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FACTORS INFLUENCING PEOPLE'S PARTICIPATION IN THE EXPLOITATION OF WATER RESOURCES IN AGRICULTURE SECTOR OF IRAN

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Abstract

The purpose of this study was to investigate the factors influencing people's participation in the exploitation of water resources for agriculture. The population consists of experts with a B.A. and higher degree employed in various sectors of Agriculture Organization, Water Organization and Research Center of Urmia city. The sample was randomly selected, and the sample size was determined through Kerjice and Morgan table to be 196. This is an applied field study. The survey tool is a structured questionnaire with close-ended question and its validity and reliability is confirmed by experienced professors, and Cronbach's alpha coefficient which indicates the validity of the questionnaire is calculated to be 0.834. The results show that there is a significant relationship among the administrative, social, cultural, educational, economic, ecological, technical, structural and political factors and the importance of people's participation in the exploitation of water resources for agriculture. The results of multiple regression showed that the independent variables explained 66 percent of the dependent variable variance. According to finding in this research these recommendation comments: Improvement and shortening of water transfer networks in order to speed up the transfer of water and reduction of water loss. Government financial support in the agricultural-industrial sector in order to use new technologies. Preventing economic, social, environmental and political losses due to Urmia Lake drying. Maintaining the diversity of plants and crops through water management and environmental management and environmental ethics. The role of mass media such as radio and television, the use of other channels of communication in highlighting the importance of optimal water consumption. Government support for farmers to renew or launch pipeline for farms and gardens to prevent water losses, as well as supporting new irrigation methods and repairing old transmission lines. Increasing cooperation between people and society and even the state regarding participation in the optimal use of water resources.

Key words**:** *exploitation, participation, water resources, agriculture sector, Urmia, Iran*

INTRODUCTION

Water is the most important factor in the countries' agricultural production and national capital. Limited water resources as a result of improper irrigation practices led to dedicating more specialized manpower to increase the efficiency of water consumption. Modern irrigation techniques are divided into two categories: drip irrigation and sprinkler irrigation which increase irrigation efficiency [11]. Factors affecting farmers' participation in the management of water supply networks include: demographic variables such as age, education level, experience in agriculture and stockbreeding activities; economic variables such as income, the area of agricultural land, the water rights, water pricing in agriculture, irrigated agriculture profitability; social variables such as membership in social organizations, membership length in Water User Associations (WUAs), solidarity and collective power, and participation in collective educational activities, etc. These factors were considered in the design and development of a questionnaire in order to access the following specific objectives [24].

Experts consider public participation in the development process of great importance such that they often equate participation to the development or introduce participation as the purpose of development. Apparently the concept of participation is clear, but actually different interpretations have been made. Sometimes participation is considered of political, cultural, social and economic perspective; and sometimes participation in the implementation is considered and

participation in decision making, evaluation, monitoring and follow-up is not even mentioned. In third world countries, because of centralized political structure and in some cases non-democratic governments, usually participation in the implementation is meant if the issue of participation is ever raised. Just like the period of lord and vassal when the master made key decisions and peasants in groups were active in the implementation [20].

According to most experts, low irrigation efficiency in developing countries is due to lack of real participation of beneficiaries in decision making, implementation, management and maintenance of irrigation networks. The policy of beneficiaries participation in the implementation of irrigation networks has been of particular interest since the late 80s, mainly due to the inability of government agencies responsible for organizing the water sector and the lack of funds for maintenance and operation of these networks; the policy of motivating and encouraging beneficiaries to participate in the construction of these networks have been adopted in more than 20 countries such as Mexico, the United States, Colombia, the Philippines, India, Pakistan, Turkey, China, Sri Lanka, Nepal and New Zealand [6].

The world is facing a challenge in relation to water. The growing increase in water consumption in Iran led to considerable investments at national and regional level. River basins especially in arid and semi-dry areas such as Iran and adjacent territories have always been the settlements for civilization of human societies [12]. Population growth and pressure on water resources and soil in recent times, in addition to the development of water supply technologies and cultivation methods, has led to give more importance to this limited resource in Iran than ever. Therefore, soil and water resource management and conservation measures are necessary [5].

It is not only a particular community or group that depends on water; however, water in the rural community due to its heavy reliance of agricultural practices on water has an important role in rural development [7]. The agricultural sector, consuming 92% of the 1.93 billion cubic meters of water obtained, is the largest consumer of water; so agricultural development strongly depends on water resources management [19].

Unfortunately, due to inappropriate and excessive exploitation of agricultural water resources Iran is facing serious constraints in supplying water for agriculture; and realizing the goals of water management in agriculture sector is faced with different challenges [4].

So it seems that we should consider limited water resources as a dynamic issue related to the sustainability of water resources. Therefore, the sustainability of these limited resources for future generations must also be considered to optimize their consumption. This issue in agriculture sector as the most important consumer of water resources is of ever more importance [1].

The purpose of integrated management of water resources is to create a system that cross-linking water management with environmental, social and economic development benefits from their reflection and feedback and finally, with the participation of different sectors the decisions for development and allocation of water resource are made. The important points that should be considered in studies of water resources management are recognition of components and their uncertainties, identification and clarification of the relationships between the components, and the direct and indirect effects of the components, so that solving a problem and planning a component will not overshadow other parts of the system [8]. Direct effects are usually measurable. Integrated water resource management take advantage of a combination of different strategies and policies such as water storage, aquifer recharge, water transportation, water saving, management of pressure and leakage in water distribution networks, increasing the water supply considering hydrological, hydraulic and structural uncertainties [17].

The spring studies in 2005 reflected the fact that there was significant relationship between the promotion of social and economic indicators and optimized management of agricultural water by wheat producers. Mohammadi [13] analysed the context and

mechanisms of agricultural water management in Zarrin Dasht city, Fars province; and studied the drop in groundwater levels, groundwater salinization caused by overuse of the water, excessive evaporation of water in the channel route, the terrestrial channels with low efficiency of water transfer, saline irrigation water, land fragmentation, priorities of problems regarding irrigation sources, water supply and consumption on the farm by farmers [13].

Dehymavi and Ahvaziyan [3] also considered reduction of government tenure in the water and irrigation sector, reduction of the maintenance and operation cost of irrigation systems, improvement of network maintenance, reduction of the disputes caused by non-uniform distribution of water among farmers, the development of lands under cultivation, job creation and solving the problem of unemployment, increasing collective cooperation and cohesion among rural communities, solving the problem of low efficiency of water, and ultimately preventing excessive water consumption and high income with solving structural and fundamental problems as the positive outcomes of handing the irrigation management to WUAs [3].

Omani and Chizari [14] studied the factors contributing to the sustainable management of agricultural water resources in the northern part of the Modarres watershed, Khozestan province and concluded that five factors determined 71% of the changes in the sustainable management of agricultural water resources: economic features, educational-promotional activities variables, social activities, awareness and support of government. This means that if these five factors be considered in planning agricultural activities, it could be argued that the level of technical knowledge of wheat farmers in the field of sustainable agriculture in Ahvaz city will highly be improved [14].

Hosseinzad and co workers [6] studied mechanisms of agricultural water management in Tabriz plain and concluded that the disproportion between the number of wells and the area of land under cultivation, salinization of groundwater resources due to excessive consumption, and groundwater levels reduction were identified as first to third priorities in agricultural water management problems of the region. The results also showed that about 61% of the total variance of agricultural water management is explained by three factors: deep and semi-deep groundwater and surface water. Therefore, reducing the amount of wells discharge and efficient use of surface water in order to increase the land area under irrigated cultivation will be effective in the management of regional water resources [6].

Shibani and Kazemi [20] in a study entitled "Factors affecting the public participation in the use of modern irrigation methods to reduce water consumption in line with the sustainable development of the environment" concluded that the reasons for the lack of acceptance of new irrigation technologies by farmers include: Recommendation of difficult and expensive technologies, failure to promote new technologies, the lack of adequate credit facilities, and so on. Inhibiting factors of new irrigation methods include: high costs, lack of education and insufficient awareness. Participation in previous phases and during procedures, as well as adequate awareness are the factors encouraging new methods of irrigation [20].

Oweis and Hachum [15] in a study, “improving water productivity in rain-fed agricultural land in West Asia and North Africa”, emphasized the role of agricultural water resources management to increase productivity and argued that economic, social and organizational structures must be considered in realization of water resources management [15].

Results of Yercan [23] shows of successful participatory management of water resources projects in other countries such as China and Sri Lanka in a study entitled "Evaluation of participatory management of irrigation projects in Sri Lanka: minor fixes, minor interests" and in Turkey also confirms these results [23].

Kijene [10] believed that there was a significant relationship among increasing agricultural water productivity, food security, increased and sustainable food supply, increased water use efficiency, water

consumption optimization and management structural reforms realization of which requires a fundamental change in the behaviour of farmers, especially cognitive domains [10].

Boelense and co-workers stated that empowerment of farmers through promotional and training measures is the major factor in the management of agricultural water resources [2].

Qiao and co-workers in a study entitled "Water associations in Mongolia: factors affecting farmers to join water management", showed that WUAs in Hubei province played an important role in reducing conflicts among upstream and downstream users; and on the other hand, they had improved the irrigation services as the lands irrigated in two weeks before the establishment of WUAs were irrigated in four days using the new irrigation system. However, this caused a 50 percent increase in irrigated land area [18].

MATERIALS AND METHODS

Regarding the purpose of the study, this study was an applied research. Also, considering the amount and degree of control of the variables, it was a non-experimental study. Besides, considering the data analysis, the study was descriptive, correlation study. In order to collect the data, in the fieldwork stage, a questionnaire was used as the main means of the data collection. To measure its validity, the necessary amendments were made after getting the professors and experts' opinions. Also, in order to measure the reliability of the questionnaire, thirty questionnaires were completed by the experts and Cronbach alpha coefficient (0.834) was calculated. The population consists of 400 experts with a B.A. and higher degree employed in various sectors of Agriculture Organization, Water Organization and Research Centre of Urmia city. The sample was randomly selected, and the sample size was determined through Morgan table to be 196. The collected data through the questionnaires was analysed by SPSS version 15. In the descriptive statistical section, distribution, percentage, and mean were used. In the inferential statistics, factorial analysis method was employed.

RESULTS AND DISCUSSIONS

The description of the age of the sample of the study showed that the mean of the age of the participants was 43, and the maximum age was 59 and the minimum age was 22. The majority of the participants were men (% 76.9) and the (% 23.1) were women.

Table 1. The personal characteristics

The distribution of respondents by gender				
Gender	Distribution	Percentage		
Male	150	76.9		
Female	45	23.1		
The distribution of the subjects' educational group				
Group	Distribution	Percentage		
B.Sc.	101	51.5		
M.Sc.	89	45.4		
Ph.D.	6	3.1		
The distribution of the age groups of the subjects				
Group	Distribution	Percentage	Mean	Variance
Less than 30 years	22	9.4		
31 to 40 years	40	19.8		
41 to 50 years	90	47.9	43.32	9.047
More than 51 years	43	22.9		
The distribution of the age experience				
Group	Distribution	Percentage	Mean	Variance
Less than 10 years	38	19.8		
10 to 20 years	42	21.87	18.66	5.81
More than 21 years	112	58.33		

Source: Research findings.

Regarding their job experience, the mean of the work experience of the participants was 18.66 years. Most of the participants, 112 subjects (% 58.33), had the job experience of more than 21 years. Considering their educational level, there were 101 B.Sc., 80 M.Sc., and 6 PhD. Other finding are shown in Table 1.

Table 2 shows the priority of variables regarding the problems of the lack of public participation in agricultural water resource utilization from the experts' view. According to this table, "the lack of cooperation between people and society" with a variation coefficient of 0.245 and "cultivation of high-water-needing crops in wide areas of lands to gain more economic interest" with the variation coefficient of 0.325 were the minimum and maximum value of variation coefficients, respectively.

Table 2. The priority of variables regarding the problems of the lack of public participation in agricultural water resource utilization from the experts' view

Variable	Average	SD	Variation coefficient	Rank
Lack of cooperation between people and society	3.76	0.922	0.245	1
False culture of the people regarding the use of water	3.78	0.984	0.260	2
Increased number of wells dug by farmers	4.06	1.093	0.269	3
Farmers believing in traditional irrigation and their lack of trust in modern irrigation methods	3.64	1.009	0.277	4
Lack of access to financial resources for applying modern irrigation methods	3.99	1.120	0.281	5
Disputes arising due to the non-uniform distribution of water among farmers	3.57	1.028	0.288	6
Lack of responsibility for protecting water resources	3.87	1.149	0.297	7
cultivation of high-water-needing crops in wide areas of lands to gain more economic interest	3.68	1.194	0.325	8

Likert scale: very low: 1; Low: 2; Average: 3; high: 4; very high: 5

Source: Research findings.

Correlation coefficient of variables

Pearson's correlation coefficient was used to examine the relationship between the aforementioned dependent variable (the importance of public participation in the exploitation of agricultural water resources) and independent variables (factors affecting people's participation in the exploitation of agricultural water resources) which include administrative, social, cultural, educational, economic, ecological, technical and structural, political factors and the problems of the lack of public participation. The results suggest that the administrative factor and the importance of public participation in agricultural water resource utilization have a significant positive correlation at the level of 1%. That is, the better administrative factor, the more important public participation in the exploitation of agricultural water resources will be.

There is a significant positive correlation between the social factor and the importance of public participation in agricultural water resource utilization at the level of 1%.

There is a significant positive correlation between education factor and the importance of public participation in agricultural water resource utilization at the level of 1%.

There is a significant positive correlation between economic factor and the importance of public participation in agricultural water resource utilization at the level of 1%.

There is a significant positive correlation between political factor and the importance of public participation in agricultural water resource utilization at the level of 1%.

There is a significant positive correlation between ecological factor and the importance of public participation in agricultural water resource utilization at the level of 1%.

There is a significant positive correlation between technical-infrastructural factor and the importance of public participation in agricultural water resource utilization at the level of 1%.

There is a significant positive correlation between the problems of the lack of public participation and the importance of public participation in agricultural water resource utilization at the level of 1%.The results of the correlation coefficient of dependent variable and the independent variables are shown in Table 3.

Table 3. Calculation of the correlation coefficient of dependent variable with independent variables

Variables	Correlation coefficient (rs)	Significance level
Administrative factor	0.582**	0.000
Social factors	0.668**	0.000
Education factor	0.647**	0.000
Economic factors	0.719**	0.000
Political factors	0.573**	0.000
ecological factor	0.665**	0.000
Technical and infrastructural factor	0.427**	0.000
Problems of the lack of public participation	0.391**	0.000

** P≤0.01

Source: Research findings.

Regression analysis of variables

This study in line with its purpose (predicting a dependent variable from independent variables) used multiple-regression model to predict the dependent variables from the independent variable. Pearson's correlation coefficient was used to examine the relationship between the aforementioned dependent variable (the importance of public participation in the exploitation of agricultural water resources) and independent variables (factors affecting people's participation in the exploitation of agricultural water resources) which include administrative, social, cultural, educational, economic, ecological, technical and structural, political factors and the problems of the lack of public participation.

A multiple regression analysis (ENTER) is used to predict the dependent variable (importance of public participation in the exploitation of agricultural water resources) variance in the event of a change in the independent variable (factors affecting public participation in the exploitation of agricultural water resources) which includes administrative, social, cultural, educational, economic, ecological, technical and structural, political factors and the problems of the lack of public participation. Multiple-correlation coefficient (R) which represents the intensity of the relationship between the dependent and independent variables, in this equation is equal to 0.812. According to the R2, these factors explained 66% of the dependent variable variance.

Beta values were used to determine the significance of the independent variables in the regression. Based on these values it could be stated that the economic and the educational factor have a more significant role in predicting the dependent variable, compared to other variables. The results of the analysis are shown in Tables 4 and 5.

The linear regression equation using the B coefficients is as following:

$$Y = 9.964 + 0.073\ X1 + 0.086\ X2 + 0.212\ X3 + 0.188\ X4$$

Table 4. The coefficients of the variables entered into the regression equation

Variables	B	SD	Beta	T	Sig. level
Constant	9.964	1.396	-	7.138	0.000
Administrative factor (x1)	0.073	0.030	0.114	2.433	0.001
Social factors (x2)	0.086	0.041	0.123	2.097	0.001
Educational factor (x3)	0.212	0.069	0.278	5.170	0.000
Economic factors (x4)	0.188	0.050	0.297	3.760	0.000
Political factors (x5)	0.096	0.054	0.145	1.778	0.077
Ecological factors (x6)	0.019	0.063	0.030	0.308	0.759
Technical- infrastructural factor (x7)	0.042	0.023	-0.115	1.826	0.071
Problems of the lack of public participation(x8)	0.086	0.065	0.123	1.365	0.089
R=0.812 R2 =0.66 F=35.921 Sig. 0.000					

Source: Research findings.

CONCLUSIONS

Due to the need of rural communities to environment, natural resources, particularly water, have very important role in agricultural sector and rural areas; the optimal utilization of these resources and their management is critical. Public participation in such cases provides the necessary opportunities for successful implementation of projects for proper exploitation of water resources. Given that water resources play a key role in the sustainable development of rural areas and definitely agricultural development without water security would not be possible, the study of effective factors in the fight against water crisis in agriculture seems necessary.

According to the prioritization of variables regarding public participation importance in agricultural water resource utilization, "improvement and shortening of water transfer networks in order to speed up the transfer of water and reduction of water loss" with a variation coefficient of 0.198 had the minimum value for variation coefficient. In other words, "improvement and shortening of water transfer networks in order to speed up the transfer of water and reduction of water loss" with the lowest dispersion was the most important variable affecting public participation in agricultural water resource utilization, from the standpoint of respondents. These results are in line with Vermillion [22].

According to the results, we can say that the water network is main concern regarding the loss of water. Accordingly, the government must identify the best route for water transport, combining irrigation expert knowledge with local knowledge about water transfer routes. Although this has many difficulties ahead, but considering the importance of the issue, it can be realized through cooperation and public participation; and certainly will have a significant impact on preventing water loss.

The results also show that "government financial support in the agricultural-industrial sector in order to use new technologies" with the variation coefficient of 0.201 had the lowest variation coefficient. The results are in line with Zarei Dastjerdi et al [24] and Stoeckl et al [21].

Government has a role to play, too; since only public participation will not be enough in implementation of projects related to water to prevent a part of the water loss. State financial support to farmers is one of the measures that can help to repair or construct new transmission lines. Government providing credits and loans not only leads to proper utilization of resources on the one hand, it also paves the way for realization of goals and executive projects through encouraging farmers to use new irrigation projects, on the other hand.

In economic factor classification, it was seen that "preventing dehydration of Urmia Lake and its revival together with the fading role of ecotourism in local economy" with the variation coefficient of 0.202 and "increasing the access to financial resources for applying modern irrigation methods" with the variation coefficient of 0.224 had the lowest variation coefficient. These results are consistent with the results obtained by the Zarei Dastjerdi et al [24] and Khoshab and Namazi [9]. In other words, the variable "preventing dehydration of Urmia Lake and its revival together with the fading role of ecotourism in local economy" with the lowest dispersion was the most important variable affecting public participation in agricultural water resource utilization, from the standpoint of respondents.

Obviously, the Urmia Lake is known as one of the most important tourist sites in the region. Every year, many people from inside and outside the country come to visit the lake basin and the residents of Lake basin earn their living by relevant businesses such as working on boats, inns, tea houses which are family jobs for some of them. Fading ecotourism in the region caused many local businesses to be closed and many people to abandon their family jobs and turned to other jobs. Naturally, participation in the revival of the lake can play a very important role in the regional economy. This due to the lack of jobs will be of high importance for unemployed population, especially young people.

Regarding the social factors affecting people's participation in the agricultural water resources utilization, "avoiding economic, social, environmental and political losses due to Urmia Lake drying" with a variation coefficient of 0.226 had the lowest variation coefficient.

Obviously, Urmia Lake in addition to its effects in the economic sector is socially considered as the most important factor, too. Given the importance of the lake to the region, this factor should also be considered and studied socially.

Regarding the ecological factors affecting people's participation in the agricultural water resources utilization, "maintaining the diversity of plants and crops through water management and environmental management and environmental ethics" with a variation coefficient of 0.834 had the lowest variation coefficient. In other words, the variable "maintaining the diversity of plants and crops through water management and environmental management and environmental ethics" with the lowest dispersion was the most important variable affecting public participation in agricultural water resource utilization, from the standpoint of respondents.

Maintaining the diversity of plants and crops in the discussion of ecological factors is very important. Because this issue could be examined from the aspect of the ecotourism sector; so that with the public and state participation and support in protecting the environment, nature lovers and those who carry out research on the plant species and medical plants will not face problems doing their activities.

Regarding the discussion of educational factors affecting people's participation in exploitation of agricultural water resources, we saw that "the role of mass media such as radio and television, the use of other channels of communication in highlighting the importance of optimal water consumption" with the variation coefficient of 0.187 had the lowest variation coefficient.

In examining technical and infrastructural factors affecting public participation in water resource utilization, it can be seen that "government support for farmers to renew or launch pipeline for farms and gardens to prevent water losses" with a variation coefficient of 0.249 had the lowest variation coefficient. These results are consistent with the results obtained by Panahi et al [16].

The study political factors affecting public participation in water resource utilization showed that "government support for modern irrigation and adjustment of old transmission lines" with a variation coefficient of 0.207 had the lowest variation coefficient. These results are consistent with the results obtained by Panahi et al [16] and Zarei Dastjerdi et al. [24].

Also in the study of problems of the lack of public participation in water resource utilization, it can be seen that "the lack of cooperation between people and society" with the variation coefficient of 0.245 had the lowest value for variation coefficient; in other words with the lowest dispersion, it was the most important variable affecting public participation in agricultural water resource utilization, from the standpoint of respondents.

Lack of cooperation between people and society can be examined in economic, social, cultural and other aspects. The lack of cooperation can have economic consequences for people, especially farmers.

All farmers want to achieve maximum profit, so they have the desire to make maximum use of resources. Agricultural water is one of the main sources that can lead lack of cooperation to have maximum profitability.

On the other hand, we can examine this issue from the socio-cultural aspect: the lack of cooperation can vary according to the lifestyle.

Therefore, the necessary situation for public participation in proper water resources utilization must be provided either economically or in terms of socio-cultural aspect.

Some suggestions are requires:

(i)Improvement and shortening of water transfer networks in order to speed up the transfer of water and reduction of water loss

(ii)Government financial support in the agricultural-industrial sector in order to use new technologies

(iii)Preventing economic, social, environmental and political losses due to Urmia Lake drying
(iv)Maintaining the diversity of plants and crops through water management and environmental management and environmental ethics
(v)The role of mass media such as radio and television, the use of other channels of communication in highlighting the importance of optimal water consumption
(vi)Government support for farmers to renew or launch pipeline for farms and gardens to prevent water losses, as well as supporting new irrigation methods and repairing old transmission lines
(vii)Increasing cooperation between people and society and even the state regarding participation in the optimal use of water resources.

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