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Adoption of Sustainable Agricultural Practices for Crop Production by the Farmers

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ABSTRACT

The study was undertaken with the objective to determine and describe the extent of adoption of sustainable agricultural practices for crop production by the farmers and to explore the relationships between the selected characteristics of the respondents and their extent of adoption of sustainable agricultural practices. The study was conducted in Cokrakhali union covering four villages of Batiaghata upazilla under Khulna district. Data were collected from 90 farmers as a sample by using a pre-tested interview schedule during the period from 3rd May to 31st May 2018. Adoption of sustainable agricultural practices which was consider dependent variable was measured by multiplying area coverage score and time score [Adoption (%) = Area coverage score × Time score]. The independent variables were measured as usual methods which are available in social arena. Analysis indicated that the highest proportion (47.78%) of the farmers had medium adoption of sustainable agricultural practices followed by 11.11% had high adoption and 41.11% had low adoption. Pearson correlation test depicted that out of 11 variables, seven named age, education, farming experience, training exposure, extension media contact, innovativeness, and training were found to have positive significant relationship with their adoption of sustainable agricultural practices.

Key words: Adoption, Farmers, Practices, Production, Sustainable agricultural

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1. INTRODUCTION

Agriculture has been the core of economic activities from the ancient time in the part of the subcontinent. It also plays a vital role in the political and cultural history of Bangladesh, where 80% of the population, accounting for 66% of the labour force, is directly or indirectly engaged in agriculture. Although the share of agriculture in Gross Domestic Production (GDP) has fallen from around 57% in the 1970s to 25% in recent years, is still the largest economic sector (BBS, 2005). Farming in Bangladesh was largely indigenous in nature until 1960s. Integral input- output relations existed between crop husbandries on the one hand and the livestock husbandry coupled with other forms of vegetation on the other. The essence of the farm practices was overwhelming dependence on natural or indigenously grown inputs. Mainly local varieties of crops were grown, restoration of the soil fertility was achieved through use of compost and farm yard manure and pests were controlled there through indigenous devices based on local wisdom and experience. Introduction of modern technologies in Bangladesh, agriculture has created tremendous pressure on land, soil and water resources. A number of undesirable costs of modern agriculture, in terms of loss of soil fertility, loss of biodiversity, health hazards, environmental pollution and other socio-economic problems have been identified and

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described by a number of researchers as complied by Anonymous (1999), Rahman (2001) and Halim & Rahman (2002). All these studies revealed the social, cultural, economic and ecological crisis of serious magnitude. To check the colossal damages caused by the introduction of modern technologies, a new approach of farming is necessary which would ensure sustainability in production in one hand and also would be economically viable, environmentally and socially just on the other (Rahman, 2001).

Sustainable agriculture is a type of agriculture that focuses on producing long-term crops and livestock while having minimal effects on the environment. This type of agriculture tries to find a good balance between the need for food production and the preservation of the ecological system within the environment. In addition to producing food, there are several overall goals associated with sustainable agriculture, including conserving water, reducing the use of fertilizers and pesticides, and promoting biodiversity in crops grown and the ecosystem.

In Bangladesh, sustainable agricultural practices includes crop rotation, mulching, mixed cropping, mixed farming, naturally managed grazing, natural pest management, green manuring, water management, naturally soil enrichment, growing local variety etc. Cereal crops, vegetables, fruits and other edible part of plant are not safe for human health due to excessive use of agrochemicals. Farmers can produce safe food through sustainable agricultural practices. It can play a great role to our country's economy. But knowledge about sustainable agricultural practices and procedure to apply in cultivable land was insignificant. Training facilities on sustainable agriculture are also very poor. Considering the beneficial effects of sustainable agricultural practices for healthy food production and preservation of environment, it should be practiced by the farmers in the field.

The success of any technology depends on its dissemination among the potential users, which ultimately is measured by the level of adoption of that technology. When an innovation is introduced to the farmer, it may be readily accepted, partly accepted, fully accepted and it may also happen that the adoption of innovation is discontinued or totally stopped. Considering this point in view, the researchers intended to conduct the study with following objectives: to find out the extent of adoption of sustainable agricultural practices by the farmers for crop production, and to determine and describe some selected characteristics of farmers with the adoption of extent of sustainable agricultural practices for crop production.

2. METHODOLOGY

The study was carried out in Cokrakhali union covering four villages namely Raingamari, Jhorvanga, Chacibunia and Mathavanga of Batiaghata upazilla under Khulna district which were selected purposively. Total numbers of farm family heads of these four villages was 905, which constituted the population of the study, 90 farm family head were selected randomly by using random number table (Kerlinger, 1973) as the representative covering 10% of active population. Data were collected during the period from 3rd May to 31st May, 2018 using a pretested interview schedule through face-to-face interview.

2.1. Measurement of Independent Variable

The independent variables such as age, education, family size and farm size were measured by using measuring units of year, year of schooling, number of members and hectare. The farming experience was computed by year of active involvement in agricultural practices. The annual income was measured on the basis total earning annually by all the members of the family and expressed in Taka. The training experience was indicated by the number of days of training that a farmer had received during period of last year under different agricultural training programs.

A score 1 (one) was assigned for each training received each day. Knowledge about sustainable agriculture of a respondent was measured by asking also 10 questions covering the different aspects of sustainability. The knowledge about sustainable agriculture scores could range from 0 to 20. Innovativeness of a respondent was measured on the basis of the period of 10 selected sustainable agricultural practices. Scores were assigned on the basis of time required by an individual to adopt each of the technology like 1 for hearing after four years, 5 for hearing after one year and 0 for not at all. The other variables like extension media contact and cosmopoliteness were measured by as usual methods which exist in social arena.

2.2. Measurement of Dependent Variable

Adoption of sustainable agricultural practices for crop production was the dependent variable of this study. It was measured on the basis of the extent of adoption of sustainable agricultural practices for crop production by the farmers for the last year. Adoption of sustainable agricultural practices was measured by multiplying area coverage score and time score.

Adoption (%) = Area coverage score × Time score

2.3. Area Coverage Score

Area coverage percentage refers to that effective area where sustainable agriculture is being practiced under potential area of total agricultural land multiplication of 100. It can be expressed in the following equation:

$$\text{Area coverage score} = \frac{E_a}{P_a} \times 100$$

Where,

E_a= Effective area

P_a= Potential area

From this area coverage percentage score can be obtained in the following chart:

Area coverage percentage	Area coverage score
1 to 25	1
26 to 50	2
51 to 75	3
Above 75	4

Time score

Time score refers to a score computed on the basis of the period of year during the sustainable agriculture practices was cultivated. In order to calculate time score, scoring was made as follow:

Year of sustainable agricultural practice	Time score
Up to 1 year	1
2 to 3 years	2
4 to 5 years	3
Above 5 years	4

Possible score could range from 1 to 16, where 1 indicating lower adoption and 16 indicating higher adoption.

Extent of problem faced by the farmers of the study area in cultivating crops through sustainable agricultural practices was determined by the problem confrontation score (PCI) score.

PCI was calculated through following formula:

$$PCI = S\times3 + M\times2 + Mi\times1$$

Where, S = Severe problem

M = Medium problem

Mi = Minor problem

Descriptive statistical measures such as number, percentage distribution, range, mean, standard deviation and coefficient variation were used in describing the selected variables. To examine the relationship between predict and response variables, Pearson's product moment correlation coefficient (*r*) was done.

3. RESULTS AND DISCUSSION

3.1. Adoption of Sustainable Agricultural Practices for Crop Production by the Farmers

Observed adoption of sustainable agricultural practices scores of the farmers ranged from 2 to 16 against the possible range of 0 to 16. The average score, standard deviation and variance were 6.42, 3.108 and 9.662 respectively. Based on the observed scores, the farmers were classified into three categories as shown in Table 1. Data contained in Table 1 reveals that the highest proportion (47.78%) of farmers were under the medium adoption category, while 11.11% had high adoption and 41.11% had low adoption. Thus, an overwhelming majority (88.89 %) of the farmers had low to medium adoption of sustainable agricultural practices.

However, it is not discouraging that 11.11% farmers fell under high adoption category. In Bangladesh majority of the farmers had no formal education and are not well aware about improved sustainable agricultural practices. In addition they have been practicing farming with a number of socio-economic problems and limited resource bases. Nevertheless, the average adoption score 6.42 indicates that the farmers were trying to adopt selected technologies in crop production. Department of Agricultural Extension and other extension organizations who are trying to adopt selected sustainable crop production technologies among the farmers. In such cases, it is expected that the farmers will be able to adopt selected sustainable crop production technologies with better performance.

3.2. Characteristics of the Farmers

The distribution of farmers based on their characteristics has been shown in Table 2. The highest proportion (47.7%) of the farmers were in the middle aged category, while 38.89% and 13.34% belonged to young and old aged categories respectively. The young and middle aged farmers were generally tended to involve with different new innovations than the older. Probably young and middle aged persons were more dynamic and willing to take more risk in their farming activities. A large proportion (47.78%) of the farmers had secondary education compared to 13.33% respondents with no education or can sign only, 33.33% having primary education and 5.56% having above secondary education. The overwhelming majority (86.67 %) of the respondent were literate from primary to above secondary. This finding also indicated that the respondents had relatively higher level of education than the national level, which is 72% on an average (BBS, 2018). Farmers those who had higher level of education were more receptive to use sustainable agricultural practices. The majority proportion (56.57%) of the farmers fell under the small family category compared to 41.11% and 2.22% having medium and large family category, respectively. These findings indicate that more than 90% of the respondents had either small or medium family size. The highest proportion (63.33%) of the farmers belonged to small farm size compared to 18.89 and 16.67% having marginal and medium farm size respectively and 1.11% belonged to landless farm size. Thus, most of the farmers were in possession of small farm and number of farmers having marginal and medium farm is almost similar. The highest proportion (53.33%) of the farmers belonged to medium experience compared to 37.78 and 8.89% having low and high experience, respectively. The large proportion (56.67%) of the farmers had low income, while only 3.33% had high and medium income, 36.67% had very low income. As a result, the most (93.34%) of the farmers in the study area were very low to low annual income earners. The highest proportion (60%) of the respondents received short training compared to 27.78% of them having no training at all and 12.22% having high

Table 1 Distribution of the farmers according to their adoption

Variables	Measuring unit	Possible ranges	Observed ranges	Category	Number	Percentage	Mean	SD	Variance
Adoption	Score	0-16	2-16	Low adoption (up to 4)	37	41.11	6.42	3.108	9.662
				Medium adoption (5 to 10)	43	47.78			
				High adoption (above 10)	10	11.11			
				Total	90	100			
Max.= 16 Min.= 2 Range= 14									

Table 2 Farmer's characteristics profile

Characteristics	Measuring unit	Observed value	Categories	No.	%	Mean ± SD
Age	Year	22-65	Young (up to 35)	35	38.89	39.44 ± 9.578
			Middle (36 to 50)	43	47.78	
			Old (>50)	12	13.34	
Education	Scores	0-16	Illiterate (0)	12	13.33	5.64±3.787
			Primary (1-5)	30	33.33	
			Secondary (6-10)	43	47.78	
			Above Secondary (>10)	5	5.56	
Family size	No.	2-9	Small (Up to 4)	51	56.57	4.67±1.649
			Medium (5-8)	37	41.11	
			Large (>8)	2	2.22	
Farm size	Hectare	0.01 - 2.69	Landless (below 0.02 ha.)	1	1.11	0.619±0.552
			Marginal (0.02 to 0.2 ha.)	17	18.89	
			Small (0.21 to 1 ha.)	57	63.33	
			Medium (1.1 to 3 ha.)	15	16.67	
Farming experience	Year	2-35	Low (1-9)	34	37.78	12.344±7.113
			Medium (10-22)	48	53.33	
			High (23-35)	8	8.89	
Annual income	Taka	51,000 - 4,80,000	Very Low income (50-100)	33	36.67	122.85±62.23
			Low income (101-200)	51	56.67	
			Medium income (201-300)	3	3.33	
			High income (above 300)	3	3.33	
Training	Scores	0-12	No (0)	25	27.78	5.06±3.669
			Short (1-6)	54	60	
			Medium (>6)	11	12.22	
Knowledge about sustainable agriculture	Scores	7-16	Low (6-9)	16	15.68	11.83±2.04
			Medium (10-13)	58	64.44	
			High (>13)	16	19.88	
Extension media contact	Scores	11-54	Very low (10-21)	4	4.44	36.31±8.321
			Low (22-33)	24	26.67	
			Medium (34-45)	51	56.67	
			High (>45)	11	12.22	
Cosmopoliteness	Scores	2-12	Low (Up to 4)	46	51.11	4.82±1.975
			Medium (4-8)	41	45.56	
			High (>8)	3	17.78	
Innovativeness	Scores	14 - 45	Low (14-24)	27	30	29.34±7.212
			Medium (25-35)	45	50	
			High (36-47)	18	20	

Table 3 Co-efficient of correlation of the selected characteristics of the respondents with their extent of adoption of sustainable practices for crop production

Dependent variable	Independent variable	Computed value of 'r'	Table value of 'r' of 88 degree of freedom. (n=90)	
			At 0.05 level	At 0.01 level
Extent of adoption of selected sustainable technologies for crop production	Age	0.526**	0.207	0.270
	Education	0.637**		
	Family size	0.012^{NS}		
	Farm size	0.055^{NS}		
	Farming experience	0.495**		
	Annual income	-0.137^{NS}		
	Training exposure	0.533**		
	Knowledge about sustainable agriculture	0.164**		
	Extension media contact	0.817**		
	Cosmopoliteness	0.045^{NS}		
	Innovativeness	0.871**		

*, Significant at 0.05 level; **, Significant at 0.01 level; NS, Non-significant

training. These findings indicate that overwhelming majority (87.78%) of the respondents were received no training to short training. Thus most of the respondents had low level of exposure to sustainable agricultural training. Highest proportion (56.67%) of the farmers had medium extension contact, followed by low (26.67%), high (12.22%) extension contact and very low (4%) level extension exposure. The findings of the study indicate that most of the respondents had low and medium extension contact with various information sources for getting necessary agricultural information.

The majority (64.44%) of the respondents had medium knowledge compared to 15.68% and 19.88% had low and high knowledge on sustainable agricultural practices, respectively. It therefore revealed that majority of the farmers (80.12%) in the study area were under low to medium knowledge categories. The 51.11 % of the farmers had low cosmopoliteness as compared to 45.56% having medium and 17.78% had high cosmopoliteness. Data also revealed that majority (96.67%) of the farmers were under low to medium cosmopoliteness. Highest proportion (50%) of the farmers had medium innovativeness as compared to 30 percent low innovativeness and only 20 percent high innovativeness. Data also revealed that majority (80%) of the respondents of the study area had low to medium level of innovativeness. A similar survey has been investigated on vegetable farmers in char region of Chapainawabganj (Ghosh et al., 2020).

3.3. Relationships between the Selected Characteristics of the Farmers with their Extent of Adoption of Sustainable Agricultural Practices

Coefficient of correlation was computed in order to explore the relationships between the extent of adoption of sustainable agricultural practices for crop production and selected characteristics of the farmers is shown in Table 3.

Correlation analysis indicated that age, education, farming experience, training exposure, extension media contact, innovativeness, and training were found to have positive significant relationship with their adoption of selected sustainable agricultural practices. On the other hand family size, farm size, annual income and cosmopoliteness, were found to have no significant relationship with their adoption of sustainable agricultural practices.

4. CONCLUSION

Sustainable agriculture implies the capacity to adapt and change as external and internal conditions change. Overall findings indicate that more than four-fifths of the farmers had low to medium adoption of sustainable agricultural practices. An attempt needs to be taken to organize for useful scientific agricultural programmes by DAE and other organizations for increasing the adoption behavior of farmers regarding the sustainable agricultural practices. Also should be made by the government and nongovernment organizations to arrange some training programme for increasing literacy rate, extension media contact, knowledge about sustainable and innovativeness of farmers. Further study needs to be undertaken from other districts of Bangladesh to draw definite conclusion.

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