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Attitudes of farmers toward participation in irrigation and drainage projects: the structural equations modeling analysis

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ABSTRACT- Application of modern irrigation and drainage canals for efficient use of water resources is necessary. Thus, identifying the factors influencing farmers' attitudes toward participation in irrigation and drainage projects (IDP) is essential. The purpose of this study is to identify factors affecting attitude toward participation in IDP in Syakh Darenjan, Fars Province, Iran. Stratified random sampling was used to collect data from 207 farmers as the research sample. The reliability and validity of the questionnaire were tested. The results of structural equations modeling from the total sample showed that farmers' attitude toward participation was affected by social cohesion, perceived behavioral control, social norms and attitudes toward water resources management variables. The results also revealed that social cohesion variable in adopter group and perceived behavioral control variable in the non-adopter group had the most significant effect on the farmers' attitude toward participation in IDP.

INTRODUCTION

Water is one of the most important factors in human life. Its absolute limitation as a renewable resource and its excessive consumption due to population growth has resulted in a major worldwide crisis (Nejat Pour, 2008). In the past 2 decades, in particular during the last years of the 20th century, water management has become an international concern. It is said that economic growth (especially in the agricultural sector), society health promotions, meeting basic needs, sustainability of water resources and environmental conservation depend upon the proper management of water resources more than ever before (Aghapour Sabbaghi, 2009).

According to the United Nations index and international water management institution, Iran is experiencing a water crisis (Ehsani and Khaledy, 2003a). Iran with 260 mm^3 of annual average precipitation, is considered an arid area. An annual rate of 7000 m^3 of renewable water in 1956 declined to 2000 m^3 in 1996, and it is predicted to be reduced to 800 m^3 by 2020. This is lower than the water scarcity level (i.e. 1000 m^3) (Ehsani and Khaledy, 2003b). Moreover, the agricultural sector as the most important economic sector, consumes approximately 93% of available water. About 70% of the rainfall is in 25% of the entire land area and the remaining 30% is in 75% of area of Iran. Also, 25% of the rainfall of the country is during irrigation season while 75% is in the non-irrigation season. Therefore, due to consumption of water in the agricultural sector, the major part of Iran is under severe water scarcity (Aghaei, 2010). Although there are water resources limitations and temporal and spatial improper distribution, water use efficiency in irrigated lands in the country is 0.7 kilograms of the produced crops during good conditions (Shahroudi and Chizari, 2007). It should be noted that the global standard is 3 kilograms in return for each cubic meter of water consumption. On the other hand, water waste in the agricultural sector is 40 percent of consumed water in irrigation (Panahi and Malek Mohammadi, 2008). Analysis of water consumption indices in the agricultural sector shows a large amount of water waste in transmission to the farms (Keshavarz and Sadegh Zadeh, 2000). Thus, application of efficient strategies is necessary. This has been taken into account by the experts in a way that in recent years, water resources planners have considered water resources management programs and proper irrigation and drainage networks. Heyd and Neef (2004) believe that for sustainability in water resources, the total system of water management should be designed such that all farmers become interested in participating to increase water resources productivity. In fact, farmers' participation in designing and managing irrigation projects will lead to improvement of the projects, reduction in governmental costs, improved efficiency, equality provision and guarantee of service standards. The involvement of local communities and utilization of local knowledge in the design and implementation of a water project is helpful to resolve anticipated conflicts. This leads to improving the trust between stakeholders and decision makers, and develops a sense of ownership and responsibility among local communities (Azizi Khalkheili and Zamani, 2009). In Iran, public participation in providing financial resources for the

water is between 25% and 30% of total investments. But farmers do not play any role in other steps of a water management project such as planning, decision making and protection. The share of government capital for plans related to water resources in Iran is 60% whereas for stakeholders' participation it is only 40%. Participation has mainly been for underground water resources. This demonstrates that public participation is low regarding surface water resources (Esfandiari, 2005). At the present, a considerable part of the government budget is dedicated to construction, maintenance and operating IDP. Farmers do not consider irrigation and drainage network problems and take no responsibility for the maintenance and protection of the networks. This leads to other problems and frustrations in these plans over a long period of time. Therefore, identifying the factors that affect farmers' attitudes toward participation in construction and maintenance of IDP for reducing costs and assigning the responsibility of maintenance and management of irrigation and drainage networks to stakeholders is essential and inevitable. The purpose of this study was to investigate the factors affecting farmers' attitudes toward participation in construction and maintenance of IDP, then to provide practical recommendations to enhance their participation.

Theoretical Background

Attitude has an important role in the adoption of new technologies (Rezaei Moghaddam et al., 2005). The studies have shown positive attitudes toward new technology as an antecedent to adopt or adopt it (Rezaei Moghaddam and Salehi, 2010). Ajzen (1988, cited in: Hyytia and Kola, 2006, p.6) defines attitude as the latent, hypothetical characteristic that can only be inferred from external and observable cues. Attitude refers to an individual's positive or negative evaluation of the performance effect of a particular behavior (Qingfei et al., 2008). This concept is likely to be a relatively good predictor of behavior and provides direction and purpose to behaviors and performance (Hyytia and Kola, 2006). According to Sanderson (Malek Saeidi et al., 2012) attitude is learned and can be changed. Attitude can also be viewed as an overall evaluation of behavior and can be measured on a bipolar dimension. "The more favorable a person's attitude is towards a behavior, the more she/he intends to perform that behavior". Some researchers have discovered that attitudes can influence behavior directly and some even found that attitudes are better predictors of behavior than behavioral intentions (Bagozzi et al., 1990).

The attitude structure continues to be a major focus of theory and research in the social and behavioral sciences. Many theories and models have been introduced for measuring individuals' attitudes, intentions and behaviors to technologies. The most frequently cited theory on the attitude-behavior relation is the Theory of Planned Behavior (TPB) (Ajzen, 1991). TPB predicts that planned behaviors are determined by behavioral intentions which are largely influenced by an individual's attitudes toward a behavior, the subjective norms encasing the execution of the behavior, and the individual's perception of their control over the behavior (Ajzen, 1985). According to the theory of planned behavior, people act in accordance with their intentions and perceptions of control over the behavior, while intentions in turn are influenced by attitudes toward the behavior, subjective norms, and perceptions of behavioral control (Ajzen, 2001).

Normative beliefs refer to the perceived behavioral expectations of such important referent individuals or groups. It is assumed that these normative beliefs, in combination with the person's motivation to comply with the different referents, determine the prevailing subjective norms. Subjective norm is the perceived social pressure to engage or not to engage in actual behaviors. It is assumed that subjective norm is determined by the total set of accessible normative beliefs concerning the expectations of important referents. Actual behavioral control refers to the extent to which a person has the skills, resources, and other prerequisites needed to perform actual behavior. Successful performance of the behavior depends not only on a favorable intention but also on a sufficient level of behavioral control (Ajzen and Fishbein, 1980). (Ajzen, 1985) believes that behavioral, normative and control beliefs influenced by a wide variety of cultural, personal and situational factors.

The studies have shown that behavioral attitude is affected by social norm (Meinzen Dick et al., 2002; Gilg and Barr, 2006; Malek Saeidi et al., 2012). They noted that local leadership affects participation in irrigation management and also farmers who have memberships in religious groups have greater willingness to participate in the collective actions. Shahroudi and Chizari (2007) stated a positive and significant relationship between social capital indices, especially social cohesion and attitude towards participation. Access to information on methods of natural resources conservation and management from agricultural experts significantly affects farmers' decisions to participate in natural resource conservation activities (Bekele and Darke, 2003). Blanke et al. (2007) revealed that extension efforts are the most important driving factors in adoption of water saving technologies. According to (Azizi Khalkheili and Zamani 2009), farmers have a negative attitude toward participation in irrigation management due to unfair distribution of water resources and inequality among them. Having a positive attitude toward water resources management in agriculture is a factor results in a positive interest toward water management participation.

Gilg and Barr (2006) believe that attitude toward water resources conservation affects water resources management behaviors. Garcia Vila et al. (2008) indicated that farmers with conservative attitudes toward water resources, have used more suitable cropping patterns by cultivating crops with less water needs or a mix of crops which were adapted to water scarcity. (Bjornlund et al., 2008) took the factors affecting farmers' proper management activities toward

water resources into consideration. They noted that perceiving advantages of correct management activities for increasing water resources efficiency leads to the significant use of conservation methods and management activities. Based on (Ritzema et al., 2008) awareness of the advantages related to drainage by farmers affect the use of these technologies. (Bjornlund et al., 2008) cited that understanding the existing barriers would constrict appropriate behavior. In such a way that application of modern irrigation technologies and proper management activities to increase water consumption efficiency will decrease through constricting factors like unsuitable financial status and physical conditions of farm. In other studies (Blanke et al., 2007; Karami and Mansoorabadi, 2007; Afshari, 2009), the importance of perceived behavioral control to form attitudes and sustainable behaviors has been confirmed.

The framework of this study is based on the theory of planned behavior and external variables based on above studies. The following model for investigating the factors influencing farmers' attitudes toward participation is presented (Fig. 1) and the effects of access to information of modern irrigation networks (ATI), attitude toward Water Agency Activities (ATWAA), attitude toward water resources management (ATWRM), knowledge of advantages of IDP (KOA), perceived behavioral control (PBC), social cohesion (SC), social norms (SN) and family members participation (FMP) variables on attitude toward participation in construction and maintenance of IDP (ATP) were investigated.

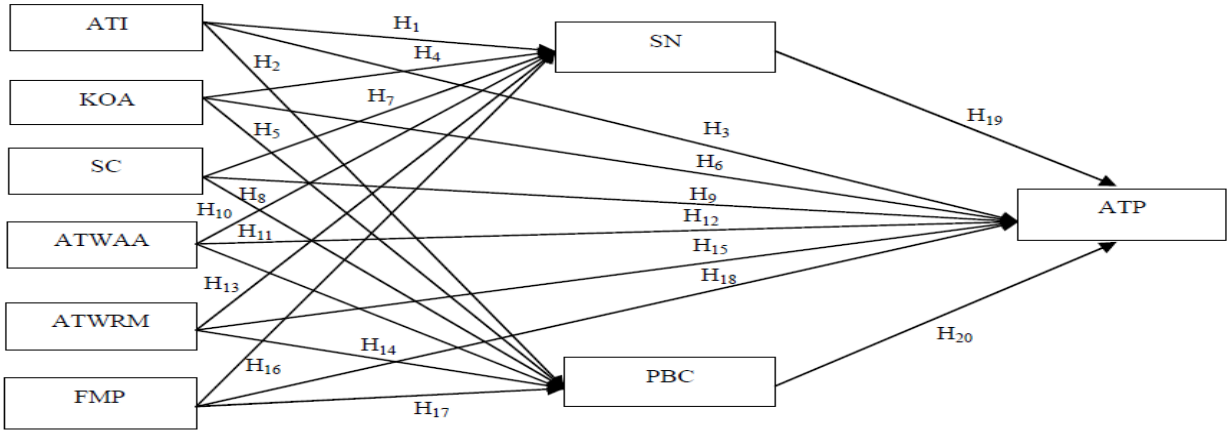


Fig. 1. Theoretical framework to study factors affecting attitude toward participation in IDP

MATERIALS AND METHODS

A survey was carried out among farmers in Syakh Darenjan, a semi-arid region located in the south west of Shiraz County, Fars Province, Iran. Stratified random sampling was used to select adopters of IDP who have participated in the construction of these projects with financial help, labor and etc, and non-adopters who had no participation in these fields. A modern irrigation and drainage network, as defined here, means open concrete or cement ditch or pipe facility carrying non-portable water for irrigation or drainage purposes as two strata. Considering Krejcie and Morgans' table (Krejcie and Morgan, 1970), a sample consisted of 156 adopters and 51 non-adopters. A questionnaire was used to collect data. The validity of questionnaire was tested by professors of Agricultural Extension and Education Department, Shiraz University. In addition, a draft of the questionnaire was-pilot tested among 28 farmers in a village outside the study area. The questionnaire was improved based on the pilot study. Cronbach's alpha to test reliability of the measurement scales ranging from 66%-85% (Table 1). Data was analyzed using SPSS and LISREL software, versions 16 and 8.54 respectively. Table 2 presents the variables definition and measurement.

RESULTS AND DISCUSSION

Measurement Model Evaluation

The proposed model was evaluated using Structural Equation Modeling (SEM). SEM comprises two aspects: the structural model in which hypothesized structural relationships between latent variables can be specified and tested and the measurement model in which hypothesized relationships between latent variables and the observed variables can be specified and tested. Estimation of measuring model, including test results of the model has been listed in Table 3. Model fit indices that arbitration results are based, including Chi-square statistic (χ_2) with degrees of freedom (df), goodness-of-fit (GFI) and adjust goodness-of-fit (AGFI), normed fit index (NFI) and non-normed fit index (NNFI), comparative fit index (CFI), root mean square residual (RMR), root mean square error of approximation (RMSEA) and multiple correlation coefficient square explaining the minimum index value for each in this step (Gefen et al., 2000; Markland, 2006). As we see the measurement model test presented a good fit between the data and the proposed measurement model and the goodness of fit indices (Table 3).

Table 1. Cronbach's alpha coefficients for research variables

Variable	Cronbach's alpha coefficient
ATI	0.66
ATP	0.76
ATWAA	0.68
ATWRM	0.84
KOA	0.86
PBC	0.66
SC	0.85
SN	0.85
FMP	0.67

Table 2. Variables definition and measurement

Variables	Variables definition and Measurement	Min	Max
ATP	This is related to opinions and beliefs of farmers about participation in irrigation and drainage projects. The variable was measured using items related to farmer's opinions in financial participation, the ability of farmers to participate in the construction and maintenance of canals, voluntary participation, establishing local associations to construct and maintain the canals and etc. The questions were in the form of five-point scales labelled from strongly agree to strongly disagree.	0	48
KOA	Estimated using items related to farmers' knowledge of advantages of irrigation and drainage networks such as preventing water waste, increasing water use efficiency, reducing land degradation, reducing drainage problems and etc. The questions were in the form of five-point scales labelled from strongly agree to strongly disagree.	0	40
ATWRM	This is related to opinions and beliefs of farmers about participation in irrigation and drainage projects. The variable was measured using items related to farmer's opinions in financial participation, the ability of farmers to participate in the construction and maintenance of canals, voluntary participation, establishing local associations to construct and maintain the canals and etc. The questions were in the form of five-point scales labelled from strongly agree to strongly disagree.	0	24
PBC	Estimated using items related to farmers' knowledge of advantages of irrigation and drainage networks such as preventing water waste, increasing water use efficiency, reducing land degradation, reducing drainage problems and etc. The questions were in the form of five-point scales labelled from strongly agree to strongly disagree.	0	16
ATWAA	This is related to opinions and beliefs of farmers about participation in irrigation and drainage projects. The variable was measured using items related to farmer's opinions in financial participation, the ability of farmers to participate in the construction and maintenance of canals, voluntary participation, establishing local associations to construct and maintain the canals and etc. The questions were in the form of five-point scales labelled from strongly agree to strongly disagree.	0	30
ATI	Estimated using items related to farmers' knowledge of advantages of irrigation and drainage networks such as preventing water waste, increasing water use efficiency, reducing land degradation, reducing drainage problems and etc. The questions were in the form of five-point scales labelled from strongly agree to strongly disagree.	0	24
SC	This is related to opinions and beliefs of farmers about participation in irrigation and drainage projects. The variable was measured using items related to farmer's opinions in financial participation, the ability of farmers to participate in the construction and maintenance of canals, voluntary participation, establishing local associations to construct and maintain the canals and etc. The questions were in the form of five-point scales labelled from strongly agree to strongly disagree.	0	64
FMP	Estimated using items related to farmers' knowledge of advantages of irrigation and drainage networks such as preventing water waste, increasing water use efficiency, reducing land degradation, reducing drainage problems and etc. The questions were in the form of five-point scales labelled from strongly agree to strongly disagree.	0	12
SN	This is related to opinions and beliefs of farmers about participation in irrigation and drainage projects. The variable was measured using items related to farmer's opinions in financial participation, the ability of farmers to participate in the construction and maintenance of canals, voluntary participation, establishing local associations to construct and maintain the canals and etc. The questions were in the form of five-point scales labelled from strongly agree to strongly disagree.	0	24

Table 3. Models' evaluation overall fit measurements

Goodness of fit measure	recommended criterion	obtained results from the total sample	Obtained results for	
			Adopters	non- adopters
Chi-square/degree of freedom (X^2/df)	≤3	1.21	1.37	0.78
p-value	≥0.05	0.42	0.76	0.90
Normed Fit Index (NFI)	≥0.90	0.99	0.99	0.99
Non-Normed Fit Index (NNFI)	≥0.90	0.98	1.03	1.2
Comparative Fit Index (CFI)	≥0.90	1.00	1.00	1.00
Goodness-of-Fit Index (GFI)	≥0.90	1.00	0.99	1.00
Adjust Goodness-of-Fit Index (AGFI)	≥0.90	0.96	0.95	0.96
Root Mean Square Residual (RMSR)	≤0.05	0.03	0.01	0.01
Root Mean Square Error of Approximation (RMSEA)	≤0.1	0.04	0.000	0.01

(Gefen et al., 2000; Markland, 2006)

Relationships and the Effects of Variables in Total Sample

Table 4 shows the correlations between the variables. The results indicated positive and significant relationship between knowledge of advantages of IDP with attitude toward participation in IDP ($r = 0.35$, $p < 0.01$). It has the least association with the dependent variable. Results demonstrated high association between perceived behavioral control and attitude toward water resources management ($r = 0.58$, $p < 0.01$). We see the highest correlation between social cohesion and attitude toward participation in IDP ($r = 0.57$, $p < 0.01$). Attitude toward Water Agency activities also has high association with attitude toward participation in IDP ($r = 0.57$, $p < 0.01$).

Based on fig 2 access to IDP information had a positive and significant direct effect on social norms ($\lambda= 0.22$, $p<0.01$), which was consistent with hypothesis H_1. The greater the access to information resources of IDP, the more the opinions of referent groups was valued. External variables such as knowledge of advantages of IDP and social cohesion have direct and meaningful effects on social norms (respectively $\lambda= 0.16$, $p<0.01$and $\lambda= 0.43$, $p<0.01$). These findings confirm H_4 and H_7 hypotheses respectively. These showed that if farmers were better informed of the IDP advantages and there was a higher social cohesion in the village, the villagers valued the opinions of farmers and agricultural experts more. Direct effect of attitude toward water resources management on social norms ($\lambda= 0.19$, $p<0.05$) is in accordance with H_{13}. In other words, farmers with a more positive attitude toward water resources management valued the opinions of referent groups more in relation to construction of IDP. The effect of family members participation on social norms was negative ($\lambda= -0.16$, $p<0.01$), which was not consistent with H_{16}. Taken together, these variables predicted 42 percent of variability in social norms (SMC = 42%).

Table 4. The correlation coefficients matrix between variables in total sample.

Variables	ATI	SN	KOA	SC	PBC	ATWAA	ATWRM	FMP	ATP
ATI	1								
SN	0.44**	1							
KOA	0.23**	0.32**	1						
SC	0.37**	0.52**	0.138*	1					
PBC	0.17*	0.03	0.21**	0.10	1				
ATWAA	0.18**	0.21**	0.133	0.53**	0.51**	1			
ATWRM	0.22**	0.25**	0.38**	0.16*	0.58**	0.42**	1		
FMP	0.12	0.36**	0.14*	0.31**	-0.16*	0.05	-0.01	1	
ATP	0.32**	0.24**	0.35**	0.57**	0.51**	0.57**	0.49**	-0.08	1

* Significant at $p<0.05$, ** significant at $p<0.01$

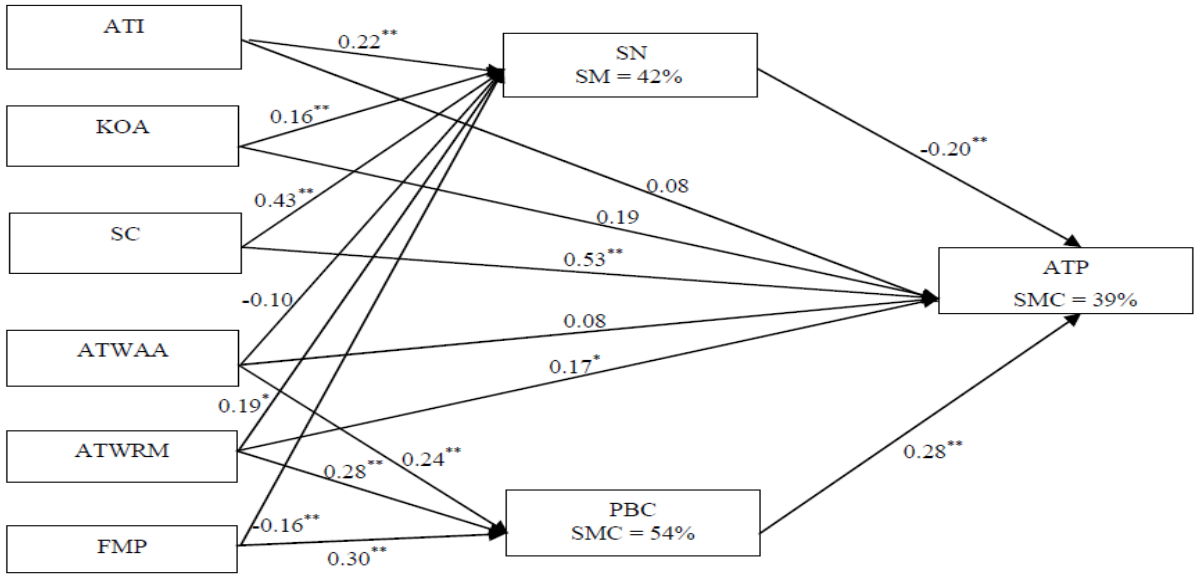
The direct effects of attitude toward Water Agency activities ($\lambda= 0.24$, $p<0.01$), attitude toward water resources management ($\lambda= 0.28$, $p<0.01$) and family members' participation ($\lambda= 0.30$, $p<0.01$) on perceived behavioral control were positive. These are consistent with H_{11}, H_{14} and H_{17} respectively. The direct effect of attitude toward Water Agency activities on perceived behavioral control indicated that the more positive attitudes toward Water Agency activities and the better perceived Water Agency activities regarding construction of IDP leads to better understanding of behavioral control. These variables accounted for 54% of the variability in farmers perceived behavioral control (SMC = 54%).

The results of causal relationships between independent or external variables with attitude toward participation in construction and maintenance of IDP, showed that social cohesion had the most direct effect on attitude toward participation in IDP ($\lambda= 0.53$,

p<0.01). This finding is in accordance with H_9 and lends support to (Shahroudi and Chizari, 2007) stated a positive and significant relationship between social cohesion and attitude towards participation in IDP.

After that, perceived behavioral control had the most significant effect on attitude toward participation in IDP (β= 0.28, p<0.01). As a matter of fact, in the case whereby farmers take advantage of more facilities and better condition for construction of modern irrigation and drainage canals, they will have an improved attitude toward participation in construction of the IDP. The significant effect of perceived behavioral control on attitude toward participation in IDP was compatible with the finding of (Bjornlund et al., 2008). Social norms had a direct, negative and meaningful effect on attitude toward participation in IDP (β= -0.20, p<0.01). One of the reasons for the low rate of construction of modern irrigation and drainage canals in areas including Fars Province, was related to referent groups whose opinions were valuable to villagers, and hence they resisted against the construction of the IDP in that area. Meinzen Dick et al. (2002) revealed that local leaderships have an effect on participation in irrigation management. Moreover, attitude toward water resources management had a direct and significant effect on attitude toward participation in IDP (λ= 0.17, p<0.05). Based on the results, a better attitude toward water resources management leads to greater participation in construction and maintenance of IDP. This is consistent with (Gilg and Barr, 2006) and Garcia- Vila *et al.* (2008). The results are in accordance with H_{20}, H_{19} and H_{15} respectively.

Based on fig 2, attitude toward Water Agency activities had an indirect effect on attitude toward participation in construction and maintenance of IDP through perceived behavioral control. It can be concluded that positive attitude toward Water Agency activities may not lead to a positive attitude toward participation unless the required conditions and facilities are provided. Participation of family had an indirect effect on attitude toward participation through perceived behavioral control and social norms. In total, the variables predicted 39% variances of attitude toward participation in IDP (SMC = 39%).



* Significant at p<0.05, ** significant at p<0.01

Fig. 2. Structural equations modeling and path coefficients between variables in total sample**.**

Relationships and the effects of variables among adopters

The relationships of nine variables tested between adopters using pearson coefficients (Table 5). A positive and meaningful relationship is seen between social norms with knowledge of the advantages of IDP (r = 0.22, p < 0.01), attitude toward Water Agency activities (r = 0.21, p < 0.01) and attitude toward participation in IDP (r = 0.21, p = p < 0.01). Based on table 5, there is a weak association between knowledge of advantages of IDP and attitude towards participation in IDP (r = 0.20, p < 0.01). We see highest positive and significant relationship between social cohesion and attitude towards Water Agency activities (r = 0.58).

A high positive and significant relationship was also seen between attitude toward Water Agency activities and attitude towards participation in IDP (r = 0.49, p < 0.01). Pearson correlation analysis demonstrated a positive and significant relationship between attitude toward participation in IDP and attitude toward water resources management (r = 0.20, p < 0.01).

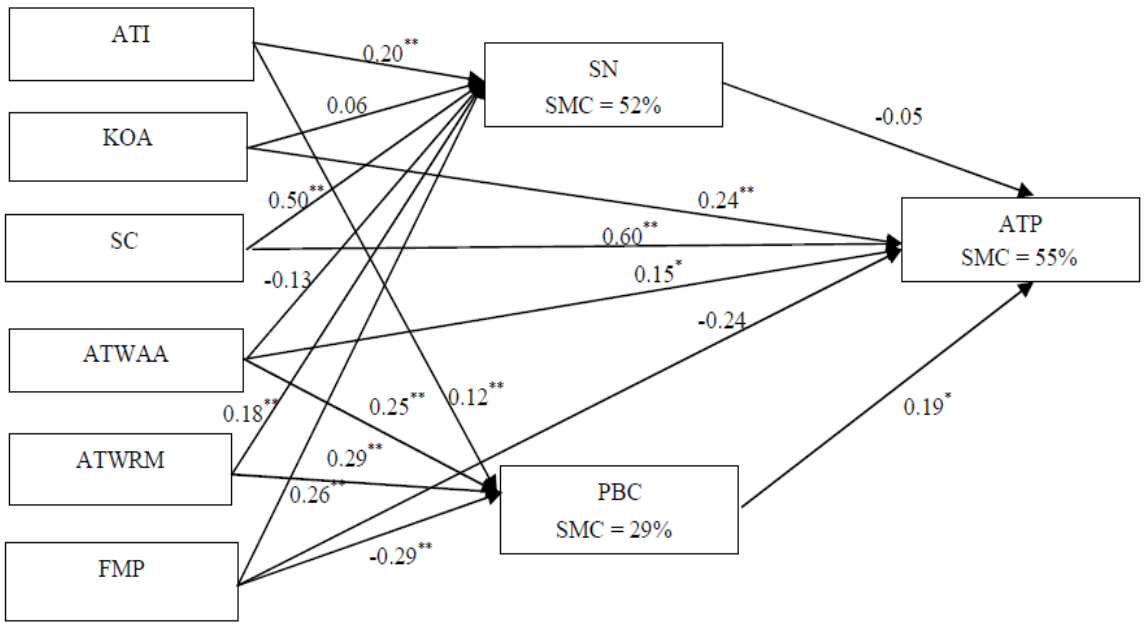
Table 5. The correlation coefficients matrix of variables among adopters.

Variables	ATI	SN	KOA	SC	PBC	ATWAA	ATWRM	FMP	ATP
ATI	1								
SN	0.43**	1							
KOA	0.12	0.22**	1						
SC	0.41**	0.60**	0.12	1					
PBC	0.03	-0.17*	-0.10	-0.13	1				
ATWAA	0.16*	0.21**	-0.10	0.58**	0.17*	1			
ATWRM	0.05	0.14	0.12	0.00	0.35**	0.13	1		
FMP	0.13	0.43**	0.15*	0.33**	-0.40**	0.00	-0.16*	1	
ATP	0.27**	0.21**	0.209**	0.54**	0.25**	0.49**	0.207**	-0.202*	1

* Significant at p<0.05, ** significant at p<0.01

Based on fig. 3, access to IDP information had a direct and positive causal effect on social norms (λ= 0.20, p<0.01). The finding confirms hypothesis H_1. Social cohesion had a direct effect on social norms (λ= 0.50, p<0.01), which was consistent with hypothesis H_7. Attitude toward water resources management and family members' participation (as an external variable) had a direct effect on social norms (λ= 0.18, p<0.01, λ= 0.26, p<0.01 respectively). The findings confirm H_{13} and H_{16} hypotheses respectively. These variables can predict 52% variances of social norms between adopters (SMC = 52%).

The access to IDP information had a direct effect on perceived behavioral control with positive and significant coefficient (λ= 0.12, p<0.01). Attitude toward Water Agency activities as an external variable affected perceived behavioral control with positive and significant coefficient (λ= 0.25, p<0.01). Attitude toward water resources management was the third variable affecting perceived behavioral control with positive causal effect (λ= 0.29, p<0.01). Family members' participation had a causal effect on perceived behavioral control with negative coefficient (λ= -0.29, p<0.01). The results were consistent with H_2, H_{11}, H_{14} and H_{17} respectively. All together, these variables predict 29% variances of perceived behavioral control (SMC = 29%).



*

significant at p<0.05, ** significant at p<0.01

Fig. 3. Structural equations modeling and path coefficients between variables in adopters

The findings showed that social cohesion had a direct effect on attitude toward participation in IDP (λ= 0.60, p<0.01). This finding is in accordance with H9. The importance of social cohesion has been emphasized in previous studies (Shahroudi and Chizari, 2007). Knowledge of the advantages of IDP as an external variable had positive and significant causal effect on attitude toward participation in IDP (λ= 0.24, p<0.01). The same finding was also reported by (Bjornlund et al., 2008; Ritzema et al., 2008), which was consistent with

hypothesis H6. The attitude toward Water Agency activities variable was effective on attitude toward participation in IDP (λ= 0.15, p<0.05). Perceived behavioral control had a direct effect on attitude toward participation in IDP (β= 0.19, p<0.05). The significant relation between perceived behavioral control and attitude toward participation in IDP was compatible with the research of (Bjornlund et al., 2008). The results are in accordance with H12 and H20 respectively. The path coefficients for the variables mentioned above could predicted 55% of variability in attitude toward participation in IDP (SMC = 55%).

Relationships and the effects of variables among non-adopters

It is found low positive and significant relationship between knowledge of advantages of IDP with attitude toward participation in IDP (r = 0.30, p < 0.05). Social cohesion had a high positive and significant relationship with attitude toward participation in IDP (r = 0.58, p < 0.01). Further we see positive and significant relationships between perceived behavioral control with attitude toward participation in IDP (r = 0.44, p < 0.01). In addition, a positive and significant relationship has been found between attitude toward participation in IDP and attitude toward water resources management (r = 0.50, p < 0.01). (Table 6).

The results of causal model related to non-adopters demonstrated that attitude toward water resources management was the most effective variable regarding social norms (λ= 0.41, p<0.01) and then the knowledge of advantages of IDP was also effective (λ= 0.24, p<0.01). The other external variable with an effect on social norms was family members participation, with negative and significant effect (λ= -0.15, p<0.01). The findings are consistent with H_{13}, H_4 and H_{16} respectively. These external variables predict 40% of variances in dependent variable of social norms (SMC = 40%).

Table 6. The correlation coefficients matrix between variables among non-adopters

Variables	ATI	SN	KOA	SC	PBC	ATWAA	ATWRM	FMP	ATP
ATI	1								
SN	0.39**	1							
KOA	0.38**	0.52**	1						
SC	0.02	-0.02	-0.07	1					
PBC	0.34*	0.22	0.18	0.07	1				
ATWAA	-0.10	-0.15	0.02	0.02	0.16	1			
ATWRM	0.43**	0.41**	0.45**	0.14	0.35*	0.26	1		
FMP	0.00	-0.06	0.04	0.08	-0.08	-0.11	0.11	1	
ATP	0.34*	0.15	0.30*	0.58**	0.44**	0.19	0.50**	0.02	1

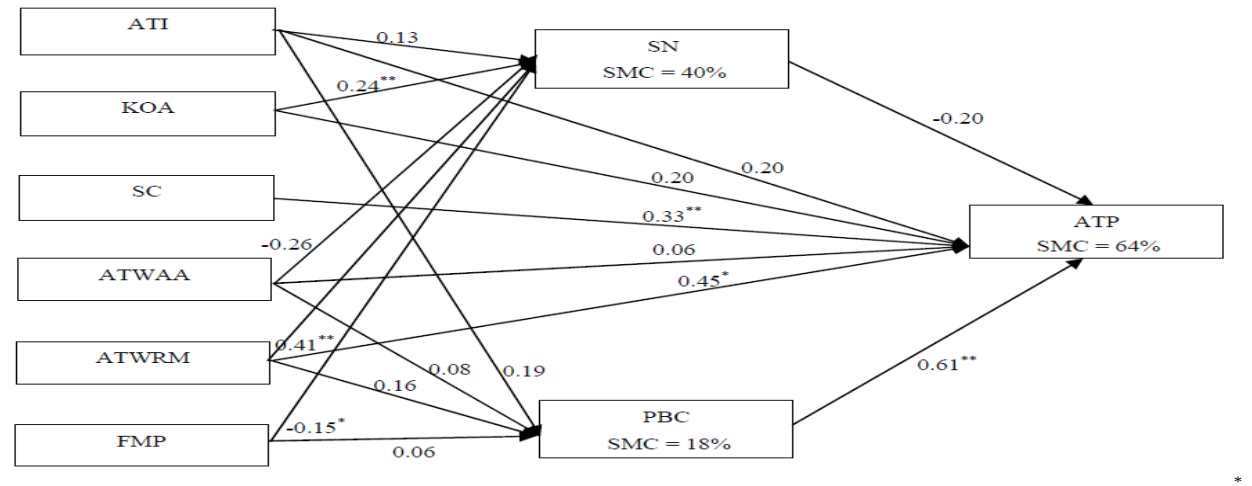
* Significant at p<0.05, ** significant at p<0.01

Based on the results, none of the external variables had an effect on perceived behavioral control. That is to say, the external variables of the study including Water Agency activities had no effect on increasing the perceived behavioral control among farmers. Actually, activities performed by Water Agency in providing conditions and facilities were not useful to increase farmers' perceived behavioral control.

The results of path coefficients between external variables and perceived behavioral control and social norms with attitude toward participation in IDP showed that perceived behavioral control as a moderating variable had the most direct and significant effect on attitude toward participation in IDP (β= 0.61 , p<0.01). This finding demonstrated the importance of this variable in forming individual attitude toward participation in construction and maintenance of IDP. (Bjornlund et al., 2008) indicated that application of modern irrigation technologies to increase water consumption efficiency will decrease through constricting factors like unsuitable financial status and physical conditions of farm. The finding is in accordance with H20.

Attitude toward water resources management (λ= 0.45, p<0.05) and social cohesion (λ= 0.33, p<0.01) are variables affecting attitude toward participation among non-adopters. The results are in agreement with H15 and H9 respectively. Significant causal relation between attitude toward water resources management and attitude toward participation in IDP confirmed the previous finding of Garcia- Vila et al. (2008) and Gilg and Barr (2006). These variables predict 64% of variability in attitude toward participation in IDP (SMC = 64%).

The results showed that attitude toward Water Agency activities had no effect on attitude toward participation. That is to say, Water Agency activities in the area had no effect to increase attitude toward participation for construction and maintenance of IDP among non-adopters. Actually, Water Agency activities as social activities had no effect on forming positive attitude toward participation in IDP. This should be taken into account, as the government strategy is to leave the operation and maintenance of irrigation and drainage canals to farmers. (Fig. 4).



Significant at $p<0.05$, ** significant at $p<0.01$

Fig. 4. Structural equations modeling and path coefficients between variables in non-adopters

CONCLUSIONS

This study used a model to investigate factors to improve attitudes toward participation in construction and maintenance of IDP to present practical recommendations. The results in total sample demonstrated that social cohesion was the most effective factor to increase attitude toward participation in construction and maintenance of IDP. Also, attitudes toward participation in IDP was affected by perceived behavioral control and social norms (reverse causal relationship). Moreover, attitude toward Water Agency activities through perceived behavioral control had an indirect effect on attitude toward participation in construction and maintenance of IDP.

The findings revealed attitude toward participation in IDP was directly affected by social cohesion, knowledge of the advantages of IDP, perceived behavioral control and attitude toward Water Agency activities among adopters. In other words, these four variables directly explained attitude toward participation among farmers adopting drainage and irrigation canals. Perceived behavioral control was the most important and effective variable on attitude toward participation in IDP among non-adapters. Besides, social cohesion and attitude toward water resources management are the variables which had a direct effect on attitude toward participation in IDP among non-adopters.

Perceived behavioral control refers to people's perceptions of their ability to perform a given behavior. Successful performance of the behavior depends not only on a favorable intention but also on a sufficient level of behavioral control. The individuals who believe they lack the required skills to perform a behavior anticipate failure and, thus, develop a negative attitude toward the behavior. Considering the effect of perceived behavioral control on attitude toward participation in construction and maintenance of IDP, particularly in non-adopters group, providing supportive helps (e.g. facilities and giving loans to farmers) with the purpose of improving farmers' financial abilities and promotion policies contribute to irrigation and drainage networks development.

Based on the results, activities of Water Agency in the area is important in improving attitude toward participation of adopters. Hence, farmers' participation in decision making, attracting their attention and confidence, engaging them, and assigning responsibilities will result in increasing participation in construction and maintenance of IDP. Also Water Agency personnel should have more frequent visits with farmers to receive their opinions and gain their trust, and to keep them informed in related issues.

Moreover, social norms had a negative effect on farmers' attitude. The policy implications are clear. Policy makers can use such important referent individuals or groups as communication channels. The application of external agent as the mediator between farmers and governmental organizations for exchanging their ideas is useful. Considering social aspects in the design of networks and employment of social experts as well as technicians and conducting scientific studies before the implementation of the projects are recommended. These improve procedures and help stakeholders in proving farmers' positive attitude toward the projects. Also providing information and strengthening extension services both in terms of its quality and coverage would boost farmers' attitude toward participation.

In collective decision making the outcome of a decision is not the result of a choice made by a central authority, but depends on the individual choices made

by the actors interested in the outcome (Achterkamp, 2002). It shows the importance of social cohesion in the formation of attitudes and behaviors. Due to the effect of social cohesion on attitude toward participation in construction and maintenance of IDP in adopter and non-adopter groups the decision makers can use assumptions of social exchange theory to increase social cohesion and improve the attitude of farmers. Social exchange theory is based on cooperative game theory. Influence in collective decision making is regarded as an exchange. An actor (ego) can choose to behave according to another actor's (alter's) wishes in one instance, in exchange to alter acting according to ego's wishes in another instance (Ibid). It can improve social interaction and reduce conflicts among villagers.

Attitude toward water resources management had a direct effect on attitude toward participation among non-adopters, so it is necessary to design suitable training courses to raise the awareness of farmers and improve their attitudes regarding conservation of basic resources, especially water.

Attitude is the most common determinant to adoption of new technologies in agriculture. A significant body of research to identify factors affecting the attitude has as its foundation in social psychology discipline. The model of this study was developed to explain the farmers' attitude to participation in a collective innovation in agriculture i.e. construction and maintenance of IDP. It is hoped the results of this study could be used to develop a comprehensive development strategy conducive to increasing attitude of farmers toward participation in development plans, especially irrigation and drainage projects. It is recommended that the model be extended to test the predicted adoption of innovations among farmers.

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تحقیقات کشاورزی ایران (۱۳۹۴) ۳۴(۱) ۸۰-۹۱

دیدگاه کشاورزان نسبت به مشارکت در طرح های آبیاری و زهکشی: تحلیل مدل معادلات ساختاری

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چکیده– بکارگیری کانال های مدرن آبیاری به منظور استفاده بهینه از آب کشور امری ضروری می باشد. به همین دلیل، بررسی عوامل تاثیرگذار بر نگرش کشاورزان نسبت به مشارکت در این طرح ها امری ضروری می باشد. این پژوهش به منظور تعیین عوامل موثر بر مشارکت در ساخت و نگهداری کانال های مدرن آبیاری در منطقه سیاخ دارنجان در استان فارس در ایران انجام گردید. از نمونه گیری تصادفی طبقه ای برای انتخاب ۲۰۷ نفر از کشاورزان بعنوان نمونه تحقیق استفاده شد. روایی و پایایی پرسشنامه مورد آزمون قرار گرفت. نتایج تجزیه و تحلیل داده ها با مدل معادلات ساختاری در کل نمونه مورد بررسی نشان داد که نگرش فرد نسبت به مشارکت در ساخت و نگهداری کانال های مدرن آبیاری از متغیرهای انسجام اجتماعی، درک کنترل رفتاری، ارزش قائل شدن برای نظرات گروه های مرجع و نگرش نسبت به مدیریت منابع آب متاثر می شود. همچنین نتایج بیانگر آن است که انسجام اجتماعی در گروه پذیرنده و درک کنترل رفتاری در گروه نپذیرنده بیشترین تاثیر را بر نگرش کشاورزان نسبت به مشارکت دارند.