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2 **Relationships between farmers' environmental behaviors and water resource**
3 **management: The case of Khuzestan Province, Iran.**
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14 **ABSTRACT (ARIAL, BOLD, 11 FONT, LEFT ALIGNED, CAPS)**
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Aims: This study investigated the Relationships between farmers' active in Zohre-Jarahi, Maroon and Gotvand Dam Irrigation Networks environmental behaviors and water resource management.

Study design: Cross- sectional study.

Place and Duration of Study: In Zohre-Jarahi, Maroon and Gotvand Dam Irrigation Networks in Khuzestan Province, between January 2008 and September 2009.

Methodology: Using simple random sampling technique, We included 278 farmer (258 Men, 20 women; age range 16-87 years). This study used Health Belief Model (HBM) to examine the attitude toward activities of water resource management and water resource management behaviors. This study used Health Belief Model (HBM) to examine the attitude toward activities of water resource management and water resource management behaviors.

Results: The results revealed that farmers' perceived benefits of water resource protection and perceived barriers of water resource protection and improvement directly influence on attitude toward activities of water resource management. Farmers' perceived susceptibility to water resource problems and perceived barriers of water resource protection and improvement had direct effect on farmers' water management behaviors. The findings showed that farmers' attitude toward activities of water resource management positively affect on water resource management behaviors.

Conclusion: This study was successful adding variables in Health belief model and made it more complete. Some applicable recommendations have been presented at the end of article according to the research conclusion.

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17 **Keywords:** Water management behavior, Perceptions, Health belief model, Dam Irrigation
18 Network, Iran.
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21 **1. INTRODUCTION**
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23 Nowadays, most regions around the world have faced the shortage of water
24 and environmental serious problems due to agricultural activities. There is a grave
25 competition on the water resource scarce especially in the arid and semi – arid
26 (Scagz & Shilfgard, 2002). In recent years, the farmers have become aware of the

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27 extent of the environmental resources degradation and its consequences, but this
28 had not led to change their behaviors. Then, individual positive attitude is not
29 sufficient to change behavior. There are existed socio-economic and psychological
30 factors within the domain of the household decision that may have limited their
31 capacity to change behavior (Bayard & Jolly, 2007).

32 Various studies have been emphasized the role of demographic, socio-
33 economic and farming factors in farmers' water resource management behaviors.
34 These studies, while recognizing the influence of personal background and
35 economic variables on individuals' environmental attitudes and behaviors, revealed
36 the importance of perceptions in the process of change (Bayard & Jolly, 2007; Gilg
37 & Bar, 2006, Lichtenberg & Zimmerman, 1999).

38 Bayard and Jolly (2007) employed Health Belief Model (HBM) to assess
39 individuals' environmental behaviors. HBM emphasize the role of four
40 psychological dimensions to influence individuals' decision to engage in a particular
41 behavior: perceived susceptibility, perceived severity, perceived benefits, and
42 perceived barriers. According to this model, individuals facing a particular threat
43 consider their susceptibility to and the severity of the problem; then they decision to
44 take action on the perceived benefits of and the perceived barriers to different
45 actions (Bayard & Jolly, 2007; Redding et al., 2000).

46 In the research was tried to employed health belief model and shifted it to
47 water resource management issues, assessed farmers environmental behaviors
48 regarding water resource and problems dam irrigation networks. So that, available
49 variables in this model have changed proportional to water resource management
50 topic in the dam irrigation networks. Therefore, the objective of this research is to
51 examine environmental behaviors of active farmers in Maroon, Zohre-Jarahi, and
52 Gotvand Irrigation Networks.

54 **Factors affecting environmental behaviors**

55 In recent years, growing environmental awareness about the depletion of
56 natural resources and irrevocable effects of human activities on the environment
57 has revealed the need to changing farmers' attitude and behaviors toward
58 environmental resource management and adoption of practices to protect the
59 environment (Bayard & Jolly, 2007). The farmers' attitudes and behaviors toward
60 environmental degradation have been studied by a number of social scientists. They
61 have emphasized the relationship between farmers' attitudes toward environment
62 and their farming practices (Rezaei-Moghaddam et al., 2005).

63 Tucker and Napier (2001, 2002) indicated that perceived susceptibility
64 toward water resource problems, perceived barriers of water resource protection
65 and perceived severity of environmental depletion have a significant influence on
66 the farmers' protection behaviors. Kaiser et al. (1999), Gilg and Bar (2006), Katsi et
67 al. (2007), Xu et al. (2008) and Garcia-Vila et al. (2008) found that farmers' attitude
68 toward environmental resources was an important factor influencing their
69 management activities regarding water resources. Azizi Khalkheili and Zamani
70 (2009) suggested that farmers' perception of water resources problems had a
71 significant effect on farmer participation in water management. Bekele and Darke
72 (2003) found a significant positive influence of perceived severity of environmental
73 resource depletion on protection behaviors. However, several researchers such as
74 Blanke et al. (2007), Bekele and Darke (2003) and Atari et al. (2009) showed that
75 farmers' perception of problems and limitations regarding application the desirable

water management methods have significant correlation with their protection behaviors of water resources. Bayard and Jolly (2007) and Lichtenberg and Zimmerman (1999) indicated that farmers' perceived susceptibility of environmental problems, perceived severity, perceived benefits and barriers of environmental resource protection and improvement influence their environmental behaviors. These researchers showed farmers' attitude play important role in determining farmers' behaviors.

A diagram has been developed to study the effects of independent variables on water management behavior (Fig. 1). In this model, "Perceived susceptibility toward water resources problems", "Perceived severity of water resource depletion", "Perceived water resources protection benefits", "Perceived water resources improvement barriers" and "Attitude toward activities of water resource management in area" as independent variables are the main factors affecting water management behavior. The model assumes that the variables affect water management behavior indirectly through attitude toward activities of water resource management in area.

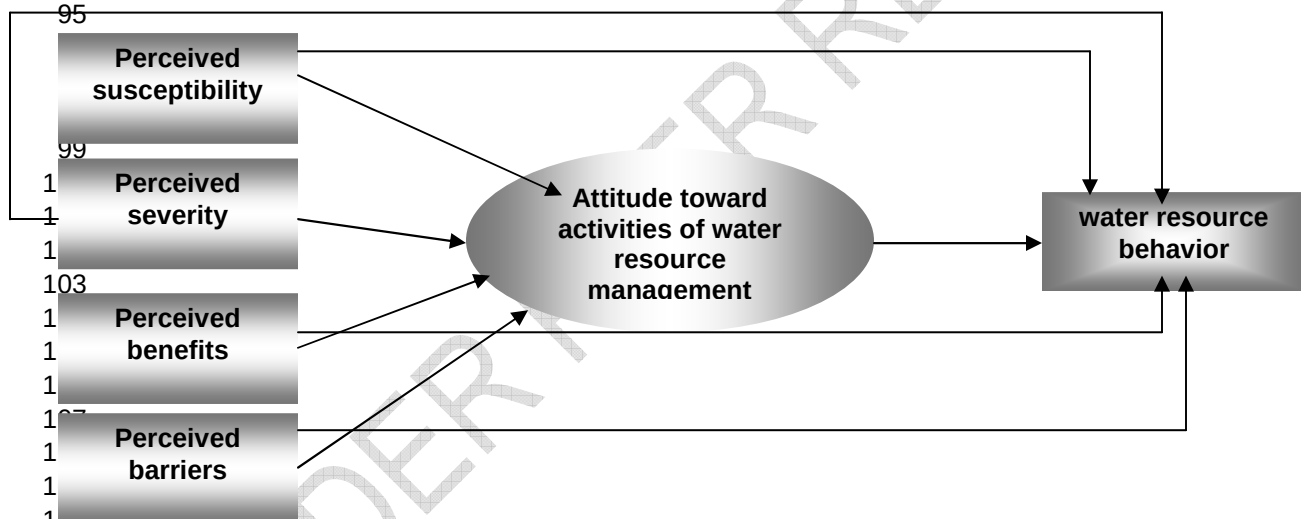


FIGURE1- THE DIAGRAM OF THE RESEARCH FRAMEWORK.

2. METHODOLOGY

The research was used a surveying methodology and conducted in Zohre-Jarahi, Maroon and Gotvand Dam Irrigation Networks, Khuzestan province, in south-western Iran. Khuzestan province is one of the important economic poles in Iran. This province has a special place in the water and energy resource planning. There are five great rivers including Karoon, Karkhe, Dez, Jarrahi and Hendijan in the Province. Five Dam Irrigation Networks with 239000 hectares exploit from these rivers in the shape of Nahye shomal, Zohre-Jarrahi, Maroon, Karkhe-shavor and Gotvand.

The final sample consisted of 278 farmers who used water from the irrigation networks. Using simple random sampling technique, the 26 farmer of Zohre-Jarahi dam

irrigation network, 72 farmer of Maroon dam irrigation network and 180 farmer of Gotvand Dam Irrigation Network were selected.

A questionnaire was used to collect required when the reviews of literatures were carried out. Based on the theoretical framework the questionnaire comprised individuals' characteristics and hidden variables with five to twenty questions, variables of Perceived susceptibility toward water resources problems, Perceived severity of water resource depletion, Perceived water resources protection benefits, Perceived water resources improvement barriers, Attitude toward activities of water resource management in area and, Water management behavior. Farmers commented on the study variable in the likert spectrum with 5 scales from completely disagree (1) to completely agree (5). Tables 1 shows conceptual definition of research variable.

Table1. Conceptual definition of the research variables

variable	Conceptual definition	Reference
Perceived susceptibility toward water resources problems	refers to an individuals' feeling of being affected by a particular problem	Bayard & jolly, 2007
Perceived severity of water resource depletion	the consciousness of the extensiveness of the problem	Reding et al., 2000
Perceived benefits	refers to the perceived economic and social benefits of environmental improvement	Bayard & jolly, 2007
Perceived water resources improvement barriers	Barriers means self-imposed psychological blockades, and factors that may hinder positive actions	Lichtenberg & Zimmerman, 1999
Attitude toward activities of water resource management in area	as a farmer's positive or negative evaluation to perform the activities of water resource management in area by the responsible organizations	Beedell & Rehman, 2000
Water management behavior	amount of applying the suitable water management activities by the farmers.	Afshari et al., 2008

To check validity and reliability, the pre-test questionnaire was filled in by a sample of 30 farmer from outside of the main sample selection, in the shape of a pilot study. Reliability is the extent to which an experiment, test, or any measuring procedure yields the same result on repeated trials. Validity refers to the degree to which a study accurately reflects or assesses the specific concept that the researcher is attempting to measure. Ideas were collected to determine Cronbach's Alpha coefficient for determining the reliability of the questionnaire and variables. The Cronbach's Alpha was between **0.61 and 0.85** for the variables.

3. RESULTS

The Pearson correlation (is a measure of the **correlation** (linear dependence) between two variables. It is widely used in the sciences as a measure of the strength of linear dependence between two variables) was used to test the relationship between selected variables and farmers' attitude toward activities of water resource management in area and water management behaviors (Table 2). The results revealed a negative and significant relationship between farmers' water management behaviors and perceived susceptibility toward water resources problems ($r=-0.197$, $P=0.001$). Also, there was also a positive and significant correlation between farmers' perceived of the benefits of protection water resources and barriers of the water resources improvement with the water

management behaviors (Table 2). The Pearson correlation test did not show any significant relationship between perceived severity of water resource depletion and water management behaviors. Results indicated a positive and significant relationship between farmers' attitude toward activities of water resource management in area and water management behaviors ($r=-0.125$, $P=0.038$). Furthermore, the Pearson correlation test indicated a significant and positive relationship between farmers' perceived of water resources protection benefits and attitude toward activities of water resource management in area ($r=-0.154$, $P=0.010$). There was also a negative and significant relationship between farmers' perceived of barriers of water resource improvement and attitude toward activities of water resource management in area (Table 3).

Table 2-Pearson Correlation between farmers' behaviors and selected variables.

Variables	r^a	p^b
Attitude toward activities of water resource management in area	0.125	0.038*
perceived susceptibility toward water resources problems	-0.197	0.001**
perceived severity of water resource depletion	0.104	0.082
perceived of water resources protection benefits	0.121	0.044*
Perceived water resources improvement barriers	0.129	0.0001**

*and **= significant at $\alpha=5\%$ and 10% , respectively.
^a and ^b= coefficient of correlation and level of significance, respectively.

Table 3- Pearson Correlation between farmers' attitude and selected variables.

Variables	r^a	p^b
perceived susceptibility toward water resources problems	0.116	0.053
perceived severity of water resource depletion	0.036	0.554
perceived of water resources protection benefits	0.154	0.01*
Perceived water resources improvement barriers	-0.219	0.0001**

* and **= significant at $\alpha=5\%$ and 10% , respectively.
^a and ^b= coefficient of correlation and level of significance, respectively.

The findings of path analysis (path analysis is used to describe the directed dependencies among a set of variables) showed that perceived of the benefits of water resource protection and perceived barriers of water resource improvement directly influence the farmers' attitude toward activities of water resource management in area (0.152 and 0.207). Attitude toward activities of water resource management in area had significant and direct effect on water resource behavior. Therefore, these variables indirectly affected the farmers' behaviors in relation to water resources management (figure 3).

Table 4- Path Coefficient of the farmers' behaviors in the HBM model.

Variables	Direct affects	Indirect affects	Total of causal effects
attitude toward actions of water resource management in area	0.204**	0	0.204
perceived susceptibility toward water resources problems	-0.266**	0.019	-0.247
perceived severity of water resource depletion	0.108	-0.011	0.097
perceived of water resources protection benefits	0.105	0.031	0.136
Perceived water resources improvement barriers	0.325**	-0.042	0.283

* and **= significant at $\alpha= 5\%$ and 10% , respectively.

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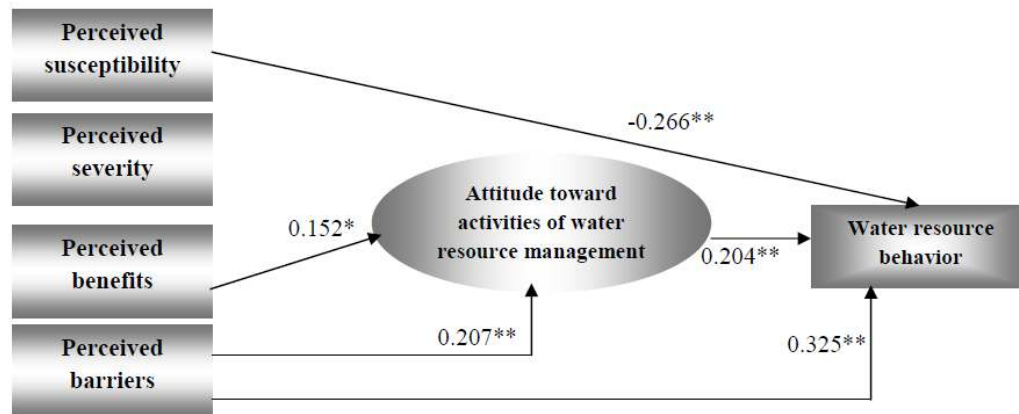
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The direct and indirect effect of variables on the water management behaviors have been presented in Table 4. The results indicated that perceived barriers of water resource protection had the most direct effect on the water resources behaviors. Perceived susceptibility toward water resources problems had a negative and significant influence on water resources behaviors. The path coefficient for perceived susceptibility was -0.266.



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Figure2- Path diagram of variables affecting water resource management behaviors

4. CONCLUSION

An important finding of the study was the significant positive effect of perceived susceptibility toward water resources problems, perceived of water resources protection benefits and Perceived water resources improvement barriers with farmers' attitude toward activities of water resource management in area and water management behaviors. The more susceptibility farmers felt about the water resource problems, they become more aware of the extent of water resource degradation in Dam Irrigation Networks limits. This leads to develop a positive attitude to perform activities by the active organizations in the area in relation to water resource management to combat the problems. Perception of the benefits of an improved water resource seemed to play a significant role in influencing farmers' attitude toward activities of water resource management in area. The results indicated that farmers were more likely to develop a positive attitude if they perceive greater

210 benefit from an improved water resource. Therefore, farmers' attitude toward activities of
211 water resource management in area significantly influences the water resource management
212 behaviors. This suggests that the active organizations in area should develop the strategies
213 to aware the farmers in the Dam Irrigation Networks the importance and severity of water
214 resource degradation and its consequences. Policy makers should consider not only the
215 importance of water resource threats, but also the reasons of these threats. They (the policy
216 makers and planners) should follow the appropriate and modern activities to improve and
217 protection of water resources. Eventually, it can be suggested that the better farmers'
218 attitude toward appropriate methods and their benefits, the better their behaviors to protect
219 water resources.

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