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Profitability of Vegetable Cultivation by the Integrated Pest Management (IPM) Farmers

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ABSTRACT

The major objectives of this study were to describe the selected characteristics of the farmers cultivate vegetable with IPM farmers; to determine the level of profitability of vegetable cultivation with Integrated Pest Management (IPM) farmers and to identify the factor that significantly influences profitability of vegetable cultivation. The study was conducted with randomly selected 115 farmers in Tetuljhora union under savar upazila of Dhaka district. A pre-tested interview schedule was used to collect data from the respondents during 25th August to 25th September, 2018. Profitability of vegetable cultivation by the IPM farmers was the dependent variable and it was measured based on benefit cost ratio. Eeleventh selected characteristics of the respondents considered as independent variables of the study. The interview survey revealed that majority (74.8 percent) of the respondents had medium level of profitability while 14.8 percent and 10.4 percent of them had high and low profitability respectively. Out of selected eleven characteristics, five namely number of vegetable grown, training in vegetable cultivation, organizational participation, annual family income and education had significant positive contribution to their profitability of vegetable cultivation by the IPM farmers. Therefore, to motivate the vegetable farmers for using IPM practices, the policy makers should consider the above mention significant factors.

Keywords: Profitability, vegetable cultivation, integrated pest management

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INTRODUCTION

Bangladesh is an agro-based country. Most of the farmers cultivate vegetable besides other crops all the year round. Vegetables are cultivated in 4.22 percent (BBS, 2016) of the total cultivatable land. Besides this, the premises of houses, tin sheds and roof tops are used for vegetable cultivation. Vegetable production has increased five times in the past 40 years. Bangladesh has scored 3rd in global vegetable production, next to China and India (FAO, 2017). The farmers are getting large amount of money from vegetable production which is changing their life (Hossain, 2017). Near about 90% of the pest infestation occurs during vegetable cultivation. In Bangladesh, vegetables are grown generally in summer and winter seasons.

Vegetables are also good source of vitamins and minerals. Nutrition survey of Bangladesh (INFS, 2013) reported that average intake meet only 80 percent of Calorie, 58 percent of Vitamin A, 50 percent of Riboflavin and 51 percent of Vitamin C requirements. The Production of vegetables in Bangladesh is not sufficient that per capita/day available is hardly 32 gm whereas the requirement is estimated to 220 gm. This gap is probably one of the main reasons for widespread malnutrition in the country. (HRDP, 2013).

Pest infestation is the major problem in vegetable cultivation. Near about 90% of the pest infestation occurs during vegetable cultivation. The farmers of Bangladesh are mostly dependent on pesticides in the endeavor to control the pests. At present different kinds of pesticides with thousands of trade names have been registered in Bangladesh and use of pesticides is not only expensive but also leads to negative environmental consequences.

Integrated Pest Management (IPM) is the best alternative strategy for pest management. IPM is not a new practice in Bangladesh and it was started in 1981 on a small scale basis. By inter country programme, FAO gave same thrust on IPM in 1989. Based on the success of FAO's inter country programme, two Integrated Pest Management Project and Strengthening Plant Protection Services(SPPS) project started in 1996 and 1997 respectively. Both the projects were implemented by the Department of Agricultural Extension (DAE) (Roy, 2009). Agricultural development and sustainability are very much linked to maintaining a healthy agricultural environment, ecological balance, sound environment and sustainable agriculture. It should be maintained for the better future and to maintain sustainable agriculture IPM should be implemented with collaboration of other related organizations.

Integrated Pest Management (IPM) is a broad ecological approach to pest control using various pest control methods in a compatible manner; that is why IPM is a holistic approach to pest control keeping sound environment. To maintain ecological balance, sound human and animal health, increasing farm output and farmers' income on a sustainable basis, IPM is considered as good practices. IPM is better than conventional method in social and environmental aspect but what about economic aspect is not known. Therefore, there is a need to conduct a study on Profitability of vegetable cultivation with IPM practices.

In this context, the present study has been conducted with a view to the following objectives.

- To describe the selected characteristics of the farmers cultivate vegetable with IPM practices;
- To determine the level of profitability of vegetable cultivation with IPM practiceand;
- To identify the factors that significantly influences profitability of vegetable cultivation.

METHODOLOGY

Study area

The study was conducted at Savar upazila under Dhaka district. As a locale to the

proposed study, one union namely, Tetuljhora under Savar upazila of Dhaka district were selected purposively. Savar upazila is one of leading upazila in vegetable cultivation .Two villages from this union were selected randomly as the locale of the study.

Population and Sampling

The Researcher himself with the help of Upazila Agriculture Officer, Local leaders and concerned Sub-Assistant Agriculture Officer (SAAO) was collected an updated list of population of the study. The total numbers of vegetable cultivars in the selected villages were 459. Out of related 459 vegetable farmers a sample of 115 (25% of 459) were selected randomly as the sample population for this study.

The sample was then selected from the two villages by considering proportionate random sampling procedure. A reserve list of 12 vegetable farmers (about 10% of the sample) was kept purposively if any respondent was unavailable at the time of data collection. The distribution of population and sample was shown in Table 1.

Table 1. Distribution of population and sample of farmers of the selected villages

Name of the villages	No. of farmers		Reserve list
	Population	Sample size	
Jhauchar	276	69	7
Haridhara	183	46	5
Total	459	115	12

Data collection methods

Individual interviews were used in the survey and were conducted in a face-to- face (Bryman, 2001) situation by the researcher. A structured interview schedule was prepared containing open and closed formed questions. The schedule was pre-tested with 10 randomly selected farmers in the study area. The pre-test was helpful in identifying faulty questions and statements in the draft schedule. Data were collected by the researcher personally. The primary data were collected from August to September, 2018.

Selection and measurement of variables

In a descriptive social research, selection and measurement of the variable is a momentous task. An organized research usually contains at least two identical elements viz. independent variable and dependent variable. Considering study nature, location of study, time and other logistic support, we selected farmers' eleven characteristics/independent variables for analysis of the study. These are age, education, family size, time spent in vegetable cultivation, experience in vegetable cultivation, farm size, training on vegetable cultivation, annual family income, organizational participation, extension media contact and number of vegetables grown. On the other hand, the dependent variable of the study was profitability of vegetable cultivation by the integrated pest management (IPM) farmers. The measurement techniques of both independent and dependent variables are discussed as follows.

Measurement of Independent Variables

Considering individual, financial, social and mental components of the target group, time and assets accessibility to the researcher, checking on applicable writing and talking about with pertinent specialists, we selected 11 characteristics of the respondents as the independent variables. Eleven independent

variables were selected which included age (year), level of education (years of schooling), family size (no. of members), time spend in vegetable cultivation (total hours per week), experience in vegetable cultivation (years of working in agriculture), farm size (hectare), training on vegetable cultivation (number of days), annual family income ('1000 BDT), organizational participation (participation in four (4) selected different organizations) extension media contact (no. of exposure to 15 alternative media), number of vegetable grown (no. of vegetable grown).

Measurement of dependent variable

Profitability of vegetable cultivation by the integrated pest management (IPM) farmers was considered as the dependent variable of the study. In this study, costs were measured in terms of variable and total cost basis. Per hectare profitability of growing vegetables from the viewpoints of individual farmers was measured in terms of output.

Profitability from vegetables was measured as follows:

$$Profitability = \frac{Output}{Cost}$$

Collection and processing of data

Data were collected through personal interviewing by the researcher himself. The researcher made all possible efforts to establish rapport with the respondent so that they could feel ease and comfort to response the questions in the schedule. Necessary steps were taken to explain the purpose of the study to the respondents and their answers were recorded sincerely. If any respondent felt difficulty in understanding any question, care was taken to help him getting understood. The researcher did not face any serious problem in data collection. The data collection took 31 days from 25th August to 25th September, 2018. The collected data were complied, tabulated and analyzed. Qualitative data were converted into quantitative form by means of suitable scoring whenever needed.

After completion of data collection, data were coded, compiled, tabulated and categorized according to the objectives of the study. The entire individual respondent's data were transferred into a master sheet for facilitating the required analysis. Local units were converted into standard units. In case of qualitative data, appropriate scoring technique was followed to convert the data into quantitative form.

Analysis of data

Bogdan and Biklen (2006) insist that data analysis is an on-going part of data collection. Qualitative data were converted into quantitative numbers, if required, after processing, scaling and indexing of the necessary and relevant variables to perform subsequent statistical analysis for drawing inferences. SPSS/windows version 22.0, which offered statistical tools applied to social sciences were used for analyzing the collected data. Both descriptive and analytical methods were employed in order to analyze the data. Descriptive techniques have been used to illustrate current situations, describe different variables separately and construct tables presented in results. These included: frequency distribution, percentage, range, mean and standard deviation. Statistical test like regression was used in this study.

To find out the contribution of selected characteristics of the farmers to their profitability, the method of stepwise multiple regressions were administrated and 11 independent variables were fitted together in step-wise multiple regression analysis.

The model used for this analysis can be explained as follows:

$Y_i = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + b_9x_9 + b_{10}x_{10} + b_{11}x_{11} + e$

Where:

Y_i the profitability of vegetable cultivation by the integrated pest management (IPM) farmers,

x_1 the vegetable cultivar's age,

x_2 educational background,

x_3 family size,

x_4 time spent in vegetable cultivation,

x_5 experience in vegetable cultivation,

x_6 farm size,

x_7 training on vegetable cultivation,

x_8 annual family income,

x_9 organizational participation,

x_{10} extension media contact,

x_{11} number of vegetables grown.

On the other hand, b_1.................b_{11} are regression coefficients of the corresponding independent variables, and "e" is random error, which is normally and independently distributed with zero (0) mean and constant variance.

RESULTS AND DISCUSSION

Selected characteristics of the farmers

The salient features of the selected characteristics of the farmers like possible and observed range, number and percent distribution, mean, standard deviation and categorisation are presented in Table 2.

Table 2. Distribution of the respondents according to their characteristics (N=115)

Variables (Measuring Unit)	Range		Categories	Respondents		Mean	SD
	Possible	Observed		Number	Percent		
Age (Years)	-	30-72	Young (up to 35) Middle Aged (36-50 Old (> 50)	3 68 44	2.6 59.1 38.3	50.80	8.81
Education (Year of schooling)	-	0.00-16	Illiterate (0- 0.5) Primary (1-5) Secondary (6-10) Above Secondary (>10)	36 10 48 21	31.3 8.7 41.7 18.3	5.70	4.52
Family size (Member)	-	3-9	Small family (up to 4) Medium family(5-6) Large family(>6)	31 66 18	27.0 57.3 15.7	5.29	1.30
Time spent in vegetable cultivation (Hours)	-	21-56	Less time (up to 35) Moderate time (36-49) High time (>49)	30 61 24	26.1 52.0 21.9	42.50	7.80
Experience in vegetable cultivation (Years)	-	10-50	Low (up to 18) Medium (19-34) High (above 34)	17 72 26	14.8 62.6 22.6	26.13	8.78
Farm size (Hectare)	-	0.29-1.06	Marginal (up to 0.2 ha) Small f(0.21-1.0 ha) Medium (>1.0 ha)	18 72 25	15.7 62.6 21.7	0.70	0.24
Training on vegetable cultivation (Days)	-	0-15	Low training (upto 1) Medium (2-7) High training (>7)	24 71 20	20.9 61.7 17.4	4.01	3.82
Annual family income ('000'taka)	-	70-540	Low (up to 203) Medium (204-337) High (above 337)	19 78 18	16.5 67.8 15.7	320.94	117.04
Organizational participation	0-12	0-8	No (0) Low (up to 3)	18 72	15.7 62.6	2.21	2.12

(Score)			Medium (4-6)	17	14.7		
			High (above 6)	8	7.0		
Extension media contact (Score)	0-60	4-30	Low (up to 10)	25	21.7	15.04	5.67
			Medium (11-20)	79	60.0		
			High (above 20)	21	18.3		
Number of vegetables grown (Number of vegetable)	-	2-6	Low (up to 2)	5	4.4	2.49	1.36
			Medium (3-4)	49	42.6		
			High (above 4)	61	53.0		

Considering the recorded age farmers were classified into three categories namely young, middle and old aged following (MoYS, 2012). The majority (86.7%) of the farmers were middle aged to old aged. About two-third (71.7%) of them were primary to secondary level of education. Based on their farm size, the farmers were classified into three categories following the categorization according to DAE (1999). Majority of the respondents had small to medium farm size (84.3%). The average farm size of the farmers of the study area (0.70 ha) was higher than that of national average (0.60 ha) of Bangladesh (BBS, 2014). Low to medium annual family income (87.6%) and no to low training received (73.5%). Most of the farmers had no to low organizational participation (76.1%), medium to high extension media contact (76.1%), and medium to high number of vegetable grown (95.6%).

Profitability of vegetable cultivation by the integrated pest management (IPM) farmers

Profitability of vegetable cultivation by the Integrated Pest Management (IPM) farmers was the dependent variable of the study. The observed profitability scores of the respondents ranged from 0 to 3.40. The mean scores were 1.46 with the standard deviation of 0.55. Based on their profitability scores, the respondents were classified into three categories namely low profit, medium profit and high profit as shown in Table 3.

Table 3, Distribution of the farmers according to their profitability

Categories (Scores)	Farmers		Mean	SD
	Number	Percent		
Low (up to 0-1.1)	12	10.4	1.46	0.55
Medium (1.11-2.2)	86	74.8		
High (above 2.2)	17	14.8		
Total	115	100		

Data contained in the Table 3 revealed that the majority (74.8%) of the vegetable farmers had medium profit from vegetable cultivation as compared to (14.8%) and (10.4%) having high and low profit from vegetable cultivation respectively. The majority (89.6%) of the respondents had medium to high profitability in vegetable cultivation.

Table 4, Multiple regression coefficients of the contributing variables related to their profitability of vegetable cultivation by the integrated pest management (IPM) farmers

Variables	Unstandardized coefficients		Standardized Coefficients	t	Sig
	B	Std. error	Beta		
Organizational participation(x_9)	0.072	0.026	0.275	2.762	.007
No of vegetable grown (x_{11})	0.210	0.063	0.222	3.360	.001
Training on vegetable cultivation(x_6)	0.028	0.012	0.194	2.321	.022
Level of education (x_2)	0.045	0.012	0.379	3.667	.000
Annual family income (x_8)	0.001	0.000	0.177	2.593	.011

Table 5, Summary of the profitability of vegetables cultivation

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.624[a]	.390	.385	.43325
2	.672[b]	.452	.442	.41256
3	.704[c]	.496	.482	.39737
4	.721[d]	.520	.503	.38939
5	.742[e]	.550	.530	.37875

a. Predictors: (Constant), participation

b. Predictors: (Constant), participation, vegetable grown

c. Predictors: (Constant), participation, vegetable grown, training

d. Predictors: (Constant), participation, vegetable grown, training, education

e. Predictors: (Constant), participation, vegetable grown, training, education, income

f. Predictors: (Constant), participation, vegetable grown, training, education, income

The contribution of the selected characteristics of the respondents to their profitability of vegetable cultivation by the integrated pest management (IPM) has been shown in Table 4. To identify the significant factors, stepwise multiple regression analysis was done. The Table shows that only five characterizes viz., Organizational participation(x_9), no of vegetable grown (x_{11}), Training on vegetable cultivation(x_6), level of education (x_2) and annual family income (x_8) of the respondents were positive and significant contribution with their profitability of vegetable cultivation by the integrated pest management (IPM) farmers. Among these five variables, training on vegetable cultivation(x_6) and annual family income (x_8) was significant at 5% level of confidence and the rest two variables were significant at 1% confidence level (Table 4). Moreover, the stepwise regression model

showed that five significant variables explained about 54.5%% variation of the model (Table 5). The other seven variables were not entered into regression equation. From the result it can be said that the data as well as the selection of analysis was appropriate.

Data presented in Table 4 revealed that annual income of the farmers was positive and significantly contributed (significant at 1% level, p<0.00) with their profitability. Based on the above finding, it can be said that farmers' had more annual family income increased farmers' profitability of vegetable cultivation increased. So, annual family income has high significantly contributed to the farmers' profitability of vegetable cultivation increased. Annual family income makes farmers self-dependent which helps farmers to satisfy on vegetable cultivation. This finding indicated that farmers' have more income increased the farmers' profitability. The finding is similar with the studies of (Gowda *et al.* 2009), (Giller, 2012), (NBS, 2012) and (Islam, 2010).

Data presented in Table 4 revealed that organizational participation of the farmers was positive and significantly contributed (significant at 1% level, p<0.00) with their profitability. Based on the above finding, it can be said that farmers' had more organizational participation increased farmers' profitability of vegetable cultivation increased. So, Organizational participation has high significantly contributed to the farmers' profitability of vegetable cultivation increased. Organizational participation increase farmer's knowledge about various aspects which helps farmers make enough profit by vegetable cultivation. This finding indicated that farmers' have more organizational participation increased the farmers' profitability.

Data presented in Table 4 revealed that training on vegetable cultivation of the farmers was positive and significantly contributed (significant at 1% level, p<0.00) with their profitability. Based on the above finding, it can be said that farmers' had more training on vegetable cultivation increased the profitability of vegetable cultivation. So, training on vegetable cultivation has high significantly contributed to the farmers' profitability of vegetable cultivation. Training helps farmers to gather more knowledge on vegetable cultivation which ultimately helps farmers grain more profitability by vegetable cultivation. This finding indicated that farmers' have more training on vegetable cultivation increased the farmers' profitability. The finding is similar with the studies of (Gupta *et al.* 2006) and (Hoque and Haque, 2014).

Data presented in Table 4 revealed that number of vegetable grown of the farmers was positive and significantly contributed (significant at 1% level, p<0.08) with their profitability. Based on the above finding, it can be said that farmers had more number of vegetable grown increased farmers' profitability of vegetable cultivation. This may be due to the fact that much number of vegetable grown is safety regarding economic region. In some case, if farmers get loss for some specific vegetable but a number of vegetable cultivation makes them positive on an average. This finding indicated that farmers' grown various types of vegetable increased the farmers' profitability.

It was revealed from the analysis that education of the farmers was positive and significantly contributed (significant at 5% level, p<0.05) with profitability of vegetable cultivation. Based on the above finding, it can be said that farmers' education increased the farmers' profitability of vegetable cultivation will increase. So, education has significantly contributed to the farmers' profitability of vegetable cultivation. Education plays an important role to gain more profitability in vegetable cultivation in many cases. Education enhances knowledge on many aspects such as training, participation, extension contact and so on. This finding means that increase of level of education of the farmers will also increase their profitability. The finding is similar with the study

of (Gupta *et al.* 2006), (Adenuga *et al.* 2013) and (Khan, 2004).

CONCLUSIONS AND RECOMMENDATIONS

From the above findings and discussion it may be concluded that overwhelming majority (89.6%) of the farmers' were medium to high profitability in vegetable cultivation. Only few framers had low profitability in vegetable cultivation. Therefore, still there have scope to increase farmers' profitability scenario through taking various steps. Organizational participation, no. of vegetable grown, training on vegetable cultivation, level of education, and annual family income of the farmers was important in making more profit. The result concluded that in order to increase profitability it is necessary to motivate farmers. Therefore, the extension agent should increase their contact with the farmers. Training received helps the respondents in different farming activities. Therefore, it can be concluded that more the training on vegetable cultivation by the respondents, higher would be profitability of vegetable cultivation. Effective steps should be taken by the Department of Agricultural Extension (DAE) and Non- Government Organizations (NGOs) for strengthening the farmers' qualities in favors of vegetable cultivation to a higher degree for their profitability. Extension worker and other concerned authorities should provide supports to fulfill the above mentioned recommendations as well as motivating farmers to enhance their annual income from vegetable cultivation and also their annual family income.

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