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Assessment Improving and Organizing Mechanism of Water Users Cooperatives Using AHP Method in Esfarayen County, Iran

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Abstract

Institutionalization of Water Users' Cooperatives (WUAS) is one of the strategies for cooperative irrigation management, which lays the foundation for the participation of farmers in tackling water shortage challenge to reach the objectives of sustainable management of agricultural water in an efficient manner. The main purpose of the present study was to identify the grounds for improving WUAs and prioritizing the effective factors for developing and strengthening these cooperatives. The statistical population was comprised of experts and members of the board of directors as well as elite farmers who were WUAs members in 2015 (n=40). The interviewees were selected through consensus sampling. The analytic hierarchy process was used to prioritize the mechanism of improvement and development of WUAs. Based on the final weights of the criteria, the mechanisms received the following scores: supportive mechanism (0.266), agricultural irrigation management (0.261), economic mechanism (0.183), education and extension (0.123), and legal mechanism (0.090) and WUA's members' attitude (0.076). Accordingly, the supportive, agricultural irrigation management and economic mechanisms were the most important mechanisms to improve WUAs. Hence, it is recommended that low-interest financing should be provided by the Agriculture Jihad Organization in collaboration with the Agricultural Bank for transforming from traditional irrigation to localized irrigation.

Keywords:

Organizing mechanism, Development, Water Users' Cooperative (WUAS), Analytical hierarchical process

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INTRODUCTION

One of the major crises threatening the worlds in the future is a water shortage catastrophe (Mirzaii *et al.*, 2011). Natural resources are regarded as commonwealth; not only for the present generation, but also as a valuable legacy they must be sustained for future generations. In order to maintain a prosperous, flourishing, independent and self-sufficient society, we have to protect our water, soil and plants (plains and jungles), «environment»; otherwise, the future world will be set by poverty, hunger and pollution. Water as a natural resource is a substance for the survival of human beings. Agricultural activities are heavily depending on utilization of water for production of foods, which is also necessary for survival of living organisms. Today, agriculture activities in Iran are faced with a shortage of water as the result of dry and semi-dry regions. Meanwhile, the earth is getting overpopulated and demands for water are increasing. Even though, demand and supply of water is in a critical condition, evidence shows that both surface and groundwater resources are used in inappropriate manner (Saeedi, 2003). All the mentioned points make the users and agencies in charge of water focus more on appropriate management of supplies of water resources (Njatpuor, 2008). Effective management of water resources requires appropriate information across many areas, including the use of the water resources, the role of water markets in determining or regulating allocation decisions, and environmental necessity (Horne, 2015). Water as a singular unit, involves both public and private institutions. Therefore, it can be considered as a common-pool resource, which may take the form of communal, private or state property (Suarez Bosa, 2015). For the past two decades, irrigation agencies around the world have been involved in transferring some of their management responsibilities to farmers. This process has been highly varied, but the overall trend has been quite consistent. The process of the actual transfer of specific management responsibilities from government bodies to organized groups of farmers has become known in the literature as an irrigation manage-

ment transfer. The trend of promoting the involvement of farmers in management, either through formal management transfer or through other less formal mechanisms, has become known as participatory irrigation management (Groenfeldt, 2003).

The presence and participation of farmers as the final users of water seems more essential at present than at any other time for making decisions, designing and evaluating programs related to water resources. Humankind as a social creature lives in a social way, obtaining his needs through cooperation and with the help of others (Njatpuor, 2008). Increasing demand for agricultural water, forces farmers to cooperate for consistent and comprehensive plan for managing and improving water consumption for the purpose of food security, to alleviate water shortage crises. Hence, a water user organization should be one of the principal strategies (Heydariyan *et al.*, 2008). Increasing productivity in agriculture are the main factors behind the establishment of efficient and independent water user organizations and serve as a source of strong motivation for participation (Salehi Tahbaz *et al.*, 2010). However, the idea of participation in such associations has remained at a very idealistic level and suffers from lack of sufficient analytical tools, scientific method and theoretical framework (Amini and Khayati, 2006). In Iran, apart from the approved rules for establishing governmental organizations in agricultural management, which are not, generally, successful, the most important instructions in WUAs are regulations of efficient consumption of agricultural water. In the past few years, a limited number of WUAs have been established in some plain irrigation networks of Iran. However, they are faced with many challenges due to their imperfect structure and lack of experiences. Sometimes, these challenges were so serious that they ended up in suspension or failure (Heydariyan *et al.*, 2008). Reformation, establishment and expansion of new organizations in agricultural irrigation are the most practical actions that will help to increase productivity, which, will bring the stable development of the agricultural sector and hence, balanced devel-

opment of rural communities (Shahroudi and Chizari, 2008).

In varying agricultural conditions and rural environment, different factors are effective information and success of WUAs, Hence, render the success of these organizations remain uncertain. Therefore, feasibility study of the WUAs development program should be a good device for identifying these organizations potential and capabilities in each region. In order to conduct a research on this ground, it is necessary to consider the obligations of water resource management, regarding the recurring drought and move towards the capabilities of local communities, also consider the requirements which are contained in the third, fourth and fifth Iranian Development Programs, including the needs for transferring the management of irrigation networks to farmers and in improving the productivity (Ataei and Izadi, 2014). The stability of WUAs is a key to the success. This stability depends on increasing knowledge, changing attitudes and farmers, skills improvement (Peter, 2004). In the past two decades, as a result of the worldwide problem of water scarcity and the inability of the irrigation projects to reach the predetermined economic goals, special attention has been made to the formation of WUAs for changing the behavior of the farmers and encouraging them in participating in the management of irrigation water (Howarth and Lal, 2002). It has been mentioned in the ultimate declaration of the third World Summit that "most countries would suffer more from crises of water management (participation and cooperation) than from water shortage"; therefore, finding ideal management of water resources and an appropriate structure for these resources, seems necessary (Mirzaii *et al.*, 2011). According to the most experts, low efficient irrigation in developing countries is due to the lack of farmers' real participation in the decision-making process, performance, management and maintenance of irrigation networks. Given the fact that the exploitation of water resources can be systematized without appealing to native knowledge and the participation of local communities, a foundation called water-users cooperatives (WUAs) has

been recognized (Heydariyan, 2003). Irrigation stability needs the overall water management system to be designed in such way that all eager farmers could cooperate in order to enhance water resources more productive. Hence, in the past two decades, due to a water shortage problem all over the world and increasing challenges among water users, special attention has been made to the formation of WUAs to involve the farmers in the management of agricultural water. WUA, as an important local association, plays a pivotal role in achieving optimal management of agricultural water usage, which is possible through the optimal participation of beneficiaries in decision-making, planning and implementation of irrigation programs (Heyd and Neef, 2004). In fact, the presence of WUAs is to develop the management of cooperative irrigation and increase the efficiency of water consumption through beneficiaries' interferences as much as possible (Hassabou and El-Gafy, 2007). Based on the local conditions, Iranian farmers suffer from insufficient rainfall and continuous droughts, which can be controlled only by conservation, storage and proper distribution of the available water, in the best way, which may be possible through the establishment of a participatory management (RazaviZand, 2008). Therefore, by establishing a new system like WUA, it is possible to provide a basis for planning and management of water resources. However, the number of WUAs established by government is not sufficient to achieve the ultimate goal (Mirzaii *et al.*, 2011). Direct participation of farmers in irrigation management is an effective device to improve the knowledge and utilization of irrigation water. As the result, increasing productivity and profitability in agricultural activities is one of the factors listed as the main elements of creating efficient and self-sufficient WUAs, and as a strong economic motivation, it can facilitate the process of irrigation management transfer (SalehiTahbaz *et al.*, 2010). Reformation and expansion of WUAs are the most principal movement toward higher productivity and more policy that is comprehensive that may be instrumental in stable improvement of agriculture

organization and balanced rural communities (Shahroudi and Chizari, 2008). Since 1980 due to water shortages around the world and increase conflicts among water users, much attention have been made to the issue of water users associations to participate in the Agricultural Water Management (Heyd and Neef, 2004). In fact, the lack of monitoring the quality and excessive water exploitation, exacerbate the water shortage, which is a serious threat (Salmani et al., 2010). In general, the term 'WUA' refers to a group of farmers who are formally in charge of administration and management of some parts of irrigation networks. They are usually a group of people located in the irrigation units, departments or regions. These groups have different names, such as; water users group, water user organization, irrigation union, etc. (Vuren et al., 2004). The associations have four main tasks related to the exploitation (measuring the volume of water need and water supply, transport and water distribution networks, irrigation, water distribution during periods of water shortage and the reuse or transfer of the excessive water); conservation (according to the experts, conservation should be performed based on exploitation requirements and necessities; therefore, a system performing exploitation should also accept conservation management); financial support and ultimately the legal authority to resolve disputes between water users; consequently, each association will be successful and sustained providing to achieve these goals, and if the members try to cope with these four obligations effectively (Najafi et al., 2013).

In a study on sustainable management of optimal consumption of irrigating water, Shahroudi and Chizari (2006) demonstrate that, increasing farmers' knowledge, attitude and skills about how to manage agricultural water through WUA may be one of the main ways for the farmers' cooperation to overcome water scarcity and reach the goals of agricultural water management. Azizi et al. (2009) investigate the effective structures of farmer's cooperation in irrigation management using an analytical approach in the irrigation network of Doruodzan Dam in Fars Province. They demonstrated that,

among considering variables, farmers, attitude towards coordination in irrigation management, and understanding the current difficulties, had the most direct effect on the rate of farmers' cooperation. The rate of being social and the farmers, positive attitude towards agricultural services and extension centers, had the most indirect effect of farmer's co-operation. Based on the results of this investigation, Executive agencies should invite farmers to cooperate in irrigation management, such as preparing positive outlook toward participation and administrative system.

Mirzaii et al. (2010) studied the role of cooperation in irrigation management and indicates that, increasing overpopulation pressure, improving living standards, and increasing demands for preserving the environment, all caused governments to provide better ways for water management. In a study based on an optimal method in the management of the water resources in Qazvin Plain, Mortezaejad et al. (2012) showed that, the most important and effective solution is to pass powerful laws to prevent excessive digging of water wells, providing technical and extensional information in order to prevent unauthorized drilling. Their results identified four factors: reformation in pricing and education, development of agricultural cooperation and reducing bureaucracy, knowledge and skill improvement, informing and supervision. These elements, overall, explained about more than 60% of all differences, and the most significant of them were reformed in pricing and education. Maqabl et al. (2014) investigates the mechanisms of development and reinforcement in WUAs in Aras River region using the AHP method. They reported that, the final weight criteria: supportive mechanisms, education, extension, policymaking, communication and law, were the main criteria. The sub-criteria, included changes in traditional irrigation to drip and rainfall irrigation, holding educational and promotional classes to increase villagers' knowledge and awareness of how to play a role in the establishment and administration of WUAs through the help of Organization of Agricultural Department and Cooperative Office and District Water Office. Narayan (1995), in

his study on 121 WUAs of Asia, Africa and Latin America found that, stakeholders' skills and knowledge increase, with regard to their participation, have a positive effect on successful water management and how making it happen, had a positive effect on the successful formation and continuation of cooperative activities. Moreover, in many cases, strengthening local organizations have facilitated the foundation of cooperatives. Another point is that the comparison of the places in some, where the socioeconomic status of farmers has received attention prior to the establishment of WUAs, and places where government and private institutions have ignored attitudes, interests and needs of the farmer's shows that the establishment of WUAs has been unsuccessful in almost all areas using the second mode of operation. Akbari *et al.* (2012); looked at the effective factors in the Iranian WUA success in the agricultural regions of Tajan, Moqan and Varamin. They found that, in these areas, the problems of WUAs are members' dissatisfaction with management of cooperative irrigation, network inefficiency and unfair water distribution, lack of confidence in project managers, lack of governmental support and lack of social solidarity. On the other hand, the most important success factors are: removing technical and managerial issues, renewing channels, educating farmers, collecting water and preserving the farmers' rights.

Given the fact that, the AHP can be expanded to decision-making problems in agricultural irrigation, this study conducted a research investigates and prioritize the major factors, which improve and organize the cooperatives to water users. Therefore, the purpose of this study was to evaluate the mechanism of improving and organizing WUAs in Esfarayen County of Iran.

MATERIALS AND METHODS

The study area

North Khorasan Province is located between the latitudes of 36°34' and 38°17' N., and longitudes of 55°52' and 58°20' E. It has an area of 24434.11 km², which is the fifteenth biggest province of Iran. The North Khorasan Province is limited to Turkmenistan from the north and

eastern north with a borderline of 301 km, to the Razavi Khorasan Province from south and east, to Semnan Province of western south and to Golestan from west (Statistical Annual Year-Book of North Khorasan Province, Iran's Statistical Center, 2012).

Khorasan Province is divided into two parts based on unevenness: a) mountainous areas b) pots and smoothly splits. The highest point is Shah Jahan Peak with the altitude of 3051 m, which is located in the Aladaq mountain ranges and the lowest point is a TazeYab Village with the altitude of 4000 m lower than sea level located in the external part of Atrak River. The average height from sea level is 1326 meters. Northern Khorasan, which has a different environment than its neighboring areas has a special climate, and is adjacent from north and south to the great deserts. However, the climate is varied in this province because of its especial topographic conditions and the western-eastern location of mountains of Kope Daq in the north and Aladaq in the south. This creates relatively optimal conditions. The environmental conditions are different inside the province due to the mountains, forests, expanded plains and abundant water resources. However, the climate of the province is, in general, moderate and mountainous because the KopeDaq Mountains in the northern part and the Aladaq and Shah Jahan mountains in the south have surrounded central plains and created optimal conditions for agriculture, animal husbandry and fruit production. The most important water resources are Atrak River, Cheshmeh Saran, and four large dams named Bydvaz in Esfarayen, Shork and Barzou Shirvan and Shirin valley and Manet and Smlqan. Besides, the underground waters are significant in providing water resources (Statistical Annual Year-Book of North Khorasan Province, Iran's Statistical Center, 2012).

Esfarayen Town is located 60 km from the Bojnoord County in the Northern Khorasan. It has two types of climate: mountainous cold and moderate, and warm and dry. This town has two parts (Central, Bam and Safi Abad), two cities (Esfarayen and Safi Abad), seven rural districts, and 175 villages that all have settlers.

The average rainfall in this town is 241 mm and the average temperature varies between 8 to 13°C (North Khorasan Governor Office, Esfarayen City Development Document, 2010).

The county water is provided from 264 wells, 142 aqueducts (including 38.5% provincial aqueducts), 83 springs watering 274.46 million m³, and permanent and seasonal rivers with 112.4 million m³. The main permanent rivers are Bidvaz and Roien, the main seasonal river is KalShoor. In 2005, underground water volume was 1533.2 million m³, and it included 27% of all aquifers of the province (North Khorasan Governorate, Esfarayen City Development Document, 2010).

Considering the current drought, 79,215 hectares of fertile lands suitable for agronomy and horticulture in this region reduced to 27,731 hectares due to water shortage (Organization of Agricultural Jihad, 2014). Although there are some capabilities like Bidvaz Dam, irrigation networks, drainage and proper lands for agriculture, and

the area is suitable for establishing WUAs, as there is no cooperation with farmers, they could not use their potential capability, and only two WUAs are registered there with the Corporation of Regional Water in the town. To date, 2440 members have registered in the WUAs (Regional Water Company Esfarayen City, 2014). Furthermore, about 2700 hectares are covered by the Nazargah WUA (founded in 2006), and 4850 hectares by Bidvaz WUA (founded in 2004). In order to facilitate and accelerate the increasing numbers of WUAs in this area and provide these associations with proper frameworks, this study tried to investigate the main effective factors in developing and organizing the WUAs and rank inclusive solutions, behavioral factors and effective structures, and adjust them for the planners of economic water in the agriculture sector of Iran. Therefore, the goal of this study was to investigate experts' viewpoints about improving activities and organizing regional WUAs (Figure 1, 2, 3).

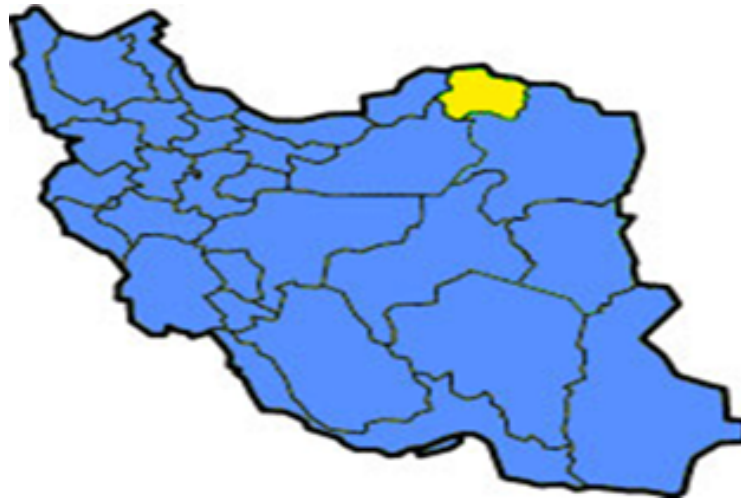


Figure 1: North Khorasan Province in Iran

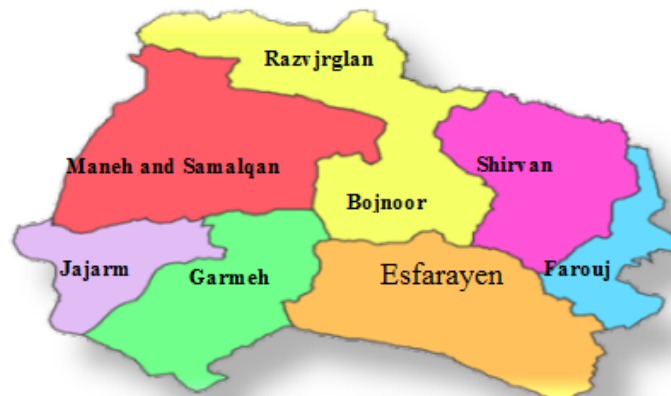


Figure 1: North Khorasan Province in Iran



Figure 3: Landscape of irrigation network of Esfarayen County (Bydvaz dam)

Each research topic has its own unique features. However, regardless of the subject of study, all researches have same administrative process, which is the objective of the research. If a proper method is not used, the scientific goals or scientific knowledge is not achieved. Today, the reliability of scientific achievements gained and influenced by research methods, only (Kalantari, 2009). Selection of a research method is the main part of any study, and it depends on the research subject, expansion of administrative facilities, goals, appropriate assumptions and moral considerations (Ahmadinejad, 2011). This study was carried out by documents and field methods. After reviewing the previous research, the mechanisms of development and organization of WUAs were determined and the criteria related to each mechanism were categorized. Then, according to studies related to the drafts, questionnaires were set up in order to compare activities two-by-two, using the collected data. The population consisted of 40 experts from the Regional Water Company, the board of directors of two WUAs, and outstanding farmers who were the members of those two WUAs. Finally, after completing the questionnaire by the 40 members, we utilized the Analytical Hierarchy Process (AHP) in order to rank activities instrumental in improving and developing the WUAs. The data were analyzed by Expert

Choice software package.

Alphonse (1997) suggested that Analytic Hierarchy Process (AHP) has some potential for resolving certain decision problems in agriculture. In these regards the AHP applied by using the set of approaches to decision-making in agricultural irrigation (Srdjevic, 1997). Compared with five different models for the estimation weight coefficient, AHP was found to produce the most credible results (Schoemaker and Waid, 1982).

The Analytic Hierarchy Process (AHP) is a method of measurement for formulating and analyzing decisions (Berritella et al., 2007). Saaty (1980) provided a theoretical foundation for the AHP that is a decision support tool which can be used to solve complex decision problems, taking into account tangible and intangible aspects. Therefore, it supports decision makers to make decisions involving their experience, knowledge and intuition (Berritella et al., 2007). Hierarchical structure consisting of the following stage (Sungguh et al., 2013):

The first level: Goal

The second level: Criteria

The third level: Sub-criteria

The fourth level: Alternatives (Figure 4).

The first level is a goal to be achieved, in this study, namely the creation of a model of organization based on water resource utilization in the basin. The second level, the criteria, indicates

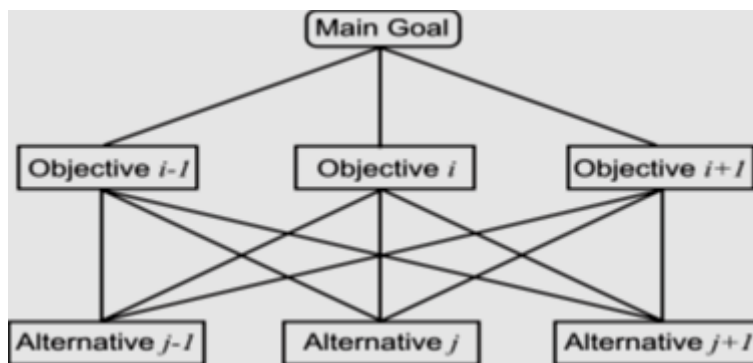


Figure 4: AHP hierarchy of goals, objectives and alternatives

the variables used in the analytic hierarchy process. The third levels, the sub-criteria, are indicators of the criteria. The fourth level is an alternative model of organization that will be created. The most important stage of the analytic hierarchy process is an assessment of the comparison pair. Unlike the conventional methods, AHP uses pairwise comparisons, which allow verbal judgments and enhances the precision of the results. The pairwise comparisons are used to derive an accurate ratio and scale priorities (Dalalah et al., 2010). Developed by Saaty (1980), AHP provides a proven, effective means to deal with complex decision-making and can assist in identifying and weighing criteria, analyzing the data collected and expediting the decision-making process.

According to six criteria that can be seen in Figure 5, sub-criteria specific to each of them were defined, some of which are as follows:

Sub-criteria of education and extension mechanisms, including meeting with promoter's agricultural service center, participation in education and promotion classes, promotional screenings, visiting the successful cooperatives, etc.

Sub-criteria of economic mechanisms, including

increasing agricultural production, creating competition in production, better use of water resources, etc.

Sub-criteria of protection mechanisms, including cover part of the cost lateral, regulatory services and facilitation of water organization, allocation of a certain percentage of prices of water cooperative, etc.

Sub-criteria of legal mechanisms, including stability of laws and regulations, management of water resources, change and transformation in the structure of agricultural water management, water user's cooperative's management pyramid codification of the law etc.

Sub-criteria of agricultural water management mechanisms including amount of land ownership, personal property on the land, area under cultivation, the price of water (right of water), etc.

Sub-criteria of WUA member's attitude improvement, are: establishing cooperatives to increase the farmers' income, create cooperative of water used, so that to distribute water in a fair way among farmers, with the membership of farmers in the cooperation, the management of irrigation water may be fulfilled in the appropriate way, etc. (Table 1) (Figure 5).

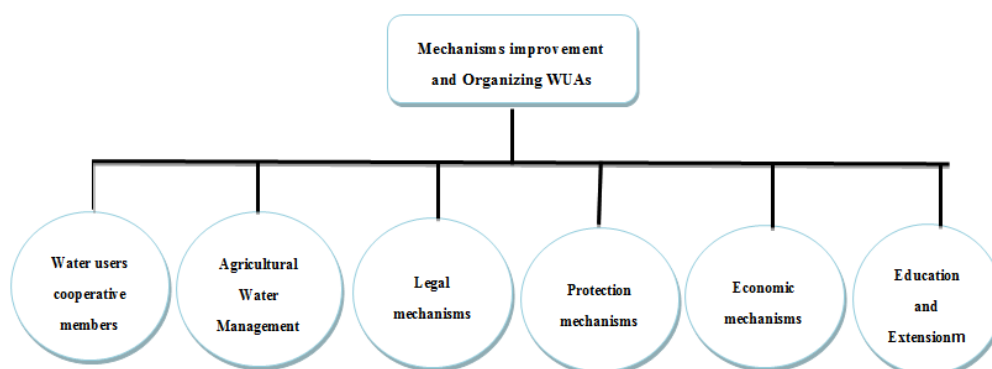


Figure 5: The hierarchy process tree to determine the criteria, sub and alternatives

Table 1: Paired comparison scale

Comparison situation	Middle preferences	Absolutely important	Much more important	More important	Equally important to a little more	Same
Weight or value	2,4,6,8	9	7	5	3	1

When this technique is used for the selection or prioritization, in general, an expert is finding a replacement because he knows which alternative should be selected as a priority (Maghabl et al., 2014).

Data collection

Four processes are essential in collecting data: questionnaire design, data collection, population determination and paired comparative table design. In the questionnaires, the number of questions is proportional to the number of criteria, and they are designed as paired comparisons of the criteria. Samples were selected through censuses. In this study, 40 people, including board members, professionals in the Regional Water Authority Company and farmers who are members of water users associations were interviewed.

Paired comparative tables

Paired comparisons are the foundation of AHP. AHP is capable of evaluating quality issues, as there are no units for measuring them. These comparative forms the matrix, in which, elements are achieved from comparison of each element in rows with the elements in columns. After arranging the hierarchy tree and identifying goals and criteria (Figure 4), the paired comparative tables, in which there were questionnaires and collected data, are analyzed. As Table 1 shows, the table must have 9 degrees, and each comparison case must be placed in front of a degree. Measuring the project data are a complicated and lengthy operation for which Express Choice software package was used.

Calculation operations

The activities for development and improvement of WUAs based on their priorities were arranged considering six criteria: supportive, agricultural irrigation management, economics, extension – education, WUAs attitude and legal mechanism. The paired comparison was studied by Expert

Choice software package. After identifying the ultimate weights by this software, the ultimate prioritization was carrying out. The purpose of the calculation operation is the evaluation of the final weights in order to prioritize in AHP method.

Average geometrical calculation: The following instructions are used in this calculation (Maghabl et al., 2014).

$$(a_{ij}^{(k)} \pi_{k=1}^n)^{\frac{1}{n}} = A_{ij} \tag{1}$$

- A_{ij}: geometric average criteria
- a: sub-criteria compared with the options
- ij: names of two alternatives compared with each other
- k: sample number
- n: all the people interviewed about a sub-criteria, And π: is the multiplication sign

The weights must be normalized after evaluation. There are different methods for normalization, but in AHP, the following rules are used (Ghodsi pour, 2000):

$$r_{ij} = \frac{a_{ij}}{\sum_{i=1}^m a_{ij}} \tag{2}$$

- a: the name of sub-criteria
 - r_{ij}: the normalized sub-criteria
 - ij: two alternatives that must be compared
- The normalization operation will be done based on the geometrical average of answers to alternatives and sub-criteria.

After the normalization of numbers, the balanced average of normalized numbers is extracted. For this purpose, the normalized numbers of each row of alternative calculation, and, finally, its average would be extracted. Instruction of the calculation of the weighted mean of following command was used (Maghabl et al., 2014):

$$W = \frac{1}{N} [\sum_{j=1}^N r_{ij}] \tag{3}$$

W: weighted mean
 N: the number of compared alternatives
 r_{ij} : the normalized amount of each row

Instructions to calculate the weighted mean for the calculation of the mean of each row of the alternatives is as follows (Maghabl *et al.*, 2014).

$$W = \sum_{i=1}^n w_{ai} w_{ci} \quad (4)$$

W: the final weighted mean first row alternative
 w_{ai} : alternative weighted mean i
 w_{ci} : weighted mean sub-criteria j
 n: whole criteria and alternatives in first row.
 The whole criteria and alternatives in the first row, and criteria and sub-criteria were measured according to this instruction.

RESULTS AND DISCUSSION

Considering the results achieved from data analysis, supportive mechanisms as the first priority (weighted mean of 0.266) were ranked as the most important mechanisms for the improvement and organization of WUAS in the studied region (Esfarayen). Moreover, Arabi and Mohebbi (2008), Knowler and Bradshaw (2007), Mortezaejad *et al.* (2012), Maghabl *et al.* (2014), Narayan (1995), Peter (2004) and Wijayaratna (2002) all showed that supportive mechanisms are one of the most effective mechanisms in developing WUAs. The agricultural irrigation management mechanisms with the relative weight of 0.261 were found to be the second priority and were the most important mechanisms for the improvement and organization of WUAs in the studied area (Esfarayen

County), which is in agreement with Mohammadi *et al.* (2010). The third priority was found to be economic mechanisms with a relative weight of 0.183, and was confirmed by Ahmadvand and Sharifzadeh (2009), Maghsodi and Moe-menQharib (2013) Narayan (1995). The extension and education mechanisms were the fourth priority with a relative weight of 0.123, and this achievement was similar with the results of Ehsaniand Bustos *et al.* (2001), Farshi (2004), Heidari *et al.* (2006), Khaledi (2003), Restrepo (2005), and Zahtabyan (2005). The next was legal mechanisms with a relative weight of 0.090, which was confirmed with Restrepo (2005), and the last was WUAs member's attitude with a relative weight of 0.076 which is similar whit Ahmadvand and Sharifzade (2009) (Figure 6).

CONCLUSIONS

The results of this research reveal that for improving and organizing WUAs in the region, the support mechanism, should be first, in the priority list of policymakers agenda in Iran. The current supportive plan, including political, administrative, financial and technical are insufficient and inappropriate. Hence, it is essential and necessary to review these supportive plans. Therefore, it is suggested to set up some committees to study and arrange the appropriate supportive plan for each WUAs based on the local conditions, and to provide facilities and financial credits for farmers, so that they can change traditional irrigation to modern one.

Since this study recognizes irrigation water management mechanism second in the row,

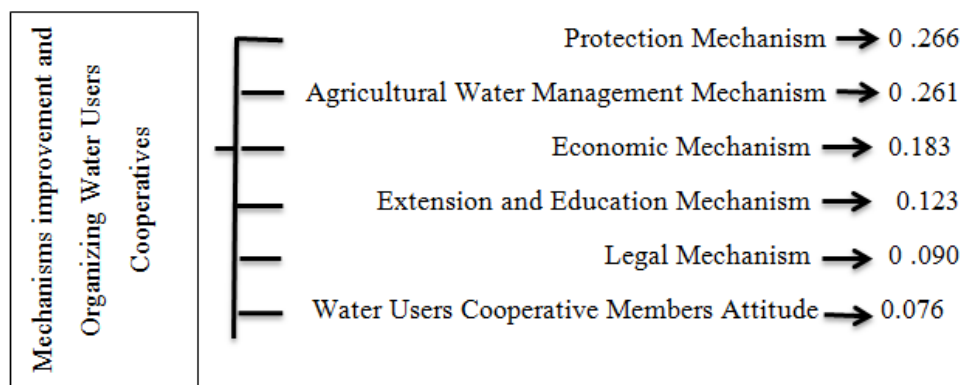


Figure 6: Ranking of the mechanisms for improvement and organization of Water Users Cooperatives with regard to the weighted average

therefor, the mechanism should be listed in the government program for the national water management plans. In order to induce positive attitude in farmers toward different water management methods, it is necessary to provide an appropriate approach for encouraging them towards water resource management, particularly for underground water.

Considering that economic mechanism third in the row, which implies that economic grounds for development of WUAs do not exist in the region? Therefore, more attention should be paid to economic organizations before their establishment, such as local markets for products, the profitability of associations, the quantity of production in the region, etc. Accordingly, economic and feasibility studies are necessary before the establishment of WUAs.

With regard to the fourth priority, i.e. extension and education mechanisms, it is suggested to provide technical trainings to develop and protect irrigation structures, especially measurement devices, and volumetric flow meter. Furthermore, education and legal assistance should be provided to prevent farmers' trespass on each other's territory and impermissible harvest. In addition, proper opportunities must be provided to enhance the knowledge and awareness of users, representatives, and boards of director members by holding training courses, visiting successful cooperatives, holding seminars and conferences.

Ranked in the next priority, are legal and attitude of cooperative water user's mechanisms. Given the importance of these mechanisms, sub-criteria are needed to be planned. As a result, considering the importance of the WUAs establishment and the fact that the country should inevitably follow the trend of water transfer from the public sector to the users' associations, it is essential that native experts of each region to conduct comprehensive studies in this regard, and by identifying and eliminating the impediments, attempt to successfully establish organizations which participate farmers in order to lay the foundation for the development and improvement of WUAs.

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