Journal of Experimental Agriculture International
14(4): 1-6, 2016, Article no.JEAI.29132
Previously known as American Journal of Experimental Agriculture
ISSN: 2231-0606

SCIENCEDOMAIN *international*
www.sciencedomain.org

Determinants of Rice Farmers' Adoption of Integrated Pest Management Practices in Bangladesh

Mirza Mobashwerul Haque[1], Muhammad Humayun Kabir[1*] and Noushin Anjum Nishi[1]

[1]Department of Agricultural Extension and Information System, Sher-e-Bangla Agricultural University, Dhaka, Bangladesh.

Authors' contributions

This work was carried out in collaboration between all authors. Author MMH designed the study, wrote the protocol and wrote the first draft of the manuscript. Author MHK reviewed the experimental design and all drafts of the manuscript. Authors MHK and NAN managed the analyses of the study. Authors MMH and NAN selected the study location. Authors MHK and NAN performed the statistical analysis. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JEAI/2016/29132
Editor(s):
(1) Mariusz Cycoå, Medical University of Silesia, Poland.
Reviewers:
(1) Vishal Dagar, Central University of Himachal Pradesh, India.
(2) H. U. Nwalieji, Chukwuemeka Odumegwu Ojukwu University, Nigeria.
(3) Govind Pal, Indian Institute of Seed Science, India.
Complete Peer review History: http://www.sciencedomain.org/review-history/16779

Original Research Article

Received 24th August 2016
Accepted 12th October 2016
Published 5th November 2016

ABSTRACT

Currently the technologies which are available in Bangladesh agriculture, integrated pest management (IPM) are one of the most important to them. Reasonably, the objectives of the study were to determine the adoption extent of IPM practices by the rice farmers and to determine the influencing factors of IPM adoption. The study was conducted at Mymensing district. One hundred and sixteen (116) rice farmers were asked about the use of IPM practices and it was found that majority of the farmers (82.3 percent) were under medium to high group in aspect of adoption extent of IPM practices. The factors that significantly influenced farmer's adoption of IPM were training exposure, experience of IPM practices, extension media contact and knowledge on IPM. Among

**Corresponding author: E-mail: mhumayunsau@gmail.com;*

these variables, training exposure was the most influencing factor. Therefore, it can be suggested that if initiative can be taken by the Department of Agricultural Extension (DAE) along with other relevant organizations to increase training facilities and extension media contact then the adoption extent of IPM practices will be increased. Furthermore, more focus concentrate on the farmers belong to less experience in IPM practices and poor knowledge on IPM is also helpful to increase this environment friendly farming practice.

Keywords: Influencing factors; adoption; IPM; rice farmers.

1. INTRODUCTION

Agriculture is the single largest producing sector of Bangladesh since it comprises about 18.6% of the country's GDP and employs around 45% of the total labor force [1]. The performance of this sector has an overwhelming impact on major macroeconomic objectives like employment generation, poverty alleviation, human resources development and food security. However, among various subsectors of agriculture, crop subsector plays the most important role in developing country's economy.

Rice is the principle crop with 75% the nation's farm land allotted to its cultivation. Other important crops are pulses, wheat, jute, fruits and vegetables. As Bangladesh's population continues to grow, the amount of additional land available to be brought into cultivation will be limited while at the same time demand for food from a growing population puts pressure on the agricultural sector to increase output [2]. To face the pressure, in one hand, farmers use pesticide to increase yield. On the other hand, pesticide has potentially negative implications to the environment, agriculture and human health. In this dilemma, such method is needed that can suppress pest, increase production as well as keep the environment safe and sound [3,4]. Usually individual methods of pest control have the capability to suppress pests, nevertheless no single method provides satisfactory outcome, and as such an integrated approach is essential. Farmers need alternative pest management approaches that are not only environmentally sound but also economically feasible. By considering these, the one and only alternative that can help increase agricultural production and reduce pesticide misuse is integrated pest management (IPM) [5,6].

IPM is a broad ecological approach to pest control using various pest control tactics in a compatible manner. In the present day usage, IPM is not limited to dealing with pesticides and pest management. In fact, IPM is a holistic approach to crop production based on sound ecological understanding. To realize the importance of IPM, with the help of Food and Agricultural Organization (FAO), the government launched IPM program for rice farmers in 1981 [7]. Since then the Department of Agricultural Extension (DAE) with the help of various government and non-government organizations, disseminating IPM technologies among the farmers. Based on the above facts, the researcher felt necessity to conduct a research on the adoption extent of IPM practices by the rice farmers. In most of the cases, past studies related to the adoption of IPM, focused to explore the relationship between farmers' characteristics and the adoption of IPM practices whereas the present study has given emphasize on identifying contributory factors of IPM adoption [8].

1.1 Objectives of the Study

The objectives of the study were to-

1. Determine the adoption extent of IPM practices by the rice farmers and
2. Determine the influencing factors of adoption extent of IPM practices

2. MATERIALS AND METHODS

2.1 Study Location and Sampling

The study was conducted at Moshakhali union of Gafargaon upazila under Mymensingh district. Out of 13 villages of Moshakhali union, three were purposively selected as the locale of the study. The selected villages were Mosakhali, Birkharua and Mukhi. There were plenty rice growers in these villages and they controlled pest by using IPM technologies.

The farmers of the selected villages cultivated rice using IPM were considered to be the population of the study. An up-to-date list of farmers of these villages was prepared with the

Table 1. Distribution of population, sample and reserve list of the study

Name of village	Population	Sample size	Reserve list size
Mosakhali	562	56	5
Baldi	218	22	2
Birkharua	385	38	3
Total	1165	116	10

help of Sub-Assistant Agricultural Officer (SAAO) of the area. The total number of farmers was 1165 which constituted the population of the study. Ten percent of population was considered as sample of the study (Table 1 above). Besides, a reserve list of 10 farmers was also prepared to be interviewed in time of needed.

2.2 Data Collection Method

A survey was conducted by following a structured questionnaire to collect relevant information and data from the respondents. The questionnaire was prepared considering the objectives of the study in mind. The questions and statements contained in the questionnaire were simple, direct and easily understandable by the farmers without giving rise to doubt and misunderstanding. The questionnaire contained both opened and closed form of questions. It was organized into three sections mentioning some selected characteristics of the farmers in first. To measure the adoption extent of IPM practices, a list of IPM practices applicable for rice was presented in the second section. A list of barriers of using IPM was presented in the last section. Before finalization the questionnaire a pre-test was run in the study area in actual field situations. The pre-test was helpful to locate faulty questions. Alterations and adjustment were done in the schedule on the basis of experience of the pre-test. The researcher incorporated valuable suggestions from his research supervisor into it. Finally, the schedule was replicated to 116 keeping in view the total number of the respondents.

2.3 Variables of the Study

Success of a research to a considerable extent depends on the successful selection of the variables. Irrational, inappropriate and inconsistent selection of variables may lead to misleading and unfruitful results. The researcher keeping all these in mind took adequate care in selecting the variables of the study. Moreover, the researchers visited the study area several times and talked to the crop growing farmers intimately. Therefore, based on knowledge about study area, extensive literature review and discussions with relevant experts and academicians, the researchers selected eleven characteristics of the farmers which were considered as independent variables for the study. These are age, education, family size, farm size, training exposure, experience of IPM practice, annual family income, extension media contact, organizational participation, innovativeness and knowledge on IPM. On the other hand, extent of use of IPM practices was the dependent variable. Appropriate scale was used to measure the independent variables. To measure the dependent variable, a list of 20 IPM practices applicable for rice cultivation and used by the farmers of the study area since long ago was selected. Then a four-point rating scale ranging from “regularly” to “not at all” (3 to 0) was used to measure the extent of use of IPM practices by the farmers (Islam 1996). Thus, the range of IPM practice score of a respondent could vary from 0 to 60 where, 0 indicates no use of practice and 60 indicate the highest use of IPM technologies.

3. RESULTS

3.1 Adoption Extent of IPM Practices

Farmers’ use of IPM practices scores ranged from 23 to 48 whereas the possible range of 0 to 60. The average was 36.00 with a standard deviation of 5.67. Based on the observed IPM practices scores, the farmers were classified into three categories in which majority of the farmers were in medium practice group (Table 2).

3.2 Influencing Factors in Adopting IPM Practices

The study covered 11 characteristics or factors (age, education, family size, farm size, training exposure, experience of IPM practices, annual family income, extension media contact, organizational participation, innovativeness and knowledge on IPM). These were treated as independent variables and the adoption extent of IPM practices by the rice growers was treated as

dependent variable. To identify the significant factors, stepwise multiple regression analysis was done. The output of the analysis reveal that out of 11 variables four namely training exposure, experience of IPM practices, extension media contact and knowledge on IPM were significant. Among these four variables, knowledge on IPM was significant at 5% level of confidence and the rest three variables were significant at 1% confidence level (Table 3). Moreover, the stepwise regression model showed that four significant variables explained about 56% variation of the model (Table 4). From the result it can be said that the data as well as the selection of analysis was appropriate.

4. DISCUSSION

The majority of the farmers were in medium to high categories in use of IPM practices though about one sixth of the farmers were in low practice group. This means that the use of IPM practices by the farmers are at satisfactory level while still there is a scope to improve the scenario. Training exposure, experience of IPM practices, extension media contact and knowledge on IPM were significantly influenced the farmers in using IPM practices.

The contribution of training was positive and significant which indicates that the higher the training exposure the higher the use of IPM practices. This was the highest important factors influencing use of IPM practices (Table 4). [9] and [10] also found similar results. In fact, training program (FFS) is conducted under IPM promotion project and they provide in-depth training on specific crop. During the discussion, the rice farmers mentioned that they had gained more knowledge and skills in the use of IPM practices by attending the training program. Additionally, they informed about social (health), economic and environmental benefit of using IPM technologies which positively influence them to make their decision regarding IPM adoption.

Table 2. Distribution of the farmers according to their use of IPM practices

Categories (Scores)	Farmers		Mean	Standard deviation
	Number	Percent		
Low practices (up to 30)	19	16.7	36.00	5.67
Medium practices (31-40)	72	61.6		
High practices (above 40)	25	21.7		
Total	116	100		

Table 3. Coefficient of independent variables included in the adoption of IPM model

Variables	Unstandardized coefficients		Standardized coefficient	t	Sig
	B	Std. error	Beta		
Training exposure	.376	.076	.440	4.923	.000
Extension media contact	.278	.102	.200	2.722	.007
Experience in IPM practices	-.315	.116	-.167	-2.712	.008
Knowledge on IPM	.284	.141	.192	2.017	.046

Table 4. Summary of the adoption of IPM practices model

Model	R	R Square	Adjusted R square	Std. Error of the estimate
1	.689[a]	.475	.471	4.10758
2	.728[b]	.530	.521	3.90612
3	.745[c]	.555	.544	3.81522
4	.755[d]	.570	.555	3.76574

a. Predictors: (Constant), training
b. Predictors: (Constant), training, media
c. Predictors: (Constant), training, media, experience
d. Predictors: (Constant), training, media, experience, knowledge

The farmers were also influenced by extension media contact in using IPM practices. It was likely that farmers with high extension contact exposure more information of farm affairs which strengthened the base of their agricultural knowledge. Such knowledge was probably conducive to motivate the farmers toward use of modern IPM practices. [11] and [12] also found that extension media contact helped the farmers in using IPM practices. Experience in rice farming was also another important factor for the farmers in adopting IPM practices. This may be due to the fact that because of long experience, farmers were capable to compare among various practices in rice cultivation. Moreover, they observed the economic and environmental cost of frequent use of pesticides which influence them to practice IPM.

The influence of knowledge on IPM on adoption extent of IPM practices was positive and significant which indicates the higher the knowledge the higher the use of IPM practices. The result is consistent with generalization. According to knowledge-attitude-practice (KAP) model, before to use a technology, farmers need to know about that technology. The Rogers model of technology adoption also makes similar comment [13]. The result of the study gives support to these models. One of the important logics behind the result is to use of IPM practices is a technical job that requires special knowledge.

5. CONCLUSION AND RECOMMENDATION

The study was conducted in a region where farmers use IPM practices in cultivating rice. To understand the scenario regarding adoption extent of IPM practices of the farmers of that region, two objectives were set which one is to determine the adoption extent of IPM practices by the farmers and indentifying influencing factor of IPM adoption is another. It was observed through survey that majority of the farmers were medium users of IPM practices. Four factors namely training exposure, experience of IPM practices, extension media contact and knowledge on IPM were significantly influenced the farmers in using IPM practices. Therefore, it can be recommended that initiative should be taken by the DAE with the help of other relevant organizations to increase these facilities (significant factors) to improve the scenario regarding adoption of IPM practices.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Bangladesh Bureau of Statistics (BBS). Statistical pocket book of Bangladesh. Statistics Divisions, Ministry of planning, Government of the People's Republic of Bangladesh, Dhaka; 2012.
2. Gilbert JR. Cost-effectiveness evaluation of integrated pest management (IPM) extension methods and programs: The case of Bangladesh. Masters in Science in Agricultural and Applied Economics. Faculty of the Virginia Polytechnic Institute and State University; 2005.
3. Kabir MH, Rainis R. Determinants and methods of integrated pest management adoption in Bangladesh: An environment friendly approach. American–Eurasian Journal of Sustainable Agriculture. 2013a;7(2):99–107.
4. Kabir MH, Rainis R. Farmers' perception on the adverse effects of pesticide on environment: A case of Bangladesh. International Journal of Sustainable Agriculture. 2012;4(2):25–32.
5. Mauceri M, Alwang J, Norton G, Barrera V. Adoption of integrated pest management technologies: A case study of potato farmers in Carchi, Ecuador. Selected paper prepared for presenting at the American Agricultural Economics Association Annual Meeting, Providence, Rhode Island, July 24-27; 2005.
6. Bonabana-Wabbi J, Taylor DB, Kasenge V. A limited dependent variable analysis of integrated pest management adoption in Uganda. Paper presented at the American Agricultural Economics Association Annual Meeting, Long Beach, California; 2006.
7. Kabir MH, Raini R. Integrated pest management farming in Bangladesh: Present scenario and future prospect. Journal of Agricultural Technology. 2013b;9(3):515–527.
8. Islam MM. Farmers' use of indigenous technical knowledge (ITK) in the context of sustainable agricultural development. M.S. (Ag. Ext. Ed.) Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh; 1996.

9. Kabir MH, Rainis R. Adoption and intensity of integrated pest management (IPM) vegetable farming in Bangladesh: An approach to sustainable agricultural development. Environment, Development and Sustainability. 2015;17(6):1413-1429.
10. Haque MM. Farmer's adoption of modern maize cultivation technologies. M.S. (Ag. Ext. Ed.) Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh; 2003.
11. Hossain MM. Use of integrated pest management practices by the farmers of Brahmanbaria District. M.S. Thesis, Department of Agricultural Extension & Information System, Sher-e-Bangla Agricultural University, Dhaka; 2009.
12. Rahman MS. Knowledge, attitude and adoption of the farmers' regarding Aalok 6201 hybrid rice in Sadar Upazila at Mymensingh District. M.S. (Ag. Ext. Ed.) Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh; 2001.
13. Rogers EM. Diffusion of innovations. 3rd Edition. New York: The Free Press; 1983.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/16779