



REVIEW ARTICLE

Identifying factors affecting optimal management of agricultural water



Masoud Samian *, Karim Naderi Mahdei, Heshmatollah Saadi, Reza Movahedi

Agricultural Extension and Education Dep., College of Agriculture, Bu-Ali Sina University, Hamedan, Iran

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Abstract The main aim of this study was to explore the factors affecting optimal management of agricultural water in Hamadan's area. The statistical population of the study included all Hamadan's farmers. A number of 148 farmers were selected randomly through a proportional sampling method in two phases. Both questionnaire and interview techniques were used in order to collect data. The empirical and face validity of the questionnaire was verified by a panel of experts consisting of faculty members and natural resource specialists. The questionnaires' reliability was tested by Cronbach's Alpha technique and it was 91% ($\alpha = 0.91$).

In addition to quantitative methodology such as descriptive statistics and factor analysis a qualitative methodology was employed for dynamic simulation among variables through Vensim software. In this study, the factor analysis technique was used through the Kaiser-Meyer-Olkin (KMO) and Bartlett tests. From the results, four key elements were identified as factors affecting the optimal management of agricultural water in Hamedan area. These factors were institutional and legal factors, technical and knowledge factors, economic factors and social factors.

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* Corresponding author. Tel.: +98 918935722.

E-mail address: samian.masoud@yahoo.com (M. Samian).

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1. Introduction

Water is an important resource for human society and protection of this natural resource efficiently has become one of the main challenges of this century. According to Iran's geographic information, the country is located in a semi-arid region on the earth. Therefore, it can easily be claimed that the limitation of water resources is one of the major factors in the agricultural development of Iran. The atmospheric precipitation (70% rain and 30% snow) brings the total up to 450 billion m³ of water (Goudarzi et al., 2009). In the present situation, about 269 m³ of this figure is lost in different forms; however, 30 and 35% of this is devoted to urban areas and agriculture, respectively (Zahtabiyani, 2005). On the other hand, 93% of the total water resources are used in agricultural sector, and less than 7% is allocated to municipal and industrial uses. Therefore, the proper water management in this sector is essential and plays a critical role in the sustainable development of agriculture (Keshavarz and Heydari, 2004). Since many countries for years have been faced with a serious crisis due to shortage of water resources on one hand and on other hand due to population growth and economic and social development, it can be said that water problems in the future would be more and more and water would be undoubtedly an important issue (Najafi, 2005). Based on the UN Commission on Sustainable Development, the growth of water demand in 2025 would be equivalent to 212% of demand in 1990, which means the need to consume water will be more than the country's water resource.

Water is a critical resource for farmers, and ensuring access to water is very important for reducing poverty in rural areas because poverty reduction will lead to food security. There is no agriculture and food security without water; this is an important message from a member of the International Federation of Agricultural Producers (International Federation of Agricultural Producers, 2005). Iran, as a developing country, is located in arid and semi arid areas in which water scarcity is a major issue (Forooghi et al., 2006) and regarding to the highest level of water shortage is in the agricultural sector, the need for efficient use, or in other words, management of agricultural water is inevitable. Agricultural water management is a systematic approach to control water in the farm and it leads to the provision of crop irrigation and drainage while there are physical, social and governmental problems in production systems (Forrest, 2002). The aim of the effective management of agricultural water is to increase economic performance with reduced consumption of water and energy (Pandy et al., 2000; Panda et al., 2004). So, agricultural water management in areas that are facing the problem of water shortage seems to be more important to expect maximum efficiency from the minimum water resources.

Undoubtedly, understanding the factors affecting agricultural water management can provide management strategies

in agricultural water. About factor affecting the agricultural water management some researches and studies have been conducted both in Iran and worldwide. Below some of these studies are mentioned.

Wijayaratna (2002) believes that the major obstacles of the success of agricultural water management are lack of providing subsidies and financial support for farmers and users' enterprises. Burak (1999) also acknowledges that having the government technical support is essential, especially for small WUAs (Water User Associations), because they have so many financial challenges in the new irrigation system. Koh et al. (2002) in a study entitled agricultural water in Korea mention that water use, water quality and integrating the laws which are related to improving water use are all important factors in water management and they believe that comprehensive rules should be developed in the field of water management. Based on the study of Regner and the colleagues (2006), failure to provide necessary training to farmers on irrigation management is an important problem in the field of water management success. Pereira et al. (2002) also determine the responsibility of farmers for maintenance of canals and water resources as an effective component in water management.

Azizi (2001) divided the components of successful water management in several categories that include management, physical (cropping pattern, the number of components, climate, irrigation method, etc.), economy (finance, insurance, difficult access to inputs, etc.), social (consumer behavior, neighbors, responsibility of sponsoring, non-agricultural income, etc.) and institutional components (ownership of water resources, lack of law enforcement, rental of water resource). Davarpanah et al. (2001), in their study, add to crop insurance agent in the form of economic agent, coordination between governmental organizations in the form of institutional agent, and supportive government policies. Ehsani and Khaledi (2003), about the role of education in promoting and increasing the efficiency of agricultural water considered the role of extension and education important. Zahtabiyani (2005) believes that lack of the irrigation management is due to low irrigation efficiency and he adds that the role of education in promoting and improving irrigation management and irrigation efficiency is remarkable. Panahi et al. (2009), confirm on increasing farmers' knowledge and skills through various training and extension programs (with new methods and considering the recent developments in the agricultural world) as important actions which should be considered in the programs of improving water use efficiency. Farshi (2005), in his study, refers to the role of education and extension in irrigation and increasing farmers' knowledge, development and improvement of modern water transmission and distribution networks, applying new methods of irrigation in increasing irrigation efficiency and water efficiency management. Accordingly, Farzampour (2001) believes that the following factors are influencing toward agricultural water management: effective pass

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