



Research Article

Effectiveness of Public and Private Extension Services in Building Capacity of the Farmers: A Case of Bangladesh

Muhammad Humayun Kabir* and Md. Saiful Islam

Department of Agricultural Extension and Information System, Sher-e-Bangla Agricultural University, Dhaka-1207, Bangladesh.

Abstract | There is a debate since long ago that which one is better, a public or private extension service. In this context, the objectives of the study were to measure the degree of effectiveness of public and private extension services for the building capacity of the farmers and to make a comparison between public and private extension services regarding their effectiveness towards farmers' capacity building. A multistage (both purposive and random) sampling method was applied to select the study location as well as the sampling unit (farmer/household head). Data were collected from randomly selected 336 farmers of Dhamrai Upazila (sub-district) under Dhaka district, Bangladesh using a face-to-face interview survey. Focus Group Discussions (FGDs) were also conducted to cross-verify the collected data. The data were analyzed using some common descriptive statistical parameters and an independent-sample t-test. The survey indicates the majority of farmers (81.46 percent) believe private sector extension programs are less effective in boosting farmers' farming abilities. In contrast, 59.55 % of farmers thought the same for public sectors extension. The independent sample t-test explored a significant difference between public and private extension services regarding farm and home visits, demonstration, and training programs. These services of public extension organizations were more effective than the private sector. The public extension organizations should strengthen their services that were not more effective than the private sectors and the private extension providers should rethink how they can increase the effectiveness of their extension services.

Received | November 03, 2021; **Accepted** | December 12, 2022; **Published** | February 14, 2023

***Correspondence** | Muhammad Humayun Kabir, Department of Agricultural Extension and Information System, Sher-e-Bangla Agricultural University, Dhaka-1207, Bangladesh; **Email:** mhumayunsau@gmail.com

Citation | Kabir, M.H., and M.S. Islam. 2023. Effectiveness of public and private extension services in building capacity of the farmers: A case of Bangladesh. *Sarhad Journal of Agriculture*, 39(1): 101-110.

DOI | <https://dx.doi.org/10.17582/journal.sja/2023/39.1.101.110>

Keywords | Crop farmers, Capacity building, Public organization, Private organization, Agricultural extension



Copyright: 2023 by the authors. Licensee ResearchersLinks Ltd, England, UK.

This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Introduction

Agricultural extension is regarded as one of the most important gateways for disseminating agricultural innovations globally. It plays an important role in guaranteeing long-term agricultural

development and improving farmer livelihoods (Okrely *et al.*, 2010). In most countries in the Asia-Pacific region, extension services were traditionally provided by the government. Many countries, on the other hand, have failed to meet their goals for a variety of reasons, including a lack of organizational

structure, the insufficient incentive for extension agents, low target group participation, and a lack of communication between researchers, policymakers, and extension workers. Recently, there has been some development in the region's extension services. In many countries, services are now supplied by the private sector and non-governmental organizations in addition to government agencies (APO, 2006). In many developing countries, including Bangladesh, there is strong competition for farmers' attention between governmental and private extension services (Talib *et al.*, 2018; Rashid and Qijie, 2016).

Given two indicators such as several labor force engagement and contribution to the national GDP, the agriculture sector can be considered the bedrock of Bangladesh's economy. The figure for these two indicators is 37.75% and 14.23%, respectively (BBS, 2020a). The development of this sector is ongoing. Agricultural extension has been playing a meaningful role to keep intact the trend of this development. Several public and private organizations offer extension services to the farmers (Sultana *et al.*, 2019). Agricultural extension is considered as one of the main services for capacity building of the farmers in Bangladesh.

Capacity-building may be defined as the capability to improvement knowledge and skills of recommended practices which increase farmers' performances (Talib *et al.*, 2018). In the study, capacity building means farmers' ability to apply new farming knowledge and skill to increase crop production. The country is continuously facing pressure on producing the highest yield by utilization of limited land (Mishuk *et al.*, 2021). Therefore, it is very important to improve farmers' performance by using recommended or modern technology. In such a context, the private and public agricultural extension services can show significant role. Since independence, the public agricultural organization serving extension services among the farmers. Besides, over time, some private organizations such as Bangladesh Rural Advancement Committee (BRAC), ACI Ltd, etc. also involved in providing similar facilities to the farmers.

A variety of public organizations namely the Department of Agricultural Extension (DAE), Bangladesh Agricultural Development Corporation (BADC), and Bangladesh Rural Development Board (BRDB) work in Bangladesh for agricultural

development, but the DAE plays a more important role than the others. This organization mainly provides extension services for farmers socio-economic development through their capacity building in farming activities. Besides this public organization, several national and international non-government organizations and companies such as ACI Ltd also work to develop farmers' capacity towards improving agriculture.

From the birth of the country, its population growth rate curve is upward. As the cultivable land of a country is fixed, therefore, increasing population influences to reduce land coverage. Findings reveal that cultivable land is gradually decreasing in Bangladesh by 0.29% per year (MoA, 2021). Such condition (where the population is increasing and land is decreasing) has led farmers to be more innovative. To increase crop production through limited land, farmers need to be more aware of modern and sustainable technologies and ultimately the adoption of these practices. To acquire this skill, it is important to take the initiative to make available all extension services to the farmers. But what extent the extension services are available and effective to increase farmers' skills has yet not been examined. There is a lack of study specifically focused to assess the effectiveness of GOs and NGOs in Bangladesh regarding the capacity building of the farmers. Some studies focus on assessing farmers' satisfaction towards extension services provided by government organizations, especially the Department of Agricultural Extension (DAE) (Rahman, 2007; Oluwasus and Akann, 2014; Mishuk *et al.*, 2021; Moonmoon, 2022). Some more studies also happen to see the status of non-government organizations' efforts besides GOs for agricultural development (Rashid and Qijie, 2016; Talib *et al.*, 2018). These studies considered a variety of organizations and services whereas the present study considered specific public and private organizations and their common services. In addition, the present study differs from the above studies in the methodological aspect. In this context, the current study was considered to measure the degree of effectiveness of public and private common extension services for the capacity building of the farmers in the Dhaka district. The study also makes a comparison between some common public and private extension services to improve the farming skill of the farmers. The findings may help the policymakers to take initiative to strengthen the extension services in increasing farmers' skills.

Growth and role of public and private extension services in Bangladesh

In Bangladesh, agricultural extension has elongated history that dates to the eighteenth century. Due to the dissemination of knowledge about growing methods of high yielding variety (HYV) rice used as input, the role of agricultural extension service (AES) became crucial with the start of the green revolution in the 1960s. The farmers had no idea how to grow modern rice types because they didn't know how to plant them. The importance of extension service work has increased with the adoption of modern technologies in agriculture (Afrad *et al.*, 2019; Saiful, 2013).

Over time, a variety of public and private organizations developed in Bangladesh and provides agricultural extension services. Department of Agricultural Extension (DAE), the largest public agro-based organization has its extension services. The organization works for the development of all categories of farmers. Besides, Bangladesh Agricultural Development Cooperation (BADC), Bangladesh Rural Development Board (BRDB), Agriculture Information Service (AIS), Bangladesh Water Development Board (BWDB), Cotton Development Board (CDB), and Tea Board are some prominent public organizations having their way of extension system to serve the targeted farmers (Saiful, 2013). Apart from the public sectors, the private sectors also work for farmers' capacity building. Among private sectors, Non-government organizations (NGOs), Companies, and Community Based Organizations (CBOs) work with the farmers for their development. Though all NGOs have no agricultural program many of them work with the farming community, and their activities are wider than the companies and CBOs. Among various subsectors of agriculture (livestock, fisheries, and field crops), this study focused on crop farmers. Therefore, the study was designed to compare DAE (public sector) and NGOs (private sector) efforts in building the capacity of the farmers.

The DAE primarily concentrates on crop sector extension services. They provide extension services using various approaches/systems. The Training and Visit (T and V) system is the foundation of the extension service. The T and V system was developed by the World Bank in partnership with the Food and Agriculture Organization (FAO) in the 1970s and 1980s. Through the constant broadcast of extension

messages, the system envisioned an increase in agricultural production. It emphasized better farm management methods, improved land preparation, improved seedbed as well as nursery maintenance, the practice of good seeds, the necessity for the application of seed treatment, timely field operations, optimum plant spacing, and so on. To promote contemporary variety to farmers, the T and V system used a top-down strategy (Afrad *et al.*, 2019). However, the system can't sustain long due to two important reasons. Firstly, emphasizing the target farmers (group farmers) rather than individual farmers and secondly top-down approach (Ahmed, 2012). Over the last few decades, the DAE applied several approaches/initiatives like the National agricultural extension policy, the new extension approach, the Technology diffusion approach, the problem-solving approach, etc. to serve the farmers.

In the late 1970s, non-governmental organizations (NGOs) began to offer their extension services to disseminate information among their target populations. Farmers receive extension services from NGOs to promote their products. Almost all of Bangladesh's main NGOs have agricultural projects, either as stand-alone initiatives or as part of larger initiatives such as income production, natural resource management, environmental protection and regeneration, catastrophe mitigation and livelihood enhancement, and so on. Agricultural extension and advising operations are carried out by more than 100 local, national, and international NGOs (Birner *et al.*, 2010). According to Haque (2010), over 400 NGOs are directly engaged in farming activities, therefore providing extension services. Some of the major NGOs providing extension support in Bangladesh are Bangladesh Rural Advancement Committee (BRAC), Rangpur Dinajpur Rural Service (RDRS), CARE International, PROSHIKA Manobik Unnayan Kendra, Thangamara Mohila Sabuj Sangha (TMSS), Association for Social Advancement (ASA), Grameen Krishi Foundation (GKF), Christian Commission for Development Bangladesh (CCDB), World Vision (WV), etc. (Rashid and Qijie, 2016). A glimpse of different extension services catered to by public and private providers is presented in Figure 1.

Materials and Methods

Study area

The study was carried out at Dhaka district in

Bangladesh which is selected purposively. Considering the intensity of public and private extension service organizations, Dhamrai Upazila (sub-district) under the Dhaka district was selected as the local of the study. In Upazila, DAE (public organization), Society for Development Initiative (SDI), and SOJAG (a private organization) have been working for farmers' capacity building. The Upazila is situated about 40 kilometers North West from the capital city Dhaka with the coordinates of 90.02 to 90.14E and 23.50 to 24.02E (Uddin and Ilias, 2012). There are 16 unions in the Upazila among which two unions namely Suti Para and Nannar were selected to conduct the study. Data were collected from seven villages namely Sreerampur, Batarkhola, Suti Para, Nannar, Kalampur, Dhaira, and Chaona of these unions under Dhamrai Upazila. The unions and villages were also selected purposively however the farmers were selected randomly.

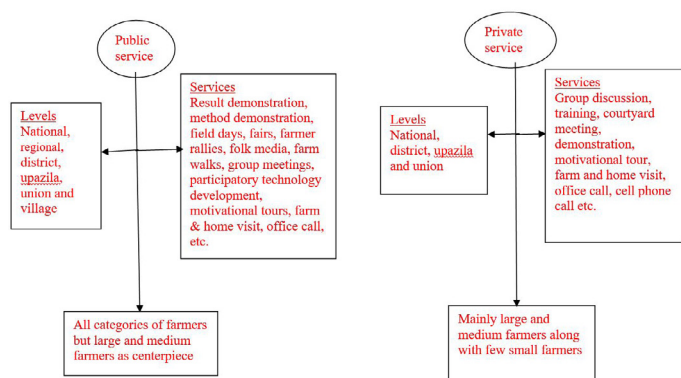


Figure 1: Flow of public and private extension services and their clients.

Source: Adapted by the authors following Rashid and Qijie (2016).

Sampling design

The researchers with the help of the Dhamrai Upazila and respective block level agriculture officers composed a list of total crop farmers living in the selected seven villages. There were 2112 farmers in these villages and they treated as the study population (UAO, 2017). The population comprises all categories of farmers (as extension service provides to all categories of farmers).

To assess the sample size from the given population, we used the following formulae with a 5% accuracy level. The formula is a modification of the widely used Yamane (1967) formula (Kabir and Rainis, 2015a; Khan et al., 2020). The sample size was 336.

$$n = N / 1 + N(e)^2$$

Where, n, N, and e indicate sample size, population

size, and the level of accuracy.

The multi-stage sampling design was utilized for the survey. The stages were applied to select district, Upazila (subdistrict), unions, villages, and the farmers chronologically (Sam et al., 2020).

Variables selection and measurement

In the study, farmers selected five personal characteristics (age, level of education, farm size, contact with extension agent, and training exposure) and the effectiveness of public and private extension services were considered as variables.

The effectiveness of public and private extension services is the focus variable of the study. To measure this variable, at first, 11 extension services common between public and private organizations were collected through a literature review. Then the collected services were checked through the pilot survey. Nine (9) extension services were finally selected. These are farm and home visits, linkage with sources of agricultural input, field day, demonstration (result or method), training on improving soil fertility and pest control, linkage with sources of credit, group formation, marketing information, and information about farm mechanization. Here it is notable that except for these nine services, DAE has more services for the farmers, but those do not match private sector services. The study only considered the practices that are similar between DAE (public organization) and SDI/SOJAG (a private organization). Farmers were asked for their thoughts regarding the effectiveness of those extension services in a four-point rating scale, namely, not at all, less effective, medium effective, and highly effective (Talib et al., 2018; Oluwasus and Akann, 2014; Okunade, 2007). The score for these responses were 0, 1, 2, and 3, respectively. Table 1 shows the measurement and scoring techniques of the selected variables for each respondent.

Collection and analysis of data

The data were collected by using a face-to-face survey. An interview schedule was followed to conduct the survey. The schedule covered three parts. In the first part, crop farmers selected socioeconomic characteristics were highlighted. The effectiveness of public extension services was put in the second part. And the same for private extension services was included in the third party. Before preparing the final version of the schedule, a pre-test was done.

Table 1: Variable measurement techniques.

Variable name	Measuring technique
Age	As usual that a respondent mentioned at the time of interview
Level of education	1 for each level of schooling
Farm size	1 for each hectare
Training exposure	1 for having each day of training and 0 for no training
Contact with extension agent (SAAOs/ NGO worker)	0 for never contact, 1 for yearly contact, 2 for seasonal contact, 3 for monthly contact and 4 for weekly contact
Effectiveness of extension services	0 for not at all effective, 1 for less, 2 for moderate and 3 for highly effective

Few corrections and modifications were needed based on the analysis of pre-tested data. The data collection period was from February 1, 2020, to March 31, 2020.

Both the quantitative and qualitative data were collected for the study. Apart from the interview schedule, the researcher conducted several Focus Group Discussions (FGDs) to gather qualitative data specially to understand the effectiveness of public and private extension services in the study area.

To describe farmers' characteristics and the level of effectiveness of public and private extension services for farmers' capacity building, common descriptive statistics were used. To compare the effectiveness of these two types of extension services, an independent sample t-test was run. The analysis was done with SPSS version 21.

Results and Discussion

Selected characteristics of the farmers

The highest number of farmers (30.34%) was between 41 to 50 years and the lowest (9.55%) was between 18 to 30 years. More than half (54.50%) of the farmers were less than 50 years, indicates fair labour accessibility in the study area. A good number of farmers' age was greater than 50 which indicates they have been observing extension services for a long. The farmers' literacy rate was 70.22 %, which is slightly lower than that of the national average of 74.70% (BBS, 2020b). The majority of the farmers (35.39%) had a primary level of education followed by illiterate and secondary education levels. The farmers' educational status indicates still there is a need to take initiative by the extension authority to arrange non-formal education programs focus on improving farming skills. The vast majority (74.72%) of the farmers had 0.21 to 1 hectare of land which indicates small-scale farmers (DAE, 1999). The

second and third category of farmers was marginal and medium farm owners respectively. Because of the rapidly increasing population and the inheritance land distribution system, the farm size is getting small to smaller day by day. The smallholder farmers need more extension services to know how they can utilize their small land to get the highest output. In terms of frequency of extension contact, the highest percentage of the farmers (37.08%) had contact with the extension agent between six months to 12 months ago followed by about two months ago (31.46%) and about a month ago (21.35%). Unfortunately, 6.18% of farmers had no contact with the extension agent for agricultural purposes, and only 3.93% had regular contact. Weak monitoring by the Upazila agricultural extension officer to the work of block-level extension agents and a poor ratio between the extension agent and the number of the farmers in the study area may be responsible for this infrequent contact. Just over half of the farmers (55.06%) indicated that they had scope to attend agricultural training programs and 44.94% indicated that they did not attend training programs (Table 2). Lack of funding support may be one of the important reasons behind this training participation figure.

Effectiveness of public extension services towards farmers capacity building

Individual effectiveness scores provided by the farmers were obtained and categorized (Table 3). The highest effectiveness scores were 18 and the lowest was 0 against possible scores ranging from 0 to 27, while the mean value was 4.37. Based on the mean value, the farmers were divided into two groups such as less effectiveness and high effectiveness. The farmers who possess a score less than the mean value were under the less effectiveness group. On the other hand, farmers having equal or higher than the mean value were under high effectiveness group to the public extension services. The results show that a lower

Table 2: Socio-economic characteristics of the farmers (N=336).

Characteristics	Categories	Frequency	Percentage (%)
Age	18-30	32	9.55
	31-40	49	14.61
	41-50	102	30.34
	51-60	74	21.91
	Above 60	79	23.59
Education	Illiterate	100	29.78
	Primary level	119	35.39
	Secondary level	83	24.72
	Higher secondary level	34	10.11
Farm size	Marginal farm (0.01-0.20 ha)	60	17.98
	Small farm (0.21-1.0 ha)	251	74.72
	Medium farm (1.01-3.0 ha)	23	6.74
	Large farm (above 3 ha)	2	0.56
Extension contact	Never contact	21	6.18
	Six to twelve months ago	124	37.08
	About two months ago	106	31.46
	About a month ago	72	21.35
Training participation	Less than a month ago	13	3.93
	No	151	44.94
	Yes	185	55.06

Table 3: Categorization of the farmers based on effectiveness of public extension services.

Effectiveness of public extension service	Scores	Frequency	Percentage	Mean age
Less	1-4.37	200	59.55	
High	4.37 and above	136	40.45	4.37
Total		336	100	

percentage (40.45) of the farmers opined public extension services (DAE) is highly effective for farmers' capacity building, while more than half (59.55%) of the farmers explored less effectiveness. [Oluwasus and Akann \(2014\)](#) found a similar result that the majority (54.5%) of the farmers had low access to extension services. However, [Mishuk et al. \(2021\)](#) and [Moonmoon \(2022\)](#) found that most farmers commented that public extension services are medium effective for improving farming skills. The study found mixed results where a group of farmers mentioned extension services as highly effective and the others made an opposite comment. This could be as a result of the extension agents' sporadic visits to the farmers and the fact that extension is typically

provided as a public good in the research area with no associated cost, which encourages respondents to expand their usage of extension services with little to no additional effort.

Table 4: Categorization of the farmers based on effectiveness of private extension services.

Effectiveness of private extension service	Scores	Frequency	Percentage	Mean
Less	1-2.95	274	81.46	2.95
High	2.95 and above	62	18.54	
Total		336	100	

However, the farmers also have preferences for extension services. Based on the scores given by the respondents, farm and home visits ranked the most effective extension service followed by method and result demonstration and training on soil and pest management ([Table 5](#)). Farmers get the scope to improve their skills through face-to-face contact with the extension agent in their farm or home and training and demonstration centre. They feel more comfortable to individual contact and learn by seeing which can be possible through these services. Marketing information was the least effective extension service. The extension agent gives more emphasis to teaching the farmers on crop production techniques than providing information about selling their products.

Effectiveness of private extension services towards farmers capacity building.

Like the public extension services, the farmers were similarly varied in the context of giving an opinion on the effectiveness of private extension services towards their capacity building ([Table 4](#)). The highest effectiveness score obtained was 15 and the lowest was 0 against possible scores ranging from 0 to 27, while the mean score was 2.95. Based on the mean value, the farmers were divided into two groups such as less effectiveness and high effectiveness. The farmers who possess a score less than the mean value were under the less effectiveness group. According to their opinion on the effectiveness of private extension services, the categorization of the farmers is shown in [Table 4](#). [Table 4](#) shows that the greatest percentage (81.46) of the farmers thought that private extension services are less effective for farmers' capacity building while only 18.54% of farmers said high effective.

SDI and SOJAG (NGOs or private extension services organization that works in the study area) mainly provide extension service based on group formation. The number of groups, as well as the size of a group under these organizations, was limited, which is probably one of the most important reasons behind such findings. Moreover, the commercial or profitability mentality of such organizations may be another reason for such findings. Talib *et al.* (2018) also observed that private sector's extension agents were not much effective in disseminating messages to the smallholder farmers.

Table 5: Farmers preferences of the extension services.

Public sector		Extension services	Private sector	
Score	Rank order		Score	Rank order
319	1	Farm and home visit	176	3
304	2	Demonstration (result or method)	221	1
272	3	Training on improving soil fertility and pest control	201	2
203	4	Linkage with sources of agricultural inputs	174	4
182	5	Field day	164	5
139	6	Linkage with sources of credit	162	6
121	8	Information about farm mechanization	109	8
134	7	Group formation	117	7
87	9	Marketing information	105	9

Again, a rank order of the private extension services was made based on the scores given by the respondents (Table 5). Method and result demonstration ranked first followed by training, farm, and home visit, and linkage with sources of agricultural inputs. The

weighted scores indicate a little difference among the extension services provided by the private sectors. However, farmers' preferences indicate either public or private, they feel comfortable with extending services like farm visits, training, and demonstration programs.

Comparison between public and private extension services
The comparison between public and private organizations regarding their effectiveness of extension services was shown through an independent sample t-test. The test showed significant differences between public and private extension services regarding farm and a home visit, demonstration (method and result), and training on improving soil fertility and pest control (Table 6). A brief description of these extension services is presented below.

Farm and home visit

The mean score of farm and home visits for public and private organizations was 1.79 and 0.99, respectively. The mean difference was significant at 1% level of probability. This means there was a substantial difference between public and private organizations regarding farm and home visit extension services. From the analysis, it can be said that the public sector's farm and a home visit was more effective than the private sector for farmers' capacity building. This result is aligned with Talib *et al.* (2018) who reported that farm and home visit provided by the public sector is more important than the private sectors for farmers' capacity building in Pakistan. Farm and home visits are one of the extension methods used to disseminate knowledge to the farmers and this practice has proven, in various instances very effective. It is one type of individual extension method that involves face to face

Table 6: Comparison between effectiveness of public and private extension services towards farmers' capacity building.

Public sector			Extension services	Private sector			t-value
WS	Mean	SD		WS	Mean	SD	
383	1.14	0.89	Linkage with sources of agricultural inputs	329	0.98	0.74	1.80 ^{NS}
601	1.79	1.04	Farm and home visit	333	0.99	0.98	7.36**
576	1.71	0.86	Demonstration (result or method)	417	1.24	0.83	5.15**
514	1.53	1.09	Training on improving soil fertility and pest control	380	1.13	0.89	3.89**
343	1.02	0.79	Field day	309	0.92	0.74	1.23 ^{NS}
262	0.78	0.77	Linkage with sources of credit	306	0.91	0.74	-1.60 ^{NS}
228	0.68	0.77	Information about farm mechanization	205	0.61	0.72	0.84 ^{NS}
252	0.75	0.86	Group formation	222	0.66	0.78	0.96 ^{NS}
165	0.49	0.73	Marketing information	198	0.59	0.68	-1.34

** : significant at 1% level of confidence; NS: Non-significant; WS: Weighted Score; SD: Standard deviation.

contact by the extension agents and the clients who are such as family members and various learners on the farm or at their home place for extension purposes (Danilo, 2016). In the case of the public sector, the Sub-Assistant Agriculture Officer (SAAO) termed as extension agent mainly does visit the farm and home of the farmers to increase their farming skills. They are locally known and popular to the farmers helping them (SAAO) to provide friendly service among the farmers.

Demonstration

The independent sample t-test revealed that there is a significant difference between public and private demonstration services. The demonstration shown to the farmers by the Upazila Agriculture Office (DAE) is more effective than the private sector's demonstration program. A study conducted by Khan *et al.* (2009) revealed that the farmers who attended the demonstration program were aware of modern technologies and applied those technologies to their farms. DAE usually shows two types of demonstrations; method demonstration and result demonstration. Method demonstration helps the agricultural information diffusing agent clarify simple farming skills to the farmers. On the other hand, result demonstration exhibit how a technology, variety, or practice works to the potential adopters. The farmers participated in these programs to acquire practical knowledge about the procedure of improved farming practices as well as observe the result of improved farming practices.

Training on-farm management and pest control

Both public and private organizations have a training programs to improve farmers' capacity on-farm management though public sectors training program was more effective. The mean difference between these two types of organizations regarding training on improving soil fertility and pest control was significant at a 1% level of confidence (Table 6). DAE has a training program for the farmers on how to improve soil fertility or productivity. Besides, they also train farmers to control crop and vegetable pests in environment-friendly ways such as applying IPM techniques. Farmers explored that such training was effective for them to improve their soil productivity and control pests. Oluwasusi and Akanni (2014) conducted a study in Nigeria to examine the effectiveness of extension services to the farmers and found that based on the most farmers (60%) opinion,

the training program named farmers capacity building on agricultural business skills was effective. Kabir and Rainis (2015b) and Kabir and Rainis (2017) also mentioned that Farmer Field School (FFS), a season-long training program, helped farmers to increase their interest and skill for adopting Integrated Pest Management (IPM) practices.

Limitations

The small sample size of 336 farmers is not enough to generalize the results to the whole country or even to the district. Though, it does help to answer the research question of whether public extension services are more effective than private extension services.

Conclusions and Recommendations

Scholars have widely recognized agricultural extension service as an important element for upgrading farmers livelihood. The farmers of the study area were resource-poor and thus they may be less receptive to change. Therefore, public and private sector extension systems should launch adult education programs to minimize the illiteracy of these farmers. Moreover, public sectors initiatives for more training and demonstration program, vehicle facilities for extension agents and an increase the number of extension agents may be helpful to increase farmers' satisfaction with extension services. Public extension services were more appreciated by the farmers than private extension, even if both groups of farmers expressed a minimum level of effectiveness for the services they received. Therefore, public and private organizations should confirm appropriate and frequent monitoring and evaluation of the extension services. In addition, steps such as the government should motivate the private sectors enabling environment to increase the quality and quantity of their extension services; the private sector extension system should also go forward to the farmers with a voluntary attitude rather than commercial, and the public and private sectors can jointly organize seminars and workshops might help to increase the effectiveness of private extension services.

The study evaluated the effectiveness of public and private extension services based on farmers' opinions for improving their farming capacity. By assessing the level of effectiveness of extension services, this study makes a comparison between these two categories of services (private and public) from farmers' viewpoint.

It reveals the usefulness of the extension systems delivered in Dhamrai Upazila from the public and private sector, therefore, informing policymakers about how the extension services could be more effective.

Novelty Statement

Despite agricultural land reducing gradually, overall crop production has been increased manifold to feed up the nation. To keep the success, it is very important to increase farmers' capacity of farming. A variety of public and private organizations provide extension services to the farmers but to what extent their services are effective is not known. Concerning this, the present study compared the effectiveness of public and private extension services to strengthen farmers.

Author's Contribution

Muhammad Humayun Kabir: Designed the study and methodology, prepared the first draft and finalization.

Md. Saiful Islam: Collected, analyzed, and interpreted data.

Funding

The article has been made based on a project financed by Sher-e-Bangla Agricultural University Research System (SAURES). Therefore, the author thanks SAURES for funding support. The author also extended his thanks to the farmers and staff of the study location for their cordial help due to the data collection period.

Conflict of interest

The authors have declared no conflict of interest.

References

- Afrad, M.S.I., F. Wadud and S.C. Babu. 2019. Reforms in agricultural extension service system in Bangladesh. Book chapter in book: Agricultural Extension Reforms in South Asia. <https://doi.org/10.1016/B978-0-12-818752-4.00002-3>
- Ahmed, T., 2012. A study on communication between department of agricultural extension (DAE) and the farmers of Bangladesh. Master Thesis. Environmental Communication and Management. Swedish University of

Agricultural Sciences, Uppsala, Sweden.

- APO, 2006. Report of the APO seminar on enhancement of extension systems in agriculture held in Pakistan, 15-20 December 2003. Published by the Asian Productivity Organization 1-2-10 Hirakawacho, Chiyodaku, Tokyo 102-0093, Japan
- BBS, 2020a. Preliminary report on agri census, Bangladesh Bureau of Statistics, Government of the People's Republic of Bangladesh.
- BBS, 2020b. National average literacy, Bangladesh Bureau of Statistics, Government of the People's Republic of Bangladesh.
- Birner, R., A.R. Quisumbing and N. Ahmed. 2010. Cross-cutting issues: governance and gender. Bangladesh food security investment forum, 26-27 May, Dhaka, Bangladesh.
- DAE, 1999. Agricultural Extension Manual. Department of Agricultural Extension, Ministry of Agriculture, Government of the People's Republic of Bangladesh.
- Danilo, S., 2016. A presentation for extension agents on how to use farm visits and improve their effectiveness. Published in: Presentations and Public Speaking.
- Haque, J.T., 2010. Agrarian transition and livelihoods of the rural poor (Draft version). Available online at: www.unnayan.org.
- Kabir, M.H., and R. Rainis. 2015a. Factors influencing the adoption of integrated pest management (IPM) by vegetable farmers in the Narsingdi district, Bangladesh. PhD thesis. Universiti Sains Malaysia, Penang, Malaysia.
- Kabir, M.H., and R. Rainis. 2015b. Adoption and intensity of integrated pest management (IPM) vegetable farming in Bangladesh: An approach to sustainable agricultural development. Environ. Dev. Sustain., 17(6):1413-1429. <https://doi.org/10.1007/s10668-014-9613-y>
- Kabir, M.H. and R. Rainis. 2017. Are spatial factors important in the adoption of eco-friendly agricultural technologies? evidence on integrated pest management (IPM). J. Geogr. Inf. Syst., 9: 98-113. <https://doi.org/10.4236/jgis.2017.92007>
- Khan, A., U. Parvaiz, N.M. Khan, S. Ahmad and S. Nigar. 2009. Effectiveness of demonstration plots as extension method adopted by AKSRP for agricultural technology dissemination in District Chitral. Sarhad J. Agric., 25 (2): 313-320.

- Khan, I., H. Lei, I.A. Shah, I. Ali, I. Khan and I. Muhammad. 2020. Farm households' risk perception, attitude and adaptation strategies in dealing with climate change: Promise and perils from rural Pakistan. *Land Use Policy*, 91: 1-9. <https://doi.org/10.1016/j.landusepol.2019.104395>
- Mamun-ur-Rashid, M. and G. Quijie. 2016. An assessment of public and private crop extension services in Bangladesh. *IOSR J. Agric. Vet. Sci.*, 9(1): 7-16.
- Mishuk, P.S., M.H. Kabir and M.M. Alam. 2021. Assessing the effectiveness of Department of Agricultural Extension (DAE) services to increase farmers' skill. *Asian J. Agric. Ext. Econ. Soc.*, 39(6): 68-75. <https://doi.org/10.9734/ajaees/2021/v39i630595>
- MoA, 2021. National agricultural policy (Final Draft), Ministry of Agriculture, Government of the People's Republic of Bangladesh.
- Moonmoon, 2022. Farmers satisfaction towards advisory services provided by the DAE. Ph.D. thesis. Department of Agricultural Extension and Information System, Sher-e-Bangla Agricultural University, Dhaka-1207, Bangladesh.
- Okorley, E.L., D. Gray and J. Reid. 2010. Towards a cross-Sector pluralistic agricultural extension system in decentralized policy context: A Ghanaian case study. *J. Sustain. Dev. Afr.*, 12(4): 1-10.
- Okunade, E.O., 2007. Effectiveness of extension teaching methods in acquiring knowledge, skill and attitude by women Farmers in Osun State. *Res. J. Appl. Sci.*, 3(4): 282-286.
- Oluwasus, J.O. and Y.O. Akann. 2014. Effectiveness of extension services among food crop farmers in Ekiti State, Nigeria. *J. Agric. Food Inf.*, 15: 324-341. <https://doi.org/10.1080/10496505.2014.952175>
- Rahman, M.M., 2007. Effective use of extension teaching methods by the sub assistant agriculture officer (SAAO) of DAE. Master thesis. Department of Agricultural Extension and Information System, Sher-E-Bangla Agricultural University, Sher-e-Bangla Nagar, Dhaka-1207, Bangladesh.
- Saiful, 2013. Agricultural extension services in Bangladesh. A blog about agriculture and farming related news, reviews, technology, products, crops, tips, thoughts and stories. Available in <https://agricultureandfarming.wordpress.com/2013/11/07/agricultural-extension-services-in-bangladesh/>
- Sam, A.S., S.S. Padmaja, H. Kachele, R. Kumar and K. Muller. 2020. Climate change, drought and rural communities: Understanding people's perceptions and adaptations in rural eastern India. *Int. J. Disaster Risk Reduct.*, 44: 1-11. <https://doi.org/10.1016/j.ijdrr.2019.101436>
- Sultana, M.S., M.S. Ali, M.R. Islam, M.H. Kabir and M.K. Hasnat. 2019. Effectiveness of krisoker janala in disseminating agricultural information: An innovative tool. *Open J. Soc. Sci.*, 7: 272-280. <https://doi.org/10.4236/jss.2019.73023>
- Talib, U., I. Ashraf, R. Agunga and K.M. Chaudhary. 2018. Public and private agricultural extension services as sources of information for capacity building of smallholder farmers in Pakistan. *J. Anim. Plant Sci.*, 28(6): 1846-1853.
- UAO, 2017. Upazila Agriculture Office, Dhamrai, Department of Agricultural Extension, Dhaka, Bangladesh.
- Uddin, A.B. and M. Ilias. 2012. Dhamrai Upazila. In: Islam, Sirajul; Jamal, Ahmed A. (eds.). *Banglapedia: National Encyclopedia of Bangladesh* (Second ed.) Asiatic Society of Bangladesh.
- Yamane, T., 1967. *Elementary sampling theory*, Prentice-Hall: Englewood Cliffs, NJ.