

Role of irrigation management and stakeholder's participation in irrigation and Drainage project in Givi project

Rôle de la gestion de l'irrigation et la participation des parties prenantes dans l'irrigation et
Projet de drainage en Givi projet

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Irrigation and drainage development in Iran has been mostly under the small land- holding condition, in this paper we are going to present the result of studies and investigations on a particular irrigation and drainage project (Givi irrigation and drainage project network).

Givi irrigation and drainage project encompassing 7800 Ha of farm lands located in North-west part of Iran in Ardabil province.

Farm lands of givi have mostly been as rain-fed before the project. The region is uneven as far as to topography is concerned and in terms of meteorology it is classified as cold semi-arid.

Regarding these facts, pressurized irrigation systems such as sprinkler irrigation (5000 Ha) and trickle irrigation (2800 Ha) are designed for development project.

In order to meet the water requirement of the area covered by irrigation system, givi reservoir dam constructed over Givi River.

Buster pump are needed for providing sufficient head for irrigating highland areas.

Based on cadastral data, mean of land ownership in villages varies from 0.25 Ha to 4.73 Ha, so the designation of irrigation network is made upon two approaches.

In first approach in planning of irrigation layout ownership and small land-holdings are considered but in second approach accumulation of small parcels into larger farms (avg. 35 Ha) was made in order to integrate irrigation management.

Finally these two approaches compared in operation management, implementation of cropping pattern, usage of agricultural machinery and economic costs.

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General description

The project area has been studied within some projects that defined by consulting engineering corporations along the time. Some of those projects are:

- Master plan of water resources in Iran.
- Potential Analysis for construction of dam on Givi River
- Givi dam and irrigation and drainage network studies (feasibility, initiating and planning stages)
- Social and public participation studies.

Location and natural situation of project area

Project area is on the north west of Iran, on the south of Ardebil province.

The project area is located between $46^{\circ}, 11'$ to $48^{\circ}, 21'$ of east length and $37^{\circ}, 34'$ to $37^{\circ}, 47'$ of north width .The project area is mostly mountainous and has large slopes. Most of the fields have deep waterways. Slope directions are mostly along to the Sangvarchay river. in some cases the slope directions are along to the Nilagh and Heris rivers.



Figure 1. location of project area

Climate

Project area is classified in cold semi-arid. High altitude causes that the winter Precipitations Downfall as snow.

Annual Precipitation

The major resources of Precipitations in project area are moisturized systems that enter the area from October to May. Average annual Precipitation in project area is 325mm.

Temperature

The average Temperature in project area is about 9.8 ° Celsius. The minimum Temperature in project area is -38.5 ° Celsius and the maximum is 43 ° Celsius. The coldest month in the year is January and the warmest month is July.

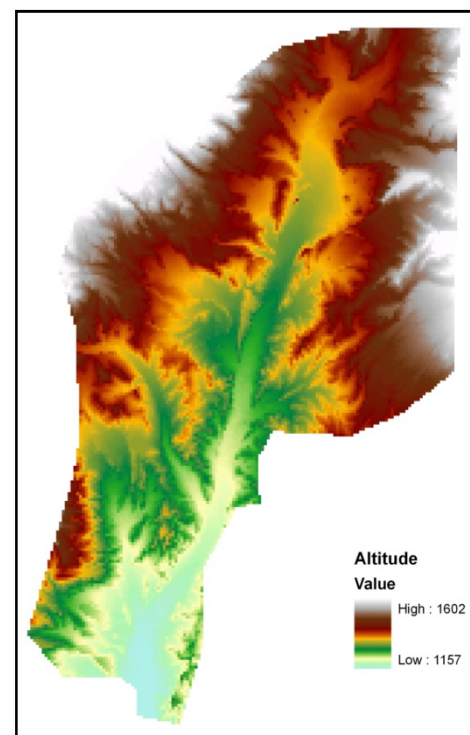


Figure 2. Topographic condition map

Frost days

In project area there is 129 days that the temperature is sub zero on them.

Relative Humidity

Minimum RH is in summer and maximum of it occurs in winter. Average Relative Humidity in project area is about %57.

Sunny hours

Most of the Sunny hours have been observed in July and least of them has been recorded on January. Average sunny hours are 2654 hours per year.

Wind

Wind direction in October, February and March is from east to west and in the other months is west to east. Average of the wind speed is 1.66 m/s

Cropping pattern

In project area 2732 hectares is allocated to Cultivation and 3081 hectares is allocated to gardening (see Table1)

Development zones (village fields)

Givi plain fields have much kind of limitations such as topography, agrology, terrain and ownership boundaries. According to those limitations project area has been divided to Development zones.(Table 2)

Irrigation and drainage development network

Components of the projects are:

- Givi Reservoir dam and its appliance.
- Conveyance system that convey water from dam to network.
- Irrigation network that contains pressurized pipes and structures.

Givi reservoir dam

Givi reservoir dam has been constructed on Givi River. The specification of this dam as follows:

Active volume: 43.3 mcm

Annual regulated release: 73.28 mcm

Total annual demands: 74.81 mcm

Annual Trickle irrigation system demand: 16.63 mcm

Annual sprinkler irrigation system demand: 22.51 mcm

Annual surface irrigation system demand: 12.51 mcm

Annual water ride demand: 21.15 mcm

Annual Domestic demand: 2 mcm

Main irrigation system components
Givi Main irrigation system contains collection of turnout appliance, conveyance system and main and sub main pipes, pumping stations, sedimentation structures and valves.

Turnout appliance

These appliances contain turnout structures and hydro mechanical and

Table 1. Cropping pattern

Crop	Percentage of cropping pattern			
	Sprinkler irrigation system		Trickle irrigation system	
	Percentage	Area (hectare)	Percentage	Area(hectare)
Wheat	25	683	0	0
Barley	10	273	0	0
Grain corn	8	219	0	0
Forage corn	6	164	0	0
potato	20	546	0	0
Bean	10	273	0	0
Alfalfa	16	437	0	0
Soya	5	137	0	0
Grape	0	0	30	924
almond	0	0	70	2157
total	100	2732	100	3081

electrical appliance beside Givi reservoir dam. Turnout system directly and under hydro static pressure takes water from dam and supplies conveyance system demand.

Conveyance system

Conveyance system contains a 2000 mm steel pipe and related structures. This pipe takes water in elevation 1460 m from reservoir dam. It covers the demands of irrigation system. Length of conveyance pipe is about 7 km.

Methods of irrigation

Selecting the method of irrigation is based on topography. According to that, the highlands and the lands that have more topographic limitations are allocated for trickle irrigation. But the land that are flat or semi flat is allocated for sprinkler systems. This paper study the sprinkler method because this method has more problems an irrigation management is more necessary on it.

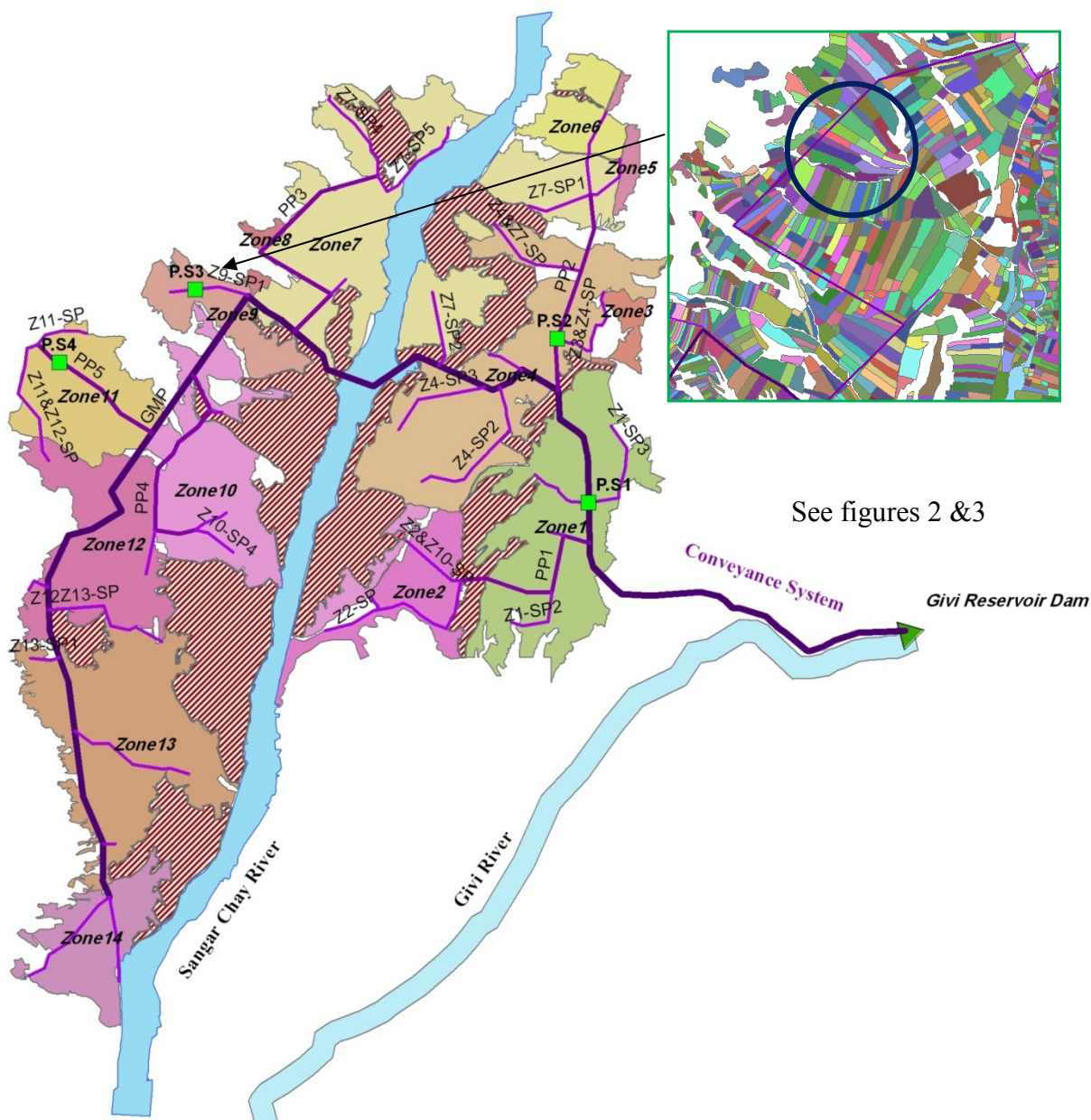


Figure1. Givi Irrigation Layout and sample of Land ownerships

General characteristics of ownerships and population

Project region with 109.12 sq.km areas has 1769 households and population about 8887 that 68.4 percent of populations live in villages and 31.6 percent live in cities.

Total stakeholders in project region are about 1567 and total areas are 7405 Ha. That average ownerships are 4.73 Ha. According abundances, ownerships less than 5 Ha are about 67.3 percent of stakeholders (1104 owner) and 21 percent of lands (1677 Ha).

With increasing of ownership size, abundance of owners decreases. While increasing of ownership size causes increasing amount of land area. That shows Disproportion of ownership land distribution.

Maximum abundance belongs to less than 1 Hectare ownerships that have 556 people and about 36 percent of total stakeholders. Lands that belong to this group are about 238Ha, 3 percent of total project area.

Minimum abundance belongs to more than 20 Ha ownerships that have 44 people and about 3 percent of total stakeholders. Lands that belong to this group are about 1339Ha, 17 percent of total project area.

Table 2. Average ownership in Project Villages (Ha.)

No.	Village name	total owners	land Area	average ownership
1	Ebli Olya	30	90.97	3.03
2	Joghanab	72	70.1	0.97
3	Ali abad	48	79.84	1.66
4	Firuzabad	49	110.84	2.26
5	Yangejeh gheslagh	16	39.52	2.47
6	Sore bargh	50	249.65	4.99
7	Heris	144	749.27	5.20
8	Nasir Abad	73	421.9	5.78
9	Ebli Sofla	54	275.12	5.09
10	Sang Abad	305	1588.82	5.21
11	Ghareh gheslagh	47	208.63	4.44
12	Nilagh	115	474.8	4.13
13	Givi bala	267	1017.62	3.81
14	Ganjgah	188	1119.93	5.96
15	Farab	109	908.19	8.33
16	Total	1567	7405.2	4.73

Exploitation of lands and water resources in project condition

Present Exploitation system of resources and production factors in project areas is peasant house holding. Small parcels and fragmentation of lands is one of the most important limitations of agricultural development and increasing of efficiency factors in project area.

These limitations decrease the possibility of permanence of activities. Therefore it is necessary to do exploitation in certain organize framework to accomplish target efficiencies and foreseen benefits.

According to project plan, borders of development zones (lands covered by turnouts) based on land villages zone. Therefore it is necessary to establish requirement associations in any villages. These associations are representative for villages and exploitation organization connection with main irrigation system.

This study is based on two different approaches in irrigation management as follows:

- Design of farm irrigation system with separated irrigation management.
- Design of farm irrigation system with integrated irrigation management.

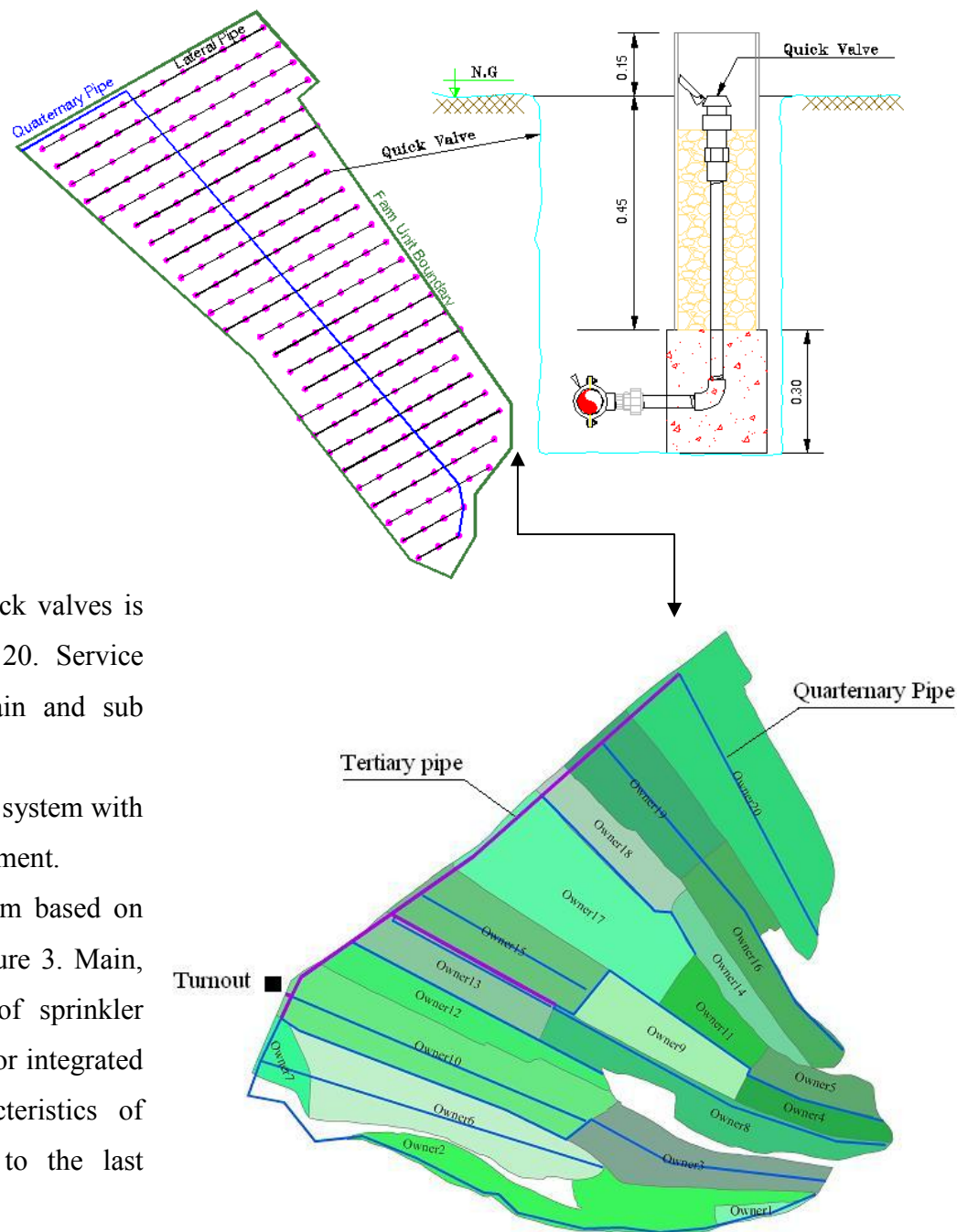
I) Design of farm irrigation system with separated irrigation management.

Figure 2 shows the layout of farm irrigation system based on this approach. Main, sub main and laterals pipes of sprinkler irrigation system are designed for separated farm units. Tertiary pipes convey water from farm turnout to quaternary pipes and these pipes provide water requirement of lateral pipes. Quick valves are constructed in specific distance on the lateral pipes. Based on requirement discharge of each farm unit specific number of sprinkler and raiser are used.

Total length of main and sub main pipes is about 6400 meters and total length of lateral pipes is about 17200 meters and total number of quick valves is 860 and total farm units are 20. Service roads are allocated beside main and sub main pipes.

II) Design of farm irrigation system with integrated irrigation management.

Layout of farm irrigation system based on this approach is showed on figure 3. Main, sub main and laterals pipes of sprinkler irrigation system are designed for integrated farm units. The other characteristics of irrigation system are similar to the last alternative.



**Figure 2 . Farm Irrigation layout
(Separated Irrigation Management)**

Total length of main and sub main pipes is about 2350 meters and total length of lateral pipes is about 17200 meters and total number of quick valves is 860 and total farm units are 3. Service roads are allocated beside main and sub main pipes.

Summary and Conclusions

According to previous sections, to applying integrated irrigation management (Alternative II) it is necessary to make major changes in farm irrigation system. But it has many benefits compared with the separated irrigation management (Alternative I)

I- construction costs for farm irrigation system

Construction, purchase and operation costs for Alternative II is about 3242 US\$ per hectare and while in alternative I these costs are about 4722US\$ per hectare (Chart 1)

Changing the irrigation system plan that based on integrated irrigation management can reduce the construction and purchase costs about %45 in farm.

II- land loss from applying the integrated management system is about 3 hectares and in the separated management systems is about 8 hectares. Therefore, with applying the separated management system, the income of the project is reduced up to %5 and project justification is not good as the past any more.

III- Since the lands division due to heritage rules, the size of the units and the number of the owners can change during the life plan of the project. If designing is based on the separated management system then there is no insurance for stability of unit size and the total owners. Therefore network utilization can have many problems. While with applying integrated management system and creating the suitable irrigation associations, changing in unit size can't affect on irrigation management system.

IV- in separated management system, it is necessary to allocate a private turnout for each owner. In domestic water usage it could be common thing because for domestic water requirements we can use reservoir for water supply. Water requirement for urban usage don't have elasticity but in agriculture,

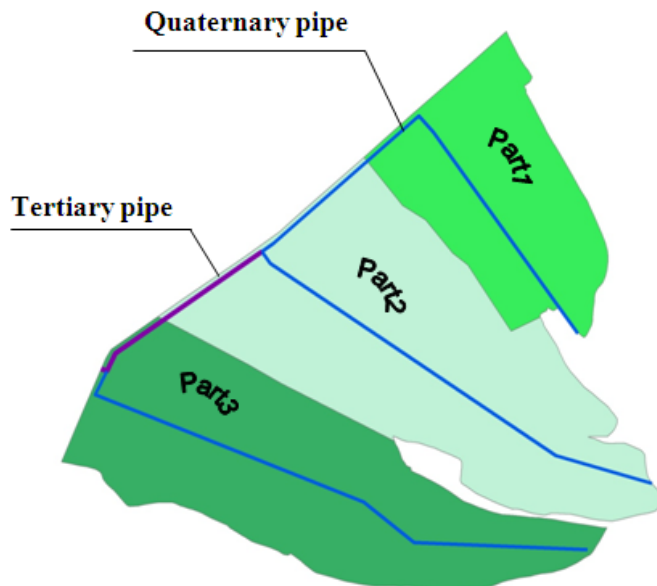


Figure 3 . Farm Irrigation layout
(Integrated Irrigation Management)

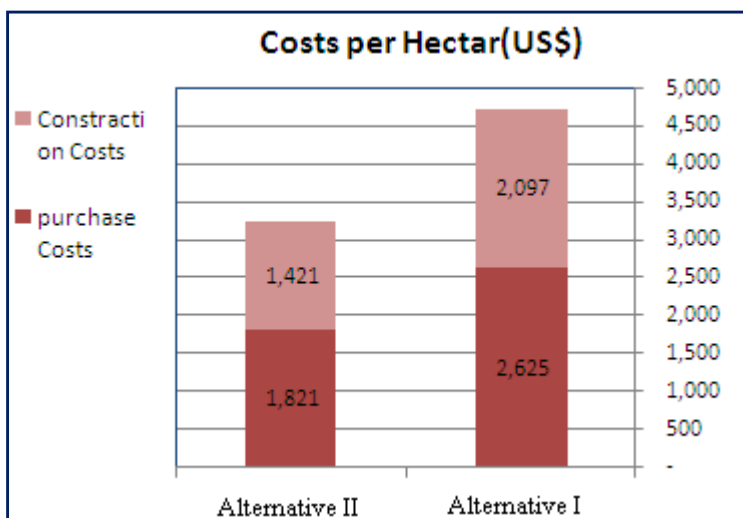


Chart 1 – Comparison of costs for integrated and separated management systems

water demand has elasticity and increasing the costs can decrease the incomes. In this case the System justification could not be logical anymore.

V- According to the traditional associations in project area (the people in project area call them "Dong") creating the irrigation associations with integrated irrigation management system is more reliable.

Finally it seems that in irrigation systems and independent irrigation associations (under farm turnout) in addition to Considering the unit ownerships and traditional associations in project area, applying the integrated irrigation management is a the best way to maintain the project.

References:

- Technical report of Givi irrigation and drainage project, Mahab ghodss consulting engineering company
- Social and Economical Reports of Givi irrigation and drainage project, Mahab ghodss consulting engineering company