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ORIGINAL ARTICLE

Affecting Factors on Water Resources' Sustainability in case of small holding farmers, Alborz province, Islamic Republic of Iran

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ABSTRACT
Agriculture water use is the main one among all water uses in Alborz province of Iran. This province is faced in a state of severe water scarcity and water supply plays an essential role in producing food and fiber for ever increasing population of this province with a total population of 1614626 persons and being near a city of Tehran with a population of 12425000-Individuals. Agricultural Irrigation water's uses face severe competition with non –agricultural users of water. Improving the water demand is essential especially for small holders of lands for producing food. The main goal of this paper is to introduce an optimal pattern of the water use to deal with the water crisis toward sustainability in the agriculture. Experts of the Alborz Province's "Governmental Agricultural Jihad Organization" and the" farmers" of the mentioned province formed two sample populations of the research. A researcher made questionnaire was used to collect data. Statistical regressions' analysis has been used to analyze collected data. Three proposed scenarios were examined by the results of appropriate regression's estimations. The findings suggest there are significant relationships between social - economic, technical-irrigation, law-politic mechanisms , optimization of cropping patterns and individual characteristics' of the farmers regarding sustainability use of agricultural water resources in the smallholding farming systems of the Alborz province.
Keywords: sustainability of the optimization, water resources, the smallholder farming in the Alborz province,

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INTRODUCTION

To produce food for growing population of Alborz province, one of the very important input is enough water for cultivation. Agricultural Irrigation water's uses face severe competition with non –agricultural users of water. Improving the water demand is essential especially for small holders of lands for producing food. The main goal of this paper is to introduce an optimal pattern of the water's use to deal with the water crisis toward sustainability in agriculture. In general, some important roots of the existing water scarcity in this province are due to several reasons, such as illegal drilling the wells, illegal use of the underground resources, consecutive droughts, decrease in precipitation, improper use of consumption water and tend to plant the crops that require a lot of water. Moreover, a part of the agricultural lands faces with water scarcity despite reasonable annual inflow rate (discharge) of the surface water and groundwater as well as existence of Amir Kabir and Taleghan Dams in the province. One must consider the reason for scarcity of water in this province is due to the fact that 78 percent of the existing water in the Alborz province is for the neighboring provinces. The mentioned province has a good potential for producing various crops and fruits if enough water will be available by proper use of existing water. This province has both favorable biological and climatically conditions [1-5].

About 45,159 hectares of the agricultural lands of the Alborz province are the cultivated lands, and 24,950 hectares of these are gardens. About 615 million cubic meters of water is consumed for production of fruits and crops in this province. The amount of water being used in gardens is 261 and crops is 354 million cubic meters of water. According to a survey conducted, considerable part of the irrigated water for producing crops is lost due to the use of traditional methods, such as flooding irrigation in farms and gardens. In the meantime, the existence of the small cultivated lands is also one of the main barriers to the use of the modern irrigation systems is mentioned agricultural lands [6-8].

Alborz province's water resources potential for agriculture is 1870 million cubic meters. Based on rainfall intensity rate in comparison with other provinces has a better condition. (the rainfall average in the country is about 250-mm). But with the continuing decline in rainfall in the province and incorrect use of irrigation waters in years before has led to reduce the water level in aquifers (the underground water) about 18 cubic meters .

In recent years, on the one hand due to the deficiency in precipitation, on the other hand, the high population density in the province, the water resources management has become one of the important challenges [9-13]. In general, some considerable roots of the existing water scarcity in this province are due to several reasons, such as illegal drilling the wells, illegal use of the underground resources, consecutive droughts, decrease in precipitation, improperly consumption water and tend to plant the crops that require a lot of water.

Moreover, a part of the agricultural lands face with water scarcity despite of the existence of the variety of the water resources such as the annual inflow rate (discharge) of the surface water and groundwater as well as despite of Amir Kabir Dam and Taleghan Dam , but because about 78 percent of the existing water in the Alborz province belongs to neighboring provinces.

About 45,159 hectares of the agricultural lands of the Alborz province are the cultivated lands, and 24,950 hectares of these belong to gardens. About 615 million cubic meters of the water are consumed for these lands, according to the irrigation methods and the use efficiency, the cultivated lands use about 354 million cubic meters of water and gardens use 261 million cubic meters of water. According to the survey conducted, an important part of the water is lost in the province due to the use of traditional methods of the agriculture such as flooding irrigation of the farms and gardens. In the meantime, the existence of the small cultivated lands is also one of the main barriers to the use of the modern irrigation systems is mentioned [14-15].

Problem statement

The agricultural farming system is defined as a set of legal, conventional technical and management procedures for the use and combination of the production factors in the form of work organization and social relationships in order to produce and supply crops. The farming system as a legal matter associated with the main structure of any society, as a result, it must be consistent and congruent with it, and secondly in relation to economic necessity it must be up to date and responsible in every stage of development.

Agricultural activities in the farming system are limited to the facilities set of the production factors that are available to farmers. This farming system includes the units of less than 10 hectares of irrigated lands and Less than 25 hectares of Rain-fed lands, and less than two hectares of garden lands [4]. With having the small and dispersed farms and its growing process, impossibility of the use of the modern agricultural tools, great losses of the water, reducing the amount of available lands and so on, are some Achilles' heels that weaken the accountability of the smallholder farming system for available requirements. The weakness and poor economy in the smallholder farming system can be considered the reason of the farming users for participating in the formation of modern systems [16-18].

RESEARCH METHODS

Experts of the Alborz Province's "Governmental Agricultural Jihad Organization" and the" farmers" of the mentioned province formed two sample populations of the research. A researcher made questionnaire was used to collect data. Statistical regressions' analysis has been used to analyze collected data. Three proposed scenarios were examined by the results of appropriate regression's estimations. The findings suggest there are significant relationships between social - economic, technical-irrigation, law-politic mechanisms, optimization of cropping patterns and individual characteristics' of the farmers regarding sustainability use of agricultural water resources in the smallholding farming systems of the Alborz province.

Study Method

The population of this study comprises two groups of farmers and experts. The sample size was determined in the quantitative section according to the Agricultural Organization of the Alborz Province

and the Statistical Center of Iran and using Cochran formula. In respect of the sample selection of corresponding farmer's community, we attempt to choose an appropriate sample using the multistage sampling method to have desirable generalizability of findings. Agriculture organization of Alborz Province comprises the 290 experts and 26584 smallholder farmers that the number of the statistical sample is 165 experts and 379 farmers using Cochran formula. Then, the statistical inference methods will be used to analyze the data through the questionnaire. The Pearson relationship coefficient in the SPSS18 software and Amos for the path analysis is used to identify the components as well.

RESULTS

H1: There is a significant relationship between social mechanism and sustainability of the agricultural water resource use in the smallholder system of the Alborz province. According to the Test of Normality, since the level of significance values of all research variables are more than 0.05, so it can be said that these variables have a normal distribution, then, the parametric tests will be used in the research hypothesis test.

1. Farmers

The Pearson relationship coefficient was used to investigate the above hypothesis.

Table 1: Pearson test for the hypothesis variables

Pearson	Correlation Coefficient	Significance level
Social mechanism- Sustainability	0.462	0.00

** The obtained Pierson test has been done at a confidence level of 99 and with an error probability of 0.01.

2-Experts

The findings show that according to experts, there is a significant relationship between social mechanism and sustainability of the agricultural water resources use in the smallholder system in the Alborz province. Due to the significance level (sig = 0/0) that is less than 0.05, the research hypothesis based on the existence of a significant relationship between the social mechanism and the agricultural water resource use is not rejected. Accordingly, it can be said that by increasing the social mechanism, sustainability of the agricultural water resource use will increase in the smallholder system of Alborz province.

Table 2: Pearson test for the hypothesis variables

Pearson	Correlation Coefficient	Significance level
Social mechanism- Sustainability	0.382	0.00

** The obtained Pierson test has been done at a confidence level of 99 and with an error probability of 0.01.

The findings show that according to experts, there is a significant relationship between social mechanism and sustainability of the agricultural water resources use in the smallholder system in the Alborz province. Due to the significance level (sig = 0/0) that is less than 0.05, the research hypothesis based on the existence of a significant relationship between the social mechanism and the agricultural water resource use is not rejected.

H1: There is a significant relationship between social mechanism and sustainability of the agricultural water resource use in the smallholder system of the Alborz province.

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The findings show that according to experts, there is a significant relationship between social mechanism and sustainability of the agricultural water resources use in the smallholder system in the Alborz province. Due to the significance level (sig = 0/0) that is less than 0.05, the research hypothesis based on the existence of a significant relationship between the social mechanism and the sustainability of the agricultural water resource use is not rejected.

H2: There is a significant relationship between economic mechanism and sustainability of the agricultural water resource use in the smallholder system of the Alborz province.

1. Farmers

The Pearson relationship coefficient was used to investigate the above hypothesis.

Table 3: Pearson test for the hypothesis variables

Pearson	Correlation Coefficient	Significance level
Economic mechanism- Sustainability	0.825 **	0.00

** The obtained Pierson test has been done at a confidence level of 99 and with an error probability of 0.01.

2-Experts

The findings show that according to experts, there is a significant relationship between economic mechanism and sustainability of the agricultural water resources use in the smallholder system in the Alborz province. Due to the significance level (sig = 0/0) that is less than 0.05, the research hypothesis based on the existence of a significant relationship between the social mechanism and the sustainability of the agricultural water resource use is not rejected. Accordingly, it can be said there is a significant relationship between economic mechanism and sustainability of the agricultural water resources use in the smallholder system in the Alborz province.

Table 4: Pearson test for the hypothesis variables

Pearson	Correlation Coefficient	Significance level
Economic mechanism- Sustainability	0.642 **	0.00

** The obtained Pierson test has been done at a confidence level of 99 and with an error probability of 0.01.

The findings show that according to experts, there is a significant relationship between social mechanism and sustainability of the agricultural water resources use in the smallholder system in the Alborz province. Due to the significance level (sig = 0/0) that is less than 0.05, the research hypothesis based on the existence of a significant relationship between the social mechanism and the sustainability of the agricultural water resource use is not rejected. Accordingly, it can be said there is a significant relationship between economic mechanism and sustainability of the agricultural water resources use in the smallholder system in the Alborz province.

H3: There is a significance relationship between Technical-irrigation mechanism and sustainability of the agricultural water resource use in the smallholder system of the Alborz province; the variables of this hypothesis have the normal distribution, so the parametric tests will be used in the research test.

1. Farmers

The Pearson relationship coefficient was used to investigate the above hypothesis.

Table 5: Pearson test for the hypothesis variables

Pearson	Correlation Coefficient	Significance level
Technical-Irrigation mechanism - Sustainability	0.345 **	0.00

** The obtained Pierson test has been done at a confidence level of 99 and with an error probability of 0.01.

2-Experts

The findings show that according to experts, there is a significant relationship between Technical-Irrigation mechanism and sustainability of the agricultural water resources use in the smallholder system in the Alborz province. Because the significance level (sig = 0/0) that is less than 0.05, the research hypothesis is based on the existence of a significant relationship between the Technical-Irrigation

mechanism and the sustainability of the agricultural water resources use in the smallholder system of the Alborz province.

Table 6: Pearson test for the hypothesis variables

Pearson	Correlation Coefficient	Significance level
Technical-Irrigation mechanism - Sustainability	0.506 **	0.00

** The obtained Pierson test has been done at a confidence level of 99 and with an error probability of 0.01.

The findings show that according to experts, there is a significant relationship between Technical-Irrigation mechanism and sustainability of the agricultural water resources use in the smallholder system in the Alborz province. Due to the significance level (sig = 0/0) that is less than 0.05, the research hypothesis based on the existence of a significant relationship is not rejected.

H4: There is a significant relationship between Policy-legal mechanism and sustainability of the agricultural water resource use in the smallholder system of the Alborz province; the variables of this hypothesis have the normal distribution, so the parametric tests will be used in the research test.

1. Farmers

The Pearson relationship coefficient was used to investigate the above hypothesis.

Table 7: Pearson test for the hypothesis variables

Pearson	Correlation Coefficient	Significance level
Policy-legal mechanism - Sustainability	0.235 **	0.00

** The obtained Pierson test has been done at a confidence level of 99 and with an error probability of 0.01.

2-Experts

The findings show that according to experts, there is a significant relationship between Policy-legal mechanism and sustainability of the agricultural water resources use in the smallholder system in the Alborz province. Due to the significance level (sig = 0/0) that is less than 0.05, the research hypothesis based on the existence of a significant relationship between the Policy-legal mechanism and the sustainability of the agricultural water resource use is not rejected. Accordingly, it can be said by creating the Policy-legal mechanism, the sustainability will be improved.

Table 8: Pearson test for the hypothesis variables

Pearson	Correlation Coefficient	Significance level
Policy-legal mechanism - Sustainability	0.378 **	0.00

** The obtained Pierson test has been done at a confidence level of 99 and with an error probability of 0.01.

The findings show that according to experts, there is a significant relationship between the Policy-legal mechanism and sustainability of the agricultural water resources use in the smallholder system in the Alborz province. Due to the significance level (sig = 0/0) that is less than 0.05, the research hypothesis based on the existence of a significant relationship between the Policy-legal mechanism and sustainability is not rejected.

H5: There is a significant relationship between the modification of the cultivation pattern and sustainability of the agricultural water resource use in the smallholder system of the Alborz province; the variables of this hypothesis have the normal distribution, so the parametric tests will be used in the research test.

1. Farmers

The Pearson relationship coefficient was used to investigate the above hypothesis.

Table 9: Pearson test for the hypothesis variables

Pearson	Correlation Coefficient	Significance level
Cultivation pattern - Sustainability	0.522 **	0.00

** The obtained Pierson test has been done at a confidence level of 99 and with an error probability of 0.01.

2-Experts

The findings show that according to experts, there is a significant relationship between modification of the cultivation pattern and sustainability of the agricultural water resources use in the smallholder system in the Alborz province. Due to the significance level (sig = 0/0) that is less than 0.05, the research hypothesis based on the existence of a significant relationship between the modification of the cultivation pattern and the sustainability of the agricultural water resource use is not rejected.

Table 10: Pearson test for the hypothesis variables

Pearson	Correlation Coefficient	Significance level
Cultivation pattern - Sustainability	0.442 **	0.00

** The obtained Pierson test has been done at a confidence level of 99 and with an error probability of 0.01.

The findings show that according to experts, there is a significant relationship between the modification of the cultivation pattern and sustainability of the agricultural water resources use in the smallholder system in the Alborz province. Due to the significance level (sig = 0/0) that is less than 0.05, the research hypothesis based on the existence of a significant relationship between the modification of the cultivation pattern and sustainability is not rejected.

H6: There is a significant relationship between the individual characteristics of the farmers and sustainability of the agricultural water resource use in the smallholder system of the Alborz province.

Since the values of the significance level of all research variables are higher than 0.05, so it can be said that these variables have a normal distribution, and the parametric tests can be used in the research hypothesis test.

The polynomial regression and top-down approach were used to investigate the effect of the personal characteristics of the utilization and sustainability unit from the agricultural water resources and all variables of the personal characteristics included in the model. Those characteristics which did not have a significant effect on the model and the significance level was greater than five percent or the t-statistic was less than two percent were removed from the model. The estimation results of the examination of the individual characteristics impact on the rate of the stability has been given in Table 11

Table 11: Checked impact of personal characteristics variables on the sustainability.

Variables	B	t	P
Age	-1.50	12.28	0.05
Education	0.39	6.04	0.001
Experiment	0.52	4.28	0.035
F=214 Pr=0.0	D.W= 2.1		R^2=75%

The results of the above table show the affective variables ($t>2$ & $p<0.05$), dummy variable of education and the number of years of the employment experience have a positive and significant impact. With the increase of the education level, the sustainability rate of the use will be increased. Moreover, the variables have a significant and negative impact on the stability scale and with the increase of them, the sustainability scale is reduced, because of increasing age, the impetus degree is reduced for adopting with the new technology and in this model, the gender and the marital status were also not significant therefore are removed from the model. The study of the indicators' value such as the coefficient of the determination (R^2), the percentage of the dependent variable distribution through the independent variables and Fisher test, the significance of all variables and Durbin-Watson test of the autocorrelation testing of the model indicate that the model is appropriate.

H7: The social mechanisms, economic mechanisms, technical-irrigation mechanisms, Legal-policy mechanisms and modification of the cultivation pattern have the impact on the sustainability of the agricultural water resources use in the smallholder system of Alborz Province.

The polynomial regression and top-down approach were used to investigate the effect of all variables on the use sustainability.

Table 12: Study of the impact of affecting variables on the sustainability according to farmers

Variables	B	t	P
Social Mechanism	3.52	12.28	0.01
Economic Mechanism	0.39	3.54	0.04
Technical-Irrigation Mechanism	0.02	2.13	2.15
Legal-policy Mechanism	2	6.04	0.03
Modification of the Cultivation Pattern	2.15	2.03	0.05
F=21.15 Pr=0.03	D.W= 1.81		R^2=83%

Table 13: Study of the impact of affecting variables on the sustainability according to farmers

Variables	B	t	P
Social Mechanism	1.44	12.28	0.001
Economic Mechanism	1.21	5.54	0.005
Technical-Irrigation Mechanism	2.15	2.13	0.04
Legal-policy Mechanism	2.32	8.04	0.006
Modification of the Cultivation Pattern	4.23	5.03	0.004
F=21.15 Pr=0.03	D.W= 1.73		R^2=78%

The results of the above table show that among of the affective factors on the sustainability, the above variables have the positive and significant impact ($t>2$ & $p<0.05$) on the sustainability scale and the sustainability of the organization increases by increasing them. The study of the indicator value such as the coefficient of the determination (R^2), the percentage of the dependent variable distribution through the independent variables and Fisher test, the significance of all variables and Durbin-Watson test of the auto correlation testing of the model indicate that the model is appropriate.

H8: The conceptual model can explain the impact of different mechanisms on the dependent variable (stabilizing of the agricultural water resources use), because in the evolution model of the H6 and H7, the variables have the significant effect on the sustainability of the water use in Alborz province, and according to the experts, the variable were selected appropriately. Both of the evolution regressions are appropriate in respect of diagnostic tests, so the conceptual model is an appropriate model.

H9: The use of the agricultural water resources in the smallholder system of Alborz province will be affected in the future from the current components.

Because the estimation regressions for investigation of the effective factors on the sustainability have the determination coefficient (R^2) of influencing of (R2), the percentage of the dependent variable with the independent variables were at an acceptable level, meaning that the effects of individual factors were 75%, and the effective factors for experts and farmers were near to 83% and 78% respectively, thus, the predictive power is higher and it can also be used to assess the effects of variables in the future.

In this study, after the estimation of the appropriate regression, some scenarios will be conducted, that instead of the various mechanisms, the various factors of them are investigated under the three scenarios:

1- The optimistic situation: the independent variables in this study, including the personal characteristics, social mechanisms, modification of cultivation mechanisms, policy and legal mechanisms, technical-irrigation methods and economic mechanisms that are effective on the sustainability dependent variable of the use of the agricultural water resources according to the estimation regression. The factors that have most widely impact on the different mechanisms were chosen which lead to increase and improve of the sustainability. Therefore, the effective factors at the different mechanisms were placed in the estimation regression and it was shown that the obtained scores are higher limit than the other conditions for sustainability variable.

Moreover, the different combinations of factors can be inserted in the regression and shown that the better scale than the others is the intermediate and pessimistic situations. The factors that can be used in the optimistic situations to increase the sustainability in a high limit for different mechanisms are provided in table 14.

Table 14: Effective factors on the sustainability of the water resources use in the optimistic situations

Personal characteristics	Social Mechanisms	Modification of the cultivation pattern	Policy-Legal Mechanisms	Technical Mechanism& Irrigation method	Economic Mechanisms
Education level	Knowledge level about the water recourses use	Integrating land and grouping cultivation	Check the status of water waste	Problems and the shortage of water features	Pricing water system and real price of water
Work Experience	Property status and its role in the water use	Drought-tolerant seeds	Government operational policies on the water resources use	The water loss rate	Economic situation of farmers
Age	Beliefs of indigenous knowledge in the field of water management	Selection of high yielding varieties	Enactment of Legislation for unauthorized wells	Amount of the under cultivation land	Creation of modern irrigation systems

2- Fifty-Fifty Situation: This situation is placed between the two optimistic and pessimistic modes and some positive and negative assumptions can be considered for it and its effect can be studied on the obtained results and also the impact of each scenario is examined on the stability of the water use degree. It means that the degree of the sustainability could be gained by placing the combinations of factors in the regression. In this situation, the scales are acceptable for the dependent variable of sustainability, but it is less than the optimistic situation, but higher than the pessimistic situation. Therefore, in the case of the use of the factors in Table 15, an acceptable level of sustainability will be seen in the water use.

Table 15: Effective factors on the sustainability of the water resources use in the fifty-fifty situation

Social Mechanisms	Modification of the cultivation mechanisms	Policy-Legal Mechanisms	Technical Mechanism& Irrigation method	Economic Mechanism
Joining the farmers in water users associations	Cultivation management	Structural factors management	Number of wells and owned water content	Irrigation system maintenance costs.
Farmers' Participation in planning optimal use of water	Immersion effect on plant growth	Responsibility and accountability of institutions	Water supply resource and dispersion of equipment	Purchase cost of the water
Farmers' participation in irrigation grid management	Plant's requirement of the water	-	Channel type and velocity of the water	Insurance of the implements & equipment of irrigation

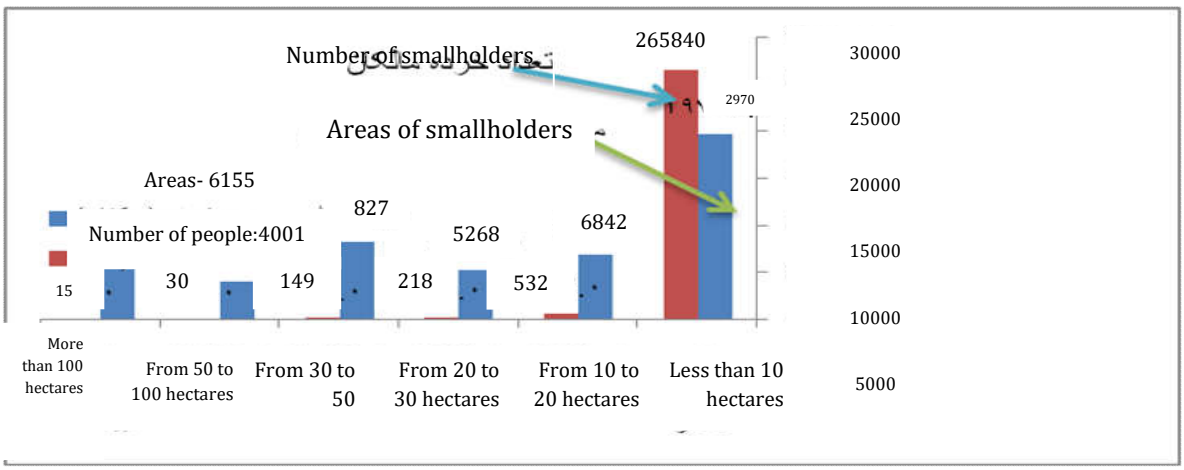
3- Pessimistic Situation: In this situation, contrary to the optimistic mode, if it has been created some assumptions for the independent variable, that its effects to be shown on the dependent variable, the different models can be provided and some results are obtained from each case. It means that the combinations of factors can be placed in the regression and the sustainability scale could be achieved from each situation. For this situation, the scales of the dependent for sustainability are lower than the optimistic and pessimistic situations. So, in the case of the use the factors of Table 16, the sustainability rate can be observed in the water use.

Table 16: To prioritize the effective factors on the sustainability of the water resources for the pessimistic situation

Social Mechanisms	Modification of the cultivation mechanisms	Technical Mechanism& Irrigation method	Economic Mechanism
Farmers' participation in drainage and irrigation network modification	Plowing and land preparation	Leveling lands	Machines and equipment Ownership Status
Investigation of the governmental groups and bodies	Amount of the Fertilizer use	Irrigation practices and storage pools	Impact of restriction of water resources and the amount of damages from it
Farmers' access to information.	Status of weeds within the farm	Meter installation	Employment of day laborers
-	Market of crops and its diversity	Length and slope of the transmission channel of water to the farm	-

DISCUSSION

An important feature of the agricultural farming system is the existence of the small and scattered of lands, this type of the agriculture farming system includes mainly the smallholder units under 10 hectares. 97 percent of farmers is smallholders and have about 40% of the total agricultural lands. The share of the land by other categories is less than 3% [19].



Graph 1: The number and area of different groups of farmers in Alborz Province.

The evaluation of water indicators, including "the renewable water per capita' and 'water stress intensity' in Iran represents the country's severe water stress conditions and intensifying the adverse conditions of water resources is not unexpected according to fixed water resources of the country, population growth, failure to adopt of the appropriate and up to date policies of the water resources management and growing demand for water. Asymmetric distribution of water in different parts of the country, the wide range of arid and semi-arid regions and the concentration of population in central areas of the country with low water-use efficiency in the agriculture section are serious challenges for water sector management which lead to intensify the use of groundwater resources, drying out and salinization of the groundwater resources and subsidence of the plains. The continuation of this situation in addition to reducing the agricultural ability of the productivity in the country, it will provide the impossibility of life in some parts of the country as well.

Due to the structural problems of smallholders' system of fruit and crop productions, population growth, increasing food intake along with increased population, ever increasing pressure on the natural resources, especially the groundwater resources, the self-sufficiency ratio is not in an appropriate condition, especially in the crops including grains and oilseeds.

The country's dependence on imported grains and oilseeds lead to the allocation of the $ 7.2 billion for importing grains and oilseeds. Moreover, the lack of adequate production of crops has led to the balance of trade deficit in the agricultural sector from the $ 1.3 billion during the third development plan to $ 2.9 billion in the fourth development plan of the country. Trade deficit has increased to 6.4 billion dollars in 2010-2013 has led to increase the agricultural sector distribution of the balance of trade deficit of the total of economy (without oil) from the average of 7% percent in the third developing country plan, to 15.8%, 39% and 46.2% in 2011, 2012 and 2013 respectively [7].

Therefore, according to the above cases, it can be said that the fundamental issue is, what problems are and obstacles in the field of water use on the farm, and in order to solve them and what solutions can be made to stabilize the use of water resources problem. Of course, the different actors and sectors involve in this field. But, the existence of the problems of the water use in the agriculture section show that none of the parties involved in this issue have not done their responsibility well and in other words, it is possible that the duties and functions of each section are not well specified. The investigations show there is not an appropriate model in the country to optimize and stabilize the water use of the resources in the farms [20].

The present study attempts in addition of identifying the existence of problems in this regard, the role and function of the components of the model and its constituent indicators are also known well, and based on it, the practical solutions should be presented to overcoming the existing problems in the water use on the farm in the Alborz province.

CONCLUSION

According to the obtained results from the current study, there is a significant relationship with the farmers' group between the social mechanisms, economic mechanisms, irrigation-technical mechanisms, legal-policy mechanisms, modification of cultivation pattern mechanisms with the sustainability variable of water resources use in smallholder system of Alborz province. In terms of individual characteristics in the farmers' group, there is a significant relationship between education and the sustainability variable of water resources use in smallholder system of Alborz province, and by increasing the education level, the rate of the stable use is increased by the farmers, and the same in the group of experts. But, for the individual characteristics, the age has a contrary relationship with the sustainability variable of water resources' use, and by increasing the age of farmers and experts in this study, the adoption rate of the technology reduces among them.

As it can be seen, the outputs of models are in the three modes as follows: In optimistic mode, the knowledge level about the water recourses' use, property status and its role in the water use, beliefs of indigenous knowledge in the field of water management, integrating land and grouping cultivation, drought-tolerant seeds, the selection of high yielding varieties, check the status of water waste , government operational policies on the water resources use, enactment of Legislation for unauthorized wells, problems and the shortage of water features, the water loss rate, the amount of the under cultivation land, pricing water system and real price of water, the economic situation of farmers and the creation of modern irrigation systems have been identified as the effective factors. The fifty-fifty situation, joining the farmers in water users associations, farmers' Participation in planning optimal use of water, Farmers' participation in irrigation grid management, the cultivation management, the immersion effect on the plant growth, plant's requirement of the water, structural factors management, responsibility and

accountability of institutions, number of wells and owned water content, the water supply resource and dispersion of equipment, channel type and velocity of the water, Irrigation system maintenance costs, purchase cost of the water, insurance of the implements and equipment of irrigation are the main factors in the fifty-fifty situation. And in the pessimistic scenario, farmer's participation in drainage and irrigation network modification, investigation of the governmental groups and bodies, farmers access to information, plowing and land preparation, amount of the Fertilizer use, status of weeds within the farm, market of crops and its diversity, leveling lands, irrigation practices and storage pools, installation of meter, length and slope of the transmission channel of water to the farm, machines and equipment Ownership Status, Impact of restriction of water resources and the amount of damages from it, employment of day laborers are the factors of the pessimistic scenario and its outputs.

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