Adoption of Integrated Pest Management (IPM) Practices by the Farmers of Brahmanbaria District of Bangladesh

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Article History

Manuscript No. 202
Received in 25th November, 2011
Received in revised form 9th January, 2012
Accepted in final form 29th February, 2012

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Keywords

IPM, adoption, adoption quotient

Abstract

A study was conducted in two villages namely Kuti and Lashiara at Kuti union of Kasba upazila under Brahmanbaria district of Bangladesh. Out of 500 farmers, 100 were selected randomly and proportionately at the rate of 20%. Data were collected using interview schedule during the period from 1st December, 2008 to 30th December, 2008. Adoption quotient was computed and was determined as 78.45. An IPM Practice Use Index (IPUI) was computed which ranged from 0 to 300. Among the 12 selected practices, 'water management' ranked first having IPUI of 286 and 'use of light trap for insect control' ranked last with IPUI of 12. The possible extent of use of IPM practices score of a respondent ranged from 0 to 36, whereas the observed score was found to be 14-26 with an average 19.38 and standard deviation 2.34. It was observed that majority of the respondents (53%) had medium use, 22% had low and 21% had high use of IPM practices. The findings revealed that age, level of education, farm size, organizational participation, cosmopoliteness and knowledge on IPM practices of the respondents had positive and significant relationship with their extent of use of IPM practices. Family size, annual family income, extension media contact and innovativeness of the respondents had statistically non-significant relationships with their extent of use of IPM practices.

1. Introduction

In Bangladesh, Integrated Pest Management (IPM) practices were first started in 1981 with the introduction of the 1st phase of FAO's inter-country program (ICP) on IPM in rice crop. However, it was in 1987, IPM activities began to expand and became popular among the farmers. From 1989 to 1995, the ICP played a strong catalytic role in promoting the IPM concept and approach among the government officials and donors. This program provided IPM training to build up the training capacity of the Department of Agricultural Extension (DAE) and introduced Farmer Field Schools (FFS) for training of farmers. However, to ensure a significant and positive impact of IPM at the national level, still a large number of farmers need to be trained in IPM and furthermore, they should practice IPM in their fields on a continual basis (Anonymous, 2002). IPM practices are seen as the way forward to achieve sustainable agricultural production with less damage to the environment. It is commonly referred to as a diverse mix of approaches such as biological control, cultural control, genetical control, etc.to manage pest and keep them below the damaging levels. Biological control of pest may be defined as the eradication or suppression of insects or other noxious pests by using their natural enemies such as frogs, birds, etc. Hand picking, use of hand net, beating and hooking, use of light trap, burning, etc. Use of pest tolerant or resistant crop varieties (such as BRRI Dhan-31), use of healthy seeds and seedling, using optimum tillage and eradicating weeds timely, use of proper fertilizer in appropriate dose and timely irrigation, etc., use of attractant, use of repellant, use of insecticides, etc. Chemical control is used as a last treatment but priority is given to botanical and bio-pesticides. In this study, it was tried to ascertain the extent of use of some selected IPM practices by the farmers. The findings of the study may provide valuable guidelines for the researchers, planners, policy makers and other government as well as non-government organizations to ensure the expansion and co-ordination for a sustain-

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able IPM program in Bangladesh. In Bangladesh, chemical control has been the primary method of pest control in the past. Up to 1974, the government promoted the use of pesticides by supplying these free of cost to farmers (100% subsidy). The subsidy was reduced to 50% in 1974. The government withdrew subsidy completely in 1979 and the pesticide business was transferred to the private sector. However, to deal with emergency situations, the government should maintain a buffer stock of 15-20 mt of pesticides. After the withdrawal of subsidy, although the use of pesticide declined during early years, their use has been on the increase again reaching 14,340 mt of formulated products or 2,462 mt of active ingredients in 1999 costing over one billion Taka (টাকা) (1 US$= 81.6327 Taka as on dated 07.03.2012) in foreign exchange (Anonymous, 2002). However, the farmers have been using pesticides to increase cropping intensity as well as crop production. The use of pesticides has been increasing rapidly over the past two decades in Bangladesh. Although pesticides may provide temporary relief but excessive use of pesticides and the long term dependency on chemical pesticides lead to serious environmental and human health problem to both the growers and consumers of crops. Pesticides can easily dissolve with water and that is why it pollutes the soil surface water and also contaminates ground water through infiltration and percolation. Besides, rain water also mixes with pesticides which pollute pond/canal/other water bodies and damage natural resources such as fish, beneficial insects, micro-organisms, etc. Therefore, an alternative method is needed to achieve sustainable agricultural production with less damage to the environment. Hence, IPM practices are now being considered as the most appropriate one to control pest. In this context, a survey was conducted to know the level of adoption of IPM by the farmers in Bangladesh.

2. Materials and Methods

The study was conducted in two villages namely *Kuti* and *Lashiara* at *Kuti* union of Kasba upazila under Brahmanbaria district during 2008. It is situated in the mid-eastern side of the country. Simple random sampling method was used to select the villages of *Kuti* union under the study. Data were collected from a sample rather than whole population. An updated list of all the farmers of the selected two villages was prepared with the help of the Sub-assistant Agricultural Officer. The prepared list comprised of 500 farmers. Twenty percent of farmers were selected randomly and proportionately from each of the selected villages. Thus 100 farmers constituted the sample of the study. A reserve list of 10 farmers was also prepared randomly and proportionately from each of the selected village considering 1% of the sample size. The extent of use as well as adoption of IPM practices by the farmers was the main focus of the study. Age of a respondent was referred to the period of time in completed years from his birth to the time of interview, thus, it was measured in terms of years. Education was measured on the basis of the ability of the respondent to read and write or formal education (school/college/madrasa) received up to a certain standard. It was ascertained in terms of year of schooling. Family size of the farmers was measured by the total number of his family including himself, spouse, son, daughter and other dependent fully or partially on the respondent's income. Farm size was measured in terms of actual operating land of a respondent that is under his authority. The annual family income has been used to refer to the total earnings of the respondents and the members of his family both from agricultural and non-agricultural sources during a year. It was expressed in Taka. Organizational participation of the respondents was measured by using the extension media on the basis of his extent of contact with 14 selected media. Cosmopoliteness of respondent was measured on the basis of score obtained by him. Innovativeness of respondent was measured by computing an innovativeness score on the basis of his extent of use of 10 selected agricultural practices. Knowledge on IPM practices of a respondent was measured by asking him 20 questions related to various pest management practices. Adoption of IPM practices by the farmers was measured on the basis of their adoption of different kinds of IPM practices. According to the objectives of the study, an interview schedule was prepared for collection of actual and relevant information. Simple and direct questions as well as both open ended form and closed forms of questions were included in the interview schedule to ascertain the dependent and independent variables. It may be seen contrary to, or in accord with common sense. It may be correct or incorrect in any event, however, it leads to an empirical test. Hypothesis may be divided into two categories, namely research hypothesis and null hypothesis. For statistical testing of the research hypothesis, they were converted into null form. The null hypothesis was that there is no relationship between each of the 10 selected characteristics of the farmers and the adoption of IPM practices. The selected characteristics of the farmers were age, level of education, family size, farm size, annual family income, organizational participation, extension media contact, cosmopoliteness, innovativeness and knowledge on IPM practices. Collected data from the respondents were compiled, tabulated and analyzed in accordance with the objectives of the study. Various statistical measures such as number, frequency distribution, percentage, range, mean, standard deviation and rank order, etc. were used in describing the selected independent and dependent variables. Pearson's Product Moment Co-efficient of Correlation (r) test was computed in order to explore the relationship between

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selected characteristics of the farmers and the adoption of IPM practices. Throughout the study, 5% (0.05) level of significance was used to reject any null hypothesis. If the calculated value of *r* was equal to or greater than tabulated value at designated (5%) level of significance for the relevant degrees of freedom, then the null hypothesis was rejected and it was concluded that there was significant relationship exist between the concerned variables. On the other hand, when the calculated value of *r* was found to be smaller than the tabulated value at the designated (5%) level of significance for the relevant degrees of freedom, then the null hypothesis could not be rejected and hence, it was concluded that there was no relationship exist between the concerned variables.

3. Results and Discussion

3.1. Selected characteristics of the respondents

There are many interrelated and constituent attributes that characterize an individual and form an integral part in the development of his behavior and personality. Hence, it was hypothesized that adoption of IPM practices by the respondents would be different according to their various characteristics. The salient features of the selected characteristics of the respondent farmers have been presented in Table 1.

The age of the respondents ranged from 27 to 70 years with an average being 52.35 years and standard deviation of 9.69. This indicates that the study group was moderately heterogeneous in terms of age level. On the basis of their age, the respondents were classified into three categories as shown in Table 1. The family size of the respondents ranged from 3 to 12. The average family size being 6.37 and standard deviation of 2.17. The farm size of the respondents of the study area ranged from 0.30 to 2.72 ha with an average of 0.94 ha and a standard deviation was 0.45. The observed annual family income score of the respondents ranged from 60.00 to 580.00 (Taka 1,000=1) with an average 235.75 and standard deviation 125.35. The extension media contact score of the respondents ranged from 2 to 25 with an average of 7.58 and standard deviation 4.28. Cosmopoliteness score of the respondents ranged from 6 to 19. The average score of cosmopoliteness being 10.73 and standard deviation 2.85. Majority of the respondents (67%) were in the medium cosmopoliteness category. About one-fifth, i.e. 20% of them belonged to low cosmopoliteness category and 13% were in high cosmopoliteness category. The road transport facilities of the study area were moderately fine. They also have the electric facility. They communicate to another place by bicycle, motor cycle, rickshaw, van, etc. They also used boat in the rainy season. The innovativeness score of the respondents ranged from 6 to 24 with an average 14.41 and standard deviation 3.46. The knowledge on IPM score of the respondents ranged from 7 to 22 with an average being 12.69 and standard deviation 3.16.

Some of them used IPM practices frequently, occasionally and partially. Besides some practices they never used at all. In the study area, the farmers cultivate mainly rice in *Rabi* and *Kharif*-I season. They cultivate BRRI Dhan-28 and BRRI Dhan-29 which are popular in the study area. In the rainy season, they cultivate a crop named *Jainta* for fuel wood which is grown in low land. It was found that they used to water their crop field in time which ranked first followed by weed management ranked second (Table 2). They irrigated their field by deep tube well, power tiller pump, etc. They used pesticides and fertilizers as their requirement which ranked fifth. They cultivated pulse crop such as Mung bean, Black gram, Lentil, etc. They also cultivated vegetables such as potato, sweet potato to some extent. Although some of them opined that they used sweeping net and light trap for insect control but it was found partially and very little use.

Table 1: Salient features of the selected characteristics of the respondents

Sl.No	Characteristics	Measuring unit	Ranges		Mean	Standard deviation
			Possible scores	Observed scores		
1.	Age	Number of years	Unknown	27-70	52.35	9.69
2.	Level of education	Schooling (years)	Unknown	0-15	6.38	4.41
3.	Family size	Number of person	Unknown	3-12	6.37	2.17
4.	Farm size	in hectares	Unknown	0.30-2.72	0.94	0.45
5.	Annual family income	000' টাকা	Unknown	60-580	235.75	125.35
6.	Organizational participation	Scale score	Unknown	0-14	5.14	3.57
7.	Extension media contact	Scale score	0-42	2-25	7.58	4.28
8.	Cosmopoliteness	Scale score	0-21	6-19	10.73	2.85
9.	Innovativeness	Scale score	0-40	6-24	14.41	3.46
10.	Knowledge on IPM practices	Scale score	0-25	7-22	12.69	3.16

1 US$= 81.6327 Taka (টাকা) as on dated 07.03.2012

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Table 2: Comparison among the identified IPM practices used by the respondents

Sl. No.	IPM practices	Extent of use				IPUI	Rank order
		Frequently (%)	Occasionally (%)	Partially (%)	Not at all (%)		
1.	Water management	90	6	4	-	286	1
2.	Weed management	82	8	7	3	269	2
3.	Use of healthy and disease free seed	34	58	8	-	226	3
4.	Cultivation of resistant variety	42	46	5	7	223	4
5.	Use of pesticides	32	53	10	5	212	5
6.	Destroy the crop residues	40	30	24	6	204	6
7.	Use of power tiller/tractor	37	27	24	12	189	7
8.	Preparation of compost/green manure	14	32	46	8	152	8
9,	Collection and destroy of eggs and larvae	12	16	62	10	130	9
10.	Practice of crop rotation	6	23	27	44	91	10
11.	Use of sweeping net	-	-	18	82	18	11
12.	Use of light trap for insect control	-	-	12	88	12	12

3.2. Overall use of IPM by the respondents

Overall use of IPM by the respondents ranged from 14 to 26 with an average 19.38 and standard deviation 2.34. Majority (53%) of the respondents had medium use of IPM practices and 21% had high use of IPM practices whereas 22% had low use of IPM practices. The overwhelming proportion (74%) had medium to high use of IPM practices. However, whether it is low, medium or high, every respondent used different level of IPM practices. The adoption quotient could be ranged from 0 to 100, where 0 indicates no adoption and 100 indicates highest adoption. More the adoption quotient more the use of IPM practices.

3.3. Relationships between selected characteristics of the respondents and their use of IPM practices

Relationships between selected characteristics of the respondents with their extent of IPM use were explored. Pearson's Product Moment Co-efficient of Correlation (*r*) was used to test the null hypotheses in exploring the relationships between only two concerned variables. Five percent (0.05) level of probability was used as the basis for rejection of a null hypothesis. The summary of *r* is presented in Table 3.

This sub-section outlines the relationships of 10 selected characteristics of the respondents with their adoption of IPM practices. Out of 10 correlations, the relationships of six were found positively significant (age, education, farm size, organizational participation, cosmopoliteness and knowledge on IPM practices) and other relationships were found statistically non-significant.

Table 3: Coefficient of correlation (r) showing the relationships between the characteristics of the respondents and use of IPM practices

Selected characteristics of the respondents	Correlation coefficient (r) with use of IPM practices
1. Age	0.350^{**}
2. Level of education	0.475^{**}
3. Family size	0.066^{NS}
4. Farm size	0.213^{*}
5. Annual family income	0.14^{NS}
6. Organizational participation	0.252^{*}
7. Extension media contact	0.152^{NS}
8. Cosmopoliteness	0.250^{*}
9. Innovativeness	-0.063^{NS}
10. Knowledge on IPM	0.223^{*}
Table value at 5% level=±0.196	
Table value at 1% level=±0.253	
N=100, Degrees of freedom=98	

^{NS} =Non-significant; *Significant at 0.05 level of probability; Significant at 0.01 level of probability

4. Conclusion

Majority of the respondents were middle to old aged. The literacy rate among them was high and they also had medium to high knowledge on IPM practices. They became more cautious in using IPM practices in cultivation. Educated farmers had been using different IPM technologies and also guide their labor for using IPM practices. Although respondent farmers and their sons were involved in cultivation but they also engaged as day laborer in cultivation and work together. Findings

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of the study showed that family size of the respondents had no significant relationship with their use of IPM practices. Hence, it may not be important to put more attention to the family size of the farmers for using IPM practices. In the study area, farmers had small to medium size of farm and they also involved in other income generation activities. Therefore, a farmer of medium farm size took the risk of using a new technology rather than a farmer having small sized farm. So, there is a scope for conducting motivational programs in their fields through performing method demonstration and result demonstration. Maximum labor in the study area came from northern part of Bangladesh such as Kurigram, Nilphamari and Dhakurgaon.

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