Educational Needs of Watershed Experts (WEs) of Khouzestan Province, Iran Regarding of Sustainable Water Resources Management (SWRM) in Agriculture

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Abstract: The purpose of this research was determining educational needs and perceptions of Watershed Experts (WEs) regarding sustainable water resources management (SWRM) in agriculture. The research method was descriptive research. Total population of experts in the study included all (watershed experts N=79) of Agricultural-Jihad Organization of Khuzestan Province, Iran. The return rate questionnaires was 92.4% (N=73). Based on the results approximately, 75.4% of respondents had moderate perceptions about SWRM in agriculture. Ranking based on coefficient of variation indicated that the six most important training needs of watershed experts were: (1) New irrigation systems, (2) Identifying appropriate cultivation models, (3) Integrated insect pest management, (4) Water productivity and efficiency in agriculture, (5) Recycling farm waste , and (6) Crop rotations. 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 training needs of them.

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1. Introduction

Iran is located in the Northern Hemisphere between 25° and 40° N and 44° to 63° E. Agriculture plays an important role in the economy of Iran. It accounts for more than 80% of food requirements (Keshavarz et al., 2003).

Keshavarz et al (2003) pointed out, that overall irrigation efficiency in Iran ranges from 33 to 37%, which is lower than the average for developing countries (45%) and developed countries (60%). Apparently, the Iranian farmers consumed a lot more water per hectare than what is done globally for different crops (Hasheminia, 2004). Water is a vital resource for human health, economic development and environmental quality (Ommani and Noorivandi, 2003). Also water is an essential component in agriculture. Current conventional practices promote soil erosion, sedimentation, salinization and loss of natural wetland and watershed systems. In order to exam the role of agricultural water resources management in sustainable agriculture, economics, social equity and environment should be considered as important elements (Chizari, et al., 2006). FAO (2003) in a report about the Iranian economy and the role agricultural sector play in economy states: increase of agricultural activities due to use of chemical materials has contributed to the pollution of water. Also FAO reported that irrigation efficiency in the Middle East region is low. Based of this report, Iran ranked second after Iraq by 32%. Also, FAO iterated that water loss in Iran is very high. Iran in this regard is ranked second after Pakistan by 45 billion m^3.

By using participatory approaches to identify agricultural production constraints and educational need assessment in irrigated agriculture unfold the way for improved productivity (FAO, 2001). The major consumer of water in Iran is the agriculture sector. Improving the water resources management in agriculture has been one of the major objectives of Economical Development Programs of Iran (Najafi, 2006).

Sustainable water resources management (SWRM) describes the set of approaches particular to transmittal, consumption and conservation of water resource in agriculture (Ommani, 2010). It is consists of multiple approaches that include (Keshavarz, et al., 2003; Alizadeh and Keshavarz, 1998; FAO, 2001):

- Special attention to the integrated use of water and other agricultural inputs (e.g. fertilizers, pesticides, etc.) and their impact on environment .
- Use of pressurized irrigation systems for optimized water consumption.
- Optimization of Irrigation efficiency and water productivity of agricultural lands in farm scale.
- Improvement on surface irrigation in farms.
- Reduction of evaporation losses from soil surface in irrigated farms.

- Modifications on current cropping patterns for the optimum use of water resource for agricultural production and to increase agricultural productivity.
- Notice to nutrient soil management to increase maintenance ability of water.
- Building channel cement in path of water to transmit to farms.
- Manufacturing water maintenance pool for increase velocity water entry to farms.
- Allocating water resource to high economic value plants.

The goal of sustainable agroecological systems is to understand how natural ecosystems work and how communities, tribes or governments can use this knowledge to their advantage instead of working against it.

In Iran, many researches have done about water management in the agro-business sector. They have looked at the problems and suggested possible solutions to improve the situation. Most of these researchers have tried to integrate certain facets of water management in the agricultural field (e.g. 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; 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 extension mechanisms for supporting of sustainable water resources management in agriculture. One of the major aims of the Ministry of Agricultural-Jihad (MAJ) of Iran has been to increase the efficiency of water use through extension of new technology of irrigation systems and to development the models to predict the adoption behavior of farmers regarding new technology of irrigation (Karami, et al., 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; 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 with shortage of water resource. Water resources management in agriculture and increasing the water use efficiency in Khuzestan province have vital role for conservation of water resource (Organization of Agricultural-Jihad of Khuzestan, 2004). The purpose of this research was determining educational needa and perceptions of Watershed Experts (WEs) regarding sustainable water resources management in agriculture.

2. Material and Methods

The research method was descriptive research. In descriptive research, the researcher describe variables and may look for relationships among them, but does not manipulate the variables (Gay and Airasian, 2003). This method seeks to determine relationships among two or more variables. Total population of experts in the study included all watershed experts (N=79) of Agricultural-Jihad Organization of Khuzestan Province. The return rate was 92.4% (N=73).

A questionnaire was developed for gathering information from experts. The model questionnaires derived from studies of Arellanes and Lee (2003); Hersman (2004); Boone et al (2007); Keshavarz, et al., (2003); Rezaei-Moghadam, et al., (2005); Chen, (2005). The questionnaire of experts covered three areas:

- *Part One: Perceptions of experts regarding Sustainable Water Resources Management (SWRM) in agriculture.*

We examined perceptions of experts regarding Sustainable Water Resources Management (SWRM) in agriculture by 12 items. Likert scale (1=strongly disagree, 2=disagree, 3=unsure, 4=agree, 5= strongly agree) was used in this regard.

- *Part Two: Training needs of experts regarding SWRM in agriculture*

Also, we examined training needs of experts by 12 items. These items were regarding transmittal, consumption and conservation of water resources.

- *Part three: Determining demographic characteristics of experts.*

This part determined characteristics of experts such as; age, level of education, position, and location of work.

3. Results and discussion

Watershed Experts' Demographic Profile

The first section described watershed experts' demographic profile in Khuzestan Province of Iran. Approximately, 56.2% of respondents were between 20 to 30 years of age and 35.6% of them between 31 to 40 years of age (Table 1). Most respondents (83.6%) reported work experience, including 1 to 10 years and the vast majority of them were male (89.04%).

In reference to the frequency of respondents' contact with research centers and other experts, 43.8% of watershed experts in total claimed that they have often direct contact with extension experts that are

working regarding sustainable practices. About 91.8 % of experts had a bachelor degree level (Table 1).

Table 1. Agricultural extension experts' demographic profile

Variables	*Fre*	*Per*	*Cum Per*
Age (years)			
20 to 30	41	56.2	56.2
31 to 40	26	35.6	91.8
41 to 50	6	8.2	100
Total	73	100	
Level of Education			
Bachelor of Science	66	90.4	90.4
Master of Science	6	8.2	98.2
Doctorate	1	1.4	100
Total	73	100	
Gender			
Male	65	89	89.
Female	8	11	100
Total	73	100	
Work Experience (years)			
5 or less	13	17.8	17.8
6 to 10	19	26	43.8
11 to 15	26	35.6	79.4
16 to 20	11	15.1	94.5
21 or more	4	5.5	100
Total	73	100	
Contact with			
Research centers	14	19.2	19.2
University faculty members	6	8.2	27.4
Other agricultural extension experts that are working regarding sustainable practices.	32	43.8	71.2
Other experts that are working regarding sustainable practices.	7	9.6	80.8
Research centers and other agricultural extension experts	7	9.6	90.4
Without	7	9.6	100
Total	73	100	

General Perceptions of Watershed Experts Regarding SWRM in Agriculture

Asked watershed experts to give their perceptions about items of SWRM in agriculture on a five Likert scale (1=strongly disagree, 2=disagree, 3=unsure, 4=agree, 5= strongly agree). Their answers to these items in combination led to the perceptions of watershed experts about SWRM in agriculture. Based on interval of standard deviation from the mean perceptions of watershed experts about SWRM in agriculture divided to five levels. Approximately, 75.4% of respondents had moderate perceptions about SWRM in agriculture (Table 2).

Table 3 presents the perceptions of watershed experts about items of SWRM in agriculture. Table 4 shows that approximately 63% of watershed experts agreed that when they were asked term sustainable water resources management in agriculture profitability readily comes to mind.

Table 2. Perceptions levels of watershed experts about SWRM in agriculture

Perceptions levels	*f*	*%*	*Cum %*
Very low	7	9.6	9.6
Low	5	6.8	16.4
Moderate	55	75.4	91.8
Very high	3	4.1	95.8
High	3	4.1	100
Total	89	100	

Scale: 1=strongly disagree, 2=disagree, 3=unsure, 4=agree, 5= strongly agree
Mean: 47.67 Median: 50 SD: 5.85

Table 3. Perceptions of watershed experts about items of SWRM in agriculture

Do experts have a clear perceptions about SWRM in agriculture? When I hear the term sustainable water resource management in agriculture ……	Strongly Disagree		Disagree		Unsure		Agree		Strongly Agree		Mean	Sd
	f	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*		
1. Profitability readily comes to mind.	----	----	----	----	----	----	46	63	27	37	4.369	0.486
2. Productivity readily comes to mind.	----	----	----	----	----	----	47	64.4	26	35.6	4.356	0.482
3. I do consider it a priority for present clientele interactions.	----	----	----	----	7	9.6	34	46.6	32	43.8	4.342	0.650
4. Organic farming readily comes to mind.	----	----	----	----	7	9.6	28	38.4	26	35.6	3.589	0.879
5. I do consider it a priority for future clientele interactions.	----	----	8	11	6	8.2	20	27.4	39	53.4	4.260	0.972
6. Low chemical input readily comes to mind.	----	----	----	----	9	12.3	14	19.2	50	68.5	4.616	0.658
7. Environmental protection readily comes to mind.	----	----	----	----	20	27.4	14	19.2	39	53.4	4.260	0.866
8. Conservational technologies readily come to mind.	----	----	----	----	----	----	15	20.5	58	79.5	4.808	0.396
9. I do consider it environmentally sound.	----	----	7	9.6	----	----	19	26	47	64.4	4.452	0.913
10. I do consider it as proof that is economically feasible.	----	----	7	9.6	7	9.6	40	54.8	19	26	3.972	0.865
11. I do consider it as proof that is socially acceptable.	----	----	----	----	6	8.2	13	17.8	54	74	4.643	0.653
12. New irrigation method readily comes to mind.	----	----	----	----	1	1.4	45	61.6	27	37	4.360	0.488

Scale: 1=strongly disagree, 2=disagree, 3=unsure, 4=agree, 5= strongly agree

Table 4. Training needs of watershed experts regarding SWRM in agriculture

What areas of sustainable water resources management do watershed experts desire training?																
I need to training on the following topics….	Without		Very Low		Low		Average		High		Very High		Mean	SD*	CV**	Rank
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%				
1. Integrated insect pest management.	----	----	----	----	----	----	7	9.6	41	56.2	25	34.2	4.246	0.618	0.145	3
2. Organic matter management.	----	----	----	----	----	----	21	28.8	33	45.2	19	26	3.972	0.744	0.187	10
3. Water quality with respect to agrichemicals.	1	1.4	2	2.7	3	4.1	8	11	13	17.8	46	63	4.438	0.799	0.180	9
4. Crop rotations.	----	----	----	----	----	----	14	19.2	33	45.2	26	35.6	4.164	0.726	0.174	6
5. Food safety and pesticide residues.	2	2.7	3	4.1	2	2.7	7	9.6	27	37	32	43.8	4.246	0.759	0.178	8
6. Recycling farm waste.	----	----	----	----	1	1.3	13	17.8	40	54.8	19	26	4.068	0.673	0.165	5
7. Economics of sustainable agriculture.	----	----	2	2.7	----	----	10	13.7	28	38.4	33	45.2	4.274	0.750	0.175	7
8. Communication in sustainable agriculture.	----	----	----	----	----	----	21	28.8	26	35.6	26	35.6	4.068	0.805	0.198	12
9. Water productivity and efficiency in agriculture	----	----	1	1.4	2	2.7	4	5.5	34	46.6	32	43.8	4.342	0.650	0.149	4
10. Identifying appropriate cultivation models.	----	----	----	----	----	----	----	----	26	35.6	47	64.4	3.972	0.482	0.121	2
11. Biological systems.	----	----	----	----	7	9.6	7	9.6	33	45.2	26	35.6	4.643	0.917	0.197	11
12. New irrigation systems.	----	----	----	----	----	----	----	----	20	27.4	53	72.6	4.726	0.449	0.095	1

Training Needs of Watershed Experts Regarding SWRM in Agriculture

To address training needs of watershed experts 12 items were asked from them. The results are displayed in table 5. The scale used range from 0 to 5 (0=without, 1=Very low, 2= Low, 3= Average, 4= High, 5= Very High). In reference to the frequency of respondents about training needs, 72.6% of respondents stated that they had high need to education regarding new irrigation systems and 27.4% mentioned that they had very high need to training regarding new irrigation systems.

Ranking based on coefficient of variation indicated that the six most important training needs of watershed experts were: (1) New irrigation systems (M= 4.726, Sd= 0.449), (2) Identifying appropriate cultivation models (M= 3.972, Sd= 0.482), (3) Integrated insect pest management (M= 4.246, Sd= 0.618), (4) Water productivity and efficiency in agriculture (M= 4.342, Sd= 0.650), (5) Recycling farm waste (M= 4.068, Sd= 0.673), and (6) Crop rotations (M= 4.167, Sd= 0.726). (Table 4).

Discussion and Recommendations

Based on the results perceptions of watershed experts about SWRM in agriculture divided to five levels. Approximately, 75.4% of respondents had moderate perceptions about SWRM in agriculture. This issue is confirmed in the researches of Chizari, et al., (2006). According to experts watershed attitude regarding SWRM and identifying their training needs, is essential for training needs to be action. Also background necessary to promote this technology over the past be provided in rural areas. Providing conditions that promote watershed managers and agriculture experts to interact with each other in designing training programs and promotional efforts on sustainable management of water drawn. Development of knowledge and operational insights and professional empowerment of farmers and provide infrastructure facilities for field optimize utilization of water resources will have to follow.

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 training needs of them. Ranking based on mean and standard deviation by using coefficient of variation indicated that the six most important training needs of watershed experts were: (1) New irrigation systems, (2) Identifying appropriate cultivation models, (3) Integrated insect pest management, (4) Water productivity and efficiency in agriculture, (5) Recycling farm waste , and (6) Crop rotations. This result is confirmed in the research of Chizari, (2006).

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