# OPERATORŚ PARTNERSHIP IN TILAKAN IRRIGATION AND DRAINAGE NETWORK DESIGN

# PARTENARIAT DES OPERATEURS EN MATIERE DE CONCEPTION DU RESEAU D'IRRIGATION ET DE DRAINAGE DE TILAKAN

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## *ABSTRACT*

*Doroodzan dam was constructed on kor river in 1961. But for various reasons its irrigation channels network hasnnot been completed yet. It was considered that further development for irrigation be made with Operators Partnership. This entailed sharing of costs and involvement in design, operation and maintenance of the system by the beneficiaries of the project.*

*The results showed that operators' participation in the network design increased. The length of irrigation channels decreased from 76 to 60km and the length of drain decreased from 70 to 60km. Local users' committees were formed. Without the said partnership of all the stake holders in an irrigation and drainage endeavour, there would be dissatisfaction among the water users and damage to the system due to lack of maintenance.*

***Key words:*** *Partnership, Design, Transfer the Operation and Maintenance Management.*

## *RESUME*

*Le barrage Doroodzan a été construit sur la rivière Kor en 1961. Mais pour diverses raisons, la construction de son réseau des canaux d'irrigation non pas encore été achevée. Il a été proposé de développer le système d'irrigation avec le partenariat des opérateurs. Cela impliquait le partage des coûts et l'implication des bénéficiaires du projet dans la conception, l'exploitation et la maintenance du système.*

*Les résultats ont montré que la participation des opérateurs dans la conception du réseau*

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*a augmenté. La longueur des canaux d'irrigation a diminué de 76 à 60 km et la longueur du drain a diminué de 70 à 60 km. Les Comités d'usagers locaux ont été établis. Sans partenariat de toutes les parties prenantes dans l'entreprise d'irrigation et de drainage, il n'y aurait pas de satisfaction chez les usagers de l'eau, et cela donne lieu aux dommages au système en raison du manque de la maintenance.*

***Mots clés :*** *Partenariat, conception, transfert de la gestion d'exploitation et de maintenance.*

# 1. INTRODUCTION

Iran is a dry and low rainfall country with the average rainfall of less than a third of global average. Adaptation is the only way to deal with drought and optimizing the use of water resources and improving the efficiency of water productivity are the ways of adaptation. One of the ways to increase the efficiency of water productivity is transferring the management from government to operators. This transferring process needs a change in the mind set and assessment of the requirements of operators. It could be possible with participating the operators at all levels such as sponsoring, decision making, designing, performing, operating and maintenance. In the irrigation networks, designing is based on technical and physical principles, without paying attention to social relationship and social problems. The purpose of this study is to make premise for the formation of participatory irrigation and drainage network management (PIM), with the operators participating in Tilakan irrigation and drainage network design.

Irrigation and drainage network of Tilakan is located on Kor River, downstream of Doroudzan dam, in the Korbal plain, east of Shiraz. In the beginning of the second stage of the Tilakan network design on the Kor River, the current situation of operation, irrigation and water management systems as well as decision system among owners, joint owners and retailers were investigated. Due to the specific object of this design- management transition to operators, a new network design was necessary to match the management system and the traditional water distributing system. For detailed investigation and use of farmers' knowledge in network design, local committees consisting of water distributers and water workers of each village and farms were formed in a democratic way through voting. The network was designed to minimize the partnership problems in terms of the maintenance and operation.

**Water transfer from Tilakan diversion dam to farms (present condition)**

Tilakan dam supply water to the farms located on both left and right side of the dam. Water is conveyed through dusty traditional channels. These old channels have become favourable spots for weed growth due to their low slope and accumulation of water. Hence, the farmers have to dredge them annually or every second year. Dredging deepens them and gravity irrigation to the adjoining farm land becomes infeasible. Therefore, it is it is necessary to replace them by constructing new channels.

With the construction of first class channels on the right side, some parts of traditional channels were eliminated and concrete channels also could not cover all the lands because of construction of second and third class channels. So farmers take water from junctions of concrete and traditional channels. On the left side, the numbers and types of motors used

by the farmers were investigated and turn outs were provided based on the area under the coverage of any pump after the investigation and renewed design of network.

Formation water users association and transferring of irrigation network management to farmers is a strategic policy to help developing the rural economy in Iran. These associations have key role in optimum management of the water resources in the farms. Some reported experiences on these associations are:

- Increase of production, increase of water consumption efficiency and improvement in maintaining the rural irrigation networks(Samad & Vermillion 1999).
- Increase of irrigation networks output is attainable through efficient management in systematic association forms. Reports show that improvement of these associations had solved the problems of irrigation plans, improved irrigation networks condition and increased the farmers' satisfaction level (FAO 1999).
- Attention to the water users associations is the surest and most efficient investment to correct the irrigation procedures and therefore increase water availability in the farms in such a way that these associations could have more favorable output either for the returning time of investment or from farm income.
- In Bulgaria water users association cause to significant increase in operating farming water and has 75% growth in farming productions (Tanaka & Sato 2005).
- In India water users' associations have helped increasing farm output (Vermillion 1997).
- There has been increased farmers' contact with the information sources after the formation of farmers' cooperatives (Ahmadvand et al, 2009).
- However, incompetent associations alienate water users and they shun participation Etaati (1380[5]).
- Irrigation management is a process of social relationship improvement between farmers and managers, increase of social capacity for extensive performance, elimination of current costs of government in operation and maintenance of the systems, etc. (Asadi et al, 1388).
- There many similar examples and experiences on participatory approach in water management in many countries.

## Irrigation and drainage network of Tilakan diversion dam project

The flat Korbal plain lies north of Shiraz and east of Marvdasht at 1568 m above the mean sea level. He gross area of the plain is 58000 ha. Tilakan dam is the third diversion dam of Korbal plain and is situated 100km away from Shiraz and it has been operating from the old times. Drainage and irrigation plan of Tilakan dam lads include diversion dam, two independent river basin on kor lake and two main channel on left and right side of the dam. Phase 1 is at the left of Tilakan dam and include peasant lands in Kamjan, Gazak, Nurabd , Jian, Hashemabad, Saghaabad and Rubhaghan villages comprising 2513 ha. From the main channels on left side, 10 second class channels are proposed in the second phase and it is also proposed that the entire land on the left be put under modern irrigation network.

5 Years starting with 13 are according to Iran calendar. To get the corresponding English calendar year, add 621.

# 2. MATERIALS AND METHODS

The study on the Tilakan project included reviewing and assessment of second phase studies, social and partnership studies and formation of water users association, PRA (participatory rural appraisal) method. To perform socio- economical analysis of one region it is necessary to recognize the main variable and then collect these variables and analyze them. The main socio- economic factors are population, employment, immigration, population growth rate, facilities, farming condition, animal husbandry, literacy rate and water resources. Necessary information about these factors is obtained through measurement, rapid rural assessment, participatory observation, interview and questionnaire survey of stake holders and also perusal of the regional plan. Relevant information were collected and field studies are performed in a participatory mode. All the collected data and information were analyzed to arrive at the conclusions on the Tilakan dam area management.

# 3. CONCLUSIONS

The purpose of the study was to review the Irrigation and Drainage Network of the Tilakan dam. Participatory approach was adopted to ensure stake holders participation in simplifying the management of a modern irrigation network and for ensuring their participation later in managing the network.

**1. Recognition of leaders and volunteers:** Readiness-to-participate form in drainage and irrigation network design performance in each villages signed by the volunteer and sealed by Islamic council of that village.

**2. Assessing present conditions:** The present conditions were assessed and recognized with a view to identifying areas of improvement.

**3. Formation of planning and decision-making local group:** After the investigation in each of the villages, sessions were held with groups that included land holders, farmers, and joint operator subgroups to chose their agent and authorize him for the channel crossing course.

**4. Examining various options:** Examination of alternative design options through participation of stake holders and reaching to a common acceptable option.

**5. Organising public session in villages:** In these sessions various doubts and misgivings due to non-clarity were discussed and resolved.

**Effective technical factors on choosing network design and operation decoration and irrigating method in drainage and irrigation network in Tilakan:**

**Farming fields' ownership scales:** Field ownership condition of left side of Tilakan dam assessed in complementary studies is shown in Table 1.

Table 1: left side field ownership condition of Tilakan diversion dam in 2010

| Name of Farm | Total Farm Area ha | Total Towners individual | Kind of owners | < 5 ha Indivi-dual | 5-10 ha Indivi-dual | > 10 ha | Average of ownership ha |
|---|---|---|---|---|---|---|---|
| Kamjan | 623 | 71 | land reforms | - | 84 | 7 | 8.77 |
| Gazak | 400 | 64 | land reforms | - | 62 | 2 | 6.25 |
| Saghaabad | 240 | 62 | land reforms | 62 | - | - | 3.87 |
| Jian | 258 | 46 | Possessive - land reforms | 43 | - | 3 | 5.61 |
| Hashemabad | 198 | 24 | land reforms | - | 24 | - | 8.25 |
| Roobahghan | 330 | 60 | Possessive - land reforms | 54 | 6 | - | 5.10 |
| Noorabad | 218 | 66 | Possessive - land reforms | 66 | - | - | 3.30 |
| Total | 2267 | 393 | - | 225 | 176 | 12 | 7.10 |

**Water transfer from traditional channels, water distribution network designing by Operators' opinion:**

The most important part for designing Tilakan drainage and irrigation network is investigation of water transfer manner and from traditional channel to farms. In new design try to align third class channels in such a way that each one of cooperating group can access water easily.

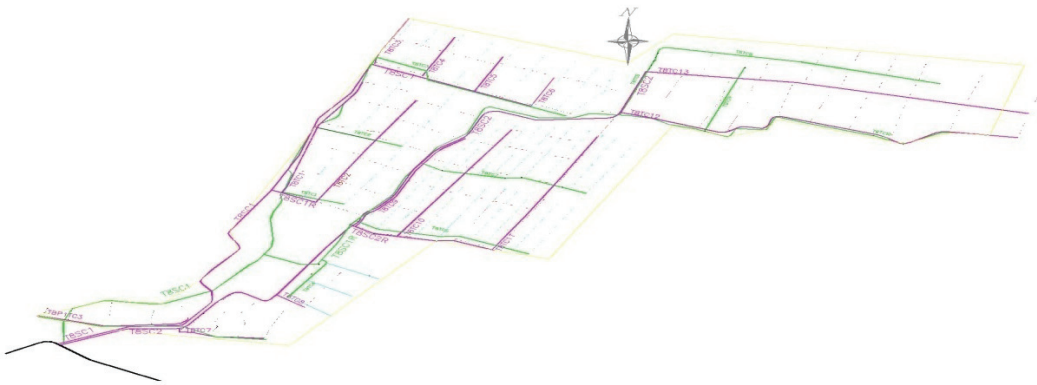
**Water distribution in some farms of phase 1**

*Gazak farms*: Supply water by a traditional independent creek using mobile pump sets. First part of farms that is under pressure irrigating field and is about 30 hectare areas, supply water by 5 mobile pump from this creek. At the start of Gazak grain field is a traditional divider with 4 choke and divide the water between 4 moshaee groups. Water of foresaid traditional creek at terminal of grain field divide between 4 paddy field by a divider in similar way . In this farm, network decoration changed totally into second studies phase design. Whereas in old design 2 third class channels were in length of grain field and 4 third class channels were in length with paddy field. After consulting with Operators agents and regard with supplying water of two Gazak group (that have 2 traditional creek) from 1 third class channel, in new design 2 third class channel in length with grain field and 2 third class channel in length with paddy field were designed. In each one of these third class channels for each moshaee group, 1 fourth class choke was designed.

*Kamjan farms*: Supply water by a traditional independent creek and irrigate under pressure irrigating farms, Moshaee grain field and Kamjan paddy field. This creek also irrigates Dehno farms in watery years. At first under pressure irrigating farms supply water by 5 mobile pump. This foresaid creek water divides between 4 *moshaee* groups by a divider. Also at its terminal Kamjan paddy field is placed and 4 Moshaee group divide their water by a traditional divider. And if there is more water, irrigate Dehno farms. In this field also existent condition in Gazak repeats and network alignment changed. Also with regard to this point that Operators of

Gazak and Kamjan farms were from Kamjan and have cultural and social relevance, they decide that their second class channels be joint about 2km because of moderating costs (that should accept 30% of project costs) and separate second class channels by division box structure. Finally with regard to Operators financial participation the length of channels and network performance costs decreased by about 25%. In following shape new alignment is shown with green and old alignment is shown with purple color. (Designed channels length decrease from 30 to 22km).

Plan 1: irrigation and drainage network plan of Kamjan before Operators participatory (green) after Operators participatory (purple)



*Nurabad village*: Nnurabad traditional creek supply water from above Tilakan dam and Kor lake border. At the beginning of the course, *Moshaee* group of Nurabad and owners supply water by mobile and fixed pumps. The reason of using this pump is because of extensiveness of farms near the channel and main channel into the lake. In each *Moshaee* group several pumps are used by the Operators to supply water and each owner is supplied water with a separate pump. Nurabad creek reaches to the grain field of the land holders. These farms were rented to the peasant in past years (*Moshaee* Operators group). In this farm after the participation of Operators in drainage and irrigation network plan, channels length got reduced from 15 to 12km.

On the basis of the study, the following summary is presented:

1. Affter Use of Operators Participation in the Tilakan irrigation and drainage network design, Operators' attitude changed toward the participatory project . For instance while starting the phase 1 operation, Operators of nearby phase opposed the investigation but later declare in writing that they want to start performing operation of pumping phase and network of phase 2.
2. Maintaining of cooperative group in farmers irrigating through the adjustment of network alignment and determining the third and fourth supply water phase with traditional irrigating in farms in a form that in operating time no problem happen to farms irrigating and Operators group can deliver their share of water.

3. In following Tables (Table 2) are given the changes of network irrigation channels length. As may be seen in the Table 2, the length of second and third class of drainage and irrigation network of phase one of Tilakan dam after the investigation and Operators' participation in network designing decrease from 76 to 60.

Table 2: decrease of third class channels of drainage and irrigation on phase 1 of Tilakan after the investigation and participation of Operators in network plan.

| Third class channels name | channels length | | length variation |
|---|---|---|---|
| | second phase studies | studies review with operators partnership | |
| T8TC1 | 1400 | 350 | 1050 |
| T8TC2 | 1400 | 650 | 750 |
| T8TC3 | 850 | 1500 | -650 |
| T8TC4 | 800 | 300 | 500 |
| T8TC5 | 650 | 350 | 300 |
| T8TC6 | 620 | 1200 | -580 |
| T8TC7 | 650 | 1200 | -550 |
| T8TC8 | 250 | 650 | -400 |
| T8TC9 | 1500 | 650 | 850 |
| T8TC10 | 1500 | 2000 | -500 |
| T8TC11 | 1500 | 870 | 630 |
| T8TC12 | 3250 | 1320 | 1930 |
| T8TC13 | 3000 | 320 | 2680 |
| T8TC14 | 1320 | 530 | 790 |
| T8TC15 | 2030 | 1020 | 1010 |
| T8TC16 | 1110 | 700 | 410 |
| T8TC17 | 1170 | 530 | 640 |
| T8TC18 | 1100 | 440 | 660 |
| T8TC19 | 320 | 580 | -260 |
| T8TC20 | 310 | 470 | -160 |
| T8TC21 | 810 | 890 | -80 |
| T8TC22 | 840 | 890 | -50 |
| T8TC23 | 910 | 800 | 110 |
| T8TC24 | 1100 | 800 | 300 |
| T8TC25 | 840 | 450 | 390 |
| T8TC26 | 770 | 1400 | -630 |
| T8TC27 | 1100 | 680 | 420 |
| T8TC28 | 630 | 320 | 310 |
| T8TC29 | 315 | 620 | -305 |
| T8TC30 | 330 | 1500 | -1170 |
| T8TC31 | 2200 | 1400 | 800 |
| T8TC32 | 1400 | 250 | 1150 |
| T8TC33 | 1500 | 260 | 1240 |
| T8TC34 | 910 | 910 | 0 |
| T8TC35 | 1300 | 1300 | 0 |
| T8TC36 | 1100 | 3150 | -2050 |
| T8TC37 | 1170 | 3400 | -2230 |
| T8TC39 | 680 | 800 | -120 |
| T8TC40 | 790 | | 790 |
| T8TC41 | 760 | | 760 |
| T8TC42 | 1000 | | 1000 |
| T8TC43 | 1000 | | 1000 |
| TOTAL | 46185 | 35450 | 10735 |

Table 3: decrease of second class channels of drainage and irrigation on phase 1 of Tilakan after the investigation and participation of Operators in network plan.

| second phase studies | | studies review with operators partnership | |
|---|---|---|---|
| **second class channels name** | **channels length** | **second class channels name** | **channels length** |
| T8SC1 | 5960 | T8SC1 | 4210 |
| T8SC2 | 5870 | T8SC1R | 5520 |
| T8SC3 | 5100 | T8SC2 | 5200 |
| T8SC4 | 6110 | T8SC3 | 6930 |
| T8SC5 | 6610 | T8SC4 | 3560 |
| TOTAL | 29650 | TOTAL | 25420 |
| length decrease of second channels | | 4230 | |

Table 4: decrease of channels totally

| **total length of second and third channels** | **second phase studies** | **studies review with operators partnership** |
|---|---|---|
| | 75835 | 60870 |
| total length decrease | 14965 | |

Notice : The channels that have same names in both studies phases is not same locally.
- lenghts unit is metric ..

## Suggestions

1. Operators attitude changes toward the participatory project in the bottom-to-top approach and it may be adopted in future.

2. in order to operation and maintenance management transfer (IMT) simplifying the dividing methods of water for Operators with keeping standards and network technical problems is suggested. This can deliver the due share of water to every group independently.

3. With regard to financial participation of Operators in network constructing, responsibility was necessary in all the planning and performing phase so that in planning time, Operators gave the best and the most useful possible design that is followed the decrease of costs and channels length.

4. In connection period, involvement of social and technical experts and Operators trained through training course is required.

5. Elected agent of Operators strengthen the cause (from the viewpoint of social acceptance and farming irrigating experiment) for establishment of water users association and in the time of network construction (if necessary ) and could take the responsibility of resolving social conflicts and supervise the contractors' work.

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