

INVESTIGATION OF TRADITIONAL WATER CONVEYANCE AND DISTRIBUTION SYSTEMS IN THE ATRAK CATCHMENT

EVALUATION DU SYSTEME TRADITIONNEL DE TRANSFERT ET DE DISTRIBUTION DE L'EAU DU BASSIN VERSANT D'ATRAK

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ABSTRACT

Expanding and developing irrigation systems is considered as a fundamental rule in less developed countries in recent years, however farmers' participation in exploitation management and maintenance of the networks in these countries have not been considered as much as needed. It seems despite huge government's investment in developing and improving irrigation and drainage networks, Irrigation Management Transfer (IMT) to farmers as a fundamental strategy to improve performance and prevent premature degradation of networks is considered. The IMT process has forced a new look on the way services are provided to users. So, like assuming the water scarcity and lack of priority in the agricultural sector between water consumers, and pressure on the agriculture sector to become more efficient, transferring irrigation management to farmers could be essential. Therefore, IMT is the process of devolvement of authority and responsibility from government agencies managing irrigation systems to farmers' organizations. Iran has a rich past in the formation of water users associations (WUAs) maintenance water resources. Basically, water consumer organizations would be formed in structures such as ethnic groups and tribes or similar structures. As the strongest social-production systems, these structures would also lead other social activities as well as water management. They were much stronger in low-water arias and obeyed more general rules for water management. The objective of this paper is to review the structure and water conveyance and distribution systems by water user associations in downstream of HERSING earth dam according to historical documents about 200 years ago. The current

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study indicates IMT as an approach for irrigation sector reform with the potential of improving the sustainability of irrigation systems.

Key words: Irrigation Management Transfer (IMT), Participatory Irrigation Management (PIM), Atrak Catchment.

RESUME ET CONCLUSIONS

Bien que dans les années récentes la considération à l'expansion et au développement des systèmes d'irrigation passe pour une règle fondamentale dans les pays moins développés, mais la participation des agriculteurs dans la gestion de l'exploitation et du maintien des réseaux est moins considérée dans ces pays. Il semble qu'en considération de la crise d'eau et manque de la priorité du rayon agricole parmi les utilisateurs d'eau, la transmission de la gestion d'irrigation aux agriculteurs est nécessaire.

L'Iran a un passé riche dans la formation des associations des utilisateurs d'eau dans l'exploitation et le maintien des sources d'eau. Au fond, des organisations des utilisateurs d'eau ont été formées dans les structures comme des ethnies, des tribus et des structures semblables. Comme le plus fort système social-producteur, ces structures dirigeaient les autres activités collectives. Dans les régions où il y avait manque d'eau, ces structures étaient de plus en plus fortes et organisées et elle obéissaient des règles plus complètes pour la gestion de l'utilisation d'eau.

Le but de cet article est de réviser la structure et le système de transfert et de distribution d'eau par des associations d'utilisateurs d'eau en aval du barrage de sol de HERSING vers 200 ans avant, d'après les documents historiques. A cause de l'élévation de la rivière Atrak, on n'avait pas la possibilité de transfert de gravité de l'eau aux fermes situées environs OKAZKARSHAN. Pour cette raison, ce barrage a été construit sur la rivière Atrak par la participation publique environs la ville actuelle Inche Boroun pour augmenter l'élévation de l'eau. Les gens de chaque tribu ont participé dans la construction de ce barrage en proportion de leur pouvoir financier. Les documents montrent que les tribus en payant leur portion au distributeur d'eau (vers un septième de leur terrains irrigués) participaient effectivement dans l'exploitation et le maintien du système. En ce cas, le rôle du doyen de chaque tribu à trouver le trajet des canaux d'eau et la distribution équitable d'eau et la division de nouveaux terrains dû à la formation des dépôts était très important. On recevait deux parts d'eau du distributeur et on aidait à résoudre des problèmes éventuels dans toutes les étapes.

En Iran, en exécutant le programme des réformes des terrains en 1960, la structure de la société rurale a chagé et le niveau des coopérations volontaires est progressivement diminué. Par conséquent, la présence du gouvernement et les institutions de l'Etat a augmenté. Cette période était le point de départ de l'affaiblissement des motifs de participation en Iran parce que les programmes du développement rural étaient en quelque sorte en contradiction avec les motifs traditionnels. Les résultats de l'examen de ce système traditionnel montrent que la coopération des gens aux niveaux différents d'un projet et faire attention aux forces actives du région diminuent au minimum le coût de construction, de maintien et d'exploitation parce que obliger les agriculteurs à participer sans qu'ils sentent de tout cœur sa nécessité et ses bénéfices, sera une fausse participation précaire.

Mots clés : *Transfert de la gestion d'irrigation (IMT), gestion d'irrigation participatoire (PIM), bassin versant d'Atrak.*

(Traduction française telle que fournie par les auteurs)

1. INTRODUCTION

1.1 The Necessity of The Irrigation Management Transfer and Participatory Irrigation Management

Agriculture has long been one of the main water consumers and it consumes 70% of all the supplyable water in the world. The number is over 85% in developing and less developed countries. This water is used for Irrigation 20% of all lands in the world which produce 40% of the food of the world. Therefore if there is enough water to extend the area of Irrigated area, we apparently will not have to worry about supplying food in future. But a short look of the statistics show that the annual increase rate of Irrigated area lands was 2% 1960s. This Index reached 0.8% now. In other word, despite having soil sources, there aren't enough water resources to increase and develop new lands. The main reason for the lack of decrease in the rate is the competition of other sectors of water consumption like drinking, industry and environment with agricultural sector. Therefore the importance of water as a necessity to produce food need for people in the world in the past, present and future is undeniable.

The conditions above are more acute in Iran because, Iran is located in dry and Semi-dry region in the world with annual raining of around 250 mm, on the other hand with the current rate of population growth, it call be one of the 10 most populated countries in the world (Seckler *et. al.* 2000). According to the current population (76 million people), the capital of water in Iran is around 1700 cubic meter. Therefore according to Falkenmak and the International Water Management Institution (IWMI) Indexes, Iran is in the situation of water stress and water crisis, respectively. Also by using hardware and software, this country can control around 70% of all the recyclable water (130 million cubic meters) up to now. Accordingly the United Nations Index, Iran is in the situation of serious water crisis.

Total area of lands that is proper for agriculture is 37 million hectares in Iran, but 22% of which (7.8 million hectares) is Irrigated area. These lands consume around 93% (83 billion cubic meters) of supplied water (90 billion cubic meters). Unfortunately developing agriculture through increasing the area of water cultivation (horizontal development) instead of increase yield in the unit of area or increase of the use efficiency of water (vertical development) is one of the problems of farming in developing and less developed countries, while in agricultural sector due to structural problems and unsuitable water management, the low efficiency is one of the main factors of quantity decrease and wasting water source. The importance of this issue is understand when we know that for 1% increase of water efficiency in Iran, around 800 million cubic meters of water can be saved annually to develop new farms. Therefore increasing water efficiency and effort to make conditions ready for vertical development instead of the horizontal one are necessary and inevitable for a country like Iran. Apart from the low water efficiency, water productivity or the efficiency of production per the unit of consumed water (crop per drop) is not proper in Iran, Unfortunately. This Index is estimated to be around 0.7 kg, while the global mean of the Index is around 1 kg.

Therefore, despite great investment to establish and installation to supply transfer and distribute water, the main goal being the increase of water efficiency and the performance per the unit of consumed water, has not been fulfilled. It should be noticed that the water efficiency in the downstream of dams and diversion dam is reported around 30 to 35 percent, while the Index is 60 percent in the traditional watering systems (Seckler *et. al.* 2000).

Apparently, the rapidly development of Irrigation and draining systems and the governments' entering the field of construction of conveyance and distribution structure, was a sign of fast agricultural development in developing countries like Iran. In these projects, not only the farmers were ignored as factors in planning the development of water and soil supplies (including supplying water, making canal), but there wasn't a good understanding of problems in operation and maintenance of irrigation systems. The governments and the international finance providers thought they could operate and maintain the system without people participate in construction and maintenance canals.

After a few year they realized that not only were they unable to save the social and financial problem of making the present canal but doing the services of operation and maintenance is out of their ability (Haydarian, 2007). Because some of the reasons of having problems are the increase in the government; current expenses, incongruity of some water structures with the villagers' primary abilities, the farmers' not participating in managing canal, the farmers' dissatisfaction, decrease water productivity due to various reasons and specially changes in ecological conditions of the region without considering environmental condition.

To decrease government expenses, making a sense of ownership for installations to maintain and reclamation them, making the farmers and users responsible for the probable defects instead of the government, the only rational way is to invite people to participation in managing irrigation and drainage systems.

1.2. Reviewing Irrigation Management Transfer in the World and Iran

The policy of letting the farmers participate in irrigation management, operating and maintenance the irrigation system was followed in 1980 in more than 20 countries like Mexico, Colombia, the U.S, the Philippines, New Zealand, Indonesia, China, India, Turkey and Nepal to encourage farmers to participate (Fekri Ershadi, 2005). The results were the increase in irrigated lands and production per hectare, deep cultural changes in teamwork and decrease the governmental domination. For example we can mention the change in irrigation management in Albania. In the beginning, the irrigation organization in Albania resisted against irrigation management by farmers. The farmers couldn't afford the expenses of the operation and maintenance. According to an agreement between the government and the World Bank, they gave the management of irrigation system to the group of water consumers. Finally by 2001, Albania had 404 participations and 22 unions, responsible for the irrigation system with an area of 166,550 hectares (Restrepo *et. al.*, 2007). People's effective participation in managing water sources in Spain is another successful example of old participation based on traditional managements. In this country where the first regional groups were formed 1000 years ago, not only the irrigation convention but any group formed about water is recognized. The irrigation conventions have to manage both the surface and underground water (Haydarian, 2005).

Considering the capacity of water sources in Iran, the local community has had much experience since a long time ago, not based on unwritten rules but in within the framework at an accepted system. So, the farmers accepted law and followed the system of using the water and soil. These activities resulted in constructing many water structures in different parts of these wide countries. The traditional conventions of water consumers federalism managed the consumption of water with traditional until the end of federalism. In early 1961, with the collapse of federalism and the traditional system at leadership in villages, the traditional groups of supplying and consuming water lost power and stopped working in many parts of the country except a few parts. The void made problems in agricultural production and management of water consumption.

In 1991, the department of water and agricultural made an agenda of getting water consumers' participation in operation and maintenance the irrigation systems, and companies for operation the irrigation system were formed after the agreement between the ministries of Energy and Agriculture and the Management and Planning Organization (MPO) to gain the participation of water consumers. But it was not very effective and the farmers didn't actually have any participation in the irrigation management. Maybe the most important reason for not forming the unions of water consumers was the lack of effective and clear laws.

Farmers, peasants and ranchmen all have their expertise. This local knowledge seems simple at first, but this simple method has enabled the deprived villagers to supply what is needed for their lives and adapt themselves to the nature. One of the outstanding features of the traditional system of agriculture in developing countries all over the world is having a great variety of life and biology. This system of traditional agriculture was formed during centuries through biological and cultural evolution and the accumulation of the local farmers' experience and interaction with environment without having any from out of the environment or having modern knowledge and with using their inventions and the experimental knowledge and the existing sources. Traditional agricultural or sustainable agricultural usually have higher efficiency than the modern ones. Believing in this approach, we will review the traditional system of supplying, conveyance and distribution example based on the participatory Irrigation Management.

2. INTRODUCING THE TRADITIONAL SYSTEM OF WATER SUPPLYING, CONVEYANCE AND DISTRIBUTION IN ATRAK CATCHMENT

The river Atrak is a flooded river with the length of 669 km; it is the fifth long river in Iran and the longest one on Turkmenistan. It originates from the Hezormasjed mountains in Khorasan Province and on its way; it affects the salt marsh in Inche Boroun city, the border city in Golestan Province. It finally reaches the Caspian Sea in Hassangholi bay. One of the successful traditional systems with Participatory Irrigation Management (PIM) in operation and maintenance is the HERSING earth dam on Atrak River. According to the documents, in 1818 a man named "Niazbai" gathered all the leaders of the region's tribes including Agh and Atabai in a place called "Tappeh UKazgarshan" near the current Inche Boroun city and in an speech he asked them to participate in building a earth dam on the Atrak River.

Since Niazbai's epithet was "Hers", after accepting to participate the audience made him the project manager and called the dam, HERSING. The documents show that the materials used

to build the dam were usually wood and soil. Although they had access to proper soil in short distance, it was hard to supply the needed wood since there were not any jungles nearby. Therefore, they used 200 camels and 400 donkeys to bring materials from EstarAbad (the current Gorgan) jungle 120 km away. All the human laborer was supplied by the locals who worked without being paid. Also the senior village and the sheriffs asked people to supply food for workers as much as they are able to. So, around 15 camels, 300 sheep, some cows and etc. were collected.

Finally with the human and financial participation at all the tribes the HERSING dam was built and ready to use. Because of good management while building the dam, the senior villagers and the sheriffs decided to elect "Niazbai" responsible to operation and maintenance the structure again. They primrose to him when even the structures need repairmen and reclamation, they help.

The documents show that the conveyance and distribution of water was gravity. The farm owners gave one-seventh of their farms to "Niazbai" to give water to the farmers using some workers. Also to supervise the sharing of water among farmers, they chose a senior villager and "Niazbai" gave two parts of the above parts to him to supervise the way water was shared.

Because the Atrak River is flooding and bring a lot of sediments, it always made proper lands for farming in upstream of dam after moving sediments in salty lands. Of people's managements in this project was dividing the new farms which were farmed after sediments were settled in salty lands. In this management, with collective agreement, they decided to divide these lands among farmer annually with the supervision of a senior villager from each tribe.

These contractual conditions (Supplying, Convenience, Distribution water and Dividing lands) were extended for many years in a written document and it seemed that everybody were happy with this method and the leads of the tribes gave the contract to Niazbai's family in next generations.

With a deep vision to this traditional system, we can easily see how people were interested in participating in construction of the dam because the management of operation and maintenance irrigation system was on the tribe. They chose efficient people trusted by everybody and made them in charge for everything. Therefore there weren't any other organizations for this system but what the farmers chose. Even for the expenses, the tribe gave shares to the water distributor and the senior villager of each tribe; it means the farmers paid for the expenses. Therefore there was an apparent sense of ownership. Also in this system the manager was one of the farmers and was familiar with the conditions, problems. So he can decide better and faster in urgent situations. Accordingly we can realize the importance the farmers in traditional supplying, conveyances and distribution water systems.

3. RESULTS AND SUGGESTIONS

Although the horizontal development of irrigation and drainage system is the requisites of supplying human food for now and future, the potential of the soil and water limits the possibility of supplying food for future population without considering increase in water use efficiency and yield per consumed water in the unit of area or crop per drop (vertical development).

Hence attention to the later development seems enough. Among the factors effective on development, Irrigation Management Transfer (IMT) to farmers and their Participatory Irrigation Management (PIM) in operation and maintenance seem necessary. This participation is rooted in the culture, convention and tradition of each country. In every traditional society such as the Iranian traditional society, they made a sustainable system for using the soil and water sources by using local facilities and putting local rules. Unfortunately they fell in oblivion after the development of modern irrigation system. Therefore the villagers don't have active roles doing some services provided by the government and local institutions. On the other hand forcing the farmers to participate without feeling the necessity and advantage completely, results in a fleeting and superficial participation which will fail by any small change in conditions and rules.

According to the presented traditional samples it seems that it is inevitable to have the water consumers' participation in all stages of planning, construction, operation and its maintenance and reclamation. In the case of eliminating the consumers in each of the stage above, we can't get the desirable results being increase in the yield and increase in the water use efficiently of consuming water. Hence it is necessary to make such formal agricultural unions along with training and support and getting suggestions for planning from these groups from the beginning of studies. In this method, the consumers will develop a mental band with the irrigation systems and their problems and will see it a duty to cooperate with the government. Also because of the consumers' complete acquaintance with the region of the project; we can easily say that big problems of the project during construction, operation and maintenance the irrigation system will be done less cost by farmers.

Of the most important factors in the making agricultural unions and their next triumphs are announcement, training, giving facilities and subsidy, introducing successful pilots, making infrastructures, allocating planting requirement on time and also the credits, keeping the social unity and coherence, having a proper statute, choosing popular and experienced managers, continued supervision and giving technical services from related governmental organizations.

Transferring Irrigation management to farmers and their participation in management doesn't mean to disband the governmental irrigation company. On the contrary, the role of governmental companies after transferring the management will become important and changes from managing the parts (every single farmer) to managing the whole irrigation system and along with monitoring and evaluation of performance of system. It will give effective and useful ways for optimal operation of water and soil sources. Therefore the governmental organization will be able to do their main job and make coordination for the system.

Even unofficial groups in traditional system in Iran caused the utilized to have fewer problems in operation and distribution water in the farming season. Therefore in regions where it is not possible to form official unions due to any reasons, the problems of the system by making unofficial groups or giving more support to unofficial groups.

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