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Research Paper

Factors Affecting Farmer's Satisfaction with Water Users Associations Performance at Gotvand Irrigation Scheme in Khuzestan Province, Iran

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Abstract

The purpose of this study was to assess the farmer's satisfaction with services delivered by Water User Associations (WUAs) and determine the factors affecting farmer's satisfaction with the WUAs. Stratified sampling was used to select 124 farmer members of WUAs in the Gotvand irrigation Scheme (GIS). A researcher-made questionnaire was employed for data collection. Its validity was confirmed by content validity and its total reliability was estimated by Cronbach's alpha as to be 0.73. Data were analyzed using descriptive statistics to describe WUAs performance; ordinal logistic regression was also used to determine the relationship between physical, socio-economic characteristics of region context and farmer's satisfaction. Results revealed that although the WUAs performance in operation, maintenance and repair and management is medium, these WUAs are successful in collection of irrigation service fee. Status of maintenance and repair in GIS is a very essential factor in farmer satisfaction with the WUAs and its status is dependent on the strength of WUA connection with government authorities. Therefore, it is recommended that maintenance and repair management is transferred to the WUAs.

Keywords:
Gotvand irrigation scheme, Water Users Association (WUA), satisfaction, Iran

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INTRODUCTION

Irrigation is facing controversial issues of inadequate water efficiency; big public contribution; lack of equipment maintenance; and socio-economic inequity (Prefol et al., 2006). These issues are due to institutional and managerial weakness in public irrigation agencies (Johnson, 1995). Over the past three decades, the world's irrigation sector has increasingly seen a global trend towards decentralization and privatization. Many countries in Asia, Africa, and Latin America have embarked on a process to transfer the management of irrigation systems from government agencies to local management entities (Vermillion, 1997). Consequently, Irrigation Management Transfer (IMT) has become the main policy strategy in improving the management system in irrigation (K'akumu et al., 2016). IMT is defined as an arrangement in which the public agency retains management control of the water source and the main distribution canals, while the water user associations (WUAs) assume responsibility for operation and maintenance on the secondary and minor canals within the distribution block and on the farm (Johnson, 1995; K'akumu et al., 2016). IMT includes state withdrawal, promotion of water users' participation, development of local management institutions, transfer of ownership and management (Koppa, 2008). In Iran, the government is the responsible for irrigation investment and management of irrigation schemes. This responsible body generally called Irrigation and Operational Networks Company (IOANC) and in the study region is called Karoun e Bozorg irrigation and operational networks company (KBOANC, in its Persian acronym). These bodies are state proxy and public water provider. IMT is implemented in some of Iranian irrigation schemes. Gotvand irrigation scheme is one of the transferred schemes to WUAs. The role of WUAs as local institutions and a local body manager who are familiar with its local resources, the direct users and receivers of the benefits providing by those resources declared by many writers, so engaging them into the management and governance would be possible, effective and sustainable solution (Ostrom, 1990; Vermillion, 1997; Sam & Shinogi, 2013). Some studies in Iran addressed the challenges of the irrigation governance as well as the enabling conditions to successfully achieve the goal of sustainable irrigation management. However, elaborated assessment of WUAs performance revealed that its performance is remarkably weak, so the contribution of this paper is three-fold. First, we investigated the importance of the factors explaining the performance of WUAs. Second, we evaluated the success of WUAs and finally we applied proper econometric techniques to identify the most important factors and to validate the proposed model of factors affecting farmer satisfaction with WUAs in GIS.

Gomo et al. (2014) mentioned key influential issues on performance of irrigation schemes including technical, agronomic, economic, social and institutional issues. According to Ostrom (1990), WUAs performance depends on both internal characteristics and external environment. This study concentrates on internal factors of three sub-categories including: physical-environmental, socio-economic characteristics, and institutional structure and management of WUAs. This study investigated the influence of the three sub-categories on performance of irrigation schemes and contributed towards recognizing irrigation schemes potentials and challenges (Bos et al., 2005; Sam & Shinogi, 2013). Improving livelihoods of members, ensuring sustainability of irrigation schemes and so farmer's satisfaction with the irrigation service are offered (Gomo et al., 2014). Physical and environmental status of irrigation scheme and water resources influences WUA's performance and satisfaction with its activities, as Araral (2009) and Easter (2000) argued that resource scarcity and type and level of irrigation technology are influential physical factors affecting WUAs performance and farmer satisfaction with irrigation services Omid et al. (2012) noted that network ineffectiveness is the most phys-

ical problem of the three northern WUAs of Iran. Findings of Joshi and Hooja (2000) and Koc et al. (2006) revealed that physical factor such as aged and worn-out irrigation facilities and problems with irrigation scheduling as an operation factor decreased farmer satisfaction and success of WUAs. Damisa et al. (2008) in Nigeria and Gomo et al. (2014) in South Africa showed that location of the plot in relation to the main canal and number of plots a farmer cultivates as physical-environmental factors improved performance of irrigation scheme and farmer's satisfaction with irrigation services. In many research on performance assessment of irrigation schemes, WUAs financial and physical indicators are used whereas socioeconomic indicators are rarely applied. (Kuscu et al., 2009; Sam & Shinogi, 2013). Based on the empirical evidence from studies of Ahmadvand and Sharifzadeh (2009), Azizi Khalkheili and Zamani (2009), Koc et al. (2006), individual or social characteristics identified as the most important factors influencing WUAs performance. Therefore, in this study we took into account socioeconomic characteristics of local water community and production, as well as personal attitudes of farmers as influential factors affecting WUA's performance and farmer's satisfaction. The researchers mentioned different socioeconomic indicators as follow:

Age, education, attitude towards participatory irrigation management, (Nishi et al., 2011; Zarafshani et al., 2008), family size, off-farm income and regular extension contact (Elias et al., 2015), farming experience and water management training (Gomo et al., 2014), organizational participation (Nishi et al., 2011), farmers' opinion and trust of members on the WUA (Arcas-Lario et al., 2014; Gorton et al., 2009) and their expectations, and payment habits, economic attributes of resources such as the farm size and water fees (Gorton et al., 2009), total harvest of the irrigated plot (Damisa et al., 2008) local's capacity and members awareness of WUAs (Arcas-Lario et al., 2014; Aydogdu et al., 2015; Sam & Shinogi, 2013). Suitable structure and conduct of WUAs can guarantee the success of WUAs, so the presence of good governance and accountability contribute to satisfaction and success. Arcas-Lario et al. (2014) found that social and managerial factors such as equity and transparency of information in the cooperative, member awareness of the cooperative, control and trust of members on the cooperative reduces information asymmetry and leads to greater satisfaction of members. They showed success in performance and running the cooperative as a firm caused members satisfaction. Bhuyan (2007) indicated that institutional and communication factors such as keeping farmers informed about operations and programs and participation in the cooperative activities, strongly correlated with overall member satisfaction with their cooperative. Omid et al. (2012) noted lack of trust towards managers and lack of government support as institutional and managerial problems of WUAs in three areas in northern Iran.

In previous studies quality of irrigation services and performance of WUAs are assessed by indicators such as: fairness in water distribution, number of days a farmer accesses to water, participation in seasonal inspection of irrigation infrastructure (Gomo et al., 2014), irrigation timeliness, water adequacy, appropriate maintenance and Irrigation Service Fee (ISF) (Sam & Shinogi, 2013). Satisfaction in this study is conceptualized as the same concept provided by Raboka (2006) who defines satisfaction as the fulfillment of certain prior expectations related to a product or service. According to Bhuyan (2007) general topic areas of satisfaction with cooperatives includes satisfaction with cooperative's principles, pricing policies, services and operations, and also satisfaction with governance, management and cooperative board of directors. Farmer's satisfaction with irrigation service can be affected by several factors such as socio-economical, physical-environmental and institutional attributes of irrigation. Relationship between quality of operation, repair and maintenance services in irrigation schemes

and farmers satisfaction was verified by Aydogdu et al. (2015). However, Omid et al. (2012) showed this relationship isn't necessarily true in all cases as if in some irrigation schemes farmers unawareness of the law about WUA and its activities is the cause of dissatisfaction. Based on the above literature review the three driving status of physical-environmental, socio-economic context, institutional structure and conduct of WUAs are determinant factors in service quality given by WUAs and farmers satisfaction; therefore, in this research we examined the relationship among driving contexts, performance and satisfaction with WUA. Success of WUA's performance in deliver of irrigation services to farmers is extremely important to the sustainability of irrigation management as well as the longevity of WUA. Increasing a farmer's satisfaction with cooperative performance leads the cooperative member to increase his or her intention to continue his or her membership, and this has implications for the survival and future success of the cooperative as an organization (Hernandez-Espallardo et al., 2013). The results of this survey give feedback and recommendations to all beneficiaries, managers and officials of irrigation section to improve process of irrigation management reform and extend viability of WUAs.

METHODOLOGY

Study area

Gotvand is a semi-arid county, with approximately 370 mm precipitation that makes irrigation important. The main crops grown in the region are wheat, potato, tomato, maize, eggplant and mung bean. The research site is in Khuzestan Province named Gotvand Irrigation Scheme (GIS) that was built from 1974 until 1976 on Karoun River and has 4720 hectares command area. This scheme consisted of a reservoir with storage capacity of 15 million m^3 and a main canal with length and capacity of 18.4 Km and 92.5 m^3/s respectively. The main canal has a pump canal, six secondary canals and 22 tertiary canal ditches. GIS was transferred from the government to two Water User Association (WUA) of Gotvand Farmer Irrigation Cooperative (GFIC) and Ab Baran Irrigation Cooperative (ABIC) in 2008. These two WUAs collectively cover a territory of 4720 hectares of 1135 farmers in Gotvand County. GFIC has operation and maintenance responsibilities of 2545 hectares of lands under the command of Gotvand Pump Canal (GPC), secondary canals of G1, G2 and 22 ditches of Gotvand Main Canal (GMC) while ABIC managing 2175 hectares lands under the command area of secondary canals of G3, G4, G5, G6. Table 1 describes the technical characteristics of GIS.

Table 1
Physical Characteristics of Gotvand Irrigation Scheme

Canal name	Pic Capacity (m^3/s)	Length (m)	No. of ditches	Command area (ha)	WUA Name
GMC[1]	92.5	18.4	22	538	GFIC[2]
GPC[3]	2.2	15	15	1547	GFIC
G_1 lateral	0.25	1.4	1	125	GFIC
G_2 lateral	0.67	2.9	3	335	GFIC
G_3 lateral	1.26	5	7	630	ABIC[4]
G_4 lateral	0.43	1.2	2	215	ABIC
G_5 lateral	2.18	10.3	13	1090	ABIC
G_6 lateral	0.47	3.6	3	240	ABIC
Total	-	57.8	66	4720	ABIC

Source: Karoun e Bozorg Irrigation and Operational Networks Company (KBOANC)

1. Gotvand main canal
2. Gotvand Farmers Irrigation Cooperative
3. Gotvand pump canal
4. Ab Baran Irrigation Cooperative

The design of this study was descriptive-casual research that was carried out by a survey method. The population of this study consisted of all 1130 farmer members of two WUAs that had been established in GIS in Khuzestan Province. Although there are some critiques about assessing WUAs performance from farmer's perspectives because of their subjective judgments (Magingxa et al., 2006), it seems that farmers as beneficiaries of WUAs are the best assessors. Stratified sampling with proportional allocation was used as sampling method. The sample size allocated proportionally among head, middle and tail of canals in the both WUAs. Researcher-made questionnaire were used for data collection. Questionnaire validity was confirmed by expert opinion and colleague reviewing. Its reliability was measured by Cronbach's alpha as 0.73. Data were obtained from 124 farmers of two established WUAs in GIS during 2016. The survey questionnaire consisted of three parts. The first part included 23 statements related to physical and environmental, socio-economic and institutional and managerial indices. These indices are called driving contexts and detailed in Table 2. The second part included 20 five-point Likert statements related to 10 indices of WUAs performance. These indices itself consisted four WUAs performance criteria including operation status, maintenance and repair status, status of water charge collection and status of WUA's management. According to the related literature WUAs performance is assessed by variables detailed in Table 3. (Dakurah et al., 2005). The third part of questionnaire estimated farmer's satisfaction with both WUAs performance and their authorities. This part consisted of 15 five-point Likert items ranging from 1 'strongly disagree' to 5 'strongly agree' to measured 10 indices of farmers' satisfaction. Farmer's satisfaction with WUAs is defined by variables (indices) detailed in Table 4.

Table 2
Driving Contexts Factors Influencing Performance and Satisfaction with WUAs

Category	Variables	Definition
Physical and Environmental	Land area	Area of land ownership (ha)
	Land plots	Number of land plots
	Hectares	Hectares cultivated
	Location	Location of farm along irrigation canal (Head, middle, tail)
	Scarcity	Status of water supply in irrigation canal (under or without scarcity)
	Other sources	Water consumption of other sources (River, well. Drain, etc.)
	Physical	Physical situation of the irrigation scheme
	Design	Design quality of the irrigation scheme
Social and Economic	Age	Age of farmer
	Education	Farmer education level
	Knowledge	Farmer knowledge level about the WUA
	Experience	Farmer experience in irrigated agriculture
	Household	Household size
	Intake members	Number of members in water users group under secondary gate
	Household income	Household income derived from non-farming activities
	Harmony	Social cohesiveness and harmony among members of the WUA
	Participation	Situation of farmer's participation in WUA
Institutional and Managerial	Qualification	Competence of management board of WUA
	Trust	Trust in the management board of the WUA
	Transparent	Transparent management structure of the WUA
	Accountability	Level of WUAs' accountability to its members
	Relationship with members	Level of relations between the WUA and its members
	Relationship with authority	Level of relations between the WUA and the water authority

Table 3
Indices of WUAs Performance Assessment

Category	Definition
Operation	Farmer accesses to required water (adequacy)
	Assured accesses to required water (timeliness)
	Equity in water distribution (equity)
Maintenance and repair	Gathering repair and maintenance costs of irrigation infrastructure
	Appropriate repair of irrigation infrastructure
	Appropriate maintenance of irrigation infrastructure
Water charge collection	Timeliness in water contracts with farmers
	Timeliness in receiving irrigation service fee (ISF)
Board of WUAs	Appropriate seasonal inspection of irrigation infrastructure
	Punishment of rule violators and free riding in irrigation scheme

Table 4
Indices of Farmer's Satisfaction with WUAs

Category	Definition
Operation	Farmer's satisfaction with irrigation schedule
	Farmer's satisfaction with repair of irrigation scheme
Maintenance and repair	Farmer's satisfaction with water distribution
	Farmer's satisfaction with maintenance of irrigation scheme
Irrigation service fee collection (ISF)	Farmer's satisfaction with irrigation service fee (ISF)
Board of WUAs	Farmer's satisfaction with board of WUAs
	Farmer's satisfaction with water controller of WUAs

Ostrom (1990) model about common pools resources was used which show direct and indirect relationships and effects of independent variables on dependent variable. This model has three driving contexts of physical-environmental, socio-economic characteristics, and institutional structure. According to this model the driving contexts as independent variables effect performance and lead to outcomes. The variables of driving contexts in this study are described in Table 2. Appling the model we argued that the driving contexts and WUA's performance as independent variables affect dependent variable of satisfaction. So in this study independent variables consisted of driving contexts (physical and environmental, socio-economic and institutional and managerial status), and WUAs performance (performance in operation management, maintenance and repair management, Irrigation Service Fee collection (ISF), WUA board competence). Dependent variables consisted of four satisfaction variables including satisfaction with operation, satisfaction with maintenance and repair, satisfaction with Irrigation Service Fee collection (ISF), satisfaction with board of WUAs. In this study all variables of driving contexts, WUAs performance assessment and farmer's satisfaction that thought to be related to each other are taken into consideration. This study had four models of satisfaction that examined and verified by ordinal logistic regression. The models calculated using Spss software. The type of link function in ordinal logistic regression was complementary log-log. Coefficients of ordinal logistic regression models were estimated by using the following formula.

$$Pr(Satisfaction)=\varphi(\beta_0+\beta_1 x_{1i}+\beta_2 x_{2i}+\cdots+\beta_n x_{ni}$$

the model fitting and goodness of fit were tested by Chi-square and Pearson Chi-square respectively. Model coefficient of determination estimated by pseudo R-square statistics (in-

cluding Cox and Snell, Nagelkerke, McFadden).

RESULTS AND DISCUSSION

It is evident from Table 5 that average farm size and number of plots is 3 hectares and 2.5 plots, respectively. Each farmer household has 5 members and cultivates about 5.4 hectares in the scheme and earns 76% of its income from farming (26% of household income derived from non-farming activities). The farmers have 44.5 years old and 25.3 years experiences in farming averagely. More than half of them are illiterate or have elementary education. Each group of farmers under secondary gate is composed of 41 farmers that most of them are members of the same tribe and family (social cohesiveness and harmony among members of the WUA is about 3.9). Based on farmer perceptions, their WUA board have medium management qualification (board qualification =3) and they have moderate trust on the board. Because of weak internal and external communication between the WUAs and their members and also government authorities (2 and 2.6 respectively), low level of transparency and accountability in the WUAs (2.4 and 2.6 respectively), the beneficiaries has low familiarity with their WUA. As revealed from Table 5, farmer's knowledge level about WUAs is low (knowledge level =2) and they have a moderate participation in WUAs.

Table 5
Internal Factors Influencing Performance and Satisfaction with WUAs

Category	Definition	Mean	SD
Physical and Environmental	Area of land ownership (ha)	3.0	0.71
	Number of land plots	2.5	0.32
	Hectares cultivated	5.4	0.63
	Location of farm along irrigation canal (Head, middle, tail)	2.0	0.17
	Status of water supply in irrigation canal (under or without scarcity)	1.0	0.8
	Water consumption of other sources (River, well. Drain, etc.)	0.3	0.05
	Physical situation of the irrigation scheme	3.0	0.25
	Design quality of the irrigation scheme	3.2	0.23
Social and Economic	Age of farmer	44.5	2.4
	Farmer education level	2.0	0.22
	Farmer knowledge level about the WUA	2.0	0.2
	Farmer experience in irrigated agriculture	25.3	2.5
	Household size	5.1	0.36
	Number of members in water users group under secondary gate	40.7	5.8
	Household income derived from non-farming activities	0.26	0.08
	Social cohesiveness and harmony among members of the WUA	3.9	0.18
	Situation of farmer's participation in WUA	3.5	0.19
Institutional and Managerial	Competence of management board of WUA	3.0	0.18
	Trust in the management board of the WUA	3.6	0.19
	Transparent management structure of the WUA	2.4	0.17
	Level of WUAs' accountability to its members	2.6	0.26
	Level of relations between the WUA and its members	2.6	0.26
	Level of relations between the WUA and the water authority	2.0	0.14

According to the results presented in Table 5, the design and physical situation of irrigation and drainage infrastructures in GIS is medium but because of water scarcity especially at tail of canals about 30% of farms use other water sources such as wells and Karoun River.

In the Table 6 status of WUAs performance and farmer's satisfaction with WUAs is delivered. The results revealed that performance of the WUAs in operation, maintenance and repair, board of WUAs was medium and farmers had moderate satisfaction in those indices. WUAs performance in collection of water charge was well and the farmers were satisfied with method of water charge collection. Differential test showed that farmer's satisfaction with WUAs boards is more than their performance that may be referred to tribal and family relations between boards and members of the WUAs.

Table 6
Status of WUAs Performance and Farmer's Satisfaction with WUAs

Category	Performance		Satisfaction		Paired samples test	
	Mean	SE	Mean	SE	t	*P*-value
Operation	3.2	0.26	3.2	0.21	0.29	0.78
Maintenance and repair (M&R)	2.8	0.12	2.6	0.18	-1.15	0.26
Water charge collection	4.3	0.13	4.1	0.19	-1.02	0.31
Board of WUAs	2.9	0.23	3.8	0.11	3.3	0.003**

**$p<0.01$

WUAs operation services mainly refer to irrigation schedule and water distribution in irrigation scheme. According to results the farmers have moderate satisfaction with the WUAs operation services. The marginal effects of the 8 variables in explaining farmers' satisfaction with operation are shown in Table 7 below. Accordingly, statistics of Chi-Square (116.9) and Pearson Chi-Square (3227.4) show that regression model is significant as well as the Pseudo R-squared (Cox and Snell=0.53, Nagelkerke=0.65, McFadden=0.37) show the robustness of the model. Based on these results, variables of location and water consumption from other sources have inverse relation with satisfaction with operation. As illustrated in Table 7, the WUAs performance in maintenance and repair (M&R) and collection of Irrigation Service Fee (ISF) have significant effects (coefficients=0.18 and 0.09 respectively) on quality of their operation services in GIS. The reason of these results is that M&R service and ISF collection cause better water flow and better water distribution in irrigation network. Among all factors of context, two variables included farmer participation and WUA relation with members directly contribute on the level of satisfaction with operation services. Therefore, the more farmer participation and communication with

Table 7
Marginal Effects of Variables over Satisfaction with Operation in Ordinal Probit Model

Variables	Coefficient	SE	Degree of satisfaction with operation				
			Prob (Y=1)	Prob (Y=2)	Prob (Y=3)	Prob (Y=4)	Prob (Y=5)
Location	-0.23**	0.00	0.27	0.23	0.2	0.195	0.164
Scarcity	0.26**	0.01	0.16	0.175	0.183	0.208	0.228
Harmony	0.17**	0.00	0.13	0.135	0.15	0.155	0.173
Participation	0.19*	0.03	0.082	0.086	0.091	0.089	0.1
Water consumption from other sources	-0.14*	0.03	0.157	0.122	0.075	0.058	0.022
Relation between WUAs and members	0.2*	0.02	0.119	0.132	0.156	0.18	0.219
Performance of water charge collection	0.09*	0.04	0.125	0.127	0.13	0.133	0.132
Performance of Maintenance and repair	0.18**	0.00	0.143	0.15	0.157	0.169	0.19

Model fitting: Chi-square =116.9, P-value=0.00 Goodness of fit: Pearson Chi-square: 3227.4, p-value=0.04
Pseudo R-squared: Cox and Snell=0.53, Nagelkerke=0.65, McFadden=0.37

**$p<0.01$

Table 8
Marginal Effects of Variables over Satisfaction with Repair and Maintenance (R&M) In Ordered Probit Model

Variables	Coefficient	SE	Degree of satisfaction with (R&M)				
			Prob (Y=1)	Prob (Y=2)	Prob (Y=3)	Prob (Y=4)	Prob (Y=5)
Location	-0.23*	0.02	0.13	0.09	0.05	0.02	0.01
Design quality of scheme	0.27*	0.04	-0.11	0.01	0.17	0.2	0.31
Participation	0.3**	0.00	0.24	0.34	0.48	0.85	0.91
Intake members	-0.08*	0.05	0.03	0.02	0.02	0.01	-0.01
Relationship with members	0.33**	0.01	0.25	0.26	0.33	0.42	0.55
Performance maintenance and repair	0.46**	0.00	0.37	0.4	0.49	0.53	0.67
Model fitting: Chi-Square =127.3, sig=0.00			Goodness of fit: Pearson Chi-Square: 2136.1, sig=0.02				
Pseudo R-squared: Cox and Snell=0.45, Nagelkerke=0.58, McFadden=0.41							

**$p<0.01$

WUA, the more they were satisfied with operation services. Results of the regression model confirmed findings of Joshi and Hooja (2000) and Koc et al. (2006) that revealed M&R performance influence farmer satisfaction and success of WUAs.

Farmers' satisfaction with Repair and Maintenance (R&M) is shown in Table 8, accordingly, statistics of Chi-square (127.3) and Pearson Chi-square (2136.1) show that regression model is significant as well as the Pseudo R-squared (Cox and Snell=0.45, Nagelkerke=0.58, McFadden=0.41) show the robustness of the model. Based on output of ordinal probit model, performance of WUAs in maintenance and repair, WUAs relationship with its members and farmer's participation have the most significant effect on satisfaction with M&R. The results of Table 8 show that variables of location and number of farmers under intake gate as variables of social and managerial contexts have inverse relation with satisfaction with operation. As showed in Table 9, ordinal logistic regression model is significant (Chi-square=128.4, Pearson Chi-square: 2527.7) and model determination coefficient is suitable (Pseudo R-squared: Cox and Snell=0.463, Nagelkerke=0.61, McFadden=0.043). Table 9 shows that water scarcity in the irrigation scheme and water consumption from other sources have inverse relation with satisfaction with water charge collection. Results indicate that variable of area of land ownership as physical and environmental context and variable of WUAs relation with its members as managerial context beside performance of water charge collection shaped level of satisfaction with payment of irrigation service fee. Qualitative observations denote that all above noted variables had an impact on access to water. While irrigation scheme is under water scarcity and

Table 9
Marginal Effects of Variables over Satisfaction with Water Charge Collection in Ordered Probit Model

Variables	Coefficient	SE	Degree of satisfaction with water charge collection				
			Prob (Y=1)	Prob (Y=2)	Prob (Y=3)	Prob (Y=4)	Prob (Y=5)
Scarcity	-0.29*	0.04	0.37	0.29	0.26	0.19	0.07
Ownership	0.47**	0.00	0.31	0.35	0.4	0.44	0.51
Water consumption from other sources	-0.34**	0.01	0.25	0.21	0.18	0.14	0.06
WUA relation with members	0.12*	0.05	0.14	0.25	0.32	0.41	0.48
Performance of water charge collection	0.41**	0.00	0.52	0.55	0.61	0.68	0.74
Model fitting: Chi-Square =128.4, sig=0.00			Goodness of fit: Pearson Chi-Square: 2527.7, sig=0.01				
Pseudo R-squared: Cox and Snell=0.463, Nagelkerke=0.61, McFadden=0.043							

**$p<0.01$

farmers have to use other water sources such as river, well, drain and so on, they are reluctant to pay irrigation service fee. The model illustrated in table 9 is consistent with findings of Araral (2009) and Easter (2000) that mentioned water scarcity and status of M&R as determinant factors in farmers' satisfaction.

Farmers' satisfaction with boards of WUA is shown in Table 10, accordingly, statistics of Chi-Square (142.4) and Pearson Chi-Square (3197.7) show that regression model is significant. Pseudo R-squared statistics shows the robustness of the model (Cox and Snell=0.45, Nagelkerke=0.58, McFadden=0.41). The results of the ordered probit model in Table 10 revealed variables related to managerial context such as accountability and relationship between WUA and members and also M&R performance have the most influence on satisfaction with manager and board of WUA. Variables related to social context such as farmers' participation, farmers' knowledge and awareness about principal of irrigation co-operatives (WUAs), directly impact on satisfaction with WUA board. These results are consistent with the finding of Bhuyan (2007), Aydoghdu (2015) and Omid (2012).

Table 10
Marginal Effects of Variables over Satisfaction with Boards of WUA in Ordered Probit Model

Variables	Coefficient	SE	Degree of satisfaction with boards of WUA				
			Prob (Y=1)	Prob (Y=2)	Prob (Y=3)	Prob (Y=4)	Prob (Y=5)
Farmer knowledge	0.18*	0.03	0.21	0.23	0.26	0.31	0.39
Farmer participation	0.16*	0.02	0.19	0.27	0.35	0.40	0.44
Accountability	0.51**	0.00	0.54	0.63	0.7	0.76	0.82
Relations with members	0.36**	0.00	0.31	0.38	0.45	0.55	0.62
Performance Maintenance and repair	0.45**	0.00	0.36	0.4	0.48	0.57	0.87
Model fitting: Chi-Square =142.4, sig=0.00			Goodness of fit: Pearson Chi-Square: 3197.7, sig=0.04				
Pseudo R-squared: Cox and Snell=0.7, Nagelkerke=0.78, McFadden=0.46							

**$p<0.01$

CONCLUSION

The first purpose of this study was to assess the farmer's satisfaction with services delivered by Water User Associations (WUAs). The second purpose was to identify effective factors of physical-environmental, socio-economic and managerial contexts that determine farmer's satisfaction with performance of WUAs in Gotvand Irrigation Scheme (GIS). The results of the survey showed that most of the WUAs members were elderly smallholder farmers who were illiterate or had elementary education and agriculture was the only source of their livelihood. The two WUAs in GIS consisted of many crowded water groups under secondary intake gates that their members was very high and almost most of members had familial ties with each other. The farmers had little information and knowledge about the WUAs. The farmers didn't completely relied and trust on their WUA board and they believed that the WUA board had medium management competence. Internal and external communication between the WUAs and their members and also government authorities was weak. The level of transparency and accountability in the WUAs was low, so both the beneficiaries' awareness with their WUA and their knowledge level of WUAs was low and they had moderate participation in WUAs. The design and physical situation of irrigation and drainage infrastructures in GIS were medium but because of water scarcity especially at tail of canals, about one third of farms used other water sources such as wells and river. The WUAs performance in Maintenance and Repair (M&R) and collection of Irrigation Service Fee (ISF) as well as farmer participation and communication with WUA had significant ef-

fects on satisfaction with operation services in GIS. Results indicated Farmer's satisfaction with maintenance and repair is dependent on location of farm in the irrigation scheme, design quality of the irrigation scheme, farmer participation in WUA, number of members in water users group under secondary gate, WUA relationship with members and M&R performance. Results indicated that variables of water scarcity and water withdrawal from other sources, variable of WUA relation with members beside water charge collection performance shaped level of satisfaction with payment of irrigation service fee. The study showed variables of farmer knowledge level about the WUA, farmer participation in WUA, level of relations and accountability between the WUA and its members besides M&R performance influenced satisfaction with management and board of WUA. Based on the results of the present study, the following recommendations can be drawn:

- WUA board had positive effect on increasing farmers' satisfaction and their commitment in WUA affairs. To achieve these goals it is essential that government encourage farmers by implementation of promoting programs to select qualified, trustful WUA board who communicate with its members and external authorities.

- It seems that performance of Maintenance and Repair (M&R) is very essential in the increase of farmer's satisfaction with WUAs, so we suggest that all necessary authorities and responsibilities related to maintenance and repair management transferred to WUAs.

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