

# FOUR YEARS OPERATION IN BILESAVAR SPRINKLER IRRIGATION SYSTEM: CHALLENGES AND SOLUTIONS

## EXPLOITATION DE QUATRE ANS DU SYSTEME D'IRRIGATION PAR ASPERSION DE BILESAVAR : DEFIS ET SOLUTIONS

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### ABSTRACT

*With increasing scarcity of water resources and also increasing cost of its management, it is important that participatory methods through WUAs, are employed faster. One common and water-saving way distributing and applying water is through sprinkler irrigation. In this context, the Bilesavar sprinkler irrigation network, in Ardabil Province under the Moghan irrigation network has been implemented at a cost of 12 million dollars to utilize 3 m<sup>3</sup>/sec flow rate from the Aras River for 3200 ha area. It has been four years after the termination of its construction when the operation of irrigation system was taken up by two cooperatives, called Saghetala and Ghatrebaran. With all the success, the project management operation is facing challenges as well. This article attempts to find out the strengths weaknesses and challenges of management transition period by focusing on reports of operation and maintenance of irrigation networks (Samanabrah Consulting Engineers) and interviews with those who are involved in the cooperatives, managers and Bilesavar Agricultural experts. The study shows that for solving many problems having financial reasons, increasing governmental supports, such as the Agricultural-Jahad Organization, Regional Water Company, Bureau of Rural Cooperatives are necessary to continue with the success in future.*

**Keywords:** *Water use, Irrigation networks, Public participation, Cooperative approach, Sprinkler irrigation, Bilesavar.*

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## RESUME

*En raison de l'augmentation de la pénurie des ressources en eau et du coût de sa gestion, il est nécessaire d'impliquer plus rapidement les méthodes participatoires dans les Associations des Usagers d'Eau (WUE). Une façon commune de l'économie d'eau est de distribution et d'application d'eau par l'irrigation par aspersion. Dans ce contexte, le réseau d'irrigation par aspersion Bilesavar de la province d'Ardabil dans le cadre du réseau d'irrigation de Moghan a été mis en œuvre à un coût de 12 millions de dollars pour utiliser un débit de 3 m<sup>3</sup>/sec de la rivière d'Aras pour arroser une superficie de 3200 ha. Il y a quatre ans que l'exploitation du système d'irrigation a été reprise par deux coopératives, à savoir, Saghatala et Ghatrebaran. Après la réussite du système, l'exploitation de la gestion du projet est maintenant affrontée par des défis.*

*Ce rapport essaie de rechercher les faiblesses, les forces et les défis que posent la période de transition de gestion en mettant l'accent sur les rapports d'exploitation et de maintenance des réseaux d'irrigation (Samanabrah Consulting Engineers), et détient les entrevues de ceux impliqués dans les coopératives - les gestionnaires et les experts agricoles de Bilesavar. L'étude montre qu'il est nécessaire de résoudre nombreux problèmes de nature financière, d'augmenter le soutien gouvernemental tel que l'Organisation Agricole Jihad, la Société régionale de l'eau, le Bureau des coopératives rurales pour réussir dans l'avenir.*

**Mots clés:** *Utilisation de l'eau, réseaux d'irrigation, participation du public, approche coopérative, irrigation par aspersion, Bilesavar.*

## 1. INTRODUCTION

From the end of the 20th century in many developing countries efforts for enhancing water use efficiency has increased. To reduce government's expenditure, the concept of irrigation management transfer (IMT) has emerged. The IMT is based on the philosophy that it gives an increased sense of ownership, decision-making authority and promotes active participation in the operation and maintenance of irrigation networks thereby encouraging the farmers to assume more responsibility in managing the water resources.

Due to lack of interests and necessary efficiency in governmental irrigation institutions, IMT is considered an efficient instrument (Heydarian et al., 2007).

Rapid development of modern irrigation and drainage networks is witnessed in many developing countries (including Iran). However, farmers' involvement in the process has been only in a few cases and in fewer countries. Numerous under-performing projects constructed and maintained by governments make strong case for farmers' involvement in the process of water resource development and use; more so, as the agriculture consumes maximum water available for use (Fathi, 1997; Heydarian, 2007).

The purpose of this study on the operation and maintenance of the irrigation network of Bilesavar is to comprehend the working problems and to seek solutions that can continue the first and largest network of sprinkler irrigation with success.

The pressurized Irrigation project is located between 5 to 12 km of Bilesavar's west, in 3,200 ha of the 90,000 ha Moghan's irrigation and drainage network (IDN). These Lands were being irrigated by 113 km long main canal with and 250 km sub-main canals using gravity and also with the help of 8 pumping stations. The last (8th) pumping station supplies the required water for the project.

IMT and Bilesavar irrigation system plans have been done by Samanabrah Consulting Engineers. Currently, the number of farms is 1394 owned by 713 farmers. This irrigation network is divided into 21 units with an average area of 150 ha and in order to supply its water, 21 pumping stations have been built.

The IDN construction was completed about 4 years ago, while some complementary activities continued later. Crop cultivation (wheat in winter and soybean in summer) and operation of irrigation system started from that time. Due to water limitation in the Moghan's main canal, the entire area is used to cultivate wheat in winter but due to its higher water requirement, soybean is grown over 40% of the area in summer.

Saghetala cooperative company has the responsibility of Operation and maintenance of sprinkler irrigation including pumping station (1) to (9) to the extent of 1350 ha and Ghatrebaran cooperative company has the same responsibility from pumping station (10) to (22) to the extent of 1850 ha.

Permanent employees of Saghetala are 8 including Director Manager, 4 pump station operators, 1 mechanic, 1 accountant and storekeeper. Usually these employees perform guard work too. The number of employees in Ghatrebaran Cooperative Company is also 8 including Director Manager, 4 secondary pump station operators, 1 Guardian and Mirab, 1 mechanic as in charge of the tractor and excavation machine and 1 person is in charge of warehouse and network monitoring.

## 2. MATERIALS AND METHODS

Initially, social studies with the goal of achieving appropriate operational system was performed and is composed of 21 Communities based Organization. After review and necessary field studies, the most appropriate organization of agricultural production cooperatives was identified for operation of the irrigation network and two production cooperatives were formed namely, Saghetala and Ghatrebaran. Upon their formation, the necessary training program to empower the members has started.

To discuss existing problems and achieve the required information, experts and participatory groups were interviewed, and their opinions in different areas were collected.

For the present study, information was collected by scanning, using the reports of operation and maintenance of Moghan's sprinkler irrigation networks and interviews with water users, managers and experts of the Agricultural-Jahad Organization. The strengths and weaknesses and challenges of operation and maintenance after four years of the assignment and transfer of management were evaluated.

## 3. RESULTS AND DISCUSSION

Bilesavar Sprinkler irrigation system, the first network of irrigation in yeoman lands in the country is considered as one of the successful projects in pressurized irrigation system. After nearly four years of Bilesavar operation of irrigation networks by production cooperatives, some problems have emerged, such as financial weakness, rising energy costs, electric transmission line problems, low water fee collection by some members etc.

In the process of transferring management, the responsibility for operation and maintenance has been entrusted to the people. The farmers by selecting cooperatives company board have attempted to run the system. After the management transfer, elections have been held every 3 years for cooperative's board in Saghetala and Ghatrebaran. In 2010 the third election was held and from each station three people, as station deputy and two candidates for the cooperatives board has been chosen. The new directors were selected from the board cooperative candidates.

Challenges ahead and the obstacles that cause problems in the optimal Operation of Bilesavar irrigation networks are presented below.

### 3.1 Economic

#### 3.1.1 Productivities

##### **A) Wheat productivity reduction and non-cultivation of soybean due to lack of water in 2009-2010 agricultural season.**

Due to rain at this year, the farmers avoided irrigating their lands. But despite the need for a supplemental irrigation and also cooperative manager's advice, the farmers were not willing to sign a contract on consideration of the water price that would have to pay. Actually, they could not be faulted much because the water price included the costs of annual service and a high repair and maintenance cost. Besides, the payment did not ensure receiving full irrigation. This, the water users felt would be too much burden on them and they did not sign any contract.

In this year due to failure to perform the last irrigation, wheat productivities had a sharp decline to 2000 kg/ha. Also, on the water cost consideration, soybean was not cultivated in the summer of 2010. Irrigation in the 8th pumping station has started again in January 2011 and has continued until the last visit in May 2011, and at this stage the 3rd irrigation is being done.

##### **B) Land fertility reduction**

Due to lack of proper crop rotation in most of the land the fertility has reduced for desirable production. The field studies show the agent is able to change the culture in some lands to cultivate rapeseed and wheat-rapeseed rotation in 2010-2011.

## **C) Rust and Fusarium incidence**

In the absence of proper crop rotation, disease spread and pest outbreak occurred for those crops which were cultivated continuously. Rust and Fusarium incidence in the region has reduced the production potential. This factor somewhat changed recently and crop rotation followed in 2010-2011 is rapeseed and rapeseed - wheat rotation.

### **3.1.2 Loan repayment issue irrigation system construction**

At the time of construction the 8th pumping station water users signed nearly 750\$/ha promissory notes for loan repayment. But with passage of time and prolonging the project's construction period, annual interest was added and the amount reimbursed for each hectare increased and reached to nearly \$2400. After negotiations with agent banks and discounts, the amount per hectare dropped to \$2000. But the farmers and the cooperative officials considered it unfair to levy charges on them due to delayed project completion.

### **3.1.3 Inadequate water supply and the suspension of new reservoir construction**

The required demand for the 8th pumping station lands is 3 m<sup>3</sup>/sec. But because of providing insufficient amount of required water in the major canal, it usually causes water shortage, and also, due to 24 hours a day operational problems, irrigation is being done with interruption (System is working 16 hours a day). To solve this problem, attempts have been made to build a reservoir. One of them with capacity of 40,000 m<sup>3</sup> has been put into operation. The Other water storage pool with the capacity of 12,000 m<sup>3</sup> had been under construction. This reservoir is not complete yet. Based on requests by the board and the 8th pumping stations managing directors, to address water shortages, especially in the maximum consumption, they are willing to build another reservoir and the completion of unfinished reservoir.

### **3.1.4 Non-performance of predicted crop pattern**

Crop pattern in the 8th pumping station sprinkler irrigation network's status is as follows:

Wheat: 90 percent (2705 hectares), Barley: 2 percent (56 hectares), Rapeseed: 5 percent (155 hectares), Lentil: 1 percent (28 hectares), Fallow: 2 percent (68 hectares) and Soybean this year: 40 to 45 percent (about 1200-1300 hectares). According to surveys, the reasons for lack of implementation of projected pattern are:

- Water Shortage;
- Farmers with 2 vocations;
- Failure to promote some products by authorities;
- Lower performance of lentil;
- High cost of cotton cultivation and high number of worker requirements for that;
- No secure purchaser for alfalfa and uncertainty of enough water in summer;
- Power failure problems and insufficient irrigation in summer;
- Non payment of water price by some farmers.

### **3.1.5. No commitment to pay water fee**

Based on reviews, about 15% of water consumers do not pay their bill. This is because their farms are located in between the other lands and irrigated occasionally. This behavior, which has been continued over the years has led cooperatives face with financial difficulties and on the other hand encourages others not to pay their expenses. In this case, the authorities expect support from the Agricultural-Jahad Organization managers to not giving the agricultural inputs (fertilizer and seeds) to such people or forcing them to settle with the 8th pumping stations cooperatives, to pay their debts. On the other hand the Pricing policy for wheat has been set on nearly \$130 in 2010-2011. Although exploiters initially declared their dissatisfaction and did not sign a contract, but due to drought in 2010-2011 agricultural seasons, about 80 percent of them have now signed a contract.

### **3.1.6. Energy subsidies removal problems**

Elimination of energy subsidies in agricultural has caused the price of electricity in a period of 2010-2011 agricultural seasons to increase eight to tenfold, compared to same period in previous years.

## **3.2 Operation and Maintenance Problems**

### **3.2.1 Poor quality of infrastructure problems in some parts of the network**

According to an investigation and also opinions of cooperative company authorities, the quality of some components used in irrigation systems were inferior and the damages rate are high, particularly, in quick valves. About 10 percent of all quick valves had to be replaced during the period of wheat irrigation. Corrosion, freezing and bursting and so on are the reasons for breaking of quick valves and these problems automatically causes failure in the pressurized irrigation system of 8th pumping stations. Although all repairs even broken parts replacement inside the quick valves, have been done by the cooperative workers.

### **3.2.2 Power failure problems and its repairs**

The 44 km long power transmission line was built in order to provide power to 22 secondary stations. Breaking the transmission line insulators, disconnections and reconnections are the main issues and problems in this case; consequently it causes a lot of problem in irrigation scheduling. The transmission line maintenance is done by cooperatives staff, as the line has been delivered to the cooperative companies.

## **4. CONCLUSIONS AND RECOMMENDATIONS**

Reviews Show that the established organizations are suitable for the operation of the network, and now, despite many problems in the management and exploitation of 8th pumping station's lands, also in spite of the few number of employees and the multiplicity of their duties, they undertake complex repairs and assigned tasks, satisfactorily. However, during the irrigation period, those employees are working about 16 hours a day. In addition to irrigating the farms and management of secondary pumping stations, they also have been responsible for

base pumping station management. Considering the newly established transfer of irrigation management in Iran and no previous knowledge of managers and those who are involved in such projects, the incidence of various problems are expected. Therefore in order to exploitation continuance and empowering of cooperative companies, new actions have to be taken. The main problem with operational organizations, are lack of support and financial problems. All other problems will be removed by strengthening financial base and more support. For instance, lack of technical staff to improve operational programs is only because of budget deficit of cooperative companies which cannot afford their employees expenses. Obviously, in order to provide a good condition to raise cooperative-company's interests is the necessity of boosting exploiter incomes, and it cannot be done without changing the crop-pattern and of course shifting towards a new pattern with more privileges.

The following suggestions to remove obstacles and get more desirable revenue operation from the network are offered:

- 1) Allocation of low-interest loans at the beginning of the agricultural season;
- 2) Collaboration between the Management of Agricultural-Jahad Organization and the Cooperative Production Unions in order to achieve one of the following two options:
  - A) The agency can get the responsibility of agricultural inputs distribution, production, reproduction and distribution of seeds and also insuring the crops by cooperative companies;
  - B) In case of (A)-failure, not distributing of agricultural inputs and no signing of insurance contracts with those farmers who failed to carry out their financial commitment.
- 3) Collaboration of the Agricultural-Jahad Management Organization with Cooperative Production Unions in following cases:
  - A) Forming classes and training workshops for exploiters to promote familiarity with the principles of the farming operation, the correct cultivation standards (e.g. not to set on fire in the farms in order to improve soil organic conditions and change of existing quick valves into new PE quick valves);
  - B) Providing agricultural implements such as sifter and chopper and storage for cooperative production companies;
  - C) To create a pilot farm in order to research appropriate crop pattern and familiarize the farmers with the successful cultivation, and encourage them to create crop rotation.
- 4) Elimination of energy cost-rising after the operation of Targeted Subsidies Plan;
- 5) Problem related to power transmission lines and electricity disconnection;
- 6) Creating new reservoirs in order to take advantage of inaccessible water and also prevent damages of surplus waters to downstream lands;
- 7) Holding constant meetings of board and CEO cooperatives with members and provide balance to communicate more and better financial transparency;
- 8) Empowering plans for developing participatory management in lower levels of society (local community and local government departments);
- 9) Holding regular meetings of board and CEO cooperatives with managers and experts of Agricultural-Jahad Department;

- 10) Alternation of wheat - Canola cultivation and rapeseed percentage enhancement in coming years to increase production efficiency. Also having beehive in farm's side to have better insemination in rapeseed fields, increasing productivities and side jobs;
- 11) Settle the bank requested-amount dispute with farmers.

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