African Journal of Agricultural Research Vol. 6(1), pp. 1-6, 4 January, 2011
Available online at http://www.academicjournals.org/AJAR
ISSN 1991-637X ©2011 Academic Journals

Full Length Research Paper

Analysis of sustainable water resources management (SWRM) in agriculture in Khuzestan Province, Iran

Ahmad Reza Ommani

Islamic Azad University, Shoushtar Branch, Shoushtar, Iran. E-mail: ommani75451@yahoo.com.

Accepted 9 August, 2010

The purpose of this research was to analyze the supportive policies and dimensions of sustainable water resources management (SWRM) in agriculture of Khuzestan Province of Iran. The research method was a quantitative research. Total population of experts in the study included all agricultural extension experts (n = 96) of agricultural-Jihad organization of Khuzestan Province, Iran. Based on frequency of respondents about important rate of supportive policies regarding SWRM in agriculture, 70.8% of respondents stated that encouraging farmers to use sustainable methods had very high importance. In reference to the frequency of respondents about extension system roles on realization of SWRM dimensions in agriculture, 52.8% of respondents stated that conservation of water resources had very high importance for supporting SWRM in agriculture.

Key words: Sustainable water resources management (SWRM), extension experts, farmers.

INTRODUCTION

Sustainable agriculture practices are tended to reduce the use of fertilizer, pesticides and maximal tillage worldwide (Chizari et al., 2006). Sustainable resource management is related to practices which local human populations use in sustainable manner (FAO, 1990; Chizari et al., 2006). Agricultural productivity reduces when ecosystems are changed and water resource decrease (Chen, 2005).

The success of sustainable agriculture depends on the motivation, skills and knowledge of farmers (Ommani, 2001). Extension programs have vital roles in this content. Extension can demonstrate the feasibility of sustainable practices. Consequently, sustainability is the successful management of resource to satisfy the challenging human needs, while maintaining or enhancing the quality of environment and conserving natural resource.

In Iran, many researches have been done on water management in the agro-business sector. They have looked at the problems and suggested possible solutions to improve the situation. Most of the researchers have tried to integrate certain facets of water management in the agricultural field (Keshavarz et al., 2003; Sepaskhah and Fooladmand, 2003; Tavakoli and Ahmadnejad, 2003; Arasteh et al., 2003; Ommani and Noorivandi, 2003; Khatoonabadi, 2003; Najafi, 2006; Aghaee et al., 2003; Chizari et al., 2006). Based on the above consideration, one of the major objectives of environmental, social and economical programs of Iran has been to identify ways such as supportive policies and dimensions of sustainable water resources management in agriculture, appropriate characteristics of agents and target groups of extension system.

Iran is located in arid and semi arid areas of the world. The average precipitation is 250 mm; that is less than one-third of the world average precipitation. The evaporation in Iran is more than the world average (between 1500 and 200 mm) and about 72% of total rainfall directly evaporates (Ommani and Noorivandi, 2003; Najafi, 2006). Therewith, spatial variation precipitation of the country is varied. Approximately, 50% of precipitation is rain at 24% of the area of the country and other 50% is rain at 76% of the country (Najafi, 2006).

Province of Khuzestan is located in the Southwest of the country, bordering Iraq and the Persian Gulf. Its capital is Ahwaz and it covers an area of 63,238 km^2. Khuzestan is the most ancient Iranian province and is often referred to in Iran as the "birthplace of the nation"(Ommani, 2001). The variety of agricultural products such as wheat, barley, oily seeds, rice, eucalyptus, medical herbs, the existence of many palm and citrus farms,

Table 1. Cronbach alpha for each part of experts' questionnaire.

Variable	Cronbach alpha
Perceptions regarding SWRM	0.915
Supportive policies regarding SWRM	0.811
Dimensions of SWRM	0.838
Resources of SWRM	0.888
New challenges regarding SWRM	0.828

having mountains suitable for raising olives, and of course sugar cane - from which Khuzestan takes its name, all show the great potential of this fertile plain (Chizari et al., 2006).

In recent years, Khuzestan province encountered shortage of water resources. Water resources management in agriculture and increasing the water use efficiency in Khuzestan province has a vital role for conservation of water resources (Organization of Agricultural-Jihad of Khuzestan, 2004).

Therefore, focus on efficient use of water through irrigation efficiency and improvements in management of water use will be the major challenges in the coming years. Recent events of drought in the country resulted in the reduction of water productivity in farming (Organization of Agricultural-Jihad of Khuzestan, 2004). Sustainable water resources management in agriculture and increasing the water use efficiency in Khuzestan province has a vital role in the conservation of water resources.

Research questions

The main research questions were: What are the supportive policies and dimensions of sustainable water resources management in agriculture and what are the new challenges regarding sustainable water resources management in agriculture? (Figure 1).

Basic challenges

Environmental pollution and destruction of natural resource is one of the serious problems faced by the people of Iran. Rapid population growth, industrialization and urbanization in the country have adversely affected the environment. Though, the relationship is complex, population size and growth tends to expand and accelerate the negative impacts on the environment (Razavi, 2001). All these in turn lead to increase in the pollution levels. However, environmental pollution not only leads to deteriorating environmental conditions, but also has adverse effects on the health of the people. Other challenges include; population growth and natural resource depletion, expand of farm lands and its effect on the destruction of environmental impact of agriculture on soil degradation and erosion impact of agriculture on water resource pollution.

Opportunities for improving

In Iran, like other developing countries, agriculture is one of the most important economic sectors and includes a high percentage of production and employment (Keshavarz et al., 2003). Sustainable water resources management (SWRM) is one of the major objectives of the agricultural development programs of Iran (Keshavarz et al., 2003; Ommani and Noorivandi, 2003). Karami et al. (2006) marked the period of 1980-present of Iran by an increasing awareness and concern for environmental problems caused by agricultural practices; period of crisis in development theory. Some of the approaches suggested for access to on-farm SWRM at period of crisis, are discussed below.

Special attention are given to the integrated use of water and other agricultural inputs (fertilizer, pesticides, etc.) and their impact on environment (Keshavarz, Heydari and Ashrafi, 2003), allocation of water to the farm based on crop water requirement, appropriate farm size to improve irrigation efficiency, usage of pressurized irrigation systems to substitute for surface irrigation methods, reduction of evaporation losses from soil surface (Hasheminia, 2004), usage of methods for storage and conservation of rain water and cultivation of crop varieties with short length of growth period (Keshavarz et al., 2003).

MATERIALS AND METHODS

A major form of non experimental quantitative research that was used in this research was correlation study.

Population of experts included total agricultural extension experts (N1=96) of agricultural-Jihad organization of Khuzestan province. Return rate was determined as 92.71% (N1=89).

To examine reliability evidence of questionnaire of farmers and experts, 30 copies of each questionnaire were distributed among Esfahan experts. Cronbach Alpha was used to examine reliability evidence used (Table 1). (Krejcie and Morgan, 1970).

RESULTS AND DISCUSSION

Agricultural extension experts' demographic profile

The first section was to describe agricultural extension experts' demographic profile in Khuzestan province of Iran. Approximately, 38.2% of respondents were between 20 to 30 years of age and 41.6% of them were between 31 to 40 years of age (Table 2). The majority of respondents (52%) had work experience in extension organizations between 1 to 10 years and a vast number of them were males (84.27%).

In reference to the frequency of respondents' as

Table 2. Agricultural extension experts' demographic profile.

Variables	f	%	Cum %
Age (years)			
20 to 30	34	38.2	38.2
31 to 40	37	41.6	79.8
41 to 50	14	15.7	95.5
50<	4	4.5	100
Total	89	100	
Level of education			
Bachelor of Science	77	86.5	86.5
Master of Science	11	12.4	98.9
Doctorate	1	1.1	100
Total	89	100	
Gender			
Male	75	84.3	84.3
Female	14	15.7	100
Total	89	100	
Work experience (years)			
5 or less	23	25.8	25.8
6 to 10	20	22.5	48.3
11 to 15	18	20.2	68.5
16 to 20	16	18.0	86.5
21 or more	12	13.5	100
Total	89	100	

concerned contact with the research centers, 7.9% of experts stated that they often have direct contact with the research centers. About 86.5% of experts had a bachelor degree level of education.

Supportive policies regarding SWRM in agriculture

The importance of conserving and protecting water resources has become an important part of resource management in rural areas. Sustainable water management is recognized in international agreements and a variety of strategies and programs in all levels of government (Anonymous, 2005).

Agricultural extension experts were asked to mention important rate of different supportive policies regarding SWRM in agriculture by 5-point scale (1=very low, 2=low, 3=moderate, 4=high and 5=very high). Ranking indicated that the 3 most important supportive policies regarding SWRM in agriculture were: (1) encouraging farmers to use sustainable methods; (2) increasing the knowledge of farmers as regards SWRM and (3) dissemination of organic farming (Table 3).

Based on frequency of respondents about important rate of supportive policies regarding SWRM in agriculture, 70.8% of the respondents reported that encouraging farmers to use sustainable methods had very high importance.

Role of extension system on realization of SWRM dimensions in agriculture

In the present study, the agricultural extension experts were also asked about the important rate of extension system roles on realization of SWRM dimensions in agriculture by 5-point scale (1=very low, 2=low, 3=moderate, 4=high and 5=very high). As Table 4 indicates, the 4 most important extension system roles according to the agricultural extension experts were: (1) conservation of water resources; (2) dissemination of new irrigation; (3) reduction of salinization and (4) reduction of chemical material in agriculture.

In reference to the frequency of respondents about extension system roles on realization of SWRM dimensions in agriculture, 52.8% of respondents stated that the conservation of water resources role had very high importance for supporting SWRM in agriculture and 38.2% of them stated that this item had high importance (Table 4).

New challenges of SWRM in agriculture

In the present study, the agricultural extension experts were also asked about the important rate of new challenges of SWRM in agriculture by 5-point scale (1=very low, 2=low, 3=moderate, 4=high and 5=very high). As Table 4 indicates, the 4 most important challenges of SWRM in agriculture according to the agricultural extension experts were: (1) Systemic thinking; (2) participatory approaches; (3) information and communication technology and (4) biotechnology and genetic engineering.

In reference to the frequency of respondents about new challenges of SWRM in agriculture, 64% of respondents stated that the systemic thinking had high importance for SWRM in agriculture and 5.6% of them stated that this item had very high importance (Table 5).

Recommendation

In service, training programs play a critical role in reinforcing staff capability, as well as renewing their skills. The organizations and institutes which are responsible for in-service training both for agricultural experts must consider the training needed by them.

The results of this study identified important supportive policies favoring SWRM in agriculture. Agricultural extension organizations in provincial and national levels

Table 3. Importance of supportive policies of SWRM in agriculture.

Supportive policies	Very low		Low		Average		High		Very high		Mean	SD*	CV**	Rank
	f	%	f	%	f	%	f	%	f	%				
Encouraging farmers for using sustainable methods	----	----	----	----	----	----	26	29.2	63	70.8	4.707	0.457	0.097	1
Increasing knowledge of farmers regarding SWRM	----	----	----	----	7	7.9	29	32.6	53	59.6	4.516	0.641	0.141	2
Dissemination of organic farming	----	----	----	----	15	16.9	50	56.2	24	27	4.101	0.657	0.160	3
Considering financial credit for SWRM	----	----	----	----	14	15.7	15	16.9	60	67.4	4.516	0.755	0.167	4
Development of local groups	----	----	----	----	15	16.9	24	27	50	56.2	4.393	0.763	0.173	5
Considering participatory technology development	----	----	----	----	22	24.7	35	39.3	32	36	4.112	0.775	0.188	6
Investigation on biotechnology and genetic engineering	----	----	8	9	34	38.2	34	38.2	13	14.6	3.584	0.850	0.237	7
Legal limitation l in pesticide using	----	----	18	20.2	17	19.1	35	39.3	19	21.3	3.618	1.039	0.289	8

Scale: 1=very low; 2=low; 3=moderate; 4=high; 5=very high; * standard deviation; ** coefficient of variation.

Table 4. Importance of extension system roles on realization of SWRM dimensions in agriculture.

Dimensions	Very low		Low		Average		High		Very high		Mean	SD*	CV**	Rank
	f	%	F	%	f	%	f	%	f	%				
Conservation of water resources	----	----	----	----	8	9	34	38.2	47	52.8	4.438	0.656	0.147	1
Dissemination of new irrigation	----	----	----	----	14	15.7	45	50.6	30	33.7	4.179	0.683	0.163	2
Reduce salinization	----	----	----	----	14	15.7	41	46.1	34	38.2	4.224	0.703	0.166	3
Reduce chemical material in agriculture	----	----	----	----	15	16.9	23	25.8	51	57.3	4.404	0.764	0.173	4
Increasing efficiency and productivity	----	----	----	----	15	16.9	26	29.2	48	53.9	4.370	0.759	0.174	5
Social and economic equality	----	----	7	7.9	15	16.9	40	44.9	27	30.3	3.977	0.891	0.224	6
Development of organic farming	----	----	6	6.7	36	40	27	30.3	20	22.5	3.674	0.914	0.248	7
Dissemination of food security dimensions	----	----	7	7.9	27	30.3	22	24.7	33	37.1	3.910	0.995	0.254	8
Improvement long-term economic situation	----	----	14	15.7	13	14.6	39	43.8	23	25.5	3.797	1.002	0.263	9

Scale: 1=very low, 2=low, 3=moderate, 4=high, 5=very high; * standard deviation; ** coefficient of variation.

Table 5. Importance of new challenges of SWRM in agriculture.

Challenges	Very low		Low		Average		High		Very high		Mean	SD*	CV**	Rank
	f	%	f	%	f	%	f	%	f	%				
Systemic thinking	----	----	7	7.9	20	22.5	57	64	5	5.6	3.674	0.703	0.192	1
Participatory approaches	----	----	7	7.9	1	1.1	23	25.8	58	65.2	4.483	0.867	0.193	2
Information and communication technology	----	----	----	----	31	34.8	32	36	26	29.2	3.943	0.802	0.203	3

Table 5 Cont.

Biotechnology and genetic engineering	----	----	7	7.9	11	12.4	49	55.1	22	24.7	3.966	0.831	0.209	4
Privatization	6	6.7	26	29.2	14	15.7	16	18	27	30.3	3.348	1.374	0.402	5
Globalization	13	14.6	19	21.3	18	20.2	4	4.5	35	39.3	3.325	1.528	0.459	6

Scale: 1=very low; 2=low; 3=moderate; 4=high; 5=very high; * standard deviation; ** coefficient of variation.

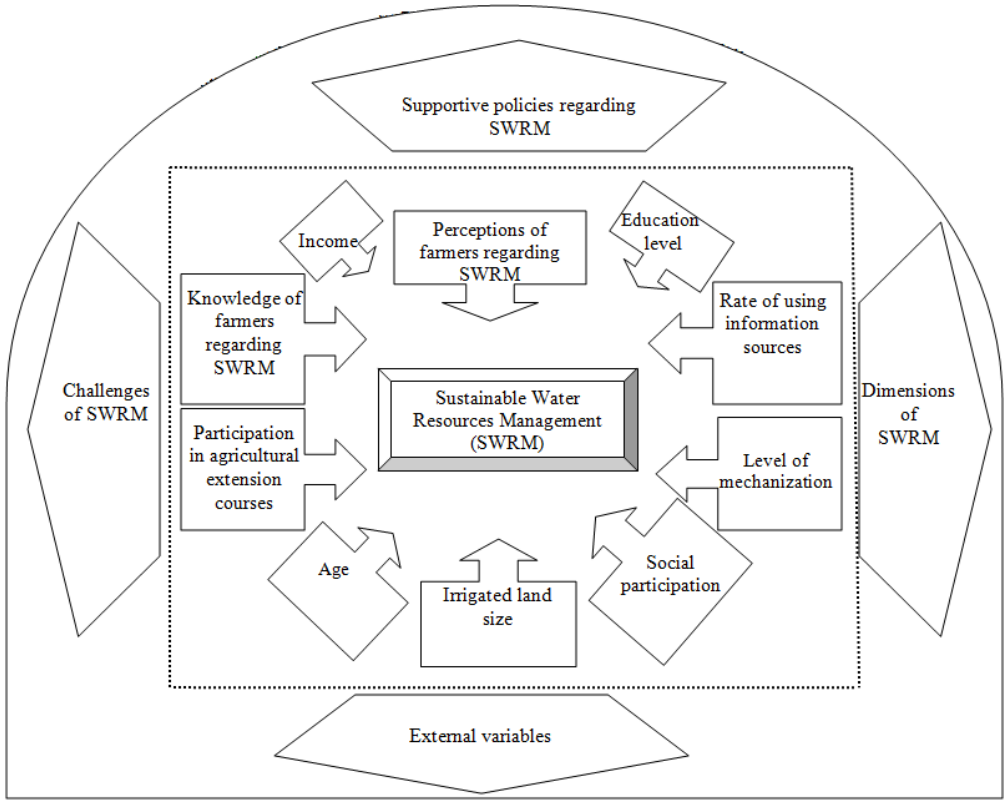

Figure 1. Theoretical framework of research.

can benefit from these proposed policies. The most important supportive policies identified for SWRM in agriculture were: encouraging farmers to use sustainable methods, considering financial credit for SWRM in agriculture, increasing knowledge of farmers about SWRM, dissemination of organic farming and limitations in pesticide usage.

In conclusion, it could be said that agricultural

extension, as a whole, aims at improving the competencies (knowledge, skills and perceptions) of farmers in order to improve their career performance. Therefore, it is suggested that adjustable and flexible extension and research programs would improve the understanding of complex farming system and effectiveness of relevant activities.

REFERENCES

Aghaee M, Hahansooz MR, Gharayazee B, Midani AR, Kanony (2003). Transfer of technology to farmers in the dryland areas of Iran. In Proceedings of the Seventh International Conference on the Development of Dryland, September 14-17, 2003, Tehran, Iran, pp. 437-441.

Anonymous (2005). Sustainable water management. Available on the: http://www.iclei.org/fileadmin/user_upload/documents/ANZ/WhatWeDo/Water/StonningtonSWMSfinal.pdf.

Arasteh PD, Shokohi AR, Saghafian B (2003). Use of geostatistics and time series analysis in groundwater simulation. In Proceedings of the Seventh International Conference on the Development of Dryland, September 14-17, 2003, Tehran, Iran, pp 453-458.

Chen (2005). In Rural Watersheds. Second South East Asia Water Forum, August-September, Bali, Indonesia. Available on the: http://www.sea-user.org/UserFiles/File/docs/Multiple Roles of Agriculture Water Management Systems Revised 02082005.pdf.

Chizari M, Ommani AR, Noorivandi AN (2006). Management of Dryland Sustainable Agriculture. Proceeding of International Symposium on Dry lands Ecology and Human Z (2005). Multiple roles of Agriculture Water Management Systems: Implications for Irrigation System Management and Integrated Water Resources Management.

FAO (1990). An International Action Programme on Water and Sustainable Agricultural Development. FAO, M/U1108/E/9-90, Rome, p. 42.

Hasheminia SM (2004). Water Management in Agriculture. Ferdowsi Mashhad University Publications, Mashhad. p. 536. (Persian).

Karami E, Rezaei-Moghadam, Ebrahimi H (2006). Predicting Sprinkler Irrigation Adoption: Comparison of Models. J. Sci. Technol. Agric. Nat. Res., 10(1): 90-105.

Keshavarz A, Heydari N, Ashrafi S (2003). Management of agricultural water consumption, drought, and supply of water for future demands. In Proceedings of the Seventh International Conference on the Development of Dryland, September 14-17, 2003, Tehran, Iran, pp 42-48.

Khatoonabadi A (2003). The role of non governmental organizations in sustainable dry land management: The case of Isfahan, Iran. In Proceedings of the Seventh International Conference on the Development of Dryland, September 14-17, 2003, Tehran, Iran, pp. 497-503.

Krejcie RV, Morgan DW (1970). Determining sample size for research activities. Educ. Psychol. Meas., 30: 608-618.

Najafi G (2006). Water and agriculture. Dehati, Monthly Agric., 28: 8-14.

Ommani AR (2001). Determining social, economical and farming characteristics of wheat farmers in Khuzestan province of Iran regarding adoption of low input sustainable agriculture (LISA). (Thesis). Tarbiat Modarres University, (Persian).

Ommani AR, Noorivandi AA (2003). Water as food security resource (Crises and Strategies). Jihad Monthly Sci., Soc. Econ. Mag., 255: 58-66.

Organization of Agricultural-jihad of Khozestan (2004). Annual report of agricultural productions in Khuzestan Province. Organization of Agricultural-jihad of Khozestan, Iran.

Razavi H (2001). Major challenges of rural and agricultural sustainable development process in Iran. Security, December 4-7, 2006, Sharjeh, United Arab Emirates. Jihad Monthly Sci., Soc. Econ. Mag., 236: 46-52.

Sepaskhah AR, Fooladmand (2003). Design and economic analysis model for rainfed vineyards in Fars Province of Islamic Republic of Iran. In Proceedings of the Seventh International Conference on the Development of Dryland, September 14- 17, 2003, Tehran, Iran, pp. 77-85.

Tavakoli H, Ahmadinejad H (2003). Agro-forestry and flood water farming as two effective methods in utilization of water in arid areas: A case study. In Proceedings of the Seventh International Conference on the Development of Dryland, September 14-17, 2003, Tehran, Iran, pp. 230-235.