Impacts of WUAs Development on Users' Satisfaction in Qazvin Province, Iran

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Abstract: Historically, the devolution of administration responsibility to water users is one of the meritorious strategies for water management transfer, which causes improvement of the operation and maintenance. This paper surveys the effects of managing evolution on water consumption management in Qazvin province as one of the prominent zones in Iran where has formed 161 water users associations, 12 unions and a provincial federation as the highest assembly in the country. The research perused the relationship of some management services for water consumers including the satisfaction due to saving time & cost, water equitable distribution, elimination of defects, NGOs trustworthiness. There were the difference variables for respondents including demographic items, means; age, literacy, experience, and the geographical location for lands, canals and habitats' area as travelling for water provision. In particular, we have investigated the feedback of function of users associations on the beneficiaries' views by comparing of water users' satisfaction level between before and after of performance of irrigation management transfer in the case. The outputs indicated that the highest satisfaction level achieved due to travelling dimension for water provision. As a result, it is most significant the distance shortening to 12 local management bureaus as WUAs unions rather than to the headquarter in the past. The research developed based on experimental investigation method as one of the authors, Mr. Ghasemi, has been the initiator and executive of this experiment in the Qazvin Pilot Project.

Keywords: Irrigation management transfer, Iran, Qazvin, water user associations, Satisfaction, Sustainable development.

INTRODUCTION

Scarcity of fresh water is a serious threat to sustainable development, environment and protection of water resources. In addition, misuse of water has increased risk of human wellbeing, food security, and the ecosystems [1]. Thus, there is a need to manage water and land resources more effectively in the present and beyond the past [2]. As a global water strategy, executive rehearsals have normally regarded as water to be reproducible sources and free. Similarly, the Water Recourses Management (WRM) systems have been arranged by user-based allocation mechanism for a major advantage which is the potential flexibility to adapt water delivery patterns to meet local needs [3]. Moreover, management reform strategies vary dramatically hence accomplished various results [4]. Certainly, in developing countries, experiences of devolution of governance directed Water Consumptions Management (WCM) systems to beneficiaries' have principally taken place through the past quarter of a century, and carry on now. Although, as a rule, much more time will be necessary before the fledgling water users associations are powerfully functional and sustainable [5].

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CASE CONTEXT

The Iranian government has started to build the modern water installations since 1950s. Almost all of the water supply programs including drinking, agriculture, and hygiene, industrial and scenic fields are sponsored by governmental capabilities. One of the significant WRM projects is Ghazvin Development Project (GDP[1]) which was formed under World Bank in 1965 following the devastate earthquake at Buein Zahra area in the south of Qazvin plain in 1962. The GDP contained several projects and they had started on both water sources of surface and underground in the Talegan project as the most significant. They were built a reservoir dam (460 MCM), a diversion dam, a water conveyance tunnel (9Km) and a hug irrigation network (1200 KM) for water delivering to 30,000 farmers who are owners of more than 60,000 hectares. Consequently, the main canal, laterals and distribution canals were equipped with hydro mechanical regulators (Amil system), C.H.O, Turn out and etc. which were set by Neyrpic hydro module Gates system [6]. Taleghan river basin has been allocated for a part of Tehran drinking water (150 of 900 MCM annually), irrigating (287 MCM), artificial recharge (20 MCM) and traditional water rights and environmental requires at downstream (12MCM) (Figure **1**) [7].

Many GOs and NGOs were following the Participatory Irrigation Management (PIM) cases in the various zones. As Qazvin plain in the west region of

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1-Formerly registered as "Ghazvin Development Project, GPD" by the World Bank

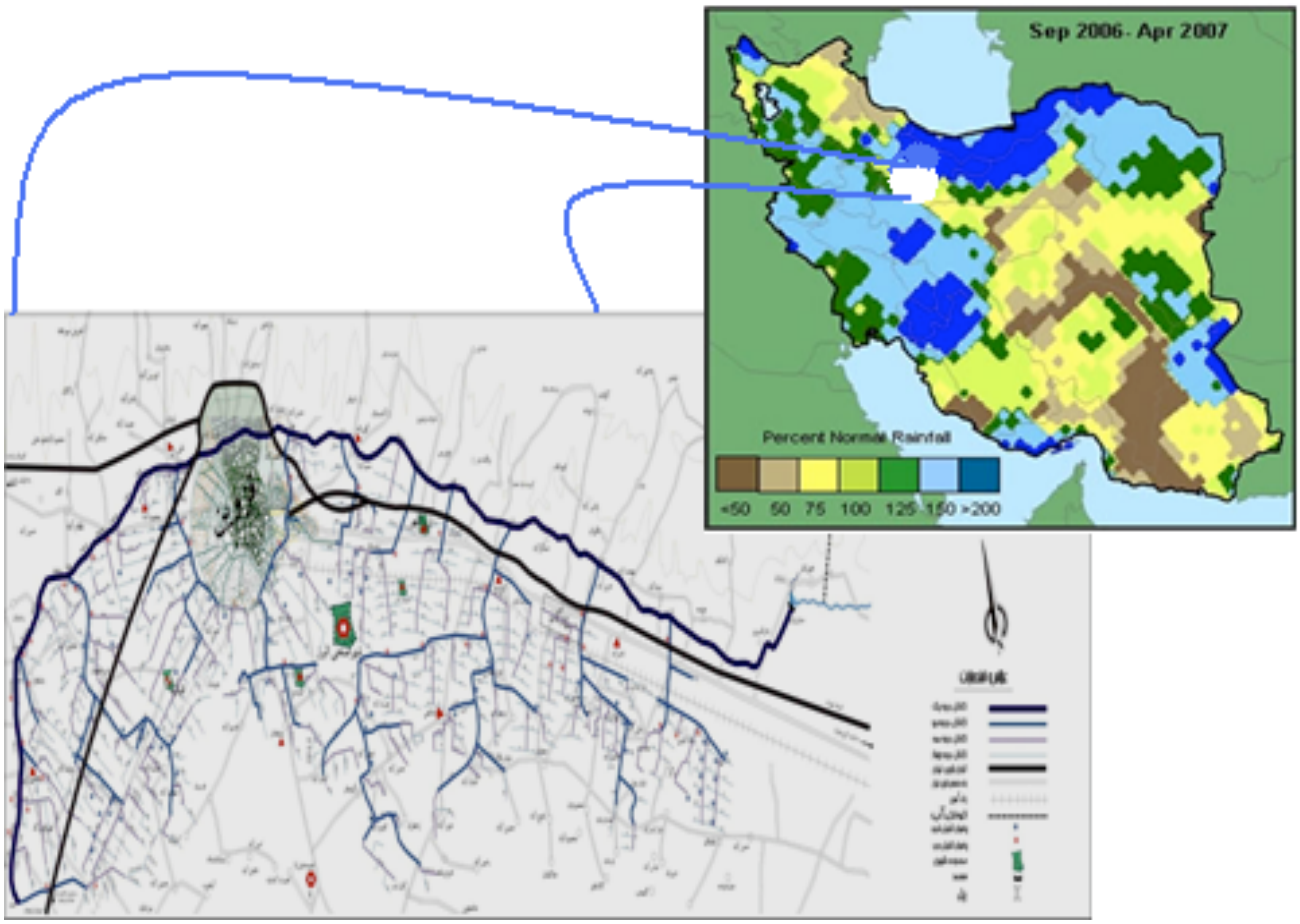

Figure 1: Location of Study zone in Qazvin irrigation network, Iran, source [7].

Tehran was a forerunner area and this districts has many potential capacities were chosen as the first PIM pilot in Iran, [8].

PIM FORMATION IN QPP

There is the grievous water limited state, which confronts the multifarious challenges such as scarce freshwater availability, low efficiency of sources operation and over-exploitation of underground water. On the other hand, common studies of WCM systems have shown that their performances are below expectations [9]. Iran has had a mixture of effective policies to improve of the productivity of WRM during the past two decades. It was approved by some significant rules on the formation of two types companies.

Water and waste water company and Irrigation and Drainage (ID) company in 1990. The Qazvin PIM plan was initiated based on the multipurpose project by devotion of Operation and Maintenance (O & M) since 2002. It was organized along hydrological borders of third degree distribution canals based on a modern type of Water Users Associations (WUAs) planning which was adapted on any crop block. Generally, Qazvin Pilot Project (QPP) has been developed from the bottom as the farm level to up as the provincial level in 2002 to 2004. The PIM development project was implemented during three steps as plan along with performance. In the last stage, the Qazvin Federation United of WUAs (FUWUAS) was formed for coverage of 161 WUAs in the water field as the biggest in Iran [10].

METHODOLOGY

The research method was based on an experimental design, which was an intervention project on the management of O&M of the ID network. The water users' satisfaction was investigated in two sections before and after of IMT project implementation and comparison between them. In addition, it was divided into the case region to zones, suburbs and

mainland, for ranking of improving of water users' satisfaction. The statistical analysis was done through software SPSS version19, using regression and logistic regression.

i. Data Collection

Significant information was achieved by effective mutual negotiations with some experts who had been the assistant in the IMT project process. Mr. Ghasemi, one of the authors, who is the head of Qazvin IC company and the initiator and executive of the PIM. Before data collection, interviewers were held to discuss with selected WUAs' representatives, WUAs' offices staffs, key stockholders, rural council and a number of members of the ID company. These meetings emphasized on a decision making in the study. These include research details such as goals, crop blocks, zones, function of WUAs, and all individuals who were involved in discussions and well data collection. Some common factors include age, literacy, experience, residence and canal geographical location and distance between lands and water services bureaus, spending time and cost on water provision. In addition, participants presented their satisfaction levels on several O & M services items.

ii. Sampling

Sample size was computed for finite population on data collection. A number of samples were selected from 3,000 stockholders through "Random Sampling" method. The sample size was calculated by a typical formula which verify the reliability of the sampling method [11].

$$n_0 = \frac{(t)^2 * (p)(q)}{(d)^2} \qquad n_1 = \frac{n_0}{(1 + n_0 / W)}$$

Where,

t = Confidence level (for 95% point, Z = 1.96)

P = Estimated population proportion (maximum= 0.5)

q = 1- p (changes 0.5 - 1)

d = Error limit; Constant 5%

n0 = Index of the first formula

w = Numbers of observation; Water users

n1 = Sample size

t=1.96 , t2=3.8416 , p=0.10 , q=0.90 , d=0.05 , d2=0.0025 , n0 = 138.30

n0 = 138.30 , Population (Water users)= 3,000 , 1- n0/Population = 0.9539

Sample to offer n1= 144.98 >> n1= 145

Water users' had to spend time once every ten days for water providing to travel to headquarter in Qazvin. Now, as one of WUAs' unions is placed near to their habitat location, they save 10% of their time. Therefore, as mentioned we could estimate the improvement of satisfaction which was accomplished by PIM development. Preliminarily, it is considered, p = 10% equal saving users time in the formula which computed n1=145. On the other hand, there were 161 active WUAs and were considered having the opinion from all. As shown, this number is more than calculated sample size by formula and the survey was conducted based on questionnaires to fill up by one of representatives in the any WUAs. As a result, the statistical population contained the numbers of 161 samples among 3000 water users' stockholders.

iii. Modelling and Analysis

The study investigated the impacts of implementation of WUAs on users' satisfaction in Qazvin province. It consisted of socio-demographic characteristics and geographical measurements. It investigated satisfaction levels on the situation of water equitable distribution, quick elimination of defects, WUAs trustworthiness and satisfaction due to saving time and cost. It had the twofold compound, which was get by difference of satisfactions levels between two sections as it was predicted the beneficiaries' satisfaction to go higher after the implementation of the IMT.

The questionnaire format was prepared for QPP in two sections, before and after IMT. Therefore, it was organised in a Bisectional format, which the division depended on before and after the devolution of O & M services. It was designed based on the mentioned factors by a four-point Likert scale which were labelled as not satisfied, fair, good and full satisfied [12]. It was ranked as a multipurpose pattern for discovering the satisfaction levels before and after the implementation of IMT in Qazvin as the multipurpose plans. The plans made extensively designs for the human resources development and the social growth indicators [13]. Thus, the satisfaction level was measured based on some socioeconomic indices by a four-scale model, Figure **2**.

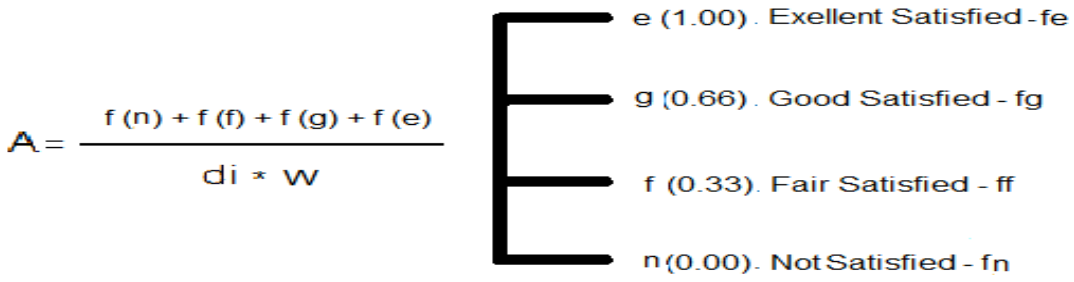

Figure 2: Surveying beneficiaries' satisfaction by Likert scale, Source; Garland, 1991.

Where;

A = Average Weighted Index

fn = Frequency of satisfied level; not satisfied at all

ff = Frequency of satisfied level; fair

fg = Frequency of satisfied level; good

fe = Frequency of satisfied level; excellent

di = Numbers of items; determining level

w = Numbers of observations; Water users

Statistical socioeconomic pattern was used for data analysis. The data analyses were used as the binary logistic regression. The internal uniformity as middling correlation of items was gauged as scales' reliability as a popular dependability statistics. Cronbach's alpha was chosen as binary variables between two range; (0) to (1) to measure the reliability of variables. They had greater reliability, if the value was larger [14]. Logistic regression system was used on intensity of influence the demographic variables such as water users' age, experience, literacy and geographical location by their satisfaction. The values ranged (0), means without relationship to (1), means perfect relationship into multiple logistic regression test. The categorical data were compared based on Pearson's distribution test to perceive variables which were independent of each other. Ultimately, the Cramer's V was used to assess the relationships of two variables which were not dependent, $p < 0.05$. They are using to demonstrate the statistical significance score of coefficients [15].

RESULTS AND DISCUSSIONS

In this study, values related to satisfaction level were compared in bisectional times, before and after the IMT. Some socioeconomically factors influenced the satisfaction level [16]. Four factors affecting satisfaction level including state of water equitable distribution, quick elimination of defects, WUAs trustworthiness and the satisfaction due to saving time and cost at both times were measured. The quad mentioned factors were assessed to explore the improvement of satisfaction level based on three variables including shortening distance to O&M services bureaus, saving time and cost of water users. In addition, they were investigated by comparing of some demographic factors. The statistical assessment showed as significant relationship between four above factors and satisfaction level with p-value < 0.001, Table **1**.

The study indicated that the factors affecting satisfaction level had been improved by implementation of PIM project. The average of improvement satisfaction level was 30.5 %, Figure **3**.

Results of investigated factors are as following;

1. Reviewing Eco-Geographical Factors

The geographical location of water turnout and habitant zones was significant to identify satisfaction level. It was divided into two zones; suburbs of cities

Table 1: Relationship of Factors Influencing Satisfaction Level and Satisfaction Indicator

Variable. Before, After	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Water Equitable Distribution	.838	.066	-17.394	160	.000
Quickly Elimination of Defect	.790	.062	-16.457	160	.000
WUAs Trustworthiness	.835	.066	-19.258	160	.000
Due to Saving Time & Cost	.742	.058	-24.975	160	.000

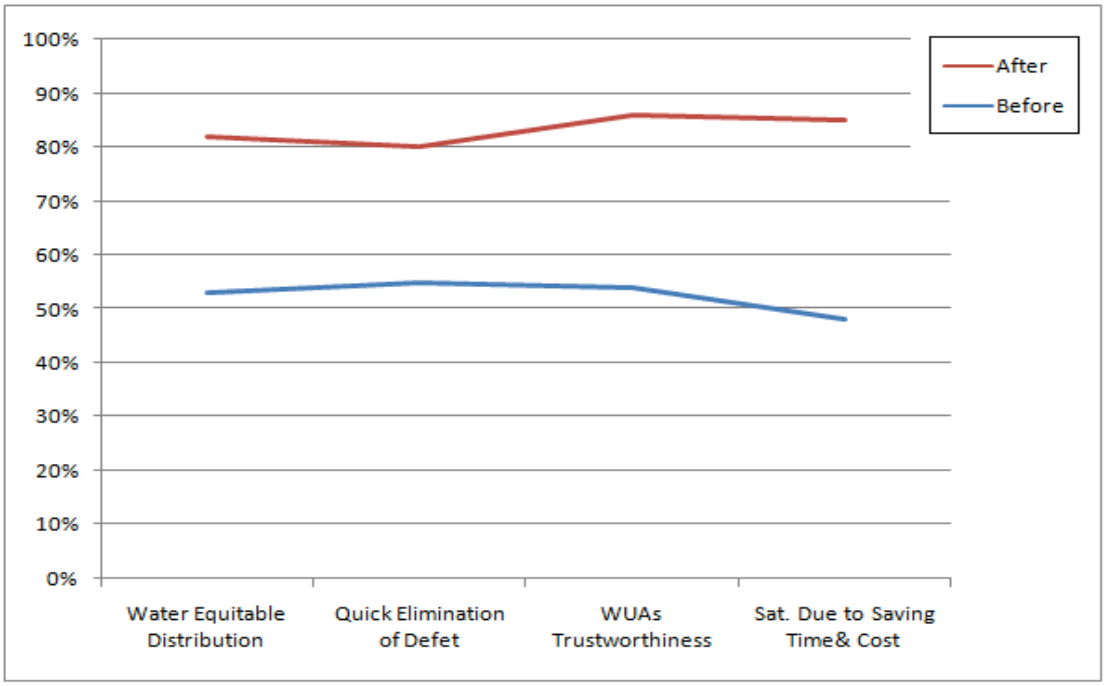

Figure 3: Satisfaction level improvement during implementation of IMT in Qazvin, Iran.

and mainland in around of headquarter as a determinant of distance of land location to O&M services offices. Then, the factors were ranked based on satisfaction level, Table **2**.

Data analysis revealed that satisfaction due to saving time and cost is most significant with a mean of 0.364 vs. 0.287 for the last rank, which is the quick elimination of defect. The mentioned value for suburbs is 0.446 due to reducing the travelling for water provision, which is the main factor to improve the water users' satisfaction by the PIM process. The highest rank factor was decomposed to triple separately items, shorting distance, saving time and saving cost to find a key indicator for assessing beneficiaries' priority, Table **3**.

It indicated that highest satisfaction was 51.9% for shortening distance vs. 24.9% and 26.1% for saving time and cost respectively. The results showed that the shortening distance was the principal factor affecting beneficiaries' satisfaction. It meant that the water users did not desire to travel for water prevision due to transport issues and its importance was more than other factors.

2. Reviewing Demographical Factors

The relationship between some demographic variables and improvement of water users' satisfaction level was identified by logistic regression method. The association of age, literacy, and experience factors with improving satisfaction level was not significant, Table **5**.

Table 2: Ranking Factors to Indicators of Improvement of Satisfaction Level

Zone		Water Equitable Distribution	Elimination of Defect Quickly	WUAs Trustwothiness	Due to Saving Time & Cost
Suburbs	Mean	.315	.312	.352	.446
	N	93	93	93	93
	Std. Deviation	.202	.194	.219	.160
Mainland	Mean	.250	.180	.268	.254
	N	68	68	68	68
	Std. Deviation	.216	.177	.185	.159
Total	Mean	.287	.256	.317	.364
	N	161	161	161	161
	Std. Deviation	.209	.197	.208	.185
	Stress	2	1	3	4
	Rank	3	4	2	1

Table 3: Indicating Water Users Priority on Satisfaction Level

Level of Satisfaction	Shorting Distance			Saving Time			Saving Cost		
	Low	High	Percent	Low	High	Percent	Low	High	Percent
Not Satisfied	10	2	2%	10	2	1.2%	10	2	1.2%
Fair Satisfied	38	24	24%	51	11	6.8	56	6	3.7
Good Satisfied	24	39	32.9%	40	23	14.3	35	28	17.4
Excellent Satisfied	5	19	19%	7	17	10.6	10	14	8.7
Total High Satisfied	----	58	51.9%	---	40	24.9%	---	42	26.1%

Table 4: Identifying the Significance of Demographical Variables for Satisfaction

Variables	B	S.E.	Wald	Df	Sig.
Age	-.492	.590	.696	1	.404
Education	.576	.427	1.825	1	.177
Experience	.566	.569	.991	1	.320

It seems that the QPP gave interests for all age-groups with different levels of education and experiences. The finding showed that since establishment of the local management in QPP, the managerial problems decreased and the degree of desirability for all groups was almost similar.

In sum, the effect of saving time and cost on variable of satisfaction development of the QPP had the highest value and the trustworthiness of WUAs at the second highest record. The value of saving time and cost increased up to 36.4% as a favour of development of the PIM system. By comparison, the impact of implementation of WUAs on satisfaction was relatively large in the suburbs zone and lower grows in the mainland. However, the statistical analysis revealed;

i. The saving time and cost and satisfaction level were highly influential indicators, because of shortening distance by a decrease of travelling for water provision to headquarter.

ii. The percentage of satisfaction level in water equitable distribution was higher than the fast elimination of defects.

iii. The satisfaction levels in all demographical groups were close and as a result, the majority of users had followed the conditions of water distribution systems for water provision services and operational observation without respectively demographic factors.

Although, all satisfactions' indicators had been growing up but users priorities were the suitable facilities in the closer places.

CONCLUSION

This study concentrated on the WUAs sustainability in the mainland and suburbs of Qazvin, Iran. The programming of IMT in Iran was relatively young. It was initiated and managed by the local ID Company after some multilateral group discussion between the water and agriculture government organisations and the key stockholders. Therefore, capacity building of human forces were generated for social mobilization to achieve higher knowledge during three years of the IMT process. Formation of 12 local managements as WUAs in the irrigation network caused the achievement of satisfaction. Although some of other component such as O&M services influenced on users' satisfaction, the decreasing of travel to headquarter in Qazvin by formation of the local bureau was the main reason to improve it. Overall, the water buying process was quite complicated before implementing of Qazvin PIM project and it wasted much time and travelling costs for water users. The main issue that water users faced were linked to the time and effort each farmer had to spend in travelling to submit his demand once every ten days during the cropping season, and paying the charges and then providing the evidence of payment for water release. Now, that issue was resolved largely [17].

In addition, regarding to improvement of existing systems, the functions of WUAs had been same between the mainland and suburbs. The respondents priorities and satisfaction were due to saving time and cost, WUAs trustworthiness, water equitable distribution, and quick elimination of defects respectively. They affirmed though the FUWUAs had a weak managerial skills, their function on O&M had improved on the quick elimination of defects of hydro-mechanical equipment and dredging which had been weak at the first time. Simultaneously, the survey showed there was no significant association between satisfaction and demographical variables including age, education, and experience. As a major result, the average of improvement of satisfaction level was achieved up to 30.5% for water users who had water right on Qazvin irrigation system. This is what that happened to the formation of local management bureaus and devolution of water authorities to WUAs. The study indicated that the local management of water was more effective than state management, so, it seems the government strategy should be regulated based on capacity building and devolution of all O&M services to water users once and forever. In this regard, the governance should support WUAs financially rather than government organisations as prevention of interference of tasks.

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