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PRACTICES OF INTEGRATED PEST MANAGEMENT USE BY THE FARMERS

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ABSTRACT

The purpose of the study was to determine practices of IPM use by the farmers and to explore the relationship between the selected characteristics of the farmers and their use of IPM practices. The selected characteristics were: Age, Education, Family size, farm size, training received, annual family income, extension media contact and agricultural knowledge. The study was conducted in Birampur Upazila under Dinajpur district. Data were collected from randomly selected 108 farmers using an interview schedule. Pearson's product Moment Correlation was used for the statistical analysis. The findings revealed that majority (97.3 %) of the respondents had medium to high use of IPM practices. Only 2.7 percent of the respondents had low use of IPM practices. However, use of practice of IPM in crop production by the farmers had positive significant relationship with their education and contact with extension media exposure, while age of the respondents had significant negative relationships with their practices. Among the five selected IPM practices, the farmers were found having good extent of use of IPM practices. Among the 5 identified IPM practices "chemical control" ranked first and 2nd, 3rd, 4th and 5th position in the rank order were "control by cultivation", "cultivation of pest resistant variety", "mechanical control" and "biological control" respectively.

Key Words: Integrated pest management, cheimcal control, pest resistant variety, mechanical cortrol, biological control

INTRODUCTION

Different pesticides are used in agricultural field. It has been observed in various countries of the world in addition to beneficial effects; the improved agricultural practices have tremendous influence on environmental pollution. Bangladesh is not exception to this (Sattar, 1994).

In Bangladesh Farmers control pests mainly by chemical method using various chemicals. At present different kinds of pesticides with 211 trade names have been registered in Bangladesh. Although pesticides provide temporary release from pest-outbreak in the crop field indiscriminate use of pesticides not only creates serious environmental and human health problems but also help to development of pest resistance to insecticides, destroys beneficial insects and imbalance the natural position between the pests and their natural enemies leading to the increase in the population of the target pests and even creates new pest problems. To avoid those consequences and to increase the crop production at the same time, a viable alternative is needed to pest management. Integrated Pest Management (IPM) is the best alternative strategy for Pest Management (Anonymous, 2003).

For sustainable agriculture one must minimize the environmental degradation consideration in agricultural production. Integrated Pest Management is the vast use practices for controlling the pest in economic and environmentally sound and unhazardous way. Department of Agricultural Extension (DAE) has introduced IPM concept and is implementing this farmers' field in a systematic way through "Farmers Field School". By this method farmers are trained not to use the chemicals unless it is essentially needed. It motivates the farmers to use all the economically feasible, socially acceptable and environmentally suitable pest control methods.

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Integrated Pest Management (IPM) is a broad ecological approach to pest control using various pest control method 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 the most important practice with minimum of ecological disruption. Therefore, this study was undertaken to accomplish the following objectives:

1. To determine practices of IPM by the farmers in crop production.
2. To determine and describe some selected characteristics of farmers, and
3. To explore the relationship between the selected characteristics and the extent of use of practices of IPM by the farmers.

METHODOLOGY

The study was conducted in Birampur Upazila under Dinajpur district. A significant number of people of this upazila were IPM farmers. 108 farmers were selected from 225 of IPM trained farmers by using a table of Random Numbers. An interview schedule was used for collecting related, valid and reliable information from the selected respondents. Data were collected during 15 September to 15 October 2005. After collection of field information they were compiled, tabulated and analyzed and categorized appropriately. practices of IPM use by the farmers was considered as dependent variable and Age, Education, Family size, farm size, training received, annual family income, extension media contact and agricultural knowledge were considered as independent variables of the study which were measured appropriately. Age was measured by the period of time of the respondents from his birth to the time of interview. Education was measured by actual years of formal schooling received from the educational institute. Family size of the respondents measured by the total members of the family including the respondents himself, children and other dependents those used to live, eat and act together in a family unit. Farm size of the respondent measured by the total area of land on which his family carried out farming operation. It is measured in hectares for each respondent by using the following formula:

$FS = A_1+A_2+1/2\ (A_3+A_4) + A_5$,Where FS = Farm size, A_1 = Homestead area, A_2 = Own land under own cultivation, A_3 = Own land given to others on borga, A_4 = Others land taken on borga, and A_5 = Others (if any). Training received is measured by the total number of days that a respondent has undertaken agricultural training in his entire life from different organizations. Annual income measured by the total earnings from agriculture and non agriculture sources (business, services, daily labour etc.) during a particular year. The extension media contact of a respondent was measured by the total scores of extension media contact on the basis of his nature of contact with 16 selected extension media. The extent of contact was determined against a four point scale as 'not at all', 'Rarely', 'Occasionally' and frequently and the score was assigned as 0, 1, 2 and 3 respectively and finally all the score of a respondent was added together. Agricultural knowledge of a respondent was measured by asking 20 selected questions related to various components of agriculture, e.g. plants, soil, past, pesticides, fertilizers, etc. The total assigned score of all the questions was 40. A full score was assigned for each correct answer and partial score was assigned for each partial correct answer and 0 for the wrong answer.

Practices of IPM use by the farmers (dependent variable) were measured on the basis of their use of different kinds of elements of IPM practices. The practice scores of the respondents were computed on the basis of the respondents' use of five (5) elements of IPM practices. A four point rating scale namely frequently, occasionally, rarely and not at all was used which were assigned scores 3,2,1,0 respectively.

An effort was also made to compare the relative use of IPM practices. An IPM Practice Use Index (IPUI) was developed to fulfill this objectives using the following formula:

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

Where,

IPUI = IPM Practice Use Index

N_1 = Number of farmers used IPM practices frequently

N_2 = Number of farmers used IPM practices occasionally

N_3 = Number of farmers used IPM practices rarely

N_4 = Number of farmers not at all used IPM practices

The collected data were coded in numerical numbers, compiled, tabulated and analyzed keeping the objectives of study in mind. To categorizing and explaining the selected personal characteristics of the respondents some statistical measures such as range, mean, percentage, and standard deviation were used. To explore the relationship between the selected personal characteristics of the respondents with their practices of IPM in crop production Pearson's Product Moment correlation coefficients were used.

RESULTS AND DISCUSSION

Selected Characteristic of the Farmers

The findings of the study on the selected characteristics are shown in Table 1.

Table 1. Salient feature of the farmers' selected characteristics

Sl. No	Selected characteristics	Scoring system	Range		Categories	Farmers (n = 108)		Mean	Standard deviation (SD)
			Possible	Observed		No.	%		
1.	Age	Actual years	-	17-65	Young (upto 35)	51	47.2	38.21	10.51
					Middle (36-50)	47	43.5		
					Old (>50)	10	9.3		
2.	Education	Years of schooling	-	0-16	Illiterate (0)	5	4.6	6.61	3.96
					Can sign only (0.5)	17	15.7		
					Primary (1-5)	21	19.5		
					Secondary (6-10)	54	50.00		
					Above secondary (>10)	11	10.2		
3.	Family size	No. of members	-	2-17	Small (up to 4)	58	53.7	4.80	2.06
					Medium (5-6)	37	34.3		
					Large (>6)	13	12.0		
4.	Farm size	Hectares	-	.02-4.87	Marginal (0.03-0.2)	21	19.44	0.8797	0.9096
					Small (0.21-1.0)	56	51.85		
					Medium (1.01-3.0)	28	25.93		
					Large (>3.0)	3	2.78		
5.	Training received	Days	-	14-107	Short (up to 35)	104	96.3	18.65	17.35
					Medium (36-90)	0	0		
					Long (>90)	4	3.7		
6.	Annual family income	In Tk. 1,000	-	17.96-228.0	Low (up to 60)	77	71.3	54.59	47.31
					Medium (60.01-100)	16	14.8		
					High (>100)	15	13.9		
7.	Extension media exposure	Scale score	0-48	0-37	Low (up to 16)	11	10.2	25.20	6.55
					Medium (17 -32)	82	75.9		
					High (>32)	15	13.9		
8.	Agricultural knowledge	Scale score	0-40	24-38	Low (up to 20)	0	0	32.25	2.72
					Medium (21-30)	26	24.1		
					High (>30)	82	75.9		
9.	Practices of IPM	Scale score	0-15	0-13	Low (up to 5)	3	2.7	9.40	2.00
					Medium (6-10)	72	66.7		
					High (>10)	33	30.6		

Age

Age of the Farmers was observed to range from 17 to 65 years. The average age was 38.21 years with the standard deviation 10.51. Based on their age, the farmers were classified into three categories as presented in Table 1.

Data furnished in Table 1 indicate that the highest proportion (47.2 %) of the respondents fell in young age, while 43.5 and 9.3 percent belonged to middle and old age categories respectively. However, data also revealed that 90.7 percent of the respondents in the study area were young to middle aged.

Young people are generally receptive to new ideas and things. However, they might have significant opinion in regard to use of IPM practices.

Education

Education scores of the farmers ranged from 0 to 16. The average score was 6.61 and standard deviation 3.96. Based on their score, the farmers were classified into five categories as shown in Table 1.

The data from Table 1 mentioned that large proportion (50 %) of the farmers fell under the category of "secondary education" while 4.6 percent under illiterate, 15.7 percent can sign only, 19.5 percent in primary education and 10.2 percent under above secondary education category. Education improves mental and psychological ability of a person to understand, decide and adopt new practices and ideas. It also helps to increase their observation power and decision making ability. Education helps to change their attitude and expand their horizon of knowledge. So, it is expected that education is one of the important factors in determining farmers' knowledge and practices in using IPM in crop production. Bashar (1993) and Ali (1993) also found the similar results in their studies.

Family Size

The family size of the randomly selected respondents ranged from 2 to 17 in numbers with an averages of 4.80 and standard deviation 2.06. On the basis of their family size, the respondents were classified into three categories as shown in Table 1.

Data shown in Table 1 reveal that majority (53.7 %) of the respondents fell under the small family category compared to 34.3 percent and 12.0 percent having medium and large family category respectively. The data indicate that the average family size (4.80) of the respondents in the study area was lower than the national average of 5.6 (BBS, 1998). The findings also mentioned that above three-fourth percent of the respondents had medium and small family size. Hossain (2001) also found the similar findings in his study.

Farm Size

The farm size of the farmers in the study area varied from 0.02 to 4.87 hectares (ha). The average farm size was 0.879 ha with the standard deviation 0.909. This farm size average were slightly higher than the national average of 0.86 hectare (BBS, 2002). According to their farm size, the respondents were classified into four categories as shown in Table 1.

The Table 1 indicates that the highest proportion (51.85 %) of the respondents belonged to small farm size while 19.44 percent, 25.93 percent and 2.78 percent having marginal, medium and large farm size respectively. The findings mention that very small amount (28.71 %) of the respondents under the study area had medium to large farm size.

Training Received

Training received score of the respondents was found to vary from 14 to 107 days with an average of 18.65 and standard deviation 17.35. The farmers on the basis of their training received scores were classified into three categories as shown in Table 1.

The Table 1 indicate that the highest proportion (96.3 %) of the respondents belonged to short training compared to 0 and 3.7 percent having medium and long training respectively. Each of the respondents was the IPM trained farmer. Training increases knowledge, skill of the farmers in a specific subject area. Respondents those who are high training received are more competent in different farming activities. Thus, training received can be considered as important factors in increasing farmers knowledge and practices in using IPM in crop production. Khan (2002) and Ali (2002) also reported similar types of findings in their studies.

Annual Family Income

Annual family income score of the respondents ranged from 17.96 to 228.0 with an average of 54.59 and standard deviation 47.31. On the basis of the annual income, the respondents were classified into three categories as shown in Table 1.

Data presented in Table 1 indicate that the highest proportion (96.3 %) of the respondents had low annual income, with 14.8 percent had medium income and 13.9 percent had high income. As a result, most (86.1 %) of the respondents in the study area were low to medium income earners.

Extension Media Exposure

Contact with extension media of the respondents ranged from 0 to 37 against the possible range of 0 to 48. The average contact with extension media score was 25.20 with the standard deviation 6.55. On the basis of their scores, the respondents were classified into three categories as shown in Table 1.

Data shown in Table 1 indicate that the overwhelming (75.9) percent of the respondents had medium contact with extension media while 10.2 percent had low and 13.9 percent high contact with extension media.

The findings of the study revealed that most (89.8 %) of the respondents had medium and high contact with extension media for getting necessary information. Hossain (2003) and Bashar (1993) reported almost the similar findings in their studies. Extension contact is a effective source of receiving information about recent and improved technologies. This is an important characteristic than others.

Agricultural Knowledge

The observed agricultural knowledge score of the respondents ranged from 24 to 38 against possible range 0 to 40. The mean score was 32.25 with the standard deviation 2.72. Based on the agricultural knowledge score, the respondents were classified into three categories as shown in Table1.

Data presented in Table 1 reveal that the highest proportion (75.9 %) of the respondents had high agricultural knowledge while 0 percent low and 24.1 percent having medium agricultural knowledge. The study also reveals that all the respondents (100 %) were in medium to high agricultural knowledge categories. It reveals that agricultural knowledge level of the study area is very good. As the farmers were selected from IPM trained farmers they are comparatively more conscious than the other farmers.

Practices of IPM in Crop Production

Observed use of practices of IPM in crop production scores of the respondents ranged from 0 to 13 against the possible range of 0 to 15. The average and standard deviation were 9.40 and 2.0 respectively. Based on the observed scores, the respondents were classified into three categories as shown in Table 1

Data presented in Table 1 reveal that the highest proportion (66.7 %) of the respondents fell under medium users' category while 2.7 percent in low users and 30.6 percent high users' category.

Findings also indicate that majority (97.3 %) of the respondents had medium to high practices of IPM use in crop production. Similar kinds of results were also found in Hossain (2003), Islam (1996) and Bashar (1993) in their respective studies.

Comparison Among the Extent of Use of Selected IPM Practices

In order to compare among the selected IPM practices regarding their extent of use a IPM practice Use Index (IPUI) was developed. The IPUIs along with their associated ranks appear in Table 2.

Table 2. Comparison among different identified IPM practices used by the farmers

Sl. No.	Technologies	Citation (N = 108)					
		F	O	R	N	IPUI	Rank
1.	Chemical control	90	15	2	1	302	1
2.	Control by cultivation	56	42	9	1	261	2
3.	Cultivation of pest resistant variety	50	40	16	2	246	3
4.	Mechanical control	11	47	46	4	173	4
5.	Biological control	0	2	31	75	35	5

Note:

F = Frequently, O = Occasionally, R = Rarely, N = Not at all, IPUI = IPM practices use index Among the 5 identified IPM practices elements "chemical control" ranked first and meaning highest extent of use by the farmers in this study in their crop production. The 2nd, 3rd, 4th and 5th position in the rank order were "control by cultivation", "cultivation of pest resistant variety", "mechanical control" and "biological control".

It is noted that among the five practices elements, chemical control was the first position in the ranking Table. Because the farmers want to get immediate and recognized benefits from their practices.

Relationship between the Selected Characteristics of the Farmers and their Practices of IPM in Crop Production

Age and Practices of IPM

The computed correlation coefficient was found to be -0.211 which reflected the following observations:

> 'Firstly, the relationship showed negative trend, secondly, the strength of relationship between variable was low and thirdly, the value of r (-0.211) with 106 degrees of freedom was significant at 5 percent level of probability'.

Hence, it can be concluded that age of the farmers had a negative significant relationship with their practices of IPM in crop production. This implies that if age increases use of IPM decreases. Because young are more interested about the new concept than the old. Young are more likely to adopt any new innovation as well as take risk. Hence, diffusion of the IPM technology in the rural community is dependant on respondents' age.

Education and Practices of IPM

The coefficient correlation was found to be 0.306 (Table 3), which reflected the following observations:

> 'Firstly, the relationship showed positive trend, secondly, the strength of relationship between variable was low and thirdly, the value of r (0.306) with 106 degrees of freedom was significant even at 1 percent level of probability:

Table 3. Correlation co-efficient showing the relationship between the selected characteristics (independent variables) of the farmers and using IPM practices in crop production

Sl. No.	Selected characteristics (Independent variables)	Correlation co-efficient (r) (knowledge on IPM)
1.	Age	-0.211*
2.	Education	0.306*
3.	Family size	0.044^{NS}
4.	Farm size	0.155^{NS}
5.	Training received	0.160^{NS}
6.	Annual family income	0.161^{NS}
7.	Extension media exposure	0.374***
8.	Agricultural knowledge	0.091^{NS}

NS = Not significant
* = Significant at 0.05 level
** = Significant at 0.01 level
*** = Significant at 0.001 level

Tabulated value of 0.05 level = 0.189
Tabulated value of 0.01 level = 0.247
Tabulated value of 0.001 level = 0.313
d.f = 106

hence, it can be concluded that education of the farmers had a positive and significant relationship with their practices of IPM in crop production. This mentioned that more education of the farmers led them to form favourable attitude towards IPM practices in crop production.

Family Size and Practices of IPM

The computed correlation coefficient was found to be 0.044 (Table 3), reflected the following findings:

> 'Firstly, the relationship showed positive trend, secondly, the strength of relationship between the variables was very low and thirdly, the value of r (0.044) with 106 degrees of freedom was not significant even at 5 percent level of probability:

Hence, it can be concluded that family size of the respondents had no significant relationship with their use of practices of IPM in crop production. This indicated that family size of the respondents in this study not important factor in using IPM in crop production.

Farm Size and Practices of IPM

The computed correlation coefficient was found to be 0.155 (Table 3), which led to the following observations:

> 'Firstly, the relationship showed positive trend, secondly, the strength of relationship between the variables was very low and thirdly, the value of r (0.155) with 106 degrees of freedom was not significant even at 5 percent level of probability'.

hence it can be concluded that farm size had no significant relationship with the practices of respondents in using IPM in crop production.

Training Received and Practices of IPM

The computed correlation coefficient was found to be 0.160 (Table 3), which reflects the following findings:

'Firstly, the relationship showed positive trend, secondly, the strength of relationship between the variables was very low and thirdly, the value of r (0.160) with 106 degrees of freedom was not significant even at 5 percent level of probability'.

Hence it can be concluded that training received had no significant relationship with respondents use of practices of IPM in crop production. This implies that most of the respondents get same training at similar duration and there was not a big variation among the respondents.

Annual Family Income and Practices of IPM

The result was found to be 0.161 (Table 3), which led to the following observations:

'Firstly, the relationship showed positive trend, secondly, the strength of relationship between the variables was very low and thirdly, the value of r (0.161) with 106 degrees of freedom was not significant even at 5 percent level of probability'.

Hence, it concluded that annual family income had no significant relationship with their use of practices of IPM in crop production. This revealed that annual family income of farmers did not hamper the use of IPM practices in crop production.

Extension Media Exposure and Practices of IPM

The computed correlation coefficient was found to be 0.374 (Table 3), which reflects the following findings:

'Firstly, the relationship showed positive trend, secondly, the strength of relationship between the variables was low and thirdly, the value of r (0.374) with 106 degrees of freedom was significant even at 1 percent level of probability'.

Hence, it can be concluded that contact with extension media of the respondents had a significant and positive relationship with their use of practices of IPM in crop production. This revealed that the farmers' high contact with extension media received more information on IPM affairs which strengthened of their knowledge, changed their attitude favorably towards IPM and finally in using IPM practices in crop production.

Agricultural Knowledge and Practices of IPM

The computed correlation coefficient was found to be 0.091 (Table 3), which reflects to the following observations:

'Firstly, the relationship showed positive trend, secondly, the strength of relationship between the variables was very low, and thirdly, the value of r (0.091) with 106 degrees of freedom was not significant even at 5 percent level of probability'

Hence, it can be concluded that agricultural knowledge of the farmers had no significant relationship with their use of practices of IPM in crop production.

The findings revealed that majority (97.3 %) of the respondents had medium to high practices of IPM use in crop production. Only 2.7 percent of the respondents had low practices. However, use of practice of IPM in crop production by the farmers had positive significant relationship with their education and contact with extension media exposure, while age of the respondents had significant negative relationships with their practices. Therefore, it may be concluded that extension media exposure increases farmer's knowledge and favorable attitude towards the practices of IPM use in crop production which help the farmers to reduce indiscriminate use of chemicals.

The findings reveal that family size, farm size, annual family income, training received by the farmers and agricultural knowledge of respondents had no significant relationships with their practices of IPM uses in crop production. In view of this fact it may be concluded that extension program should be taken by giving same priority of all categories of farmers irrespective of family size and farm size, annual income, training received and agricultural knowledge to increase IPM practices among the farmers.

Among the five selected IPM practices, the farmers were found having good extent of use of IPM practices for a number of practices. Again practices do not exert immediate benefits and somewhat complex in nature were found relatively less popular. So, it may be concluded that appropriate motivational campaign is necessary for making farmers understand benefits of use of all IPM practices.

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