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Factors Affecting on Rice Farmer's Participation in Water Resource Management; Case Study: Ilam, Iran

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Abstract – **This research aims to study the factors affecting on rice farmers' participation in water resource management in Iran. To this end, 150 rice farmers from the province of Ilam were selected by using Cochran formula. Data were collected by interviews and a proportional stratified sampling. Then, the data were analyzed by SPSS software and the impacts of individual, farming, social, and economic factors on farmer's participation in water resource management were studied. The results indicate that there is a negative relationship between farmer's participation in water resource management and farmers' age, farming experience and rice-farming experience. In addition, farmers' education, total land area, rice land area, cooperation with local communities, participation in training courses, attitude to participation, annual income, and income earned from rice production have positive and significant influence on farmers' participation in water resource management. The results of the multiple regressions demonstrate that among factors of the model, attitude to participation, rice land area and cooperation with rural communities have significant effect on the dependent variable.**

Keywords – **Participation, Water Resource Management, Rice, Ilam Province, Iran.**

I. INTRODUCTION

Humankind lives on a plant 71 percent of which is covered by water. However, most of this water; precisely, 97.17 percent is salt water, and the rest is fresh water. More surprisingly, only 0.014 of the fresh water is accessible most of which is consumed by agriculture sector. In 2002, 70 percent of accessible fresh water was allocated to agriculture [1]. Yet, in developing countries, 90 percent of fresh water is employed in agriculture [2]. On the other hand, the annual accessible water in the world is just 2001 m^3 that is predicted to decrease to the critical level of 1700 m^3 in 2 next decades [3]. Today, 26 countries, experiencing high population growth, are considered to suffer from shortage of water. Nine of such countries are located in the Middle East and facing water scarcity [4].

Iran is located in the direst part of the world and water scarcity is the most deterring factor in the development of agriculture [5]. The annual average of the precipitation in Iran is 225 mm that is a great deal lower than the average of the precipitation in the world that is 860 mm. It is also noticeable that 93 percent of fresh water resource in Iran is allocated to agriculture, and only less than 7 percent is consumed in the industry and domestic sector [6].

As agriculture sector consumes the highest amount of water, the water scarcity is the main problem in this sector. Hence, it is necessary to consume water resources efficiently; in the other words, management of water resources seems to be inevitable. In Iran, water scarcity is a major problem for agriculture in the whole country. Meanwhile, Ilam province is not an exception. It has been threatened by draught during last years. This province is located in the west of Iran with cold and semi-dry weather. The annual average of precipitation in this area is 257.6 mm. Ilam province is an important region of Iran for producing rice. In 2009, 1535 hectares of land in this province brought under cultivation of rice and produced 7934 tons rice [7]. At present, this province is facing a water crisis due to the traditional method of irrigation, inappropriate irrigation structures, overuse of underground water resources, and digging unauthorized wells. Most of water in agriculture sector of Ilam is wasted although the government designed and implemented irrigation systems without the cooperation of the stakeholders [8].

According to last studies, one way to optimize consumption of water is farmers' participation in the management of water resources. Farmers' participation not only reduces the costs for the government, it also promotes farmers' sense of ownership resulting in contribution of farmers in maintenance of infrastructure installations, and ultimately increasing irrigation efficiency [9]. Study of Shortt et al (2006) in Canada indicates that natives' involvement in water resources management settles their conflicts over water successfully, reduces the costs and improves the productivity. This is for the fact that promoting participation of natives and stakeholders makes it more possible to optimize use of natural recourses like water resources. The stakeholders will be able to minimize their problems; therefore a sustainable management of the natural resources is guaranteed [11], and scientific and technical views of experts are applied for stakeholders' benefits [12].

Sharifian (2000) studied on social factors affecting on stakeholders' participation in water engineering projects and suggested that environmental features and personal characteristics such as social dignity and economical situation are the most effective factors on stakeholders' participation. Azizi Khalkhili and Zamani, (2010) find out that factors "attitude to participation in irrigation management" and "understanding the present problems" have the highest impact on the farmers' participation in irrigation management. Khedri (2006) suggested that the more financially able the farmers are, the more often they will participate in irrigation and drainage projects. And the more aware they are of the benefits of such projects, the

more willingly they will participate. Considering the factors affecting on participation in the supervision programs, Mendoza (2006) stated that the participants were the younger and more literate subjects. The ones who had higher incomes, more extensive lands, and better local organizational relationships participated more often. The study carried out by Green et al on participatory learning in a natural resources course demonstrated that involving the owners and consumers of resources in the training courses causes these people to adopt ways that better suit the environment [17]. Regarding the importance of rice in the development of province, the high dependence of rice on water, and the optimal management of water, this research tries to study the strategies promoting rice farmers' participation in the optimal management of water resources in Ilam. The findings could provide the authorities, and policy makers with strategies to improve the agriculture in the area, and access to sustainable rural development.

II. METHODOLOGY

The research is a survey with descriptive and correlation method. The population consists of the rice farmers of Ilam province of whom 150 were selected via Cochran formula as the sample group. The data were collected by a questionnaire in Proportional Stratified Sampling. The questionnaire was studied by a group of experts of Agriculture Training and Development, and the corrections were made. This way it attained its content validity. To attain the reliability of the questionnaire, 30 questionnaires were completed, and the Cronbach Alpha coefficient was calculated which was equal to 0.76 demonstrating that the questionnaire was reliable. Then, the gathered data was analyzed in SPSS software by correlation coefficients, compare means, and multiple regressions.

III. RESULTS

The gathered data and research variables are analyzed as follow.

III.I. Descriptive Conclusions

III.I.I. the rice farmers' personal, agricultural, and economic characteristics

Based on the results shown in table (1), the mean age of the sample group is 51.32, ranging between the youngest rice farmer aged 24 and the oldest aged 77. The mean of number of years spent on education is two years and eleven months ranging between zero and twelve years. This reveals that the sample rice farmers are poorly-educated.

The mean of land area owned by the subjects is 7.97 hectares, and the mean of under-cultivation land area of rice is 1.36 hectares. The mean of farming experience is 17.5 years, and the mean of farming rice experience is 16.2 years. In addition, the mean of total annual income is 4136.6 USD per each farmer, and the mean of annual income out of rice production is 1156.6 USD per each farmer (Table 1).

Table 1: The rice farmers' personal, agricultural, and economic characteristics

Variable	Mean	SD	min	Max
Age(year)	51.32	13.81	24	77
Education (year)	2	3.25	0	12
Total land area (hector)	7.97	3.27	0.5	18
under-cultivation land area of rice (hector)	1.36	0.7	0.5	5
Farming experience (year)	17.5	8.1	1	35
Rice farming experience (year)	16.2	8	1	35
total annual income (USD)	4136.6	1014.8	2000	6500
income earned from rice production (USD)	1156.6	485.4	500	2000

III.I.II. Analysis of the farmers' participation in water resources management

In order to study how much the rice farmers of Ilam province participate in water resources management, we propounded a question with 12 items in a 5-choice Lickert scale. As seen in table (2), the participation of 54% of the respondents is very low and low, of 21.3% of them is average, and of 24.7% is good and very good.

Table 2: the farmers' participation in water resources management

Level of participation	Frequency	Percentage	Cumulative percentage
very low and low	81	54	54
Average	32	21.3	75.3
good and very good	37	24.7	100
Total	150	100	-

III.II. Analytical Conclusions

In this section, the hypotheses of the study are evaluated by considering the results of the statistics.

III.II.I. Bivariate analyses

III.II.I.I. Personal characteristics

The results indicate that farmers' participation in water resource management is related to their personal characteristics, as shown in table (3). There is a negative and significant relationship at the level of 5% between their age and their participation in water resources management. In other words, the younger ones are more willing to participate. This could be for old farmers, having traditional experiences, are less flexible to change, and participate in water management. There is furthermore a positive, significant relationship between the farmers' education and their participation at the level of 1% as shown in table (3). The higher the level of the farmers' education is, the more willing they are to participate. As higher-educated farmers access more information sources, they are more aware of the benefits. To get more benefits, they decide to apply participatory management. There is

no significant relationship between sex and participation. Men and women are not really different respecting participation in water management.

III.II.I.II. Agricultural characteristics

As shown in table (4), there is a positive, significant relationship between the farmers' participation and their under-cultivation rice land area. On other words, the bigger the land employed for rice cultivation is, the more willing the farmer is to participate. There is additionally a negative, significant relationship between farmers' farming experience, rice farming experience, and their participation in water management; to be precise, the longer the general farming and rice farming experience is, the less willing the farmer is to participate. This could be for the more experienced farmers, applying their traditional methods of water management, are less flexible to participatory water management. There is no significant relationship between farmers' participation in water resources management and their farming system, ownership type and irrigation resource (table 4).

III.II.I.III. Social characteristics

Table (5) demonstrates the relationship between farmers' social characteristics and their participation in water management. The results indicate that there is a positive, significant relationship between farmers' participation in water resources management and their cooperation with the rural communities, participation in training courses, and their attitude to participation; precisely, the socially higher the studied farmers are, the more participative they are to water management

Table 4: relationship between farmers' participation and their agricultural characteristics

Independent variable	Test	Coefficient	sig
total land area	Spearman correlation	0.168*	0.040
rice land area	Spearman correlation	0.243**	0.003
farming experience	Spearman correlation	-0.230**	0.005
rice farming experience	Spearman correlation	-0/190*	0.020
Farming system	F Test	0.689	0.504
Ownership type	F Test	0.943	0.392
Irrigation resource	F Test	0.214	0.808

*:significant at 5% level **:significant at 1% level

Table 5: relationship between farmers' participation and their social characteristics

Independent variable	Test	Coefficient	sig
cooperation with the rural communities	Spearman correlation	0.243**	0.003
participation in training courses	Spearman correlation	0.246**	0.002
attitude to participation	Spearman correlation	0.344**	0.000

*:significant at 5% level **:significant at 1% level

Table 6: Relationship between farmers' participation and their economical characteristics

Independent variable	Test	Coefficient	sig
annual income	Spearman correlation	0.208*	0.011
income from rice production	Spearman correlation	0.209*	0.010

*:significant at 5% level **:significant at 1% level

III.II.I.IV. Economic characteristics

The results shown in table (6) indicate that farmers' participation in water resource management is related to their economic characteristics**.** There is a positive, significant relationship between farmers' annual income and also income from rice production and their participation at the level of 5%. It signifies that farmers with better economic situation tend to participate more often. On other words, the participation in water management increases as the income does.

III.II.II. Multiple regressions

To achieve a better understanding of the factors affecting on farmers' participation in water resources management, we took advantage of stepwise multiple regressions. In order to study the effects of the independent variables on the dependent variable, to predict the variance of the dependent variable, and to find out how strongly each independent variable explains the variance of the dependent variable, the multiple regressions were estimated. To this end, all independent variables that could theoretically affect on dependent variable were put in the equation. Then, the effect of each independent variable on the dependent variable was studied.

Table 7: relationship between farmers' participation and their social characteristics

	B	B	t	Sig
Intercept	2.534	-	9.715	0.000
Attitude to participation	0.312	0.304	4.180	0.000
Rice land area	0.122	0.229	3.161	0.002
Cooperation with rural communities	0.185	0.232	3.139	0.002

R^2=0.24 F=17.455 Sig=0.000

As demonstrated in table (7), F is significant at 1% level. It denotes that there is at least one independent variable in the regression model that has a significant relationship with the dependent variable; therefore, the equation of the regression model could be made. In addition, R^2 signifies that 24% of the variance of the dependent variable is explained by the independent variables in the model.

Considering the results shown in table (7), the linear equation derived from the analysis of the regression is as relation (1).

$$Y=112.223-9.441X_1+25.666X_2+29.045X_3+4.898X_4+29.423X_5+5.090X_6 \quad (1)$$

In relation (1), X_1 is the age of rice farmers; X_2 is the education level of farmers; X_3 is farmers' participation in training courses; X_4 is farmers' rice land area; X_5 is farmers' attitude to participation and X_5 is the famers' income earned from rice production.

Moreover, the values of significant levels at table above demonstrate that among variables in the model, attitude to participation, rice land area and cooperation with rural communities have significant effects on the dependent variable. The other variables that have no significant influence on the dependent variable are out of the model.

SUGGESTIONS

As there is positive and significant relationship between the farmers' participation in training courses and their participation in water resources management in Ilam province, it seems quite essential to make plans to get farmers familiar with appropriate ways of water management. It is recommended that applied courses and workshops are held to introduce and explain ways of participatory management of irrigation, and appropriate ways of employing water resources. It is suggested that difficulties and obstacles of optimum use of water resources are explained by experts, and appropriate strategies are introduced to farmers in order to achieve an optimized sustainable use of water resources.

Another way to attract farmers' participation is to inform them via mass media about the benefits of participatory management of water resources.

As most of the irrigation and water transmission methods in Iran are traditional, and a considerable volume of water is wasted as a result, it is suggested that the government give long-term low-interest loans to poor farmers so that they could set up more suitable systems of water transmission, and take advantage of more efficient irrigation. It would decrease the consumption of water and increase the farmers' income.

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