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Full Length Research Paper

Exploring Indigenous Knowledge Uptake in Agricultural Water Management: A Case Study of Dry Regions in Iran

Seyed Jamal F. Hosseini[1]*, Azita Zand[2] and Masoumeh Arfaee[3]

[1]Department of Agricultural Extension and Education, Science and Research Branch, Islamic Azad University, Tehran, Iran.
[2]Islamic Azad University, IslamShahr Branch, IslamShahr, Iran.
[3]Islamic Azad University, Ashtian Branch, Ashtian, Iran.

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Experts in Iran were surveyed in order to explore their perception about the factors that influence farmers to adopt the indigenous knowledge in water management in agriculture sector. The methodology used in this study involved a combination of descriptive and quantitative research. The total population was 150 experts from Ministries of Agriculture and Interior. The results of factor analysis indicated that the factors were categorized into four groups, namely social, extension education, economic and managerial factors ordered by the magnitude of their impact.

Key words: Indigenous knowledge, agriculture sector, water, Iran.

INTRODUCTION

Today, there are several major issues in connection with the water sector in developing and developed countries which include: water cycle, quality of life, equality of water, sustainability and human rights (Sohail and Cavill, 2006). The management of water resources especially in agriculture sector has always been a major issue. Governments throughout the world have established programs to mange the water consumption more efficiently and effectively. Indigenous knowledge along with the modern irrigation systems has provided an opportunity for farmers to consume less water in the agriculture sector (Barnes and Ashbolt, 2006). Iran is no exception and the policy has been to increase agricultural production for various reasons, such as price stability, improved per capita income and increased need for non- oil foreign exchange resources and this trend has become an unavoidable reality for agricultural sector. Increasing agricultural production has resulted in consumption of more water and there is no other way to change the amount of water used which is the equivalent of 130 billion cubic meters a year unless to use water more efficiently and to adopt new methods of irrigation.

Consumption of water by agriculture sector in Iran has always been an issue of concerns, which is caused by high water losses in farm fields, farms inappropriate shape and size, lack of knowledge of farmers about making optimum use of water, rapid destruction of water infrastructure, loss in quality of irrigation networks, inappropriate methods of irrigation, irrigation efficiency and loss of water in irrigation systems (Keshavarz, 2000). Ommani et al. (2009) citing Keshavarz et al. (2003) pointed out that the overall irrigation efficiency in Iran ranges from 33 to 37%, which is lower than the average for both developing countries (45%) and developed countries (60%). Unfortunately, inefficient use of water in the past decades has nearly reduced more than 40 meter in underground water level (Unit, 2005).

Currently, the total water consumption is approximately 88.5 bm3, out of which more than 93% is used in agriculture, while less than 7% is allocated to urban and industrial consumption. Under the present situation 82.5 bm3 of water is utilized for irrigation on 7.5 million hectares of land under irrigated agriculture (Ommani and Noorivandi, 2003). One way to combat this problem is to use indigenous knowledge along with new technologies and methods to manage water more efficiently especially in agricultural sector (Karami et al., 2006). Indigenous knowledge is a part of national heritages of each

*Corresponding author. E-mail: jamalfhosseini@srbiau.ac.ir.

Table 1. Variables and their measurement scale.

Variable	Measurement scale
Attitudes about indigenous knowledge	Five- point Likert
Managerial factors	Five- point Likert
Economic factors	Five- point Likert
Social factors	Five- point Likert
Extension and education factors	Five- point Likert

nation, which included beliefs, values, methods and local awareness and ecological knowledge of people in their living environment. Studies show that indigenous knowledge has high potentials for development of rural areas with emphasize on preservation of environment. The role of indigenous knowledge in the process of sustainable development should not be ignored. In fact, agricultural sustainability is not about technical fixes and expertise. It is development processes that need to integrate ecological and societal knowledge through changes in policy, institutions, and behavior (Saifi and Drake, 2008). Over a millennium, indigenous people of Himachal Pradesh have evolved a large number of practices locally called Indigenous Technical Knowledge (ITK) relating to soil and water management systems suitable for different agro climatic conditions of the state (lal and Verma, 2008). Fazel (2008) in a study about the role of indigenous knowledge on environmental sustain- ability in Kurdistan Region found out that there was positive relation between preventive methods of soil erosion, participation in environmental projects, different methods of soil diagnosis, role of rural of population and non governmental organizations in protection of environment preservation with environ-mental sustainability.

The results of study by Rafiee et al. (2003) in the Sistan and Balouchstan province of Iran about traditional management of irrigation indicated that dredging traditional streams through participation of local population before fall cultivation season would guarantee the water rights of farmers. Greiner (1998) believes that local institutes, appropriate local technologies and low costs approaches can increase the development plans' efficacies, for that indigenous knowledge is a source which run natively and in case that some native resources used the development plans costs decrease remarkably and on the other hand causes local societies capability. Bridges (2006) in his research pointed out that utilization of indigenous knowledge would help to develop poor rural society in many parts of the world. The results of the study by Syzmnski et al. (1998) about the participatory rural appraisal methods show that indigenous knowledge would affect the utilization of farming lands. He also pointed out that the potential of indigenous knowledge have not been realized by many in rural areas. The participation of beneficiaries in designing, implementing and evaluating is an important element in water management. In this regard, it is recommended to provide grounds for participation of beneficiaries in management of water resources in rural areas (Schouten and Moriarty, 2003). The overall purpose of this study was to examine the perception of experts about the Factors Influencing the Adoption of Indigenous knowledge in water management in Dry Areas of Iran. The following objectives were formulated to guide the study: identify the personal characteristics of experts; assess the perception of experts about factors influencing the adoption of indigenous knowledge and provide suggestions for policy recommendations.

MATERIALS AND METHODS

The methodology used in this study involved a three stage combination of descriptive and quantitative research. Stage one involved a series of in-depth interviews were conducted with senior experts in the in the Ministries of Agriculture and Energy to provide a context. A questionnaire was developed based on these interviews and relevant literature. The questionnaire included fixed- choice questions. A five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) was used as a quantitative measure. The final questionnaire was divided into several sections. The first section was designed to gather information about personal characteristics of respondents. The second section was designed to measure the attitudes of experts about the factors that influence the adoption of indigenous knowledge by farmers in water management. The respondents were asked to indicate their agreements with statements by marking their response on a five point Likert-type scale. The variables and their measurement scale are presented in Table 1.

Content and face validity were established by a panel of experts consisting of faculty members at Science and Research Branch, Islamic Azad University, and some experts in the Ministries of Agriculture and Energy. Minor wording and structuring of the instrument were made based on the recommendation of the panel of experts. Stage two involved a pilot study with some experts who had not been interviewed before the earlier exercise of determining the reliability of the questionnaire for the study. Computed Cronbach's alpha score was 91.5%, which indicated that the questionnaire was highly reliable. Stage three involved a survey held in the fall of 2010. The research population included all expert in the field of water management in the Ministries of Agriculture and Energy (N = 350). Using random sampling and the results of the pilot test, a sample of 150 was constituted. The data collected by interviewing the respondents and analyzed by using ordinal factor analysis technique. The basic idea of factor analysis is the following. For given set of observed variables Y_1, Y_n one wants to find a set of latent variables $\xi_1, \ldots \xi_k$, $k<n$ that contain essentially the same information. The last version of their statistical

Table 2. Means of respondents' views about obstacles in adoption of indigenous knowledge in water management (1 = strongly disagree; 5 = strongly agree).

Statement	Mean and standard deviation	
	Mean	SD
Lack of access to indigenous of knowledge	3.62	0.84
Limited information about indigenous knowledge	3.67	0.93
Weak linkages between experts and farmers	3.79	0.97
Lack of training about indigenous knowledge	3.75	0.98
Lack of financial facilities	3.24	0.90
Lack of research about indigenous knowledge	3.50	0.98
Lack of roles and regulations	3.67	1.04
Lack of support from government authorities	3.37	1.05
Limited number of experts about indigenous knowledge	3.46	1.20
Farmers are not interested in using indigenous knowledge	3.39	1.26

Table 3. Classification of factors by using ordinal factor analysis.

Category	Variable	Variance by factor
Social	Beliefs about indigenous knowledge Farmers interests about indigenous knowledge Positive attitudes of indigenous knowledge Membership in water users association	54.13
Extension/Education	Visits to sample farms, training classes Practical projects, printed materials, Extension packages, seminar and workshops, internet	15.62
Economics	Income level of farmers Agriculture Insurance Grants during drought season Extending the time to repay the loans Drought loans	10.10
Managerial	Availability of experts in indigenous knowledge projects Organizing financial mechanisms Attitudes of managers about indigenous knowledge Participation of managers and policymakers in projects Allocation responsibilities to farmers and lower level authority	4.29
Total		84.15

software, named LISREL 8.8 can handle such analysis.

RESULTS

The results of descriptive statistics indicated that the respondents had an average age of 40 years old and more than 48% had master degree. The average of working experience was 15 years old. In order to finding the perception of experts about obstacles in adoption of indigenous knowledge in water management in agriculture sector, respondents were asked to express lack of interest by farmers in using indigenous knowledge (mean = 3.39). The classification of the factors into four variables was displayed in Table 3. The variables were classified in economic, social, managerial and extension/education. The basic idea of factor analysis is to find a set of latent variables that contain the same information. The classic factor analysis assumes that the both observed and the latent variables are continuous variables. KMO and Bartlet test were used to show their views (Table 2). As can be seen the highest mean number

Table 4. KMO amount and meaningful level of bartlet test.

Factorial analysis	KMO	Bartlet test	Sig
Factors influencing the adoption of indigenous knowledge	0.77	8201.205	0.00

refers to weak linkages between experts and farmers (mean = 3.79) and lowest mean number refers to extent variables have correlation and dependence to each other. In factorial analysis when KMO is less than 0.5, data are not suitable for factorial analysis and when KMO is between 0.5 to 0.7, data are suitable for factorial analysis. KMO amount and meaningful level of Bartlet test indicated in Table 4, that shows are very suitable for factorial analysis. The results show that these factors contributed about 84% of variance in the perception of respondents about factors influencing the adoption of indigenous knowledge in water management in dry region. Table 3 represents components of each factor, as well as, portion of each factor from the total common variance. As one may observe, about 53% of total common variance is explained by these four factors, where the majority of it has been explained by the social factor.

DISCUSSION

The perception of experts about the factors influencing the adoption of indigenous in agriculture water management in dry area of Iran was discussed in this article. The role of indigenous knowledge in improving the water management in agriculture sectors has been the subject of debate. It is evident that a significant number of the rural population in Iran has yet to be familiar about the role of indigenous knowledge in water management. In this regard, factors that influence the adoption of indigenous knowledge should be carefully identified and examined. Successful adoption of indigenous of knowledge in agriculture water management by farmers in dry areas of Iran will depend on the social, extension/education, economic and managerial factors, respectively. The results demonstrated that social factors are the most important factors influencing the adoption of indigenous knowledge. The results of this study show that economic factors influence the adoption of indigenous knowledge in agriculture water management and the results is consistent with Greiner (1998) observations that farmers favored indigenous knowledge because it is economically feasible for their communities. The results demonstrated that opinion and attitudes toward indigenous knowledge to a great extent depend upon extension/education factors. Extension/education factors influenced the adoption of indigenous knowledge.

Based on the results of the mean score, respondents indicated that visiting other farmer could influence them to adopt the indigenous knowledge. Moreover, the result is inconsistent with Hosseini et al. (2010) that farmers preferred visiting sample farmers to adopt irrigation methods. Managerial factors also contribute to adoption of indigenous of knowledge in agriculture water management. The findings highlight the need for participation of policymakers and managers in process of enhancing and encouraging the adoption of indigenous knowledge along with modern irrigation technologies. Syzmnski et al. (1998) reported that participatory methods should be considered as an important element in adopting the indigenous knowledge. The findings highlight the need for providing additional training and information, which in turn may lead to their adopting indigenous knowledge. Bridges (2005) indicate that indigenous knowledge could help farmers to empower themselves and eventually may lead to development of poor rural areas. Based on the perception of respondents, farmers are not interested in using indigenous knowledge. So in this regard, there is need for more training and education of farmers about indigenous knowledge in water management. Government should explore ways to increase the participation of farmers in planning, implementing and evaluating programs related to indigenous knowledge in water management. This could speed up the adoption and facilitate the exchange of ideas among various stakeholders.

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