Tropical Agricultural Research and Extension 2 (1): 51-54, 1999

Impact assessment of farmer training in integrated pest management in irrigated rice cultivation

R. M. Gunaratne Bandara and C. Sivayoganathan*
Postgraduate Institute of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka

Accepted 5 March 1999

ABSTRACT

Extension activities encouraging adoption by farmers of integrated pest management practices in rice cultivation started in Sri Lanka in 1984, through farmer training. The objectives of this paper are to assess the impact of farmer training on the knowledge, attitude and adoption of rice IPM practices and to identify the reasons for partial and non adoption of these practices. Data were collected by personal interviews with a stratified random sample of 120 trained farmers and 60 untrained farmers from Mahaweli System `C' area using a structured questionnaire. Trained farmers' knowledge about, attitude towards and adoption of IPM practices were significantly higher than those of the untrained farmers. Percentage of farmers falling under high adoption category was considerably low due to the difficulties experienced in adopting IPM practices. Therefore, further farmer training is necessary to enable them to select IPM practices appropriate to their fields, taking into consideration the limitations of those practices.

Key words: Integrated pest management, rice, Sri Lanka, training.

INTRODUCTION

Rice is the principal crop of the domestic food crop sector in Sri Lanka. With the introduction of new improved rice varieties, use of fertilizer and pesticides was increased as these varieties were highly responsive to fertilizer and more prone to pest problems. Due to the quick action of pesticides, farmers became more reliant on pesticides than the other control methods. The heavy dependence on pesticides resulted in numerous problems: the development of resistant pests, resurgence of pest population, emergence of secondary pests, crop and environmental contamination and hazards to human health.

In order to avoid the harmful effects of pesticides, more efficient alternative methods of pest control were sought. This was initiated at international and national levels. At the international level, a panel for Integrated Pest Management (IPM) was established by the Director General of the Food and Agriculture Organization (FAO) in 1966.

The IPM is a strategy or plan that utilizes various tactics or control methods -- cultural, plant resistance, biological and chemical in a harmonious way (Reissig *et al.*,1985). The IPM includes all approaches ranging from single component control method to the most sophisticated and complex control methods. Basically rice IPM technology is categorized into five principal methods namely use of resistant varieties, cultural methods, mechanical methods, biological control and chemical control.

Rice IPM strategy gives high profit to farmers and minimizes the bad effects of chemicals. The ultimate objective of IPM is to produce maximum returns at minimum cost taking into consideration the ecological and sociological constraints in each ecosystem and the long term preservation of the environment (Food and Agriculture Organization, 1979). In fact, it was reported that adoption of IPM practices resulted in consistently higher yields in addition to lower expenditure in pest management (Vander Fliert 1992).

Rice IPM extension activities started in Sri Lanka in 1984. Since then the IPM extension activities were conducted to different degrees among paddy farmers in Sri Lanka. At the initial stage, IPM extension activities were conducted by the Extension Division of the Department of Agriculture with the assistance of FAO of the United Nations. At a later stage, several non-governmental organizations (NGO) also came forward to implement IPM extension activities at farmer level.

Thus, the IPM training activities were conducted since 1984. Yet little is known about the impact of farmer training on the knowledge, attitude and adoption of IPM practices. Therefore a study was conducted to investigate the impact of farmer training with the following specific objectives. 1) To identify trained farmers' level of knowledge, attitude

* Corresponding author

and adoption in relation to rice IPM. 2) To identify the reason for non-adoption and partial adoption of IPM by farmers.

METHODOLOGY

The study was conducted in Mahaweli system 'C' area in Sri Lanka at the end of Maha 92/93 season. Personal interviews were conducted with a stratified random sample of 120 farmers who had completed two crop seasons after being exposed to IPM training and 60 untrained farmers, using structured questionnaire. As there was not much variability among the rice farmers in the study area with reference to living conditions and farming pattern, four block manager (BM) areas were selected for data collection out of eight BM areas. Then, from each BM area, 3 villages were randomly selected and 10 IPM trained farmers and 5 untrained farmers were again randomly selected from each village.

In this study knowledge denotes the understanding of principles underlying the different IPM practices. Twelve items were used to measure the level of IPM knowledge. Prior to data collection a test was conducted to assess the reliability and validity of the knowledge items included in the questionnaire. Twelve rice farmers who were personally known to the senior author to have high IPM knowledge were identified from the study area. Similarly, 12 farmers who have not been exposed to IPM also were selected and information was gathered individually from each farmer. The response to each knowledge item was categorized as correct, partially correct and incorrect, and scores were assigned as 3, 2 and 1 respectively. All such scores were summed up to compute the overall knowledge score. Knowledge score of each item was compared and total knowledge score of the two groups were tested. Mean knowledge scores of the two groups were significantly different.

The same test was administered to the same group of trained and untrained farmers after a lapse of two months, to test whether the performance in the knowledge test was the same after the lapse of a period of time. The knowledge level of each group was not significantly different before and after the two months.

Attitude towards rice IPM was measured with respect to four different aspects. To measure each attitudinal aspect, multiple items were used. The response to each item was recorded as strongly agree, agree, not sure, disagree and strongly disagree, and scored as 5, 4, 3, 2 and 1 respectively for favourable items and vice versa for unfavourable items. In order to get an idea of overall attitude, total scores for all the four attitudinal aspects were summed up.

The data regarding the adoption of IPM practices were collected for three consecutive seasons. A score of 5 was given if a farmer had adopted the particular practice fully in his entire field within a season, 4 if it was fully adopted only in a specific field, 3 if it was partially adopted in his entire field, 2 if it was partially adopted in a specific field and 1 if it was not adopted in any field. In order to compute a farmer's adoption score for a particular practice, the corresponding scores for all three seasons were added. Finally, overall adoption score for each farmer was computed by summing up his adoption scores for all the practices. T-test was used to measure the significance of the difference between the mean scores of the trained and untrained farmers.

RESULTS AND DISCUSSION

Knowledge and Skill of Rice IPM

The mean knowledge scores for 10 items of trained farmers were significantly higher than those of the untrained farmers (Table 1).

Mean knowledge scores for installing bird perches and recommended fertilizer were not significantly different between the two groups. Both groups were knowledgeable about installing bird perches in the field. However, both groups did not know the recommended rate of different fertilizer types according to their land size.

Beneficial insects which destroy rice insect pests form one of the important components in rice IPM. Almost all the trained farmers and 27% of untrained farmers reported the presence of beneficial insects in rice fields. Two-thirds of the trained farmers were knowledgeable about more than four beneficial insects. The average number of beneficial insects identified by the trained farmers was 4. About 50%

Table 1. Mean knowledge scores and the 't' values

Item	Trained	Untrained	t-value
1. Cleaning bunds and surroundings	2.74	2.03	5.53
2. Knowledge about resistant varieties	2.00	1.16	7.65
3. Use of granular insecticide at nursery stage	2.10	1.31	5.80
4. Proper water management	2.36	1.48	10.23
5. Proper spacing for pest management	2.13	1.50	5.79
6. Preventing staggered cultivation	2.95	2.63	8.40
7. Installing bird perches	2.86	2.63	2.33
8. Importance of correct amount of fertilizer	1.66	1.36	3.54
9. Stage of application of fertilizer	2.90	2.63	3.58
10. Knowledge about recommended fertilizer	1.45	1.20	2.50
11. Recommended pesticide for effective pest management	1.79	1.05	11.06
12. Knowledge about beneficial insects	2.66	1.30	18.32
Overall knowledge Score	29.32	21.04	15.50

Significant at 0.01 level

of trained farmers were able to identify more than four beneficial insects.

As for the insect pests and their damages, more than 70% of trained farmers were able to identify brown plant hopper insect, leaf roller and stem borer damages correctly as taught by the trainer. However, majority of untrained farmers identified the pest problems by using local names. A case study conducted in Indonesia during five rice growing seasons assessed rice farmers' practices, perception, achievements and effects after IPM training. The results showed improved knowledge on pests and natural enemy identification, changed perception with respect to pest occurrence, rice ecosystem management, pest control, and improved skills in field monitoring (Vander Fliert, 1992).

Attitude Towards IPM

Most of the farmers (90 percent) reported IPM as a useful technology. In fact 70 percent indicated that adoption of IPM was profitable.

Farmers' attitude towards IPM was measured by obtaining their response to various statements relating to yield, profit, ease of application and risk involved. The responses to all the statements relating to yield and profit were significantly different between the trained and untrained farmers (Table 2).

Also, trained farmers' attitude scores for these two aspects were high. As for the nature of IPM practices, farmers' responses to the statement "decision making on pesticide application based on economic threshold level (ETL) is a complicated technique to practise" was not significantly different between the two groups (Table 2).

The statements relating to risk involved were significantly different between the two groups except "IPM practices can manage pest problems successfully even in serious pest infestation" (Table 2). Trained farmers' scores on attitude towards IPM as not being risky and easy to practise were considerably low which need to be further discussed in training sessions. Mean attitude scores of the two groups were significantly different.

Adoption of the IPM Practices

Among the ten IPM practices, mean adoption scores for six were significantly different between the trained and untrained farmers. The mean adoption scores for use of resistant varieties, proper land preparation, transplanting and use of correct amount of fertilizer were not different between the two groups (Table 3).

Table 2. Mean attitude scores and the 't' values.

	Trained Mean	Untrained Mean	t value
a. IPM Technology Increases Farmer Yield			
1. Yield obtained using non-chemical control measures is higher than when chemical control is done	3.46	2.90	7.68**
2. Non-chemical control method itself is not sufficient to obtain higher yields; chemical control methods also need to be practised	3.33	2.03	8.88**
3. Both non-chemical and chemical control measures are necessary to be practised to obtain higher yields	3.30	1.83	12.11**
4. Chemical control method must be practised to obtain higher yield	3.33	1.86	10.34**
5. Yield losses due to pest problems can be reduced following IPM methods since crop establishment stage even if the crop is infested by pests	4.00	3.30	12.14**
b. IPM Technology increases Farmer Profit			
6. Use of IPM practices lowers the cost of rice production	4.20	3.00	17.48**
7. Rice IPM practices reduce cost incurred in pest control of rice even if supplementary pesticides have to be used	4.09	3.40	15.74**
8. Use of IPM practices lowers the cost of production whenever the crop is healthy	3.39	2.95	5.12**
9. By following IPM practices the number of pesticide applications will be less	4.13	3.01	15.74**
c. IPM Technology is Complicated to Practise			
10. Neighbouring Yaya farmers' cooperation is needed to practise IPM methods successfully in a farmer's field	4.25	3.50	7.49**
11. Methods in IPM technology are more complicated to practise	3.67	2.93	8.39**
12. Different non-chemical control methods for different pests cannot be practised when the field is infested by many pests.	3.03	2.66	3.32*
13. Decision making on pesticide application based on ETL is a complicated technique to practise	2.89	2.95	0.38
d. IPM is a Risky Activity			
14. Following IPM methods, pest problems can be managed with the minimum use of pesticides	4.13	3.20	14.10**
15. IPM practices can manage pest problems successfully even in serious pest infestation	3.09	3.01	1.40
16. Serious pest problems do not arise by practising non-chemical pest control methods since land preparation stage	3.93	2.90	12.56**
17. Even though non-chemical control measures are being practised, chemical control measures also should be done to keep the field free from pest problems	3.44	2.01	12.28**
18. Even if pest problems occurred, it does not become much serious when IPM technology is being practised in the field	3.98	2.93	14.68**
19. Pesticide application based on ETL concept will result in lowering the expected yield	3.10	2.98	3.22*
20. IPM methods can be practised in small scale farms but difficult in large scale farms	3.84	2.96	12.34**
Overall Attitude Score	77.05	58.52	18.63**

* Significant at 0.05 level ** Significant at 0.01 level

However, overall adoption scores of the two groups were significantly different; the trained farmers had significantly higher scores than the untrained farmers.

According to the findings, the adoption rates of

Table 3. Mean adoption scores and the 't' values.

Practice	Trained	Untrained	t-value
1. Cleaning bunds and surroundings	14.55	9.37	8.47
2. Use of resistant varieties	3.25	3.12	0.80
3. Proper land preparation	14.20	13.30	2.21
4. Proper water management	11.80	3.83	14.12
5. Preventing staggered cultivation	14.10	11.50	4.04
6. Installing bird perches	11.60	3.60	15.37
7. Transplanting	5.34	5.33	0.01
8. Use of correct amount of fertilizer	4.45	4.00	0.90
9. Use of fertilizer at correct stage	11.80	9.93	3.78
10. Field monitoring stepping into the field.	5.60	3.00	14.27
Overall Adoption Score	96.59	69.27	15.83

Significant at 0.01 level

some of the IPM practices were very low due to the difficulties experienced by farmers in adopting those practices. Although farmers were knowledgeable about the resistant varieties, they did not adopt them due to unavailability of seeds in time. Most of the farmers at the tail end of the irrigation channel did not practise transplanting due to lack of water and the unavailability of sufficient labour. Both trained and untrained farmers did not apply correct amount of fertilizer to their fields. The reasons given by the farmers for not applying correct amount of fertilizer were lack of money and some farmers believed that their fields should be treated with less amount of fertilizer as they were fertile. Majority of farmers at the head end of the irrigation channel adopted water management for weed control and BPH control. They had maintained water level up to a certain height in rice fields in order to control weeds at initial stage of the crop. Frequent field draining had been practised at the ripening stage of the crop to control BPH problem. Those who did not practise water management reported lack of sufficient water as the constraint to adopt this practice in their fields.

Farmers' level of adoption of preventive pest control methods such as field monitoring, stepping into the field and installing bird perches was considerably low. This needs to be further emphasised in future training classes.

CONCLUSIONS AND IMPLICATIONS

The trained farmers' knowledge of IPM is higher than that of the untrained farmers. Majority of trained farmers had understood the principles underlying the different practices in the IPM extension package. However, farmers' knowledge in relation to recommended fertilizer rates according to their own land extents is low which needs to be discussed in future training classes. Majority of trained farmers were able to identify the four beneficial insects present in the rice ecosystem.

Trained farmers' attitude towards IPM was favourable. However, steps should be taken to convince farmers that IPM is not risky and is easy to practise.

In general adoption of IPM practices by trained farmers was high when compared with untrained farmers. At the same time, level of adoption of some IPM practices was low even among trained farmers due to certain difficulties experienced by them. Therefore, while assisting the farmers to overcome these difficulties, they should be advised to choose those IPM practices that are suitable to their field situations.

REFERENCES

Food and Agriculture Organization 1979 Guidelines for integrated pest control of rice insect pests. Plant Production and Protection Paper 14, FAO, Rome.

Reissig WH, Henriches EA, Listinger JA., Moody K, Fielder L, Mew TW and Barrion AT 1985 Illustrated Guide to Integrated Pest Management in Rice in Tropical Asia. International Rice Research Institute, Laguna, Philippines.

Vander Fliert E 1992 Impact of IPM farmer training in farmers' pest control behaviour. Ph. D. thesis, Agriculture University of Wageningen, Netherlands.