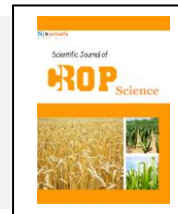Contents lists available at Sjournals

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Original article

Factors affecting rice farmer's knowledge about the principles of sustainable agriculture (case study: central part of noor township in the mazandaran province, Iran)

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A R T I C L E   I N F O

A B S T R A C T

The purpose of this study was to assess factors affecting rice farmer's knowledge about the principles of sustainable agriculture. The simple random sampling technique was used to select 130 rice farmers of central part of Noor township in the Mazandaran province. Data was gathered by using questionnaire. The findings of the study showed that the level of education, number of family labor, and social participation in rural activities had positive and significant correlations with knowledge about the principles of sustainable agriculture in the level of 0.05. Also agricultural income, agricultural experience, and total area of rice lands had positive and significant correlations in the level of 0.01 with knowledge about the principles of sustainable agriculture. The results of stepwise regression analysis also showed that the total area of rice lands, agricultural experience, and level of education explained approximately 29 percent of the variability in rice farmer's knowledge about the principles of sustainable agriculture.

1. Introduction

The word sustainable is derived from the Latin, sustinere, meaning to keep in existence, implying permanence or long-term support. In the context of agricultural production, Ikerd (1993) defines sustainable agriculture as "capable of maintaining its productivity and usefulness to society over long run. …it must be environmentally-sound, resource-conserving, economically viable and socially supportive, commercially competitive, and environmentally sound" (Rigby and Caceres, 2001). Sustainable agriculture systems are based on relatively small and profitable farms that use fewer off-farm inputs, integrate animal and plant production where appropriate, maintain a higher biotic diversity, emphasize technologies that are appropriate to the scale of production, and make the transition to renewable forms of energy (Horrigan et al., 2002). This type of agricultural systems will reduce environmental pollution, and will improve economic power in the short term, and will be guaranteed sustainability of rural communities and quality of their life (Minaei et al., 2009).

Rice is a major food for 40 percent of the world's population. Also, this crop has a particular importance in the nutrition of Iranian community (Khalili et al., 2010). Mazandaran province as one of the major poles of rice production in Iran, produce 44 percent of country's rice supply (Niknejad, 2009). However, in recent decades due to continuous cropping of rice and lack of attention to the protection of productive resources, has been created several issues regards environmental degradation in this province. Problems such as excessive use of chemical fertilizers and pesticides, various tillage, burning of crop residue, soil erosion and water pollution, deforestation due to development of paddy fields are caused by continuous cultivation of rice in the Mazandaran province. The role of rice farmers and their knowledge about the principles of sustainable agriculture, as a decisive factor in conservation of productive resources is very important. The purpose of this study is to identify knowledge of rice farmers about the principles of sustainable agriculture and assess factors affecting it.

Review of relevant literature with this study showed that many factors are affecting the sustainable agricultural knowledge of rice farmers. The study of Motamed (2010) showed significant correlation between participation of rice farmers in rural production cooperatives and their knowledge about sustainable agriculture in the Guilan province. Also Singh (2007) in his study is emphasized on the role of socioeconomic factors in improving the sustainable cultivation of rice in India. Kuponiyi and Bamigboye (2009) found that age, rice income, and farm size have significant and positive correlation with the level of indigenous knowledge of rice farmers in Nigeria. Pattanapant and Shivakoti (2009) found that agricultural experience affect development of knowledge about organic agriculture. Zhou et al (2010) in study of farmers in northern China found that the high educational level of farmers provided better access of them to information about the fertilizers. This issue led them to get more knowledge about fertilizers usage. The results of Zulfikar Rahman et al (2007) study showed that the improve of educational level of farmers in Bangladesh, increase the level of indigenous knowledge and their skills in applying integrated system of nutrients in plants.

2. Materials and Methods

This study is a quantitative research and in term of the control of the variables is non-experimental research. The rice farmers of central part of Noor township in the Mazandaran province are statistical population in this study. According to the formula in simple random sampling (Mansourfar, 2006), 130 rice farmers were selected as the sample. Data was collected through questionnaire by using random sampling method. Panel of Experts method was used to assess the validity of the questionnaire. For measuring the reliability of the questionnaire, a pilot study used to compute Alpha Cronbach's Coefficients. Alpha Cronbach's Coefficients for different sections of the questionnaire calculated 0.7 to 0.85. The data analyzed using SPSSwin19 software. Variables and criteria used in this study are included:

Knowledge about the principles of sustainable agriculture: This variable refers to farmer's awareness about the principles of rice sustainable agriculture. To measure this variable also designed 15 questions about their knowledge of the activities and techniques in sustainable production of rice, including conservation and management of soil fertility, crop residue retention, use of organic fertilizer and green manure, crop rotation and use of crop diversity, conservation and management of water resources, the use of safe and certified seeds and new varieties of rice, using a multi-culture system (combining agriculture and animal husbandry, integrated cultivation of rice-fish, integrated cultivation rice and duck, forestry-farming), efficient use of fertilizers, minimum

tillage, sustainable management of rice weeds, pests and diseases. To evaluate farmers' responses was used a range from 5 options (very low, low, medium, high and very high).

Social participation in rural activities: The purpose of this variable is the level of farmers' cooperation in activities of rural production cooperatives, the activities of local organizations and activities of the village council. To assess the level of participation, 6 items designed in two parts and the second part were evaluated by a range of five options (very low, low, medium, high and very high).

Access to information resources and technologies: This variable means access of farmers to training and extension classes, magazines and newspapers, management of Jihad-e-Keshavarzi in township, agricultural extension and service centers, rural production cooperatives, research centers, pioneer farmers, television and radio, family and friends to gain new knowledge and information about rice sustainable production. This variable was measured using 11 items and the range of five options (very low, low, medium, high and very high).

Characteristics of farming systems: these characteristics including the agricultural experience, total area of rice lands, and the number of family labor.

Economic Characteristic: This feature includes variable of agricultural income.

Personal characteristics: These characteristics include age, level of education, number of farmer household members.

3. Results and discussion

The descriptive findings showed that the average age of farmers was 48 years. The average education was 9 years (middle school level). The average agricultural experience of farmers was 22.3 years. The average of total rice farming area was 2 hectare. Also the average income of rice in year was 67 million rials (approx. 2233 USD).

Also, ISDM (^Interval of Standard Deviation from the Mean) method was used to assess the level of rice farmer's knowledge about the principles of sustainable agriculture. This variable was grouped according to the mean, standard deviation and using the following formula:

$$A < Mean - SD$$
$$Mean - SD < B < Mean$$
$$Mean < C < Mean + SD$$
$$Mean + SD < D$$

A = Low
B = Relatively Low
C = Relatively High
D = High

Table 1 shows the results of this analysis. The results indicate that 14.6 percent of respondents have low knowledge, 37.7 percent have relatively low knowledge, 40.8 percent have relatively high knowledge and 6.9 percent of respondents have high knowledge about the principles of sustainable rice production.

Table 1
Distribution of rice farmers based on the level of knowledge about the principles of sustainable agriculture.

Level of Skill	Frequency	Percent	Cumulative Percent
Low	19	14.6	14.6
Relatively Low	49	37.7	52.3
Relatively High	53	40.8	93.1
High	9	6.9	100
Total	130	100	-

Maximum = 52   Mean = 32.60
Minimum = 21   Std. Deviation = 5.70

The correlations between independent variables and rice farmer's knowledge about the principles of sustainable agriculture have been shown in Table 2. The results showed that variables of level of education, number of family labor, and social participation in rural activities had positive and significant correlation in the level of 0.05 with knowledge about the principles of sustainable agriculture. The findings of Zulfikar Rahman et al

(2007), Kuponiyi and Bamigboye (2009), Zhou et al (2010), and Motamed (2010) supported these findings. Also, variables of agricultural income, agricultural experience, total area of rice lands had positive and significant correlation in the level of 0.01 with knowledge about the principles of sustainable agriculture. These results are consistent with Singh (2007), Pattanapant and Shivakoti (2009), Kuponiyi and Bamigboye (2009) findings.

Table 2
Correlation of variables with knowledge about the principles of sustainable agriculture.

Variables	Correlation Coefficient (Pearson)	Significant Level
Age	0.104	0.241
Level of education	0.149	0.048
Number of farmer household members	0.101	0.252
Agricultural income	0.367	0.000
Agricultural experience	0.379	0.000
Total area of rice lands	0.398	0.000
Number of family labor	0.197	0.025
Social participation in rural activities	0.145	0.035
Access to information resources	0.120	0.175

In order to predict the variability of knowledge about the principles of sustainable agriculture by the independent variables, Stepwise Regression Analysis Method was used. The variables used in this analysis were the level of education, agricultural income, agricultural experience, total area of rice lands, the number of family labor, and social participation in rural activities. Based on the regression coefficients (B) and constant coefficient calculated, regression equation is as follows:

$$Y = 23.330 + 1.529X_1 + 0.163X_2 + 0.308X_3$$

The results showed that the independent variables of total rice farming area, agricultural experience, and level of education explained 28.7% of the variability in the rice farmer's knowledge about the principles of sustainable agriculture (Table 3). Also, based on the Beta coefficients to determine the contribution of independent variables in explaining the dependent variable, agricultural experience have the most important role in explaining the variability of this variable.

Table 3
The results of stepwise regression analysis with dependent variable of the knowledge about the principles of sustainable agriculture.

Independent Variable	B	SE B	Beta	T	Tsig	R	R^2	R^2Adj
Total area of rice lands (X_1)	1.529	0.357	0.325	4.286	0.000	0.398	0.158	0.152
Agricultural experience (X_2)	0.163	0.035	0.368	4.718	0.000	0.502	0.252	0.240
Level of education (X_3)	0.308	0.101	0.233	3.054	0.003	0.551	0.304	0.287
Constant	23.330	1.375	-	16.966	0.000	-	-	-

F = 18.321   Signif F = 0.000

4. Conclusion

This research has been conducted to assess rice farmer's knowledge about the principles of sustainable agriculture in the central part of Noor township in the Mazandaran province. More than half of the rice farmers had low and relatively low knowledge about the principles of sustainable agriculture. Social participation of farmers in rural activities is related with improving knowledge about the principles of sustainable agriculture. In other words, with improving the level of social participation of rice farmers in rural activities such as the activities of rural production cooperatives, local organizations and activities of the village council improves their knowledge about the principles of sustainable agriculture. According to the results, improvement of agricultural income, agricultural experience, level of education improve farmer's knowledge about the principles of sustainable agriculture. Also with increase number of family labor and total area of rice lands improves rice farmer's

knowledge about the principles of sustainable agriculture. The results showed that the independent variables of total area of rice lands, agricultural experience, and level of education explained a part of the variability in the knowledge about the principles of sustainable agriculture. Among these variables, agricultural experience had the most important role in explaining the variability of the knowledge about the principles of sustainable agriculture.

According to the above results, the following recommendations are offered:

Based on the positive and significant correlation between education level and knowledge about the principles of sustainable agriculture, is recommended the expansion of literacy projects in provincial level.

Investigation and analysis of other factors that influence rice farmer's knowledge about the principles of sustainable agriculture, is recommended.

According the importance of rice as a strategic product in Iran, it is suggested that this study is conducted in other provinces that are engaged in the cultivation of this crop, and are compared the results.

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