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Effectiveness of Farmer Field School for Soil and Crop Management

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Abstract

The purposes of the study were to investigate the effectiveness of Farmer Field School (FFS) for soil and crop management as perceived by the FFS farmers and to explore the relationships of the selected characteristics of the FFS farmers with their perceived effectiveness. Data were collected from 100 FFS farmers of Mymensingh district in Bangladesh during April, 2013. The highest proportion (76%) of the FFS farmers perceived FFS as medium effective followed by highly effective (15%). A little more than two-thirds (65%) of the respondents perceived FFS as a medium effective mean, while 20% of them perceived high regarding soil management issue. 'Use of organic manure in the crop field' had the highest cumulative effectiveness score (CES), while 'soil testing for nutrient statuses had the lowest CES. On the other hand, the highest proportion (76%) of FFS farmers perceived FFS as medium effective, and 'piearching in the crop field for insect control' had the highest CES and 'use of light trap for pest control' had the lowest CES in crop management aspect. The selected characteristics of the FFS farmers, viz. years of schooling, farm size, farming experience, engagement with FFS, extension media contact, risk orientation and knowledge on soil and crop management showed significantly positive relationship with the effectiveness of FFS for soil and crop management.

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Therefore, it can be mentioned that FFS regarding soil and crop management is significantly effective to the farmers. So, necessary steps need to be taken to enhance the existing activities of FFS that could improve the sustainable crop production as well as the livelihood of the FFS farmers.

Keywords: Farmer Field School; FFS farmers; effectiveness; soil management; crop management.

1. Introduction

In agriculture, soil and crops are complementary to one another. Satisfactory crop productions become hampered without properly managing soil and crop. In Bangladesh, agriculture constitutes the major portion of national economy but due to the inefficiency of farmers in managing soil and crop the production is hampered. Farmer Field School (FFS) is considered as an extension approach where the farmers are being trained up about different aspects of crop production especially management of soil and crop in a low cost and environment friendly means through a season long training program. FFS is a very popular extension and education approach worldwide. Now a day, about 78 countries are implementing this approach [1], although in different forms and with varying focus depending on the national context. The aim of an FFS is to build farmers' capacity to analyse their production systems, identify problems, test possible solutions and eventually adopt the practices most suitable to their farming system. In 1989, FFS was introduced in the Food and Agriculture Organization's (FAO's) South East Asia Integrated Pest Management (IPM) programme in irrigated rice, after it become apparent that IPM practices which expected farmers to be 'expert' managers of agro-ecosystems could not be transferred by Training and Visit (T&V) type of extension services [2-3]. FFSs were designed to educate farmers on the principles of "Integrated Pest Management" (IPM) in order to deal with major outbreaks of Brown Plant Hopper (BPH) [4].

In Bangladesh, the FFS was first used in the early 1990's in FAO implemented Integrated Pest Management (IPM) program. Initially, FFSs organised by Department of Agricultural Extension (DAE) followed the "original" rice IPM FFS curriculum to a large extent, with a strong focus on managing pest problems and with the aim of reducing pesticide related problems. But, with the passage of time the curriculum has been revised and improved several times. Gradually this has changed to a more holistic approach of crop production i.e. Integrated Crop Management (ICM). Empirical study shows that the FFS approach has significantly enhanced cotton farmers' skills for making rational and informed decisions, thereby contributing to more cost-effective and environment-friendly crop management decisions. Further, the FFS approach has increased farm-level efficiency [5]. FFS farmers growing rice who adopted FFS knowledge derived from IPM practices were able to reduce the number of applications of insecticides by 81 percent. But surprisingly, farmers completing the FFS did not adopt other recommended farm practices and the study provided little evidence of farmer to farmer transmission of the principal practices of the FFS [6].

Although FFS is an extension approach but its usefulness in influencing farmers' understanding and adopting new soil and crop management technologies is still a question in the mind of many FFS practitioners. It is also doubted that whether the farmers are practicing different soil and crop management technologies or not taught in the FFS training sessions. On the other hand, the curricula of FFS are changing continuously towards broader

aspect i.e. IPM to ICM considering FFS as effective. The study was conducted in Mymensingh district because FFSs were launched here in 1990s but the number of FFS households is very few and many of the farmers are doubted to practice FFS technologies for soil and crop management. Considering the above facts, the researchers undertook the study to get answers of the following research questions.

- To what extent the FFSs are effective towards soil and crop management?
- What is the relationship between the selected characteristics of FFS farmers and effectiveness of FFSs towards soil and crop management?

2. Materials and Methods

The study was conducted in three unions of Muktagacha Upazila under Mymensingh district of Bangladesh. The study area was selected purposively for investigation, because highest number of ICM-FFSs has been conducted there. There were five ICM-FFSs and the male farmers (125) of the ICM-FFSs of the selected unions of Muktagacha upazila were considered as the population of the study. The total list of male participants of ICM-FFSs was obtained from the office of the Upazila Agriculture Officer of Muktagacha Upazila. Simple random sampling was used in selecting the respondents from each ICM-FFS and a total of 100 ICM- FFS farmers were selected as sample size from the population i.e. about eighty (80) percent of the total population was the sample size of the study. The empirical data were collected using personal interview method along with Focus Group Discussions and observations during the period of 10 to 30 April, 2013. Before collecting final data pre-testing of the interview schedule was made to locate any defects regarding the questions and statements.

Effectiveness of FFS for soil and crop management was the focus variable and the explanatory variables of the study were 10 selected characteristics of the FFS farmers. To measure the focus variable a 4-point rating scale such as very effective, effective, somewhat effective and not effective was used. The scale contained i) ten technologies on soil management and ii) twelve technologies on crop management. Weights of responses were: 3 for very effective, 2 for effective, 1 for somewhat effective and 0 for not effective. For determining the effectiveness of individual item rank order was made based on Cumulative Effectiveness Score (CES) of the individual technology. The CES was computed by using the following formula:

$$CES = N_1 \times 3 + N_2 \times 2 + N_3 \times 1 + N_4 \times 0$$

Where,

CES = Cumulative Effectiveness Score

N_1 = No. of the respondents perceived soil and crop management technologies as high effective

N_2 = No. of the respondents perceived soil and crop management technologies as effective

N_3 = No. of the respondents perceived soil and crop management technologies as somewhat effective

N_4 = No. of the respondents perceived soil and crop management technologies as not effective

Thus, the CES of individual technology could range from 0 to 300, where 0 indicating the soil and crop management technologies as not effective while 300 indicating highly effective.

3. Findings and Discussions

3.1. Selected characteristics of the FFS farmers

Perceptions of the FFS farmers become affected by their characteristics. In this study ten selected characteristics of the FFS farmers were considered. The characteristics profile of the FFS farmers has been presented in the Table 1.

Table 1: Characteristics profile of the FFS farmers

Characteristics	Score ranges		Categories	FFS farmers		Mean	SD
	Possible	Observed		No.	%		
Age (Years)	unknown	20-63	Young (up to 35)	29	29	43.67	11.929
			Middle aged (36-50)	41	41		
			Old (> 50)	30	30		
Year of schooling (Total years of schooling)	unknown	0-17	Illiterate (0)	39	39	5.22	4.875
			Primary (1-5)	15	15		
			Secondary (6-10)	35	35		
			Above secondary	11	11		
Household size (No. of members)	unknown	2-13	Small (up to 4)	31	31	5.47	1.936
			Medium (5-8)	64	64		
			Large (> 8)	5	5		
Farm size (Hectare)	unknown	0.05-2.61	Landless (<0.02 ha)	0	0	0.706	0.567
			Marginal (0.02-0.2 ha)	11	11		
			Small (0.21-1.0 ha)	65	65		
			Medium (1.01-3.0 ha)	24	24		
			Large (>3.0 ha)	0	0		
Farming experience (Years)	unknown	6-45	Less (up to 15)	33	33	22.47	9.570
			Medium (16-30)	47	47		
			High (> 30)	20	20		
Engagement with FFS (Years)	unknown	1-5	Low (up to 2)	20	20	3.16	1.401
			Medium (3-4)	60	60		
			High (> 4)	20	20		
Annual family income	unknown	17-460	Low (up to 153)	64	64	155.47	106.926
			Medium (154-305)	24	24		
			High (> 305)	12	12		
Extension media contact (Scores)	0-30	4-25	Low (up to 10)	20	20	14.26	4.743
			Medium (11-20)	73	73		
			High (> 20)	7	7		
Risk orientation (Scores)	6-18	7-17	Low (up to 9)	11	11	13.21	2.500
			Medium (10-13)	36	36		
			High (> 13)	53	53		
Knowledge on soil and crop management	0-40	11-37	Low (up to 13)	4	4	21.44	5.292
			Medium (14-26)	77	77		
			High (> 26)	19	19		

Data in the table reveal that majority of the FFS farmers (41%) were middle-aged and considerable proportion of the FFS farmers (39%) was illiterate. The highest proportion (64%) of the FFS farmers had the medium sized household while the farm size of the highest proportion of the FFS farmers (65%) were small. Data also reveal that the majority of the FFS farmers (47%) had medium farming experience while the highest proportion of the FFS farmers (60%) had medium engagement with FFS. Data related to annual family income indicate that the highest proportion of the FFS farmers (64%) were in low income category but a satisfactory proportion (73%) of the FFS farmers had medium extension media contact. More than half (53%) of the FFS farmers were highly risk oriented while the highest proportion of the FFS farmers (77%) had medium level of knowledge on soil and crop management.

3.2. Effectiveness of FFS for soil management

Effectiveness scores for soil management ranged from 9 to 23 against a possible range of 0-30, with an average 15.90 and standard deviation 4.310. The respondents were classified into three categories i.e. less, medium and highly effective. Distribution of the respondents according to the effectiveness of FFS for soil management has been shown in Table 2.

Table 2: Distribution of the respondents according to the perceived effectiveness of FFS for soil management

Score range		Categories of FFS farmers	FFS farmers (n=100)		Mean	Standard deviation
Possible	Observed		Number	Percent		
0-30	9-23	Less effective (up to 10)	15	15	15.90	4.310
		Medium effective (11-20)	65	65		
		Highly effective (> 20)	20	20		
		Total	100	100		

Data in the table reveal that almost two-thirds (65%) of the FFS farmers perceived FFS for soil management as medium effective, while 20% and 15% of them perceived FFS as high and low effective. The findings indicate that four-fifth (85%) of the FFS farmers perceived FFS as medium to high effective of soil management. So, it can be mentioned that the effectiveness of FFS for soil management is medium to high effective in the real situation.

Data in Table 3 reveal that Cumulative Effectiveness Score (CES) of individual soil management technology ranged from 75 to 271 against a possible range of 0 to 300. The top five highly effective soil management technologies were: i) Use of organic manure in the crop field ii) Reduced use of chemical fertilizers iii) Decaying crop residues in the field iv) Balanced fertilizer application and v) Leveling of soil surface. Another technology ‘Soil testing for nutrient status’ had the lowest CES value and hence got the lowest (10th) position in the order.

The FFS farmers opined that use of organic manure increases crop production. As a result, they need not to apply excessive chemical fertilizers for production and they also opined that chemical fertilizers reduce soil fertility. It is also told that the decayed crop residues work as organic materials in the field and for overcoming any nutrient deficiency they applied balance fertilizers. FFS farmers said that leveling of soil surface is more

effective for equal movement of irrigation water which is necessary for each crop plant. The technology 'Soil testing for nutrient status' got the lowest score but they opined that due to unavailability of soil health testing kit it was not possible to practice but they opined it is effective as well.

Table 3: Rank order of the soil management technologies based on their effectiveness

Technologies	Extent of effectiveness				CES	Rank order
	Very effective	Effective	Somewhat effective	Not effective		
Use of organic manure in the crop field	72	27	1	-	271	1
Reduced use of chemical fertilizers	27	58	13	-	210	2
Decaying crop residues in the field	25	48	24	-	195	3
Balanced fertilizer application	31	44	13	-	194	4
Leveling of soil surface	21	27	41	-	158	5
USG fertilizer application	39	17	4	-	155	6
Composting and mulching for soil fertility management	21	31	10	-	135	7
Crop rotation for soil nutrient management	11	16	21	-	86	8
Cultivation of nitrogen fixing plants	9	19	12	-	77	9
Soil testing for nutrient status	16	10	7	-	75	10

CES= Cumulative Effectiveness Score

3.3. Effectiveness of FFS for crop management

Effectiveness scores for crop management ranged from 10 to 30 against a possible range of 0-36, with an average 17.86 and standard deviation 4.740. The respondents were classified into three categories i.e. less, medium and highly effective. Distribution of the respondents according to the perceived effectiveness of FFS for crop management has been shown in Table 4.

Data in the table 5 reveal that the Cumulative Effectiveness Score (CES) of individual crop management technology ranged from 22 to 267 against a possible range of 0 to 300. The top five highly effective crop management technologies were: i) Perching in the crop field for insect control ii) Maintaining proper spacing of crop iii) Line sowing of crops iv) Production of healthy and quality seeds and v) Germination test of seed. Another technology 'Use of light trap for pest control' had the lowest CES value and hence got the lowest (12^{th}) position in the order. The FFS farmers opined that due to perching in the crop field the pest infestations have been reduced and for controlling pest infestations they need not to apply any pesticide. They also opined that due to line sowing and proper spacing of the crop, they required minimum number of seedlings per hill, intercultural operations like application USG fertilizers become easy to do and crop production has been increased. They said that production of healthy and quality seeds and germination test of seeds is also more

effective for enhanced crop production. A very few FFS farmers used light trap for pest management and hence, it got the lowest CES in the rank order and was considered as low effective.

Table 4: Distribution of the respondents according to the perceived effectiveness of FFS for crop management

Score range		Categories of FFS farmers	FFS farmers (n=100)		Mean	Standard deviation
Possible	Observed		Number	percent		
0-36	10-30	Less effective (up to 12)	15	15	17.86	4.740
		Medium effective (13-24)	76	76		
		Highly effective (> 24)	9	9		
		Total	100	100		

Data in the table reveal that the highest proportion (76%) of FFS farmers perceived FFS for crop management as medium effective, while 15% and 9% of them perceived FFS as less and highly effective. Based on the findings it can be mentioned that FFS for crop management was medium effective in the real situation.

Table 5: Rank order of the crop management technologies based on their effectiveness

Technologies	Extent of effectiveness				CES	Rank order
	Very effective	Effective	Somewhat effective	Not effective		
Perching in the crop field for insect control	74	20	5	-	267	1
Maintaining proper spacing of crop	58	36	5	-	251	2
Line sowing of crops	53	40	7	-	246	3
Production of healthy and quality seeds	34	55	8	-	220	4
Germination test of seed	26	52	11	-	193	5
Rouging of weed from crop field	11	45	40	-	163	6
Management according to growth stages of crops	22	19	24	3	128	7
Ail crops cultivation for pest control	5	17	29	1	78	8
Cultivation of insect resistant variety	9	19	12	-	77	9
De-tillering and defoliation for pest management	5	20	18	5	73	10
Conservation and augmentation of natural enemies	2	10	7	1	33	11
Use of light trap for pest control	3	4	5	2	22	12

CES= Cumulative Effectiveness Score

3.4. Overall effectiveness of FFS for soil and crop management

Effectiveness of FFS for soil and crop management was the main thrust of the research. Effectiveness scores for soil and crop management ranged from19 to 49 against a possible range of 0-66, with an average 33.93 and standard deviation 8.351. The respondents were classified into three categories i.e. less effective, medium effective and highly effective. Distribution of the respondents according to the effectiveness of FFS for soil and crop management has been shown in Table 6.

Table 6: Distribution of the respondents according to the perceived effectiveness of FFS for soil and crop management

Score range		Categories of FFS farmers	FFS farmers (n=100)		Mean	Standard deviation
Possible	Observed		Number	percent		
0-66	19-49	Less effective (up to 22)	9	9	33.93	8.351
		Medium effective (23-44)	76	76		
		Highly effective (above 44)	15	15		
		Total	100	100		

Data in the table reveal that three-fourths (76%) of the FFS farmers perceived FFS for soil and crop management as medium effective, while 15% and 9% of them perceived FFS as highly and less effective, respectively. The findings indicate that about four-fifth of the FFS farmers (91%) perceived FFS for soil and crop management as medium to highly effective in the study area. The probable reason for this may be due to the fact that FFS farmers could harvest more benefits from the FFS regarding different aspects of crop production. So, it can be mentioned that FFS is mostly effective to the FFS farmers concerning soil and crop management that could be helpful for sustainable crop production.

3.5. Relationship between the selected characteristics of the FFS farmers and effectiveness of FFS

Pearson's Product Moment Co-efficient of Correlation (r) was used to ascertain the relationships between the selected characteristics of the FFS farmers and the effectiveness of FFS for soil and crop management. The correlation has been shown in the Table 7.

The years of schooling, farm size, farming experience, engagement with FFS, extension media contact, risk orientation and knowledge on soil and crop management had significant and positive relationship with the effectiveness of FFS. Years of schooling of the farmers provide broader outlook to gain knowledge on different aspects of crop production. It increases the capability of the farmers to observe and understand a critical situation. Thus, they become more dynamic than the others and hence, they perceived FFS as more effective. Islam [7], Meagy [8] and Miah [9] found similar relationship between the concerned variables. Farm size is an important indicator for socio-economic status of the farmers. The FFS farmers with larger farm size were more innovative and risk oriented to adopt new agricultural technologies in their farming.

Table 7: Correlation between explanatory and focus variables

Explanatory variables	Correlation co-efficient (r)
Age	- 0.053
Years of schooling	0.228*
Household size	- 0.095
Farm size	0.233*
Farming experience	0.204*
Engagement with FFS	0.309**
Annual family income	0.060
Extension media contact	0.294**
Risk orientation	0.301**
Knowledge on soil and crop management	0.259**

***** = *Significant at 0.05 level* *Table value of r = 0.197 (0.05 level) and 0.257 (0.01 level)*

****** = *Significant at 0.01 level*

They took part in many agricultural training programmes and hence, they perceived FFS as effective for soil and crop management. Meagy [8] found the similar relationship between farm size and effectiveness. Farming experience enables the farmers to understand the farming situations and different farm related problems and the findings may be due to that the FFS farmers having more experience in farming could be more aware about the FFS activates. Based on the findings, the FFS farmers having higher engagement with FFS perceived FFS for soil and crop management as more effective. This might be due to that the farmers having long time engagement with FFS practiced different soil and crop management technologies provided in the FFS training and thus perceived FFS as more effective than the FFS farmers having low engagement with FFS. Extension media contact had significant and positive relationship with the effectiveness of FFS thus, it can be concluded that the FFS farmers having higher contact with extension media perceived FFS for soil and crop management as more effective. On the other hand, the FFS farmers who had comparatively higher contact with extension workers as well as other media practiced more soil and crop management technologies in their crop field. Islam [7] and Meagy [8] also found the similar findings. The FFS farmers having higher risk orientation towards new agricultural technology perceived FFS for soil and crop management as more effective. This finding is in line with Chandrashekhar [10]. Findings also indicate that the FFS farmers having higher knowledge on soil and crop management perceived FFS for soil and crop management as more effective. Meagy [8], Roy [11] and Sayeed [12] found the similar relationship in their respective research.

4. Conclusions

It is demonstrated that more than nine-tenths (91%) of the respondents perceived FFS for soil and crop management as medium to highly effective. The findings lead to the conclusion that the FFS farmers would be able to harvest more benefits from the FFS especially for soil and crop management if these would be properly

executed. It can also be concluded that there is a great chance of involving other than FFS farmers in the soil and crop management activities if the information obtained from the FFS would be properly disseminated to the non-FFS farmers. Again the findings indicate that year of schooling, farm size, farming experience, extension media contact, risk orientation and knowledge on soil and crop management has considerable influence on the effectiveness of FFS. The extension personnel should provide regular visit to the farmers so that they can make effective communication with them for their farming activities. The FFS practitioners should incorporate adequate trials in the curricula and also provide adequate training materials to the participants so that the individual farmer could practice and learn effectively from the training session. Regular monitoring should be continued by the concerned authority after completion of a FFS training program so that the farmers can practice it effectively in their respective field. Therefore, necessary steps need to be taken to establish more number of FFSs as well as to enhance the activities of the existing FFS that could improve the sustainable crop production and the livelihood of the FFS farmers. In this case, different GOs and NGOs can take necessary measures in collaborate to establish and execute the same.

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