Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 20, Issue 1, 2020
PRINT ISSN 2284-7995, E-ISSN 2285-3952

ANALYSIS OF THE PADDY FARMERS' KNOWLEDGE ABOUT INTEGRATED WEED MANAGEMENT (IWM)

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Abstract

In the recent years chemical control of weeds has become a dominant method of weed control. The heavy use of these chemicals has had a negative impact on the environment and human health. So this study tries to investigate the analysis paddy farmers' knowledge about integrated weed management (IWM) in Iran. The study was done by a descriptive-surveying method that including field and documentary data. The population of the study consisted of selected Dooreh - CHegeni farmers that cultivation wheat and rice together. Sample population was selected by using the Cochran formula (n=198). The main instrument used in this study was a questionnaire. The validity of research tool was obtained by the idea of experts and for reliability of questionnaires a pilot test was conducted. The Cronbach' Alpha coefficient of higher than 0.7 showed that research tool was reliable (learning style (0.818), economic characteristic (0.700) and social characteristic (0.723) respectively). The result of correlation analysis showed that the variables such as: belief in discussion with other farmers about sustainable weed management, the importance of dialogue and implement the recommendations of experts, quality and quantity of extension programs, attitude towards the impact of SWM (Sustainable Weed Management) on healthy crop production and farmers 'attitude toward the effects of this type of management on increasing production has a significant effect on farmers' awareness of integrated weed management in the field The results also showed that farmers' use of appropriate seed (weed-free) and farmers' appropriate attitude toward discussion with other farmers about integrated weed management in the field is the most important variable could be predicted the rice farmers' knowledge of IWM(Integrated Weed Management) in the field.

Key words**:** *integrated weed management (IWM), paddy farmers, knowledge management*

INTRODUCTION

Integrated weed management (IWM) is a new approach for cropping systems to weed management that relies on essential knowledge for its implementation and focuses on crop health and safe production in fields. It can be viewed as a series of interactions among several weed control components. It is inclusive, taking into account agronomy and social, economic, and environmental issues. In other words it is an interdisciplinary and multidisciplinary subject. Simply defined, IWM can be thought of as the ‘‘use of many little hammers” [19]. "The philosophy of sustainable agriculture is gaining ground in a world becoming acutely aware of finite fossil fuel resources and adverse impacts of agriculture and other industries on the environment. In spite of substantial advances in productivity through applications of fertilizers, pesticides, and irrigation, it is necessary to realize that inappropriate or excessive use of these inputs can have unexpected and undesirable effects on the environment, natural ecosystems, and the world's human inhabitants. Therefore, the concept of sustainable agriculture is to develop the systems that will provide for our needs without endangering the quality of life of future generations"[14]. Sustainable agriculture has raised as a major challenge of the 21st century to meet these complications and natural and human difficulties; that is, agriculture should be consumed less and be sustainable more [14]. In the present century, the most important concern in the international community is the detrimental impact of human activities on the world's natural resources and environment. Experience of recent decades of advanced agricultural technology activities has shown that such activities cause: erosion and destruction of soil, air pollution and water

loss, destruction of marine ecosystems, destruction of natural habitats for plants and animals and also the pest resistance against insecticide and pesticide [1]. Basically integrated weed management or sustainable weed management on the farm seeks to develop a systematic strategy for farmers to use less and less herbicides at the farm level. In this respect, several approaches can be emphasized in order to make the farm more sustainable. One of the most important is the creation of better knowledge and knowledge about the agricultural ecosystem for farmers. It is important for the farmer to change his or her current practices and practices in weed management and to assist in sustainable farm management by choosing more effective strategies such as using other weed control techniques. Integrated weed management emphasizes the proper use of all physical, agronomic, biological and chemical methods to reduce weed damage [21].

Rice (Oryza sativa L.) is now a staple food for a population of nearly 3 billion people worldwide. Roughly half of the world's population use rice as their main source of food. The amount and per capita consumption of rice in many countries, especially Asian countries, is higher than in other parts of the world [8]. In Iran, rice is, after wheat, the second major source of food for people. So that the Iranian basic goods it covers include wheat, rice, crude oil and raw sugar. In resent sutdied indicated the total 14,000 tonnes of agriculture pesticides were annually used in Iran. Herbicides constituted the largest volume (43%) [20]. Iran accepted the Basel convention 1992 and became a party to the Rotterdam Convention in 2004. The Plant Protection Organization, as a part of the Ministry of Jihad-e- Agriculture, established in 1967, has been in charge of programming pesticide usage strategies and securing the pesticide use based on international conventions. It has also been the authority responsible for supervising the import, production and distribution of pesticides; managing, supervising and legislating phytosanitary quarantine, and providing technical recommendations for both chemical and biological controls [8]. Considering chemical pesticide usage in Iran indicates the highest consumption of chemicals in the paddy fields. Since pesticides can pose serious threats to human health and the environment, therefore the paddy farmers' knowledge about integrated weed management is very important [9]. Research results in Iran and other underdeveloped countries show that this amount of paddy farmers' knowledge about integrated weed management is undesirable [3, 7, 10].

Literature review

Wilson et al (2009) studied the acceptance of integrated weed management by farmers. The results of their research showed that farmers have a good understanding of the need to adopt integrated weed management on the farm but do not apply this type of management. This failure may be due to a gap in farmers' understanding of the human role in weed dispersal, with no belief that this type of management can pose serious risks to the management of the farm, natural resources and environmental risk [21]. Sinzogan et al (2004) surveyed farmers' knowledge and perceptions of pest management in the field. They state that farmers obtain information on pest and disease management using informal networks and channels. The most common and most effective type of information acquisition has been the use of informal contacts with other farmers. The results of the study indicated that farmers do not have an understanding of the key concepts of pest control systems. However, they were keen to share their knowledge, insights, and practices in pest management [18].

Borkhani et al (2011) investigated the application of integrated pest management (IPM) practices of paddy farmers. The results revealed that strategies based on education can be an efficient approach, provided that farmers have direct access to quality training and The results also emphasize that variables such as: level of education of the farmer, the participation of the farmer in training and extension courses, amount of belief and attitude of the farmer about the effectiveness of integrated pest and disease management as

well as the level of income of the farmer can be the most important predictors to related the rate of application of integrated pest and disease management by rice farmers [2]. The result of Rejaul & Bakshi (2005) research found that It can be stated that there are as many variables as: farmers' participation in farm management activities, the participation of the farmer in training and extension courses, farmer's education level, farmer's age, farm comparisons and their involvement with local management. In contrast, variables such as: agricultural experience and poor health have a negative impact on the adoption of integrated pest and disease management by the farmer [15]. Pouratashi and Iravani (2012) studied the farmers' knowledge and perception of integrated pest management in Iran. The result of this reseach showed that the amount of agricultural pesticides consumed in Iranian farms is high and the farmers, although the farmers were to some extent aware of the side-effects of the excessive use of chemical fertilizers and pesticides, they still continued utilizing chemical inputs due to the shortage of knowledge of and little access to the alternative or sustainable techniques and facilities [13].

Fami et al. (2010) conducted a research with the objective to study the farmer's attitude on sustainable agriculture and its determinants. The results of study showed that Iranian farmers have a shortage of information about the appropriate spray time and use pesticides and herbicides . Also the result ahowed there is a positive correlation between literacy, participation in extension courses, farmer's knowledge about sustainable agriculture, level of use of sustainable agriculture methods, extensive contacts and job satisfaction and negative correlation between age, experience in agricultural activities and agrarian land with attitude toward sustainable agriculture [5]. Borkhani et al (2013) investigated the socio-economic factors affecting the adoption of integrated pest management innovations by rice farmers. The results of their research showed that socio-economic and institutional factors influence farmers' adoption decisions of IPM innovation. Also their results showed that variables such as: the extent of farmer participation in social activities and the presence of strong local leaders in the area can have a positive and significant impact on farmers' adoption decisions of integrated pest management innovations [2].

Kotile & Martin (2012) investigated the best practices for sustainable weed management in the field by farmers. The result showed that a majority of respondents use sustainable agricultural practices associated with weed control, and continued to show interest in learning about those practices they consider sustainable. Respondents are likely to get interested in learning about the practices they already use [9]. Jabbour et al (2014), in their research, they examined farmers' knowledge and perceptions of weed management. Their research results showed that farmers' knowledge and understanding of total seed density can be predicted. The result of this reseearch showed that the farmers used less seed densities, discussing more about weed management with other farmers, especially about the dangers of weeds, as well as the important benefits of weed-free management. They usually use the method of weed management practices, and learning from their own experience and extension workers. These farmers usually had more knowledge about weed management and also showed a greater understanding of the importance of using about integrated weed management (IWM)[6].

The result of Mortezaie et al (2017) showed Iranian farmers use more than 14,000 tonnes of agricultural pesticides annually on their farms. In Iran's agricultural fields, the most commonly used pesticides are: Herbicides constituted the largest volume about 6,000 tonnes annually (42%), followed by insecticides and acaricides about 5,000 annually (38%) and in the third place fungicides about 3,000 tonnes annually (20%) [11]. Integrated and sustainable weed management in Iranian farms can not only reduce the use of herbicides but also reduce the environmental risks.

Singh et al (2018) studied the Adoption of integrated weed management practices correlates with farmers profile characteristics. The result of this research showed that a positive and significant correlation between level of adoption of respondents on overall IWM practices with other variables such as: age, education, farm size, training, extension contact, mass media exposure, input availability and innovativeness were noticed [17].

MATERIALS AND METHODS

The purpose of this study was to analysis the paddy farmers' knowledge about integrated weed management (IWM). The study was carried out in 2014 in Dooreh-Chegeni County, located in the Lorestan province in Iran. The instrument used for the collection of the data was a questionnaire. The questionnaires designed for wheat producers who were living in the study area (N=1,650) [4].

Applying a multistage sampling technique, 198 farmers were randomly selected. Developments of the items in the questionnaire were based upon a comprehensive review of the literature, suggestions made by researchers in agricultural education and sociology, and the experience of the researchers. The respondents were asked to respond to statements regarding the knowledge about sustainable weed management in wheat for weed control. The statements were measured using a Likert-type scale (1-5) to indicate whether the respondents have knowledge about sustainable weed management in wheat. Descriptors for the scales were as follows: 1 = not at all, 2 = very little, 3 = sometimes, 4 = often and 5 = always for the knowledge scale [16].

The respondents also answered some questions on the demographic characteristics, including educational level, age and etc. In order to establish its content validity, the questionnaire was reviewed by the researchers. Clarity and the readability of the instrument were improved after the review. The reliability coefficient for the knowledge of sustainable weed management scale was 0.85, indicating a good level of reliability. The results of the Alpha coefficients (shown in Table 1) indicated that the selected scales were appropriate.

Table 1. Reliability Analysis (Alpha)

Scale Name	No. Of items	Alpha Value
Learning style	17	0.818
Economic characteristic	23	0.700
Social characteristic	12	0.723

Source: the result of this research.

Data were analyzed descriptively and inferentially using SPSS (Statistical Package for Social Science) for Windows, version 21. This procedure yielded percentages, means, and standard deviations, and The Spearman correlation procedure to determine whether there was a significant relationship between some of the demographic characteristics and the variables in the study. Also, in this study, used in the stepwise regression for data analysis.

RESULTS AND DISCUSSIONS

According to research result, more than 39% of the respondents were middle-aged. Also, age mean of the answers were about 45 years. The educational level of respondents was in primary school level. Literate and primary school farmers had the highest (59.6%) and only 4.5% of farmers have post high school educations (Fig 1).

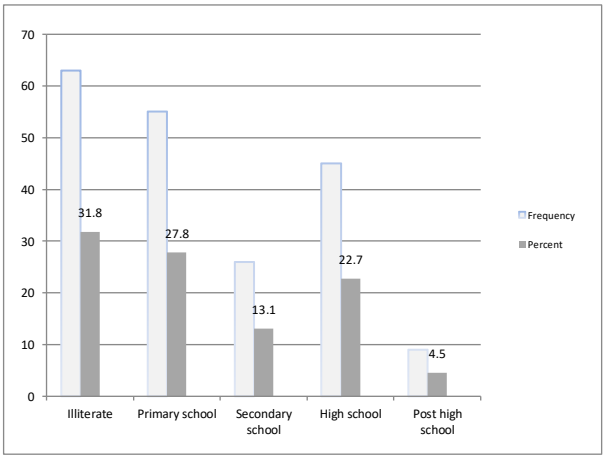

Fig.1. Distributional pattern of respondents' Educational level

Source: the result of this research.

Attention to Table 2, distributional pattern of respondents' agricultural work experience showed that farmers have about 18 year agricultural work experience.

Table 2. Distributional pattern of respondents' Agricultural work experience (years)

Agricultural work experience (years)	Frequency	Percent	Cumulative percent
10<	40	20	20
10-20	56	29	49
20-30	53	27	76
>30	49	24	100
Plural	198	100	-
Mean	18.44	-	-
Standard deviation	10.566	-	-
Minimum	2	-	-
Maximum	41	-	-

Source: the result of this research.

Results (Table 3) showed a few farmers (only 5.6 percent) had above 2 hectare cultivation paddy field. The main cultivation of respondents' was 0.65, ranging from 0.25 to 3 hectares.

Correlation analysis was used to analyze the relationship between the variables. Table 4 demonstrates a significant correlation between paddy farmers' knowledge about integrated weed management with independent variables. Spearman coefficient of correlation was used to determine the relationship between the independent variables and other variables.

Table 3. Distributional pattern of respondents' based on cultivation paddy field

Cultivation (hectare)	Frequency	Percent	Cumulative percent
1<	153	77.3	77.3
1-2	34	17.2	94.4
>2	11	5.6	100
Plural	198	100	-
Mean	0.65	-	-
Standard deviation	0.490	-	-
Minimum	3	-	-
Maximum	0.25	-	-

Source: the result of this research.

Based on the results, there is a positive and significant relationship at 95 percent level of confidence between the variable of paddy farmers' knowledge about integrated weed management with other independent variables such as: level of importance of dialogue and implement the recommendation of experts, quality and quantity of extension programs, attitude towards the effects of sustainable weed management in crop health and level of attitude towards the effects of sustainable weed management in increasing production in fields. In addition, there is a positive and significant relationship at the 99 percent level between a variety of belief in discussion with other farmers about weed management and knowledge of integrated weed management (Table 4).

Table 4. Relationship between the respondents' knowledge level and selected independent variables (Spearman's correlation)

Independent variables	Coefficient of Correlation	Level of significance
Belief in discussion with other farmers about sustainable weed management	0.272**	0.000
The importance of dialogue and implement the recommendations of experts	0.214*	0.002
Quality and quantity of extension programs	0.147*	0.039
Attitude towards the effects of sustainable weed management in crop health	0.148*	0.038
Attitude towards the effects of sustainable weed management in increasing production	0.167*	0.018

*Significant at 0.05 levels **Significant at 0.01 levels
Source: the result of this research.

Step by step multiple regression analysis was used to analyze the paddy farmers' knowledge of integrated weed management. In this method, the independent variables having a significant relationship with the dependent ones are entered into the equation to evaluate the each one`s role in the independent variable. Thus, the multiple stepwise regression method was used to evaluate the role of 6 independent variables having a significant relationship with the dependent farmers' knowledge in IWM one. Based on the regression results, as illustrated in table 5.

According to the results, in the first step, the percent of knowledge the use of pure seed (X1) with 0.195 coefficients of determination was taken into the analysis. At the second

steps, the amount familiar with using crop rotation was analyzed (X2). This variable specified about 6.5% of the changes related to the dependent variable.

Table 5. Step by step regression analysis of conformity of the level farmers' knowledge in IWM

Steps	R	R2
1	0.442	0.195
2	0.509	0.260
3	0.563	0.317
4	0.584	0.341
5	0.599	0.358
6	0.614	0.377

Source: the result of this research.

Table 6. Influential factors on conformity of the paddy farmers' knowledge about integrated weed management

Independent variables	Unstandardized coefficients		Standardize coefficients	Calculated T	Level of significance
	B	Std. Error	Beta		
Constant number	32.604	2.552	-	12.778	0.000
(X1)	2.505	0.395	0.371	6.338	0.000
(X2)	1.051	0.392	0.168	2.684	0.008
(X3)	1.394	0.418	0.197	3.331	0.001
(X4)	0.935	0.399	0.136	2.344	0.020
(X5)	1.143	0.468	0.151	2.439	0.016
(X6)	1.045	0.436	0.141	2.400	0.017

**P<0.01 *P<0.05
Source: the result of this research.

At the three steps, variables of belief in discussion with other farmers in the integrated weed management (X3) were analyzed. This variable specified 5.7% of the changes related to the dependent variable. At the fourth steps, variables of extension activities (Skilled farmers) (X4) were analyzed. This variable specified 2.4% of the changes related to the dependent variable. At the fifth steps, variables of amount familiar with using flooded (X5) was analyzed. This variable specified 1.7/% of the changes related to the dependent variable. At the sixth steps, variables of attitude towards the effects of sustainable weed management in increasing production (X6) were analyzed. This variable specified 1.9% of the changes related to the dependent variable. Regression of variables was led to a linear equation analyses of these total variables showed that they specify about 37.7% of the changes related to conformity of the paddy farmers' knowledge about integrated weed management in fields.

Analyzing β of the changes showed that knowledge the use of pure seed (X1) is the most influential variable. Other results are shown in tables (5) and (6).

According to the regression coefficient the regression line equation could be written as:

$$Y= 32.604 + 2.505\ X1+ 1.051\ X2+ 1.394\ X3+ 0.935\ X4+ 1.143\ X5+ 1.045\ X6$$

CONCLUSIONS

The findings of this study indicated that more than 39% of the respondents were middle-aged. Farmers have about 18 year agricultural work experience and a respondents' educational level illiterate and primary school farmers had the highest (59.6%). The result of correlation analyzed showed that there are positive and significant relationships between variables such as: belief in discussion with other farmers about sustainable weed management, the importance of dialogue and implement the recommendations of experts, quality and quantity of extension programs, attitude towards the effects of sustainable weed management in crop health and also attitude towards the effects of sustainable weed management in increasing production have positive significance effect. The results of regression analysis to predict the behavior of farmers accepting innovation of integrated weed management in the field show that variables such as: the amount of pure seed used by paddy farmers also believe that discussion with other farmers in integrated weed management can be influenced the farmers knowledge and awareness about IWM(integrated weed management). However, the results of the study emphasize that the extent of farmers' participation in training and extension activities and the use of extension activities can also help to develop a proper attitude towards the application of integrated weed management by rice farmers. the effects of integrated weed management in

increasing production in fields could explain the most variation in the extent of IWM practice application by paddy farmers. Therefore, it is recommended to use FFSs and extension workshops could be increasing the wheat producers' knowledge toward IWM practices. It seems the farmers like to view the tangible effects in integrated weed management your field by the increased of their paddy field production.

ACKNOWLEDGMENTS

This study was based on a research project financially supported by Isfahan University of Technology, Iran, which is highly appreciated.

REFERENCES

[1]AL-Subaiee, S. S., Yoder, E.P., Thomson J.S., 2005, Extension agents' perceptions of sustainable agriculture in the Riyadh Region of Saudi Arabia. Int. J. Agric. Extent. Educate. 12, 5-13.

[2]Borkhani F. R., Rezvanfar A., Fami H. SH. and Pouratashi M. 2013. Social Factors Influencing Adoption of Integrated Pest Management (IPM) Technologies by Paddy Farmers. Int. J. Agric. Manage. Develop. (IJAMAD), 3(3):211-218.

[3] Chizari, M., Ommani, A. R., Noorivandi, N. A. 2006,XAnalysis technical knowledge of farmers regarding dryland sustainable agriculture in Khuzestan province of Iran. International Symposium on Drylands Ecology and Human Security Perspectives, Policy Responses and Sustainable Development in the Arab Region, Challenges and Opportunities, Dubai.

[4]Ebrahimi, M. S., 2015, Agricultural development management. Isfahan. Amokhteh Publisher.

[5]Fami, H.SH., Asadi, A., Sadati, S. A., 2010, Farmer's Attitude on Sustainable Agriculture and its Determinants: A Case Study in Behbahan County of Iran. Res. J. Appl. Sci. Engineer. Technol. 2(5):422-427.

[6]Jabbour, R., Gallandt, E. R., Zwickle, S., Wilson, R., Doohan, D., 2014, Organic Farmer Knowledge and Perceptions are associated with On-Farm Weed Seed bank Densities in Northern New England. Weed Sci. 62(2), 338-349.

[7]Khalid, A. 2002. Assessing the long-term impact of IMP farmer field schools on farmer's knowledge, attitudes and practices: A case study from Gezira scheme, Sudan. International learning workshop on farmer field schools, Emerging issues and challenges, Yogyakarta, Indonesia. Oct. 21-25.

[8]Khush, G. S., 2004, Harnessing Science and Technology for Sustainable Rice-based Production System. In: Proceedings of FAO Rice Conference. International Rice Commission Newsletter.

[9]Kotile, G., Martin, R., 2008, Sustainable Agricultural Practices for Weed Management: Implications to Agricultural Extension Education. J. Sustainable Agric. 16, 31-51.

[10]Mancini, F., Van-Bruggen, A. H. C., Jiggins, J. L. E. 2006. Evaluating cotton integrated pest management (IPM) farmer field schools outcomes using sustainable livelihoods approach in India. Cambridge University Press. Agric. Journal, 43: 97-112.

[11]Mortezai, Z., Mosavi, S B., Baghestani, M A., Atoti, A. 2017. An assessment of agricultural pesticide use in Iran, 2012-2014. J Environ Health Sci Eng. 2017; 15: 10.

[12]Plant Protection Organization, 2005, Country report of Islamic Republic of Iran. Sub-regional workshop on the implementation of Stockholm Convention and synergies with other Chemicals related conventions, 21-24 February 2005, Cairo, Egypt.

[13]Pouratashi, M., Iravani, H., 2012, Farmers' Knowledge of Integrated Pest Management and Learning Style Preferences: Implications for Information Delivery. Int. J. Pest Manage. 58(4): 347-353.

[14]Rasul, G., Thapa, G.B., 2004, Sustainability of ecological and conventional agricultural systems in Bangladesh: An assessment based on environmental, economic and social perspectives. Agric. Systems. 79, 327–351.

[15]Rejaul, H., Bakshi, K., 2005, Pest Management, Productivity and Environment: A Comparative Study of IPM and Conventional Farmers of Northern Districts of Bangladesh. Pak. J. Soc. Sci. 3(8):1007-1014.

[16]Sayadmansoure, I., Ebrahihmi, M.S., 2017, Investigation of wheat producers' knowledge about sustainable weed management. Int. J. Sustainable Society. 9(2):165-177.

[17]Singh, P. K., Gharde, Y., Choudhary, V.K. 2018, Adoption of integrated weed management practices correlates withfarmers profile characteristics. Indian Journal of Weed Science 50(1): 69–71.

[18]Sinzogan, A. C., Van-Huis, A., Kossou, O. K., Jiggins, J., Vodouhe, S., 2004, Farmers' knowledge and perception of cotton pests and pest control practices in Benin: results of a diagnostic study. J. Life. Sci. 52, 285-303.

[19]Swanton, J., Mahoney, J., 2008, Integrated Weed Management: Knowledge-Based Weed Management Systems. Weed Sci. 56:168–172.

[20]United Nations Development Program, UNDP, 2005, Healthier rice for people, better livelihoods for farmers, safer environment for migratory birds in the Caspian region by farmer's field schools method, November 2005, Tehran.

[21]Wilson, R. S., Hooker, N., Tucker, M., LeJeune, J., Doohan, D., 2009, Targeting the farmer decision making process: A pathway to increased adoption of integrated weed management. Crop Prot. 28, 756–764.