Reprint **ISSN 1923-7766 (Web Version)**

International Journal of Experimental Agriculture

(Int. J. Expt. Agric.)

Volume: 3 **Issue: 1** **March 2013**

Int. J. Expt. Agric. *3(1):32-37(March 2013)*

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http://ggfagro.com/ejournals/current issues

ijea** issn 1923-7766, HQ:19-10 cantral place, saskatoon, saskatchewan, s7n 2s2, Canada

ISSN-1923-7766 (Online)
Int. J. Expt. Agric. 3(1):32-37(March 2013)

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Accepted for publication on 20 February 2013

ABSTARCT

Haider ML, Roy AK, Alam MZ, Uddin MS, Hassan AWR (2013) Socio-economic and demographic profile of farmers' and their adoption of environment friendly Integrated Pest Management (IPM) practices in rice production. *Int. J. Expt. Agric.* 3(1), 32-37.

The purpose of the study was to determine the adoption of environmental friendly agricultural practices by the farmers' through Integrated Pest Management (IPM). Farm family heads of the selected 15 Farmers' Field School (FFS) of 6 Upazillas from 3 districts Rajshahi division of Bangladesh constitute the population of the study. Out of 25 members of each FFS, 10 members were randomly selected for interview. A total of 150 respondents were finally selected which constituted the sample of the study. Interview schedule was used for data collection. Selected 12 characteristics of the respondents were considered the independent variables. Adoption of environment friendly agricultural practices through IPM was the dependent variable of the study which was measured by present situation of the investigation only. The findings revealed that most (80%) of the respondent were medium adopters and only 13% of them were high adopters. Among the five environments friendly agricultural practices, adoption of use of tolerant variety and judicial use of chemicals were ranked first and second, respectively. However, adoption of use of biological agents was ranged fifth. Respondents' education, farm size, annual income, knowledge on IPM and attitude towards IPM showed positive significant relationship and farming experience showed negative significant relationship with their adoption of environment friendly agricultural practices.

Key words: *environment, adoption, agricultural practice, integrated pest management, farmer's field school*

INTRODUCTION

Integrated Pest Management (IPM), an ecologically-based approach has played a vital role for fostering production in a sustainable way by embracing natural practices and seeking friendly coexistence with the environment and wildlife. IPM has no standard definition, but comprises approaches that range from carefully-targeted used of chemical pesticides to biological techniques that use natural parasitoids and predators to control pests (Sorby *et al.* 2003). It is a suitable tool of managing pests effectively and safely leading to sustainable agriculture. Besides, IPM has the potential to integrate various eco-friendly techniques of producing healthy crops by minimizing pesticide use, conservation of bio-diversity, augmentation of biological control agents and use of pest tolerant crop varieties, thereby increasing cost-effectiveness (UNESCAP 2002). For sustainable agriculture it is essential to minimize the environmental degradation during agricultural production. Integrated Pest Management includes all elements contributing to an effective, safe, sustainable, economically and environmentally sound crop protection system. The IPM approach follows a learning cycle in which farmers systematically observe a situation, critically analyze their observation and then plan to take appropriate action. According to an estimate, annual yield loss due to insect pest alone for rice is 18 percent (Anon. 2002). Most of the farmers of Bangladesh manage these pests mainly by using chemicals. They use pesticides injudiciously, which is the cause for environmental hazards. The IPM technique may protect these environmental hazards. Department of Agricultural Extension (DAE) and some other organizations have been conducting IPM training through Farmer's Field School (FFS) on rice.

The mechanism of FFS is a non-formal type of education. The goal of IPM training through FFS is to change farmer's traditional knowledge, attitude and adoption of modern agricultural practices. Farmer's Field School focused on increase of yield and income and reduction pesticide cost and application. Keeping all these things in consideration the present study was, therefore, undertaken.

METHODOLOGY

The research was conducted by taking great care for using appropriate methods in all aspects of investigation. The research design of the study was a descriptive survey research. Among the eight districts under Rajshahi region three districts *viz:* Rajshahi, Natore and Pabna were purposively selected as because rice is widely grown in these districts. Finally, six Upazillas two from each district were randomly selected. Farmers Field Schools those had been established in Boro season 2010 in the six selected Upazillas were taken purposively. The total number of such FFSs was 21. Fifteen FFSs out of these 21 were selected randomly. All members of these 15 FFSs under six selected Upazillas were the population of the study. However, representative sample from the population were taken for collection of data through simple random sampling method. A list of 375 FFS

members was collected from six Upazilla Agriculture Officer. One hundred and fifty farmers (FFS Farmers) were then selected using random sampling technique taking 10 farmers from each FFS. Dates were collected using a structured interview schedule and the entire process of data collection took 45 days.

Measurement of variables

Two types of variables were used in this study such as independent and dependent variable. The independent variables (Socio-economic characteristics) of this study were Age, Education, Family size, Farm size, Annual income, Annual expenditure, Training experience, Farming experience, Organizational participation, Knowledge on IPM, Attitude toward IPM and Aspiration.

The dependent variable was "adoption of environment friendly agricultural practices i.e, IPM practices by the farmers". It was measured by computing a composite IPM adoption score which was obtained by adding 1) tolerant varieties use score 2) cultural practices use score 3) mechanical measures use score 4) biological agent use score and 5) judicial use of chemicals score. These scores were based on two dimensions such as (a) simple land use sub-score and (b) proportional land use sub-score as proposed by Hamidi *et al.* (2004).

Statistical Analysis

Descriptive statistics such as frequency, percentage distribution, index, rank-order, range, mean and standard deviation were estimated to describe the social-economic and demographic profiles of the respondents and their adoption of environment friendly agricultural practices. Relationship between dependent and independent variables was estimated through computing ‘r’ values.

RESULTS AND DISCUSSION

Socio-economic and demographic profile

The age of the respondents ranged from 18 to 70 years with an average of 38.63 years. The highest proportion (46.2%) of the respondents were in young aged group followed by middle (42.4%) and old (11.3%) majority (43%) of the respondents had secondary level education followed by higher secondary level education 25%. Among the respondents 19% were primary level, 6% could sign only and 7% were illiterate (Table 1) family size of the respondents ranged from 2 to 10 with an average of 5.36. Distribution of the respondents according to their family size indicates that the highest (49.3%) proportion of them falls under medium family category which was nearly followed by small family category (34.7%).

The highest proportion (56%) of the respondents had medium farm size followed by small (27.3%) and large (16.7%) farm size respectively. The highest proportion (56%) of the respondents had medium annual income. while 37.3% high and only a few (6.7%) had low annual income. Data in the Table 1 revealed that majority (62.7%) of the respondents had medium annual expenditure, while 30% had high and only 7.3% had low annual expenditure. The findings indicate that the majority (92.7%) of the respondents had medium to high annual expenditure.

The training experience score of the respondents was found to vary from 2 to 8 days with an average of 5.53 days. The highest proportion (70.0%) of the respondents belonged to medium training experience compared to 16.7% and 13.3% having high and low training experience respectively. Farming experience scores ranged from 4 years to 20 years, mean being 7.86 years. The majority (62.7%) of the respondents had medium farming experience followed by low farming experience (26%) and only (11.3%) of the respondents had high farming experience. The observed organizational participation score of the respondents ranged from 8 to 16 years. The average was 11.28 years. The highest proportion (62%) of the respondents had medium participation as compared to 30% and 8% having low and high organizational participation respectively. The data indicated that most (70%) of the respondents in the study areas had high to medium organizational participation that might be helpful to implement IPM activities. Knowledge on IPM score of the respondents ranged from 34.0 to 76.0. More than half (52.3%) of the respondents had high knowledge on IPM compared to about one third of them (32.0%) having medium Knowledge and only a few (15.7%) having low knowledge. The mean knowledge score of the respondents on IPM was 56.60.

The major portion (56.7%) of the respondent had moderately favorable attitude followed by slightly favorable (25.3%) and highly favorable (18%) attitude towards IPM. The highest proportion (43.3%) of the respondents had medium level of aspiration followed by low aspiration (32%) and high aspiration (24.7%) that indicated about two-third (68%) of the respondents had medium to high aspiration.

Table 1. Distribution of the farmers according to their Socio-economic and demographic profile

Variables	Unit	Categories	Respondents (N=150)		Mean	Standard deviation
			Number	Percentage		
Age	Year	Young (<35)	68	46.2	38.63	10.70
		Middle aged (35-50)	65	42.5		
		Old (>50)	17	11.3		
Education	Years of schooling	Illiterate (0)	11	7.0	8.0	4.09
		Can sign only (<0.5)	9	6.0		
		Primary level (1-5)	29	19.0		
		Secondary level (6-10)	64	43.0		
		Above secondary level (>10)	37	25.0		
Family Size	Number	Small family (≥ 4)	58	38.7	5.36	1.82
		Medium family (5-7)	74	49.3		
		Large family (>8)	18	12.0		
Farm size	Hectare	Small farm (≤ 0.33)	41	27.3	0.79	038
		Medium farm (0.34-1.00)	84	56.0		
		Large farm (> 1.00)	25	16.7		
Annual Income	'000' Taka	Low income (<50)	10	6.7	10.49	3.59
		Medium income (50-100)	84	56.0		
		High expenditure (>100)	56	37.0		
Annual Expenditure	'000' Taka	Low expenditure (<50)	11	7.30	9.39	3.34
		Medium expenditure (50-100)	94	62.7		
		High income (>100)	45	30.0		
Training Experience	Day	low training experience (<4)	20	13.3	5.53	1.13
		Medium training experience (4-6)	105	70.0		
		High training experience (>6)	25	16.7		
Farming Experience	Year	Low farming experience (<10)	39	26	7.86	2.94
		Medium farming experience (10-15)	94	62.7		
		High participation (>15)	17	11.3		
Organizational Participation	Year	Low farming experience (<10)	44	30.0	7.86	2.94
		Medium farming experience (10-15)	93	62.0		
		High participation (>15)	13	8.0		
Knowledge on IPM	Score	Low knowledge on IPM (<40)	21	15.7	56.60	12.89
		Medium knowledge on IPM (40-50)	48	32.0		
		High knowledge on IPM (>50)	81	52.3		
Attitude towards IPM	Scores	Slightly favorable (<40)	38	25.3	44.55	5.19
		Moderately favorable (40-50)	85	56.7		
		Highly favorable (>50)	27	18.0		
Aspiration	Scores	Low aspiration (<20)	48	32.0	20.92	1.96
		Medium aspiration (20-22)	65	43.3		
		High aspiration (>22)	37	24.7		

Adoption of IPM practices

The decision to adopt IPM practices of rice production was made by the Individual farmer. Hence, this study deals with individual adoption. The computed adoption score of different IPM practices in boro rice cultivation ranged from zero (0) to 40. The respondents were classified into three categories on the basis of their adoption scores (Table 2).

Use of Tolerant Varieties

The tolerant varieties use was measured in order to measure the extent of adoption of modern tolerant varieties of boro rice for composite adoption of IPM practices. Among the varieties cultivate in the study area, BRRIdhan28 was moderately tolerant to blast and leaf bight disease, BRRIdhan29 was moderately tolerant to sheath blight, BRRIdhan33 was tolerant to white backed plant hopper, however, moderately tolerant to blast disease and BRRIdhan39 was tolerant to tungro disease. Findings revealed that more than half (60%) of the respondents had medium adoption compared to 27 percent having high adoption and 13 percent having low adoption of tolerant varieties of rice. It is evident that the overwhelming majority (87%) of the respondent had medium to high adoption of tolerant varieties.

Table 2. Distribution of the respondents according to their adoption of different IPM practices

Variables	Categories (Scores)	Respondents (N=150)		Adoption Indices (AI)	Rand order
		Number	Percentage		
Tolerant Verities	Low adoption (1-13)	20	13	76.8	1
	Medium adoption (14-26)	90	60		
	High adoption (27-40)	40	27		
Cultural Practices	Low adoption (1-13)	25	16.5	52.2	3
	Medium adoption (14-26)	75	50.0		
	High adoption (27-40)	50	33.0		
Mechanical Measures	Low adoption (1-13)	110	73.3	44.2	4
	Medium adoption (14-26)	40	26.6		
	High adoption (27-40)	0	0		
Biological Agents	Low adoption (1-13)	115	76.6	39.6	5
	Medium adoption (14-26)	30	20.0		
	High adoption (27-40)	5	3.33		
Judicial Use of Chemicals	Low adoption (1-13)	20	13.3	76.2	2
	Medium adoption (14-26)	60	40.0		
	High adoption (27-40)	70	46.6		

Use of Cultural Practices

The scores of five different cultural practices i.e., transplanting healthy seedlings, use of balanced fertilizer, following appropriate method of weeding, appropriate water management and synchronized crop production were used to measure the extent of adoption of cultural practices. Findings of the study showed that the majority (50.0%) of the respondents had medium adoption followed by high adoption (33%) and low adoption (16.5%). All the respondents adopted at least one cultural practice.

Use of Mechanical Measures

Five different practices i.e., collection of insects by sweeping net, perching, using light trap, cutting the top of infected leaves and collection of egg mass by hand were used to compute the extent of adoption of mechanical measures. The majority (73.3%) of the respondents had low adoption, compared to medium adoption (26.6%) and none of them having high adoption of mechanical measures (Table 2).

Use of Biological Agents

The majority (76.6%) of the respondents had low adoption compared to 20.0% had medium adoption and only 3.3% had high adoption of biological agents.

Judicial use of chemicals

The judicial use of chemicals score was computed to measure the adoption of chemical methods in rice cultivation by the farmers. It was indicated that the majority (46.6%) of the respondents had high adoption compared to medium adoption 40.0% and only 13.3 of the respondents had low adoption of judicial use of chemicals.

Comparative adoption of IPM practices

For having a clear understanding about the extent of adoption of technologic Adoption Index (AI) was computed for each of the five component technologies as proposed by Hamidi *et al*. (2004). The possible AI of a technology could range from zero (0) to 100, while zero indicated no adoption and 100 indicated the maximum adoption. Five IPM component technologies have been arranged in rank order in the Table 2 on the basis of the adoption indices (AI) in a view to have an understanding of the comparative adoption of five components. Among the five IPM component technologies use of tolerant varieties ranked 1st with AI score 76.80 followed by judicial use of chemicals which ranked 2nd with AI 76.20. The use of cultural practices and use of mechanical measures were ranked 3rd and 4th with AI score 52.20 and 44.2 respectively. The lowest (39.60) AI was for the use of biological agents which ranked 5th among the five IPM components.

Composite adoption of IPM practices

In order to determine total technology adoption behavior of the farmers and to explore its relationship with the selected characteristics of the respondents, composite adoption of all five technologies of each of the five IPM components was taken into consideration. A composite IPM adoption score was determined for each of the respondent by his all average adoption scores obtained from all of the five IPM component technologies. The composite adoption score ranged from 0 (zero) to 150. The respondents were classified into three categories according to their composite adoption scores as shown in Table 3. Data indicated that most (80%) of the

respondent were medium adopters and 13% of them were high adopters. however, a few (7%) of them were low adopters.

Table 3. Distribution of the farmers according to their composite adoption score of IPM practices

Composite adoption level	Respondents		Mean	Standard deviation
	Number	Percent		
Low adoption (0-5)	10	7	72.38	20.15
Medium adoption (46-95)	120	80		
High adoption (96-150)	20	13		
Total	150	100		

Relationship between independent and dependent variables

Education, farm size, annual income, knowledge on IPM and attitude towards IPM had positive significant relationship with adoption of IPM practices (Table 4). Education broadens mental horizon and also incase adjustment ability of the individuals, adoption a technology by testing with their higher ability and try to make the best use of the technology. In case of using IPM practices it is also applicable. The farmer who has Large farms has the opportunity of pilot testing their big areas for any innovation with minimum risk and who has more income does not face credit and other input shortage. Especially, the respondents who remained proper knowledge of IPM practices. It was easy for them to adopt it more early than there respondents. On the other hand, attitude referred to the extent of knowledge, believe and action towards. The farmers having positive attitude towards IPM helped them to acquire proper knowledge on IPM to adopt it. Regarding education, farm size and knowledge on agriculture, similar relationship was also reported by Pandit (2007) with farmers' preference of farm broadcasting programmed. In contrary, respondents' farming experience showed negative significant relationship with the adoption of IPM practices. It might be due to that the farmers who had more farming experience were in old aged, backdated, possessed more confidence on their experience and always possessed a negative attitude towards any new knowledge or practice, So, the farmers having more farming experience had less adoption of IPM practices, Similar finding was also reported by Haque *et al.* (2007). They observed farming experience of the conventional farmers had negative significant relationship with their attitude towards organic farming.

Table 4. Coefficient of correlation (r) between the respondents selected characteristics and adoption of IPM practices (N=150)

Dependent Variable	Independent Variables	Correlation Coefficient (r)
Adoption of Environment Friendly Integrated Pest Management(IPM) practices	Age	-0.130^{NS}
	Education	0.240**
	Family size	-0.082^{NS}
	Farm size	0.315**
	Annual income	0.242**
	Annual expenditure	0.122^{NS}
	Training experience	-0.001^{NS}
	Farming experience	-0.152*
	Organization participation	0.011^{NS}
	Knowledge on IPM	0.341**
	Attitude towards IPM	0147*
	Aspiration	0.087^{NS}

* Significant at 0.05 level of probability
**Significant at 0.01 level of probability
NS= Not Significant

CONCLUSION

From the above discussion, it appears that the most (80%) of the respondent were medium adopters, 13% of them high adopters and a few (7%) of them were low adopters. Among the five IPM component technologies adoption of use of tolerant varieties ranked first, judicial use of chemicals ranked second, use of cultural practices ranked third, use of mechanical measures ranked fourth and adoption of use of biological agents ranked fifth. Education, farm size, annual income, knowledge on IPM and attitude towards IPM of the respondents had positive significant relationship and farming experience of the respondents had negative significant relationship with their adoption of IPM practices.

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