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Social Factors Influencing Acceptance and Execution of Modern Irrigation Techniques Case Study: Kahak Region in Qom Province

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ABSTRACT

Development of modern irrigation technologies is one of the important solutions to face the water crisis in particular during the recent drought. In this concern, during the recent years, the above-mentioned technologies have been developed to improve the efficiency of agricultural water in Iran. Iran is located in arid and semi-arid regions. Close study of the characteristics of irrigation system in such regions and factors influencing it may provide a suitable ground for local and regional planning. The present study is mainly aimed to discuss the social problems of farmers in using pressurized irrigation systems in Qom province and make a comparison between these systems and traditional techniques. The research is of applied-developmental kinds and a descriptive-correlative methodology is used to make study. The statistical society of the present study consists of farmers executing the modern irrigation technologies in Kahak region in Qom province. The questionnaire was, after some corrections and revisions, validated by the members of the scientific board of Isfahan University and experts in Agricultural Jihad. Reliability of the research instruments was proved on the basis of an introductory test through completion of the questionnaire; and Kroenbach Alpha coefficient (**a**) was calculated for various regions. The results of research show that from among social factors, satisfaction with execution of modern technologies was of the greatest influence and increase in occupation rate of the least impact in accepting such techniques. There is a significant relation between social factors and execution of modern irrigation techniques (T = 124.2). Also, it was confirmed that execution of such techniques would be of influence in reducing villagers immigration (T = 95.77).

Key Words: pressurized irrigation, traditional irrigation, social evaluation, agricultural development, Kahak region (Qom Province).

INTRODUCTION

Structurally and functionally speaking, the national environment consists of urban, rural and tribal areas; and as a part of this system, village has its own identity and as a system, it is considered sometimes to be influencing and some other times influenced and since the sustainable development of villages is one of the goals of the rural planning and the economy of village is based on agriculture which is, in turn, based onuses made of the special irrigation techniques, using modern techniques in agriculture in general and in irrigation in particular will increase production and earnings of the villagers and prevent them from immigrating as a result of which villages may be abandoned.

In the field of water management, it is more than two decades that experts throughout the world have found that, to manage water resources, management of supply should be paid more attention. To do so, scientists have introduced combined management of water. Combined management follows two general policies and one main objective. Policies of the combined management are as follows: 1- water should be considered as an economic-social, and environmental item; 2- policies and options directing water management should be included in an integrated framework. The combined management is mainly aimed to attain sustainable, efficient and just development of water resources.

Thus, principles of combined management are based on a combination of supply management and demand management in which environmental, social, and economic factors are taken into account [8]. Wichlens studied costs of pressurized irrigation, saving in water consumption, and possible increase of income as a result of execution of pressurized irrigation in California. Results show that inaccessibility of information resources for farmers has prevented development of pressurized systems and, finally, caused dissatisfaction of the users with execution of such systems [20]. In an important study, Smith and Munoz showed the role played by consultative services in

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acceptance of the technology of irrigation and techniques used to increase productivity of water [6]. Beyen shows that in many agricultural development programs, changes in the level of knowledge and skills are, together with changes in approaches, emphasized. According to many scholars, positive approach of the farmers is necessary to accept innovations [1]. According to Binswanger, there is a strong significant relation between the cultivated land and acceptance of tractors in South Asia [2]. In a study made by Kashani in villages in Isfahan Province concerning factors influencing acceptance of sowing maize in 1990, it was shown that individual characteristics such as literacy, age, and the number of children are not in a significant relation with acceptance of innovation; economic situation and the number of referring of the promoter to the farmer have been of positive influence on acceptance [13]. Studying cultural and social factors which are of influence on those who sow wheat in Nahavand concerning development of Sprinkler irrigation, Nowrouzi and Chizari showed that there is a significant relation between their function, number of promotional contacts, the extent of uses made of contact channels, the extent of social participation and their technical knowledge of management of agricultural water on the one hand and the approach of farmers towards development of sprinkler irrigation systems on the other.

The results of the study made by Taghvaei*et al* show that separation between and scattering of the farming lands are the most important obstacles to development of the pressurized irrigation systems. Three structural, economic, and natural factors with a variance of 66.10% explain variables [17].

As the vehicle of national development, agriculture and its sectors pave the way to go out of the bottleneck of the absolute dependence on oil export which is the main characteristic of the Iranian economy. In this concern, importance of the agricultural sector in the Iranian economy as well as its introgenoity, when the great domestic possibilities are taken into account, is an option which is in accord to the national interests [9]. The present study is aimed to identify impacts of the modern irrigation systems on reducing villagers' immigration, the role played by social factors influencing execution and acceptance of modern irrigation techniques. To attain the above objectives, in the present study, the following assumptions have been analyzed: the first assumption: there is a significant relation between execution of the modern irrigation techniques and social aspects; the second assumption: the modern irrigation techniques play an important role to reduce immigration of villagers.

HISTORY

Many studies have been made concerning social impacts of the modern irrigation techniques among which some resources which are in close relation to the subject of the present study are mentioned: a modern agricultural technology may be followed by higher efficiency, lower costs, and other desired consequences; changing the process of production, however, requires acceptance of the modern technology. But, it may be accompanied, because of incomplete information or possible errors, by some risks [14]. Having analyzed satisfaction of farmers with pressurized irrigation systems, Lahannama concluded that dissatisfaction of the users of pressurized irrigation systems is, mainly, a result of limitations and problems such as inconsistency between climatic conditions of the region and the system, absence of sufficient credit and facilities, insufficiency of the designing companies, and low quality of the equipment [3]. The cultivated land is another factor whose role has been taken into account in studies concerning acceptance of innovations. This point is justified as follows: farmers with small farm cannot afford fixed costs resulted from acceptance of modern technologies; for, they are faced with limited credit and thus they do not like to accept risks [7]. Thus, to specify the kind of training and the way it should adopt, trainers have to, at first, evaluate farmers' knowledge, skills, and viewpoints. Then, based on such points, they are able to specify the direction and path of training to attain the ideal level [5]. In his study, Nguyen came to the conclusion that factors such as the level of income, cultivated land, education, and promotional services enjoyed by farmers are of influence on their satisfaction with employing pressurized irrigation technology [4].

Developments of the past 50 years in various fields and aspects such as employment of the modern agricultural technology, excavation of deep and semi-deep wells, employment of modern technology to pump water and as a result decline of water table and reduction of runoff rate which results in dewatering of Qantas and springs, transfer of water from water tables in humid regions to arid regions and even social and political developments such as depowering of Khans and great landowners which have led to changes in natural, social, and cultural circumstances, have been followed by changes in priority of farmers' needs. Thus, traditional irrigation systems should be changed and improved in proportion to the continuously changing geographical environment [18]. In their article, Problems of and Obstacles to Employment of Sprinkler Irrigation by Farmers, Hayati and Lari mention profit escalation, profitability, and increase in cultivated land among the most important factors influencing satisfaction; and strategies adopted to execute development of this technology such as training and persuading the farmers to install and employ these systems among factors influencing farmers' dissatisfaction with this technology [11]. In a research made in four provinces (Fars, Bushehr, Kohgiluyeh and Boyer Ahmad, and CheharMahalBakhtiyari), Karami*et al* came to the conclusion that there is a significant difference between those who had accepted pressurized irrigation systems

and those farmers who had not in terms of population characteristics, knowledge and perspectives, ownership, technology, and income [12].

Theoretical Foundations of Study

Researchers are of the opinion that employment of modern technologies will help increase in efficiency of irrigation (sprinkler irrigation up to 85% and drip irrigation up to 95%). Water is wasted in Sprinkler irrigation system up to 20% and in drip system up to 5%. In ground irrigation, however, even with costly land leveling, irrigation efficiency will not exceed 50% and under traditional circumstances that most farming lands in our country are irrigated in this way, this figure is less than 35%. This means that if we do not employ sprinkler or drip irrigation, 65% of the water used in farms will be wasted; and if we take into account the water wasted in transfer canals, waste rate will be more than 75%. Thus, employment of pressurized irrigation system can prevent wastes in irrigation and, in this way, economic growth and consequently sustainable development in all fields may be attained.

To promote optimal use of the water resources, at first, correct irrigation techniques as well as correct employment of water resources should be found. To do so, certainly skilled human forces will be needed to promote such techniques in villages. Holding training courses, encouraging those who will benefit from correct techniques of irrigation, and attempts made by promoters in farms together with farmers are among points which lead to promotion of correct employment of water resources [15].

Because of irregular development of various industries in Iranian cities and transfer of human resources from agricultural sector to the urban industrial sector and since no suitable technology has replaced human forces in agricultural sector and governmental investment on agriculture, as compared to the industries, has been reduced, and a policy of supplying cheap foods in favor of the urban industrial sector has been adopted, and since import of agricultural products has been, as a result of increase in government's income of oil, increased, as well as because of some other points, the agricultural sector came during the past development plan into stagnation; and share of this sector in gross national production is continuously decreasing. That is why immigration of villagers to cities and transfer of physical problems of villages to cities have intensified during past decades in many countries including Iran. Now, there are many problems and bottlenecks resulted from development of agriculture in a western way in our country [21]. As a matter of fact, integrated and consistent development in the villages begins with development of agriculture but, gradually, freeing labor forces required by other sectors, it follows other objectives the most important among which are: improvement of life level including improvement of earnings, occupation, training, health, nutrition and housing; reduction of inequality in distribution of rural income and reduction of imbalance in incomes and economic facilities between urban and rural regions; regional-rural ability to establish and accelerate the trend of progress in the course of time [19]. As a matter of fact, surplus of agricultural production improves economic and social welfare of villagers relatively; they will be able to construct better houses, use more durable consumptive goods, and demand more social services such as training, health services, water supply canals and transportation and communication equipment. Corints calls this phenomenon (i.e. relative improvement of welfare) aid-welfare; for, he is of the opinion that as a result of increase in agricultural surplus and income, the life level of the mass of people in the rural regions will be elevated [10].

Scope of Study

The region under study is located in Qom Province. Qom consists of a city and five regions. Kahak region is located at a height of 1455 from sea level between 50^{o}-51'-51" E geographical longitude and 34^{o}-23'-46" N geographical latitude. Kahak town is located 40 km from Qom in southern direction in Qom-Kashan road. Water in Kahak is supplied from ground and phreatic resources. Kahak basin consists of three sub-basins (Karmajgan, DarrehBagh River, Siram) and Fordu, Kebar basin, and two basins upstream and downstream to ImamzadehEsmail Dam.

For farming in the region, Kebar River and the water impoundment of Kebar dam are used. At the present time, the dam reservoir is full of deposits brought from its basins by runoffs. Many Qantas, springs, and manually-dug wells have been abandoned and cannot be employed. In the region under study, in most dwelling places, activities such as farming and husbandry, gardener and poultry are performed. Farming is the first one among all activities in the region. Approximately, a half of economic activists are working in farming sector. Since this region is a mountainous one, and skirts of the mountains are steeped, suitable soil for farming is limited. Also, water and moderate and sometimes cold weather in the region have been of influence on development of gardener in the region. It should be noted that gardener in the region under study is of relative economic importance and the greatest cultivated lands of gardens have been, respectively, devoted to walnut, pomegranate, cherry, almond, apricot, peach, grape … Because of rain deficiency and drought during the last 4-5 years, there is no dry farming in this region and gardener and farming products are irrigated by water. In this region, irrigation is made in three ways: 1- ridging

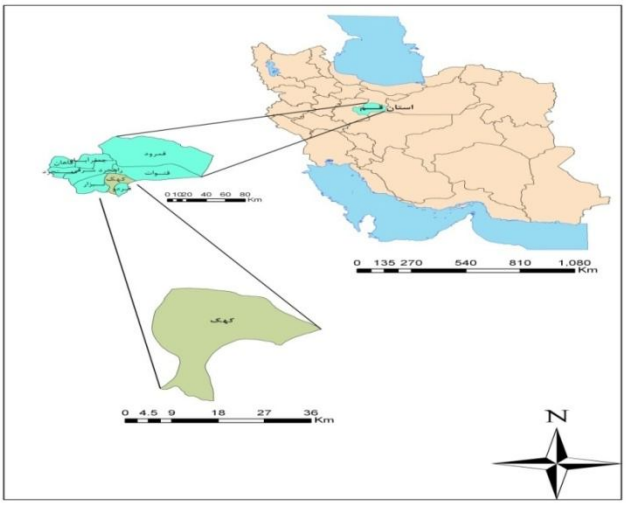
irrigation, slop irrigation, pressed (drip) irrigation. Topographically speaking, Kahak is located in a mountainous region. As a result, farming activities are more limited in lands of this region; the second main problem in the region concerns water; for, farming water depends upon phreatic reserves.

Table-1. The present situation of agriculture in Kahal region

Number of families	Number of farmers using modern irrigation (families)	Under cultivated land		Lands cultivated by farmers employing modern irrigation	Lands surface		Fallows (hectars)	Number of springs		Number of qanats		Number of wells		
		Gardens (hecatrs)	Farming (hectars)		Irrigated farming (hectars)	Dry farming (hectars)		Kahak	Fordu	Kahak	Fordu	Kahak Semi-deep	Fordu Deep	Fordu Semi deep
4196	130	100	250	250	250	0	500	48	20	281	99	400	10	30

Source: Findings of Research

Figure-1: The Location of the Region under Study



METHODOLOGY

The present study is of applied-developmental kind and the methodology employed to make study is a descriptive-analytic and correlative one. Statistical society consisted of 130 families who had employed pressurized irrigation system.

Concerning validity and reliability, 30 questionnaires were completed and Kronbach alpha coefficient was 88%. Then, based on the share of each class as well suitable geographical distribution, data were gathered through completion of questionnaires in both villages. To process data, SPSS software was used. Since the independent economic variable has been introduced at a distance level on the one hand and the dependent variable has been employment of modern techniques at a nominal level on the other, the statistical method used in the present study has been one sample T test.

Findings of Study

Personal and Occupational Characteristics

The results of findings show that average age in the sample population is 51.09. lands owned by those who have completed the questionnaires are averagely of a surface of 205 hectares all of them are irrigated lands. The average number of the members of a family is 4.6 and the monthly average income of farmers is 420,000 Tomans. In terms of education, most of them have a degree higher than diploma, and the average level of literacy in the statistical population is 29.8.

Variables Influencing the Study

Using Likert five choice scale, in the present study, census has been analyzed and variables influencing the modern irrigation techniques have been explained (very high = 5, very low = 1). Scores of such variables have been given in the table 2.

Table-2. Social Variables Influencing Execution of Modern Irrigation Techniques

Index	Average	Standard Deviation
Reduction of immigration	4.17	0.83
Occupational security	4.25	0.71
Increased knowledge of the occupation	4.41	0.70
Innovation in production	4.28	0.84
Availability of tools	4.93	0.32
Increased rate of occupation	4.15	0.87
Staying in village	4.68	0.58
Village progress	4.86	0.34
Satisfaction with techniques	4.94	0.22
Inclination to farming		

Source: Findings of the Study

Table-3. Farmers' View to Social Impacts of Employment of Modern Irrigation techniques

Dimensions	Index	Test Value 3				
		T	Sig	Mean difference	Lower limit	Upper limit
Social	Reduction of immigration	16.01	0.000	1.17	1.02	1.31
	Occupational security	20.08	0.000	1.25	1.13	1.37
	Increased knowledge of occupation	22.89	0.000	1.41	1.29	1.54
	Innovation in production	17.39	0.000	1.28	1.14	1.43
	Availability of tools	67.76	0.000	1.93	1.88	1.99
	Increased occupation	14.92	0.000	1.15	1.00	1.30
	Staying in villages	32.59	0.000	1.68	1.58	1.78
	Village progress	60.74	0.000	1.86	1.79	1.92
	Satisfaction with techniques	97.17	0.000	1.94	1.90	1.98
	Inclination to farming	31.88	0.000	1.68	1.57	1.78

Source: Findings of the Study

Results of the table 3 show the extent of impacts of employing modern irrigation techniques as viewed by farmers using this technology. As may be found from results, the modern irrigation techniques have been of positive and significant impact on most social variables and it may be said that such influences are of paramount importance in satisfaction with execution of these techniques, availability of tools required for execution, impact on village progress, inclination to farming, and increased knowledge of farming as an occupation. From among them, the greatest impacts may be attributed to variable such as satisfaction with execution of techniques, availability of tools, and village progress. Increased occupation as a variable has been of the least impact.

Analysis of the Hypotheses of Study

Examination of the views of those who have completed the questionnaires to analyze the social aspects influencing the execution of modern irrigation techniques, introducing two assumptions through T test, shows the following results:

Assumption 1: There is a significant relation between social aspects and employment of the modern techniques. The independent variable of social aspects has been introduced at a distance level on the one hand and the dependent variable of employment of modern techniques has been evaluated at a nominal level on the other. Thus, to examine this assumption, one sample T test has been used. Statistical hypotheses are put down as follows:

Hypothesis 0: $H : P = o$

Hypothesis 1: $H : P > 0$

According to the hypothesis 0, we assume that there is no significant relation between social aspects and employment of modern techniques. According to the other hypothesis, there is a relation between two variables.

Table-4. Relation between Social Aspects and Employment of Modern Techniques

Variable	Frequency	Mean	T	Df	Sig
Social aspect	130	45.39	124.2	128	000

Table 4 has been used to evaluate the relation between social aspects and employment of modern techniques by T statistical method. According to the table 4, frequency is 130 and T = 124.2 which is significant at level 0.000.

Thus, and based on the value of Sig which is less than 0.o5, the relation is confirmed with a reliability of 99%. In other words, our assumption that there is a relation between social aspects and employment of modern techniques is confirmed.

Second hypothesis: employment of modern techniques for irrigation will reduce the rate of villagers immigration.
To evaluate this hypothesis as well, one sample T test has been used and the following relations may be discussed:
Hypothesis 0: H : P = 0
Hypothesis 1: H : P > 1
According to the hypothesis 0, we assume that there is no relation between modern irrigation techniques and reduced immigration of villagers. And the other hypothesis assumes that there is such a relation between the two variables:

Table-5. Impact of modern irrigation techniques in reducing villagers' immigration

Variable	Frequency	Mean	T	Df	Sig
Reduced immigration of villagers	129	26.8	95.77	128	0.000

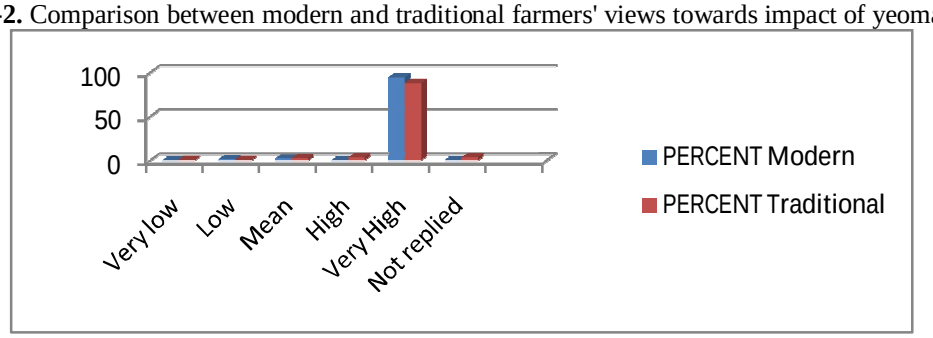
Table 5 shows the results of relation between modern irrigation techniques in reducing villagers' immigration. According to the above table, frequency is 130, T = 95.77 and significance value is 0.000. Since Sig is less than 0.05, the relation is confirmed with a reliability of 99%.

In other words, our assumption that there is a relation is confirmed and such techniques reduce villagers' immigration.

Social Factors Influencing Execution and Acceptance of Modern Irrigation Techniques As Viewed By Modern and Traditional Farmers

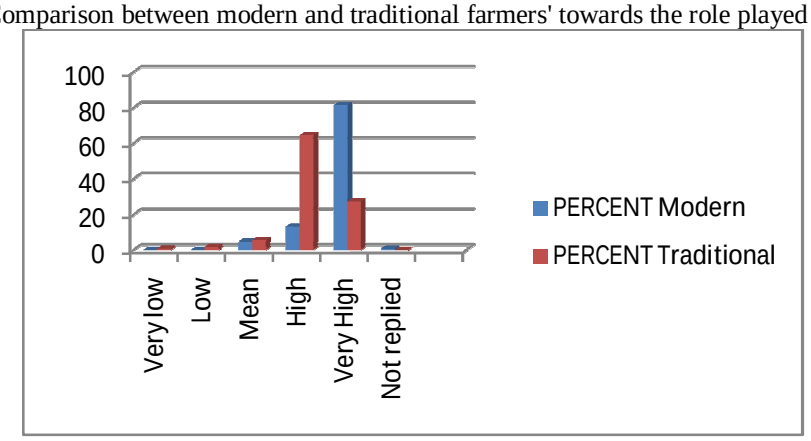
Figure 2 shows frequency distribution of responses by modern and traditional farmers concerning the impact of yeoman ship on acceptance of modern techniques. According to the diagram, impacts of modern techniques as viewed by farmers who have executed the modern techniques are as follows: very high: 94.6%, high: 0.8%, average: 2.3%, low: 1.6% and 0.8% of them did not response to this index. For traditional farmers, these impacts are as follows: very high: 88.2%, high: 3.6%, average: 2.7%, low: 0.9%, very low: 0.9% and 3.6% of them did not response to this index. Thus, it may be concluded that both groups accept impact of yeoman ship on acceptance of modern irrigation techniques.

Figure-2. Comparison between modern and traditional farmers' views towards impact of yeoman ship



Source: Findings of Study

Figure-3. Comparison between modern and traditional farmers' towards the role played by promoters



Source: findings of Study

Figure 3 shows the frequency distribution of responses provided by modern and traditional farmers concerning the role played by promoters in execution and acceptance of modern irrigation techniques. According to the diagram, impacts of the modern techniques as viewed by farmers are as follows: very high: 81.4%, high: 13.2%, average: 4.7% and 0.8% did not response to this index.

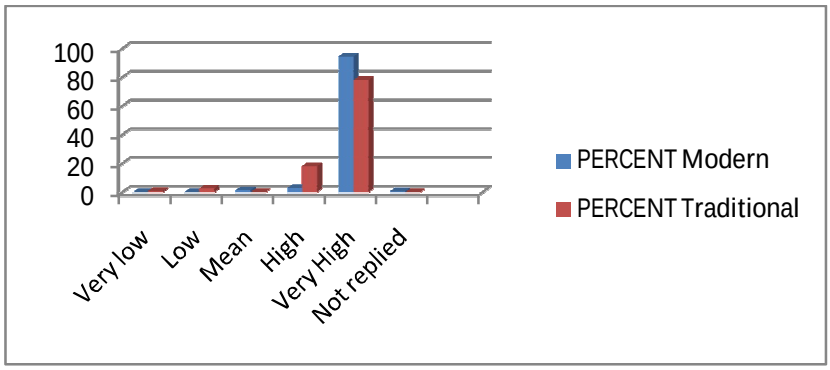
Frequency distribution of traditional farmers' responses, according to the above diagram, is as follows: very high: 27.3%, high: 64.5%, average: 5.5%, low: 1.8% and very low: 0.9%. Thus, results show that both groups confirm the positive role played by promoters in execution and acceptance of the modern techniques.

Managerial and Technical Factors

Figure 4 shows frequency distribution of responses provided by farmers concerning the role played by managerial and technical factors in execution and acceptance of modern irrigation techniques.

According to the diagram, approximately 92.3% of the modern farmers have shown very positive and positive responses concerning such factors. Also, responses shown by the traditional farmers represent very positive impact of these factors and approximately 92% of these farmers have responsed positively about their impact. Thus, results confirm the role played by managerial and technical factors in execution and acceptance of these techniques for both groups.

Figure-4: comparison between modern and traditional views towards the role played by managerial and technical factors



Source: Findings of Study

CONCLUSION AND RECOMMENDATIONS

Absence of motivation in agricultural sector is one of the old and permanent problems in this sector. This is among factors increasing country's need to import agricultural products. Weak presence of technology and contemporary knowledge is a problem which is considered as the main challenge facing farming in Iran. In addition to provide a ground in which the contemporary knowledge may be present more seriously, modern techniques will help to profitability of investment in this sector and improvement of its productivity. The crisis of mechanization

and the fact that lands are not integrated are among social –economic problems of the country and because of these problems, cultivated lands cannot provide necessary incomes. In this case, farmers are not able to meet their living needs and are forced to immigrate. Shortage of water in the villages in the region under study and heedlessness of some farmers to pressurized irrigation systems as well as reduction of cultivated lands from 7754 hectares in 1383/2004 to 2500 hectares in 1391/2012[1] forced the researchers to analyze the social factors influencing execution of modern techniques of irrigation. Thus, the present study is aimed to identify impacts of employment of modern irrigation techniques in social fields for farmers' families. Findings of the study showed that their average income is 520,000 Tomans. In terms of education, most of them have a degree higher than diploma. The most important social indexes in this study are, according to the table 2, satisfaction with execution of these techniques, availability of tools for execution, impact on the village progress, inclination towards farming, and increased knowledge of farming as an occupation. In this concern, however, the greatest impacts may be assigned to variables such as satisfaction with execution of these techniques, availability of tools for execution, and impact on the village progress. Also, the results of study showed that factors influencing farmers' satisfaction with these techniques are as follows: saving in water consumption because of low wastes of irrigation water and possibility of micro-irrigation, needlessness of leveling lands which are not smooth, reduction in labor costs for irrigation as compared with surface techniques, easy measurement and control of water resources in irrigation, control of temperature and humidity of vegetations, possibility of using various kinds of fertilizers, pesticides, and soil amendments in a fast, economic, and influential way with the irrigation water, increase in production, reduction of damages to vegetations because of salinity of water, prevention of growing weeds, saving in energy, higher efficiency of irrigation and high quality of labor forces, higher efficiency of production and increased earnings. Also, concerning availabiligty of tools, factors such as governmental loans granted to farmers (80% of loans have been ex gratia), increase in the number of companies executing the project and designing modern techniques in the region (two companies in Kahak village), and increase in the number of stores supplying tools and services required for such techniques in the villages of region have been involved.

Because of problems stemmed from urban life such as unemployment of farmers (since they do not have access to formal education, costs of life and marginalization), the best recommendation that may be made is increased serviced provided in villages and more attention which should be paid to all-covering rural improvement and development. Since results of study show that villagers are inclined to reside in their villages and are fully satisfied with execution of modern techniques, thus it is recommended that special attention should be paid to expansion of mechanization in villages through making villagers familiar with up-to-date tools and creating necessary environments to train farmers. This will help to develop factories and plants manufacturing tools and equipment which, in turn, will lead in higher rate of occupation:

- Training and retraining experts involved in promotion these techniques in various regions
- Regional studies and consistent researches to adapt the intended technology to the regional climatic-social circumstances
- Training-promotional courses held for farmers and visiting working units to see economic advantages of such systems during courses
- Since most farmers are illiterate or not so literate, thus it is necessary to creat necessary motivations to attract the young and educated generation to consultative departments so that the suitable technologies may be developed and accepted.

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