The effect of farmers´ participation in designing the on-farm irrigation and drainage network: Case study of on-farm network of downstream lands of the Salman Farsi dam

Participation des agriculteurs à la conception de la sur-irrigation des terres agricoles et le système de drainage en aval du barrage de Salman Farsi

Enayatolah Farahani[1]
Reza Gholizadeh[2]

Abstract

Irrigation and drainage networks haven't been developed as much as development of the dams in many water resources projects, because of the lack of investment and beneficiaries and opponents participation in accomplishments of networks. Carrying out irrigation and drainage, social and beneficiaries' participation studies simultaneously and using combination of the results of technical, social, exploitation and participation of water users for designing the layout of networks will lead to outstanding successes in construction and operation of the networks.
Social, farmers' participation, Irrigation and drainage studies are being simultaneously carried out as a pilot project in the Salman Farsi on-farm network project. Herein this project, the primary layout of on-farm network was prepared and checked with the results of the social, farmers' participation and operational studies.
After revising the primary layout, the prepared scheme of location of the irrigation and drainage channels and intakes were explained. Then they were investigated by irrigation, drainage, exploitation and social studies experts as well as beneficiaries and water users. Some of their feasible comments and point of views were applied considering the existing technical limitations for revising the location and layout of the irrigation and drainage channels in the fields in order to get approval and attract land owners participation.
Herein this article, the methodology of the studies and the effects of cooperation between employer, consultant and farmers for reducing problems and expediting construction of networks, will be presented for the irrigation and drainage network of the downstream lands of the Salman Farsi – Dasht-e Laghar diversion dam.

Key Words: On-farm irrigation and drainage network, beneficiaries, employer, farmers' participation, Salman Farsi dam.

1.Preface

Regarding increase of worries about water resources scarcity and population growth, water supply and optimization of water consumption has become important more than ever and proper usage of water resources as well as conveyance and distribution of water while preserving its quality and quantity have attracted a lot of attention . In this respect the propensity for improvement of traditional system , development of modern irrigation method and consequently optimum usage of water resources and increasing of area has led the

1 Irrigation Tech Division Manager & Senior Project Manager I&D Department. Mahab Ghodss consoulting engineering co. Fax: 098-22259285 Tel: 098-66875145 Mail:

2 Manager of on-farm study project of irrigation and drainage network of the Salman Farsi dam, Mahab Ghodss consulting engineering co. Fax: 098-22259285 Tel:098-66875145 Mail:amordade55@yhoo.com

engineers to study and recommend proper and confident solution . Therefore , farmers , participation in establishment of WUAs, implementation of irrigation networks and operation and maintenance are inevitable and as a matter of fact, resignation of water resources management from government organization to the stakeholders and users is raising all over the world. This could result in higher distribution and application efficiency, more adequate usage of water resources, higher productivity, increasing of cultivation area and more income in improvement and development projects key factors to attract the farmers, participation which could be mentioned include their presence in all stages of the project, from designing the layout of irrigation network through execution of the project, ensuring the farmers, benefits, participation of the farmers in O&M management and establishment of mutual trust. The farmhands at downstream of Salman Farsi dam has a net area of 22850 ha, including 15500 ha of development area and 7350 ha of improvement farmlands which is all located in south-west of Iran in Fars province and encompasses Ghirokarzin, Aliabad, Afzar and Laghar plains. As the largest plain in this network, Laghar plain covers an area of 8250 ha, in which a high level of participation of the farmers, stakeholders and users has been of on-farm irrigation and drainage of canals result of mutual cooperation between the client, the farmers and the consultant.

1-1. Project Objectives

Salman Farsi dam has been designed to be constructed on Gharedagh river in Fars province, aiming to regulate agricultural water requirement in downstream plains, as well as supplying potable water to cities of Jahrom, Larestan and other cities along the route and also controlling periodic floods with total volume of 1400 Mm^3. In addition, there are some other goals including reclamation of saline and sodium lands, increasing agricultural and livestock production, creating job opportunities and finally building infrastructures for national and regional development, decreasing immigration to cities and improvement of social conditions.

1-2. Basic Data

As far as meteorological condition are concerned, Laghar plain is an arid to semi-arid area with hot summers and moderate winters. Mean annual precipitation in this plain is 251 mm, average annual temperature is 23.5 and minimum and maximum temperature is -3 and 50 °c respectively. The main resource to meet agricultural water requirement is Ghareh Aghaj river. Water would be extracted from this river through Laghar diversion dam which is already under construction and at final stages. Groundwater resources in Laghar plain are being used through wells, springs and Qanats and only covers a small area of the plain. Overall, the major problem which is being faced by the farmers in the region is water plain shows that the farmlands in this plain do not have an effective limitation in terms of slope and topography and soil texture is mild to heavy. Agricultural activities in Laghar plain include agronomy, horticulture and animal husbandry and most important products are cereals ,summer crops, vegetable, palm date groves and citrus gardens. The most common irrigation method in the region is surface irrigation however in some newly-built garden trickle irrigation system is applied.

1-3. Social Situation

Social situation and existing operation systems in the region have been investigated through official and field studies and also by putting on public and training workshops and results have been used in designing of on-farm irrigation and drainage systems.

1-4. Population

According to data of Iran statistics center for year 2006 there are 950 households with a population of 4877 living in the project area and based on information of rural health houses this has been raised to a population of 5090 in 2008.

1-5. Cultural and communal features

The information gathered from communities in laghar plain area shows that the occupation rate in these communities is less than rural areas and Khonj town and unemployment rate in communities of Jengouyeh,Cham Kookoo, Makouyeh and laghar is more than provincial and urban mean.

2. Operation System

The most common operation system in the area is based on farmers possession in small scale farms.
In generated, studding individual characteristics of heads of farmers units in Laghar plain shows that the farmers' mean age in the region is 46 years old and in terms of literacy, about 43.2 percent of the farms are illiterate or they can read and write. Reviewing the cadastre maps of laghar plain irrigation and drainage system reveals that average ownership in these farmlands is 9.1 ha. Minimum ownership is 0.03 ha and maximum is 363.67 ha. However, about half of the owners in the network area own less than 2 ha. On the other hand, despite the fact that more than half of the owners, own less than 2 ha land and it is relatively small hand holding, more than 70 percent of farmland are owned by owners having more than 15 ha. This is an advantage for implementation of land consolidation programs and also for improvement and development of agricultural operation system in with-project conditions.

3. Necessity for farmers' participation in the project implementation

According to the World Bank definition, participation is a mutual process through which people influenced by the project get enabled to actively interact in directing and implementation of development projects. In other word, participation is a dynamic process through which the operators not only are shared in the project benefits but also they have effect on the project main direction, execution and operation. Experience show that the effectiveness of irrigation systems depends on participation of majority of the farmers in O & M management of irrigation and drainage networks. During recent years, governments have tried to lessen their dependability through farmers' participation in the networks. This results in higher effectiveness of irrigation system and also decrease of O & M costs.

3-1. Hindrances to participation of users

There are some obstacles for participations of water users in irrigation and drainage systems, some of which are as follows:
- Making unwise and loaded decision without having social studies and public participations and receiving comment of the stakeholders about execution of the projects.
- Not having the local crops adapted to the proposed irrigation practices.
- Not believing in deriving any benefit from the executed projects.
- Dispersion of farmlands.
- Bureaucracy.
- Poorness of villagers.

- Pervious failure experiences.
- Not benefiting from credentials.
- Not having enough time.
- Unreliability towards the project executors.
- Tribal disputers.
- Prolongation of the main system implementation.
- Ambiguity in ownership of the farmlands.
- Boundary of national pieces of land and disputes between the farmers and natural resources organization.
- Occupation of national lands by the villagers.
- Not having clear area for ancestral Lands in related documents and having no separated document.
- Not having coordination between various organization in the region.
- Not having laws completely abided.
- Uninterested ness of farmers in establishment of agriculture cooperatives.

4. Organizing public workshops

In order to increase farmers` participation in the project implementation, after identification of local reliable individuals who were eager to cooperate with the project, some of them were selected as local colleagues (local coordinator). They were informed with required information and objectives of the studies and then public workshops in villages with the irrigation network were organized with presence of water users and the stakeholders.
In these workshops some issues were presented as follows:
- General layout of irrigation and drainage network from location of Laghar diversion dam up to the farmlands of the farmers
- Financial participation of the farmers in implementation of on-farm irrigation networks
- Tentative cropping pattern and irrigation method
- Necessities of agriculture development plan such as land consolidation, etc.
- O&M management of irrigation and drainage networks by the WUAs.
- Duties and responsibility of the WUAs and familiarizing them with existing experiences.

Holding such workshops not only made the farmers familiar with the project objectives through distribution of educational brochures but also a proper foundation was created for receiving comments of the water users on construction of the on-farm irrigation and drainage network and developing a convivial and friendly atmosphere between the water users and the consultant experts.

5. Methodology for designing of the system layout and the farmers` participation

After conducting official and field studies and activities in order to receive and apply the farmers` comments and get their approval on alignment of canals and drains of the on-farm system and obtaining written approval for participation in construction of the on-farm system, then for each farm, one separated drawing including layout of irrigation and drainage network and name of the owners was prepared and was approved and signed by the farmers. Chart 1 illustrates the methodology for designing the layout of irrigation and drainage on-farm system in Laghar plain.

5-1. Official studies

Major activities, carried out in this regard as follows:
- Collecting and studying the reports, documents and previous studies.

- Providing required information, drawings and facilities for field activities.
- Obtaining information from related organizations and authorities.
- Designing the primary layout of irrigation and drainage on-farm system.
- Studying the primary layout the results of studies being undertaken fields of social and public participation, O&M and WUAs.
- Preparation of required information and brochures aiming to inform people at the right time.
- Planning for organizing public workshops.
- Acquiring name and identity of the farmland owners in each farm unit separately.
- Preparation of layout maps together with name of owners for each farm.
- Summation and conclusion.

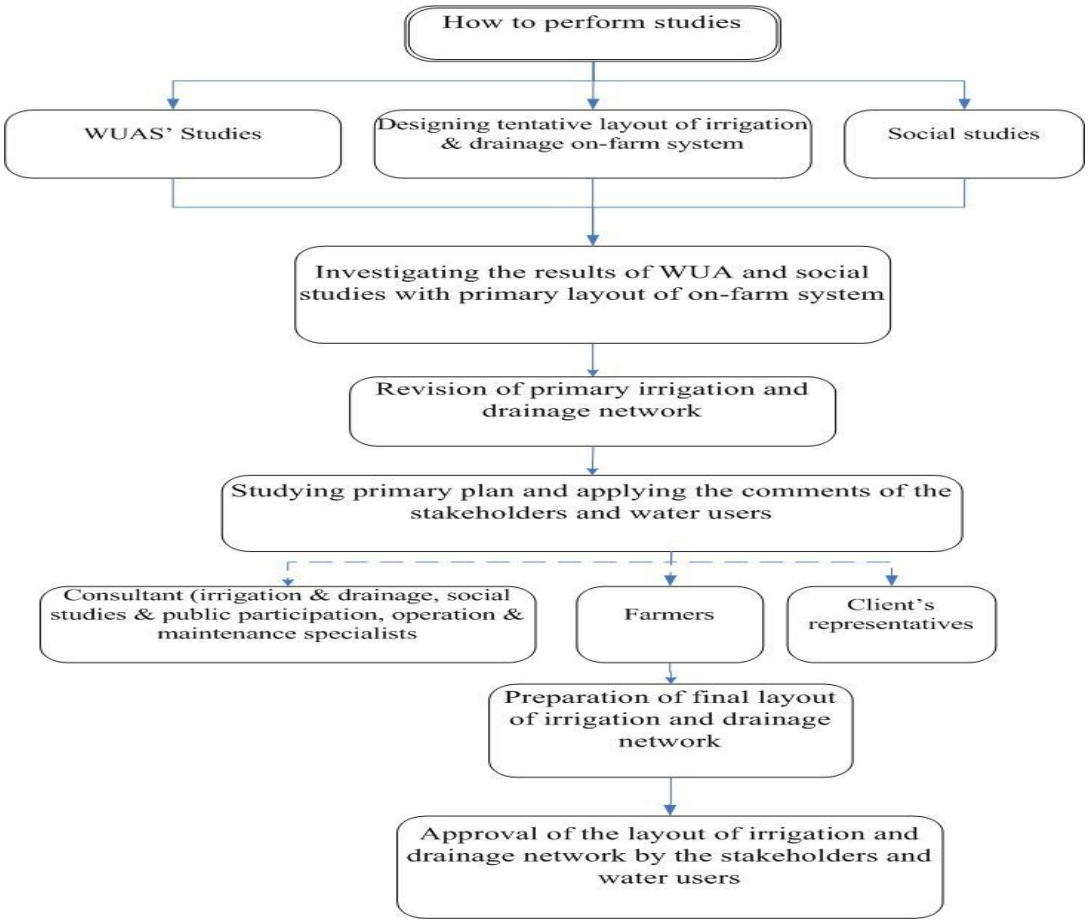

Chart1-Methodology for designing layout of on-farm irrigation and drainage system
(la sous – syste'me d' approche de conception irrigation ef de drainage re'seau)

5-2. Field studies

In order to get the comment of the water users and approval of layout of on-farm system, filed studies and investigations have been done as follows:

- Local visits and collecting required data and information from respective organizations and offices and residents in the project area
- Holding public meetings with users and stakeholders
- Filling in social and participatory questionnaires
- Field visits and studying constraints and obstacles

- Identification of well-known individuals and local trustworthy people
-Reviewing results of social studies such as history, tribal, culture, traditions, believes, financial situation and capability of the stakeholders` participation with the tentative plan
- selecting representative for water user group in each farm
- Establishment of WUAs.

5-3. Participation of farmers in designing and approval of layout of on-farm system

After primary design of layout of irrigation and drainage on-farm system and studying the maps of farm network layout (conformed with ownership boundaries on cadastre maps) with results of social studies and public participation, the primary layout has been revised and then name and identification of the owners in each farm unit have been extracted from cadastre maps as list of owners and water users in each farm (some schedule groups) has been prepared and put into respective tables. The local trustworthy and informed people were provided with these tables together with layout map of the canals and drains in each farm, in which ownership areas of the farmers were illustrated, so that they can comment on accuracy of the presented data and layout.
After completion of data of ownerships and boundaries and correction of errors in cadastre maps, and final list of farm owners were prepared and were presented to farmers in each village in workshops and meetings to obtain their approval and justify the designed alignments and presents the existing restrictions and advantages of the layout in order to content the farmers with it.
Then the owners in each farm unit formed a group and chose a representative for each farm according to minutes of the meeting for selection of water users` representatives in order to organize the farmers as independent operation units. These meetings were held about the objectives and acquiring the stakeholders' comments, acceptance and participation of the farmers and approval of the layout as follows:
- In the meeting it was explained to the farmers that sharing water and construction of on-farm canals are not obligatory and they would be registered as water share receiver only upon their enthusiasm and request to do so.
- No compensation would be paid by Fars Regional Water Company for damages due to passing of canals and construction of service roads.
- Each turnout belongs to some owners who should reach to an agreement for passing of canal and road and also operation and maintenance and shall compensate for the damages caused by passing of canals and drains through the farmlands.
- According to the current laws, 70 percent of costs of on-farm system are funded by the government and the rest shall be paid by the owners and stakeholders of each farm.
- Owners of each farm shall choose one representative of water users for the sake of future coordination.
- In case that the farmers asked for changes in alignment of canals and drains, these changes were inspected and studied in situ and considering technical issues, required changes were applied if possible, and if not possible the farmers were given sufficient explanations to accept and get satisfied.
The meetings sometimes faced hindrances and obstacles by some of the owners or dissatisfactions due to not receiving damages caused by the main irrigation and drainage system. In such cases, having advance coordination with the team members and taking long time and presenting sufficient explanations regarding the technical restrictions and issues in an understandable way to the farmers, mutual trust was achieved with significant cooperation and welcoming of the farmers. In these meeting, the farmers requested registration for water shares from the system, accepted the alignment and layout of on-farm canals, position of

turnouts located within their farmlands area as the shape, arrangement and conditions presented in the prepared maps and they admitted to participate in construction and meeting constructional requirements of on-farm irrigation and drainage system and also operation and maintenance, in compliance with laws, regulations and policies of I.R. Iran.

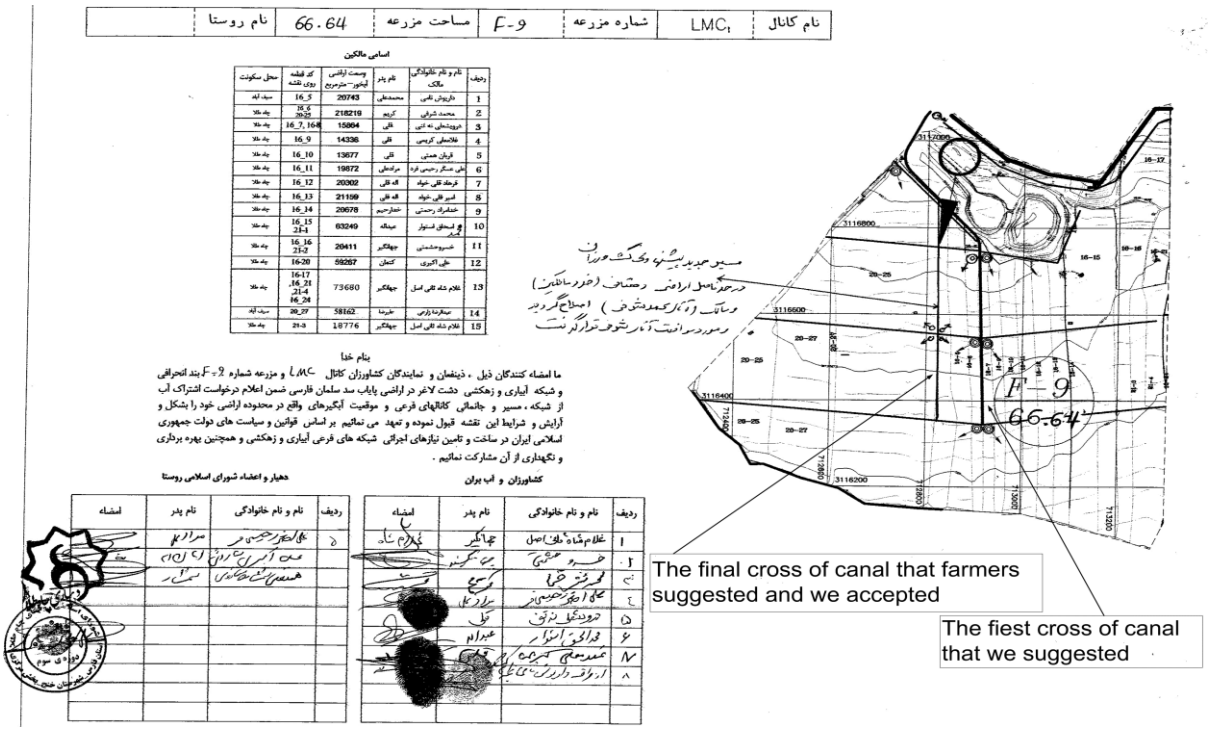

figure 1. A sample approved of layout irrigation and drainage on-farm system in Laghar Plain by the stakeholders and water users. (Confirme' par la sous-re'seaux d' irrigation et de drainage par les intervenants et les atilisateurs d' eau).

6. conclusion

The cost of this project per 8000 hectare is 24000000 dollar and according to in this project all of the farmers accepted to spend 30 percent (7200000 dollar) of all the cost (the cost that government must be pay ,such as canals and drainage and etc), it increases the capability of government to make investment all over the country. according to results of studies in this project, farmers participations caused this project did very faster than all of the similar projects and the distribution efficiency increased to 90 percent. It is one of the results of direct use farmers from the irrigation system. In result according to table 1 amount of necessary water reduced until 11 percent and we could increased farms about 11 percent for this project and increase the benefits very much.

Table 1- Compare effect of farmers´s participation in amount of water use (Comparaision de I 'effect sur le taux de participation des agriculteures d 'eau n'ecessaire pour le project)

	Area (ha)	Distribution efficiency	Necessary water(Mm3)	Benefit (Mm3)	Benefit (%)	New area of project
Without farmers´ participation	8000	80	108	-	-	8000
With farmers´ participation	8000	90	96	12	11	8900

In this project because of farmers and owners participation, according to table 2, we could do land acquisition very well and in result the cost of it reduced to 2080000 $.

Table 2- Compare effect of farmers´s participation in amount of lands (Comparaision de I 'effect sur le taux de participation des agriculteures des coust de maintenance et d 'exploitation)

	Cost of land acquisition	**Damage of plants**	**Sum**
Without farmers´ participation	1760000 $	320000 $	2080000 $
With farmers´ participation	-	-	-

Farmers conservated all of the cannels and drainages in their lands and it cause according to table 3 to reduce the cost of conservation near to 4 percent per year.

Table 3- effect of farmers´s participation up amount of operation and maintenance cost(Comparaision de I 'effect sur le taux de participation des agriculteures sur les couts d 'aquisition de terres agricoles)

	Without farmers´ participation	**With farmers´ participation**	**benefit**
Cost of operation and maintenance per year	1680000 $	960000 $	72000000 $

6.conclusion

Le coût de ce projet par 8000 hectares est 24000000 dollar et en fonction de ce projet tous les agriculteurs ont accepté de consacrer 30 pour cent (7,2 millions de dollars) de tous les coûts (le coût que le gouvernement doit être payé, comme les canaux de drainage et etc), il augmente la capacité du gouvernement à faire des investissements dans tout le pays. selon les résultats d'études dans ce projet, participations agriculteurs en raison de ce projet a très vite que l'ensemble des projets similaires et l'efficacité de la distribution a augmenté de 90 pour cent. Il est l'un des résultats des agriculteurs utilisation directe du système d'irrigation. Dans la suite conformément au tableau 1 quantité d'eau nécessaire réduite jusqu'à 11 pour cent et nous avons pu fermes ont augmenté d'environ 11 pour cent pour ce projet et d'accroître les avantages beaucoup.

Dans ce projet parce que la participation des agriculteurs et des propriétaires, selon le tableau 2, nous pourrions faire l'acquisition de terrains très bien et en conséquence, le coût de celui-ci réduit a 2080000 $.

Table 1- Compare effect of farmers´s participation in amount of water use (Comparaision de I 'effect sur le taux de participation des agriculteures d 'eau n'ecessaire pour le project)

	Ré gion (ha)	**Efficacité de la distribution**	**L´eau nécessair(Mm3)**	**Benefie(Mm3)**	**Benefie(%)**	**Nouvea zone du projet**
Sans Agriculteur ´s la participation	8000	80	108	-	-	8000
avec Agriculteur `s la participation	8000	90	96	12	11	8900

Les agriculteurs conservated tous les cannels et de drainage dans leurs terres et il cause selon le tableau 3 pour réduire le coût de la conservation de près de 4 pour cent par an.

Table 2- Compare effect of farmers´s participation in amount of lands (Comparaision de I 'effect sur le taux de participation des agriculteures des coust de maintenance et d 'exploitation)

	Cout de l´acquisition de terrains	**Dommage de plants**	**somme**
Sans Agriculteur ´s la participation	1760000 $	320000 $	2080000 $
avec Agriculteur ´s la participation	-	-	-

Table 3- effect of farmers´s participation up amount of operation and maintenance cost(Comparaision de I 'effect sur le taux de participation des agriculteures sur les couts d 'aquisition de terres agricoles)

	Sans Agriculteur ´s la participation	**Sans Agriculteur ´s la participation**	**benefie**
Cout d´exploitation et de maintenance en par an	1680000 $	960000 $	72000000 $

7. results

Considering farmers suggestions in designed and building the network which is done for them is caused:

-Effects of cooperation between employer, consultant and farmers for reducing problems and expediting construction of networks, will be presented for the irrigation and drainage network of the downstream lands of the Salman Farsi – Dasht-e Laghar dam.

-Take advantage of trustworthiness in order to reduce all of the variations.

-Promotion the modern methods of irrigation with starting didactic classes.

-Designed irrigation and drainage system according to technical parameters and field reviews and exact cognition of region and status of culture, society and economy for farmers.

-Retinue the trust between employer and farmers and counselor.

7. résultats

Considérant suggestions agriculteurs conçu et construit le réseau qui est fait pour eux est due:

Effets de la coopération entre l'employeur, le consultant et les agriculteurs pour réduire les problèmes et d'accélérer la construction de réseaux, sera présenté pour l'irrigation et de drainage des terres en aval du persan Salman - Dasht-e Laghar barrage.

-Profitez de la fiabilité, afin de réduire tous les écarts.

-Promotion des méthodes modernes d'irrigation à partir des classes didactiques.

-l'irrigation et de drainage conçu en fonction de paramètres techniques et examens sur le ------

-terrain et de la cognition exacte de la région et le statut de la culture, de la société et l'économie pour les agriculteurs.

-La suite du la confiance entre l'employeur et les agriculteurs et les conseiller.

8. reference

Iranian National Committee on Irrigation and Drainage. 2007. Agricultural Drainage Water management in arid and semi – arid areas.

Iranian National Committee on Irrigation and Drainage. 2007. Irrigation Management Transfer; Principles and Methodology.
Iranian National Committee on Irrigation and Drainage. 2009. Irrigation management transfer (Worldwide efforts and results).
Iranian National Committee on Irrigation and Drainage. 2009. Proceeding of the 5th Workshop on Water Users Participation in the Management of Irrigation Systems.
Iranian National Committee on Irrigation and Drainage. 2005. Workshop Proceedings of Farmers Participation in Irrigation & Drainage Management (Principles & Applications).