3916.

Karim, S. M. R., S.K. Pal, M.E. Haque, M.H. Rahman and M. Kamruzzaman. 2016. Factors affecting problems faced by the farmers in sugarcane cultivation. Journal of Innovation and Development Strategy,

10: 1-5.

Klerkx, L., F. Landini and H. Santoyo-Cortés. 2016. Agricultural extension in Latin America: current dynamics of pluralistic advisory systems in heterogeneous contexts. The Journal of Agricultural Education and Extension, 22: 389-97.

Lobley, M., E. Saratsi, M. Winter and J. Bullock. 2013. Training farmers in agri-environmental management: the case of Environmental Stewardship in lowland England. International Journal of Agricultural Management, 3: 12-20.

Mahmood, N., M. Arshad, H. Kaechele, M. F. Shahzad, A. Ullah and K. Mueller. 2020. Fatalism, Climate Resiliency Training and Farmers' Adaptation Responses: Implications for Sustainable Rainfed-Wheat Production in Pakistan. Sustainability, 12: 1650.

Mardy, T., M. Uddin, M. Sarker, D. Roy and E. Dunn. 2018. Assessing Coping Strategies in Response to Drought: A Micro Level Study in the North-West Region of Bangladesh. Climate, 6: 23.

Mengal, A., M. Mallah, Z. Mirani and B. Siddiqui. 2012. An analysis of public and private agricultural extension services in Balochistan, Pakistan. Pakistan J. Agric. Res. 25 (4): 307, 317.

Miah, H. 2015. Agriculture Sector Development Strategy: Background Paper for Preparation of the 7th Five Year Plan. Bangladesh: Food and Agriculture Organization. Place Published.

Moyo, R. and A. Salawu. 2018. A survey of communication effectiveness by agricultural extension in the Gweru district of Zimbabwe. Journal of Rural Studies, 60: 32-42.

Mulinya, M. 2017. Factors Affecting Small Scale Farmers Coping Strategies To Climate Change In Kakamega County In Kenya. IOSR Journal of Humanities and Social Science, 22.

Olorunfemi, T. O., O. D. Olorunfemi and O. I. Oladele. 2020. Determinants of the involvement of extension agents in disseminating climate smart agricultural initiatives: Implication for scaling up. Journal of the Saudi Society of Agricultural Sciences, 19: 285-92.

Pandit, J. C. and N. C. Basak. 2014. Constraints faced by the farmers in commercial cultivation of vegetables. Journal of the Bangladesh Agricultural University, 11: 193-98.

Petros, M. T., D. K. Nachimuthu, M. H. Atinikut and M. Mohammed. 2018. Agricultural Extension: Challenges of Extension service for rural poor and youth in Amhara Region, North Western Ethiopia. The Case of North Gondar Zone. International Journal of Scientific Research and Management, 6.

Quddus, A. and J. D. Kropp. 2020. Constraints to Agricultural Production and Marketing in the Lagging Regions of Bangladesh. Sustainability, 12: 3956.

Ragasa, C., G. Berhane, F. Tadesse and A. S. Taffesse. 2013. Gender Differences in Access to Extension Services and Agricultural Productivity. The Journal of Agricultural Education and Extension, 19: 437-68.

Rashid, M. and Q. Gao. 2016. An assessment of public and private crop extension services in Bangladesh. IOSR Journal of Agriculture and Veterinary Sciences, 9: 7-16.

Rashid, M. M. and Q. Gao. 2016. An assessment of public and private crop extension services in Bangladesh. IOSR Journal of Agriculture and Veterinary Sciences, 9: 7-16.

Roy, D., M. G. Farouque and M. Z. Rahman. 2014. Problem Confrontation of the FFS Farmers in Participating Farmer Field School Training Session. Progressive Agriculture, 24: 273-80.

Sattaka, P., S. Pattaratuma and G. Attawipakpaisan. 2017. Agricultural extension services to foster production sustainability for food and cultural security of glutinous rice farmers in Vietnam. Kasetsart Journal of Social Sciences, 38: 74-80.

Shalaby, M., K. Al-Zahrani, M. Baig, G. Straquadine and F. Aldosari. 2011. Threats and challenges to sustainable agriculture and rural development in Egypt: implications for agricultural extension. The Journal of Animal & Plant Sciences, 21: 581-88.

Sontakki, B., R. Samanta and P. Joshi. 2010. Redesigning agricultural extension in India: Challenges and opportunities, summary proceedings and recommendations of NAARM-IFPRI workshop held during 20-21 August 2010. National Academy of Agricultural Research Management, Hyderabad.

Šūmane, S., I. Kunda, K. Knickel, A. Strauss, T. Tisenkopfs, I. d. I. Rios, M. Rivera, T. Chebach and A. Ashkenazy. 2018. Local and farmers' knowledge matters! How integrating informal and formal knowledge enhances sustainable and resilient agriculture. Journal of Rural Studies, 59: 232-41.

Taylor, M. and S. Bhasme. 2018. Model farmers, extension networks and the politics of agricultural knowledge transfer. Journal of Rural Studies, 64: 1-10.

Thuo, M., A. A. Bell, B. E. Bravo-Ureta, M. A. Lachaud, D. K. Okello, E. N. Okoko, N. L. Kidula, C. M. Deom and N. Puppala. 2014. Effects of social network factors on information acquisition and adoption of improved groundnut varieties: the case of Uganda and Kenya. Agriculture and Human Values, 31: 339-53.

Uddin, M. and G. Qijie. 2013. Prospects and challenges of privatization of agricultural extension service in Bangladesh. Asian Journal of Agriculture and Rural Development, 3: 477-87.

Uddin, M. N. 2008. Agricultural extension services in Bangladesh: A review study. Department of Agricultural Extension Education, Bangladesh Agricultural University, Bangladesh.

Uddin, M. N., W. Bokelmann and E. S. Dunn. 2017. Determinants of Farmers' Perception of Climate Change: A Case Study from the Coastal Region of Bangladesh. American Journal of Climate Change, 06: 151-65.

Uddin, M. N., K. H. Kabir, D. Roy, M. T. Hasan, M. A. Sarker and E. S. Dunn. 2021. Understanding the constraints and its related factors in tilapia (Oreochromis sp.) fish culture at farm level: A case from Bangladesh. Aquaculture, 530: 735927.

USAID. 2017. Bangladesh: Desk Study of Extension and Advisory Services. https://www.digitalgreen.org/wp-content/uploads/2017/09/Bangladesh-Desk-Study.pdf.(Accessed on July 15, 2020). Place Published.

World Bank. 2010. Extension and Advisory Systems: Procedures for Assessing, Transforming, and Evaluating Extension Systems, Washington, D.C. Place Published.

———. 2019. Arable land (hectares per person). https://data.worldbank.org/indicator/AG.LND.ARBL.HA.PC?locations=BD (accessed on 6 August 2019). Place Published.

Wossen, T., T. Abdoulaye, A. Alene, M. G. Haile, S. Feleke, A. Olanrewaju and V. Manyong. 2017. Impacts of extension access and cooperative membership on technology adoption and household welfare. Journal of Rural Studies, 54: 223-33.