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Factors Influencing the Success of Water User Associations in Iran: A Case of Moqan, Tajan, and Varamin

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ABSTRACT

The purpose of this descriptive correlational study was to determine problems and success factors among members of Water User Associations (WUAs) in Moqan, Tajan and Varamin areas in northern Iran. The population consisted of farmers who were members of Water User Associations (N= 2,500). Using simple random sampling procedure, 262 farmers were selected for the study. A researcher made structured questionnaire was used to collect data. Exploratory factor analysis revealed six factor solutions explaining 78% of variance in problems faced by members in WUAs. Problems common in all three regions were: Dissatisfaction of member farmers towards PIM, network ineffectiveness, inequitable distribution of water, lack of trust towards managers, lack of government support, and lack of in group coherence. Moreover, success determinants were factor analyzed using Varimax method. Common factors explaining success mechanisms in all three regions were elimination of administrative and technical problems, canal rebuilding and restoring, farmers' education, fee collection, and farmers' legal rights. These factors accounted for 74 percent of the variance in the success of Water Users Associations. The result of this study has implications for water management practitioners in Iran. If Water Users Associations are to take over government-based irrigation networks, farmer members should be provided with clear objectives inherent in PIM as well as sufficient support after the takeover. In addition, clear national policy along with legal basis and functional irrigation facilities warrant attention.

Keywords: Irrigation Management Transfer (IMT), Irrigation networks, Participatory Irrigation Management (PIM), Water User Association**.**

INTRODUCTION

The great challenge for the current century is to use less water to produce more food, particularly in countries with more limited water and land resources. The effective and sustainable use of water for agriculture has become a global priority requiring urgent and immediate solutions in view of intensifying competition (Smith and Munoz, 2002). The current solution adopted by many countries, especially developing countries is to create more and more irrigation facilities. However, these irrigation schemes have not achieved 100% success, as most of are managed by the government where farmers' participation is non-existent (Haydarian, 2007). During the 1980s and early 1990s, governments started to realize the significance of farmers'

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participation in management of irrigation systems in view of sharing the costs and contributing towards maintenance (Tanaka and Sattto, 2005; Yercan, 2003; Sato *et al.,* 2007; Wegerich, 2001). This kind of concept was adopted by many countries such as Iran as Participatory Irrigation Management (PIM). Traditionally, the provision of water has been the responsibility of the Iranian government. In recent years, there has been a large increase in private sector financing of water projects, especially irrigation networks. The construction of about 300,000 hectares surface irrigation networks has been financed by government and the operation of these networks has been transferred to the Water User Associations (WUAs). In addition, the operations of some parts of the old irrigation networks have also been transferred to the WUAs. Another role of the WUAs in Iran is to decrease the number of water delivery points and it is also their responsibility to further distribute the irrigation water and collect the fees. All in all, WUAs are to maintain what is left from government-based irrigation projects.

In some other developing countries, the purpose of organizing WUAs was to involve farmers in irrigation management including operation and maintenance. The merits of WUAs were to decrease wasteful use of water (Tanka and Sato, 2005), improve the efficiency, productivity and sustainability of irrigation (Koc *et al*., 2006), improve the reliability of the system and increase cultivated area (Fami *et al*., 2007). This dazzling benefit encouraged the Iranian government to establish Water User Associations (WUA) in order to give farmers a greater role in managing irrigation facilities. However, despite their apparent growth in number, there is still little information about their success in agricultural development of the country. Therefore, the main objective of this study was to identify factors underlying problems and success across three WUAs in Varamin, Tajan, and Moqan. Specifically, the objectives addressed were to:

Describe selected demographic characteristics of WUA members.

Identify factors underlying problems and success among WUA members.

Determine the proportion of variance in problems and success that can be explained by these factors.

In order to review determinants of success among WUAs, it is imperative to shed light on success factors in Irrigation Management Transfer Programs (IMT). According to Shah *et al*. (2002) and Vermillion and Sagardoy (1999), four conditions are necessary for the success of MIT programs. First, a better life situation for members; second, a central irrigation system; third, a sustainable self-management program, and fourth, a low transaction cost for members. Moreover, Geiger (1995) reported six essential conditions for successful irrigation management efforts namely: (1) high level of political support; (2) clear national policy directions; (3) legal basis for new managing entities; (4) economic benefits to the farmers; (5) well defined water rights at national and farmer levels and (6) functional irrigation facilities (Hamdy, 2007).

A review of turnover impact studies conducted by Koc *et al*. (2006) revealed that turnover has neither improved nor interfered with agricultural productivity. Other studies in irrigation management transfer in Asia have also shown a modest contribution of water user groups in the maintenance of irrigation systems (Koc *et al*., 2006). Some countries, such as Turkey and Mexico have been successful in establishing PIM-based projects, while other countries especially monsoon-Asian countries, are yet to achieve their goal (Haydarian, 2007).

Farmers' typology and their participation in irrigation schemes have also been studied by several researchers. For example, Prasad Bhatta *et al*. (2006) and Serunkuma *et al*. (2004) found that younger farmers are more inclined to participate in farmer-led irrigation projects. Interestingly, Bagadion (2000); Wegerich (2001) and Serunkuma *et al*. (2004) showed that irrigating farmers were more interested to participate in

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irrigation management networks than their rain-fed counterparts. These researchers also found that economically advantaged farmers were more interested to take part in participatory irrigation management projects. Performance of irrigation facilities has also been shown to influence farmers' participation in irrigation schemes. For example, Joshi and Hooja (2000) and Koc *et al*. (2006) concluded that worn-out parts in irrigation facilities as well as problems with irrigation scheduling decreased the motivation of water users to participate in water management schemes. They further suggested that inadequate funds allocated to maintenance and repair along with aged and worn-out irrigation facilities had a negative influence on farmers' participation in government-based irrigation projects.

Although there has been limited study in Iran concerning farmers' motivation to participate in irrigation schemes, we will point out to some of these studies. In a Discriminant analysis conducted by Zarafshani *et al*. (2008), it was found that farmers who intended to participate in irrigation management tend to be younger, are more likely to be smallholders operating rain-fed farming, have less education, earn higher income, and have positive attitude towards participatory irrigation management. Moreover, the result of Rapid Diagnosis (RD) on irrigation management transfer in Qazvin irrigation network conducted by Iranian PIM working group (IRPIM) in 2002 shed light on some of the challenges faced by farmers after the take-over. These challenges were lack of clarity along with poorly defined shared responsibilities among a majority of farmers; transfer of farmers with undefined budget sources; insufficient capacity of farmers to carry out such transferred responsibilities; poor existing legislation to carry out the responsibilities; lack of coordination between farmers and government soon after the take-over, and lack of incentives to motivate farmers to continue their responsibilities (Hydari *et al*., 2007). Overall, it can be concluded that for any irrigation management transfer program, the government would need to make certain that irrigation facilities are intact before turning over to WUAs members.

MATERIALS AND METHODS

A descriptive survey design was employed in this study. The target population (N= 2,500) included farmers who were members of Varamin, Tajan, and Moqan Water User Associations (Figure 1). The associations were selected for their geographical locations while mainly focusing on their problems and successes. Using simple random sampling, 262 farmer members were selected following the formula set up by

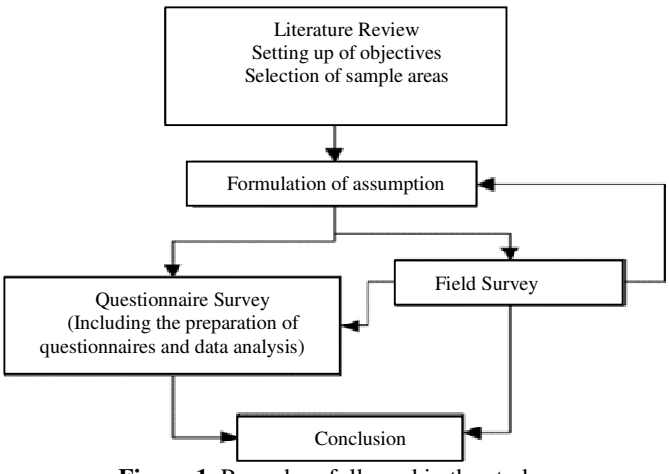

Figure 1. Procedure followed in the study.

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Krejcie and Morgan (1970) with 5% margin of error. A total of 262 farmer members were interviewed. Content and face validity for the questionnaire was established by a panel of experts from Department of Agricultural Extension and Education and the Department of Irrigation and Reclamation at University of Tehran as well as Extension Agents from Jihad-e-Agriculture Ministry. To test for reliability, the questionnaire was pilot tested with a group of 30 farmer members not targeted in the study. Cronbach's alpha was calculated on data received and resulted in a coefficient of 0.72. The final instrument consisted of 37 Likert type items measured on a five point scale. Exploratory factor analysis was used to identify the factors underlying problems and success among WUA members across the three sites. Norusis (1988) indicated that factor analysis is used to identify a relatively small number of factors that can be used to represent relationship among sets of many interrelated variables. The evidence on the number of subjects recommended for conducting factor analysis varies from five to ten observations per item (McCaslin and Torres, 1992).

RESULTS AND DISCUSSION

The mean age of WUA members was 50 ranging from 26 to 70 years. The majority of member farmers held elementary education. The mean years of membership in WUA was estimated to be six years. The average land-holding size among farmer members was 7 hectares. Moreover, their landholding on the average was divided into three pieces. Due to limited water resources, their uncultivated land area was 1.3 hectares. When asked about their farming experience, 27 years was their mean response (Table 1).

It was assumed that the variance of each measured variable could be decomposed into common and unique portions and a maximum likelihood (common factors) factor analysis of the data was conducted. This approach is considered to be appropriate in cases where the measured variables are assumed to be a linear function of the unmeasured (latent) variables. Since the analysis was carried out on a sample rather than a population, maximum likelihood factor analysis was considered appropriate.

Only factors with Eigen -value equal to or greater than 1.0 were considered in the analysis. In addition, a screed plot of the Eigen-values was used to identify breaks or discontinuity in determining the number of factors. The two procedures resulted in identification of six factors underlying problems faced by WUA members.

The factors were labeled as (1) dissatisfaction of member farmers towards PIM (2) network ineffectiveness (3) inequitable distribution of water (4) lack of trust towards managers (5) lack of government support and (6) lack of in group coherence.

These six factors accounted for approximately 78 percent of the variance in the problems faced by WUA members across three regions (Table 2).

Factors influencing success of WUAs were determined using principle component factor analysis with Promax rotation. Eliminating items that cross-loaded or loaded less than 0.45 resulted in five factors underlying success mechanisms in WUAs. Computations revealed that the internal coherence of the data was appropriate, with Bartlett's statistical data being significant at 0.01 level. The factors were labeled as (1) elimination of administrative and technical problems, (2) canal rebuilding and restoring, (3) farmers' education, (4) fee collection, and (5) farmers' legal rights. These five factors accounted for 74 percent of the variance in the success of Water Users Associations (Table 3).

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Table 1. Demographic characteristics of WUA members.

	F	Percent	Mean	Sd.	Min	Max
Age (Years)						
43	90	35.3	50.32	14.05	26	70
43-57	76	29.8				
57	89	34.3				
Educational level						
Illiterate	32	12.5				
Reading and writing	71	27.7				
Elementary education	45	17.6				
Guidance	68	26.6				
High school	40	15.6				
College						
Membership duration in						
WUAs	94	66.2				
2	21	14.8	5.8	7.9	2	30
2-6	27	19				
6						
Land area (ha)						
3	76	32.2	6.6	5.34	1	35
3-9	111	47				
9	49	20.8				
Number of land plots	-	-	2.9	1.7	1	12
Uncultivated land area (ha)						
0.5	88	51.8	1.3	1.7	0.2	10
0.5-2	28	16.4				
2	54	31.8				
Agricultural experience						
(Years)	57	26				
18	117	53.4	27	12.01	2	62
18-30	45	20.5				
30						

CONCLUSIONS

Based on the literature (Ahmadvand and Sharifzadeh, 2009; Azizi Khalkheili and Zamani, 2009; Koc *et al*., 2006) and empirical evidence from this study, it is possible to conclude that the most important factors influencing WUAs problems are "people or human factors". For example, WUA members were dissatisfied with Participatory Irrigation Management. According to Bhuyan (2007), one of the major problems confronting all organizations that involve membership (e.g., associations, cooperatives) is members' dissatisfaction toward their organization and organizational activities. Moreover, cooperative literature has also shown that without members' satisfaction, cooperatives cannot survive in the long run. Results also indicated that members felt that irrigation network was ineffective because they were not given sufficient authority to manage the irrigation facilities and that they were not fully familiar with what their association was doing.

More human factors were derived from inequitable distribution of water. For instance, elite farmers were given more power thereby making other members more vulnerable in obtaining their fair share of water. In the case of farmer-owned organizations such as WUAs, research has shown that unequal distribution of power among members is the prime reason for these organizations to fail. Finally, lack of trust toward managers, lack of

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Table 2. Percent of variance explained by factors influencing problems in water user associations.

Factors	Percent	Eigen value	variable	Factor load
Dissatisfaction of member farmers towards IPM	19.35	2.6	-Lack of members' knowledge towards the whole project	0.792
			-Government not keeping up with their promises	0.753
			-Incompatibility of irrigation project with farmers' context	0.617
			-Passive role of government officials towards members' wrongdoing	0.616
			-Unfixed nature of water fee	0.864
Network ineffectiveness	15.65	1.834	-Not giving sufficient authority to members	0.814
			-Lack of improvement in irrigation system	0.743
			-Keeping members unaware about the purpose of project by government	0.530
Inequitable distribution of water	13.03	1.81	-Giving more power to elite farmers	0.910
			- Not everyone receiving a fair share of water	0.621
Lack of trust towards project managers	11.90	1.7	-Lack of trust among members towards management strategies used by project managers	0.785
			-Not including members in decision-making	0.627
Lack of government support	10.57	1.21	-Lack of sufficient resources	0.825
			-Lack of governmental support after project turnover	0.798
			-WUA members not being recognized by other governmental sectors	0.666
In/within group coherence	7.5	1.04	-Lack of trust among farmer members	0.644

Table 3. Percent of variance explained by factors influencing success in water user association.

Factors	Eigen value	Percent	variables	Factor load
Elimination of administrative and technical problems	3.184	24.492	-Contracting with farmer members	0.877
			-Punishing those who do not follow the rules	0.872
			-On time rebuilding of outlets	0.792
			-Control for illegal use of water	0.696
Canal rebuilding and restoring	2.172	16.710	-Improving longevity of water networks	0.72
			-Reducing cost on water use	0.74
			-On time restoring of canals	0.678
			-Reducing maintenance, service and restoring of irrigation networks	0.594
Farmers' education	1.623	12.485	-Conducting extension classes on PIM	0.768
			-Installing water measuring devices	0.72
Fee collection	1.455	11.190	-Collecting water fee from farmer members	0.82
Farmers' legal rights	1.195	9.189	-Making sure that all members' rights are met	0.751
			-Making sure that farmers receive their needed water on time	0.651

support by government and weak group coherence was cited by members as problems inherent in WUAs. It has long been argued that trust and social solidarity are important determinants of association success (Poggie *et al*., 1988). Moreover, Unal *et al*. (2009) concluded that some cooperatives performed below their potential due to weak legislative support by the government.

Comparing the three types of WUAs with each other with respect to factors influencing their success, members in all three associations agreed that smooth administrative procedures as well as functional irrigation facilities would contribute to the success of WUAs. Findings of Joshi and Hooja (2000) and Koc *et al*. (2006) revealed that aged and worn-out irrigation facilities as well as problems with irrigation scheduling decreased the motivation of water users to participate in participatory irrigation management schemes. Training farmers on water measuring devices seemed to be an important factor in the success of WUAs. The effect of training farmer members on the success of cooperatives has also been reported by Amini and Ramezani (2008) and Unal *et al*. (2009). Farmer members also believed that a sound procedure in water fee collection as well as making members aware of their rights would contribute to the success of WUAs.

Although Iranian Water User Associations make important contribution to the society, implementing the following measures will reduce problems and enhance their success rates: (1) If farmer members are to feel belonged by their association management, they should have a voice in decision-making and those managers should "hand over the stick". This in turn increases the level of satisfaction among WUA members. (2) Mutual trust between the government and farmer members is possible through more interactive approaches when working with members. This interactive approach helps managers to plan their irrigation schemes by putting farmers first. (3) The government is advised to transfer irrigation network to WUAs, when all the facilities are intact. (4) Training farmer members on the basics of Participatory Irrigation Management would enhance their understanding and support for farmer-based irrigation management. The government should also take into consideration that Irrigation Management Transfer (IMT) is a gradual process and that they need to take a monitoring role until farmers are efficacious in taking full control over irrigation networks.

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عوامل تأثیرگذار بر موفقیت تشکل آب‌بران در ایران: مطالعه تجن، مغان و ورامین

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چکیده

هدف این مطالعه توصیفی- همبستگی تعیین مسایل و عوامل موفقیت در بین اعضای تشکل‌های آب‌بران در شبکه‌های تجن، مغان و ورامین در ایران بود. جامعه آماری تحقیق حاضر کشاورزان عضو تشکل‌های آب‌بران بودند (N= 2500). با استفاده از روش نمونه‌گیری تصادفی ساده تعداد ۲۶۲ کشاورز انتخاب شدند. ابزار تحقیق برای جمع‌آوری داده‌ها پرسشنامه محقق‌ساخته بوده است. با استفاده از تحلیل عاملی اکتشافی، شش عامل، ۷۸ درصد از واریانس مشکلات فراروی تشکل‌های آب‌بران را تبیین کردند. مشکلات تشکل‌های آب‌بران عبارت از نارضایتی اعضا از مدیریت مشارکتی آبیاری، عدم کارایی شبکه، توزیع ناعادلانه آب، عدم اعتماد به مدیران پروژه، عدم حمایت‌های دولتی و فقدان انسجام اجتماعی بودند. به علاوه، عوامل موفقیت با استفاده از تحلیل عاملی به روش وریماکس تحلیل شدند. مهمترین عوامل موفقیت تشکل در سه منطقه عبارت از حذف مسایل فنی و مدیریتی، بازسازی کانالها، آموزش کشاورزان، جمع‌آوری آب‌بها و حفظ حقوق کشاورزان بودند. این عوامل در مجموع ۷۴ درصد واریانس موفقیت تشکل آب‌بران را تبیین نمودند. نتایج این تحقیق الزاماتی را برای مدیران در ایران در بر دارد. اگر تشکل‌های آب‌بران جایگزین شبکه‌های دولتی شوند، باید اهداف انها روشن بوده و حمایت‌های کافی از آنها صورت گیرد. به علاوه، سیاست‌های ملی شفاف و مبانی قانونی به همراه تسهیلات آبیاری باید مورد توجه قرار گیرند.

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