American-Eurasian J. Agric. & Environ. Sci., 6 (1): 53-61, 2009
ISSN 1818-6769

Assessing Effective Factors Involved in Applying Skills Respect to On-Farm Water Management (OFWM) by Wheat Farmers of Nahavand Township, Hamadan Province, Iran

Omid Noroozi, Mohammad Chizari and Ahmad Akhoundi

Agricultural Extension and Education Department, College of Agriculture,
Tarbiat Modarres University, Tehran, Iran

Abstract: The purpose of this study was to assess the effective factors involved in applying skills respect to OFWM by wheat farmers of Nahavand Township, Iran. The design of this study was descriptive-correlation. The questionnaire was used for data collection. Wheat farmers (N=15365) in the Nahavand Township were the target population. The sample obtained through proportional stratified sampling (n=375). Validity was established by a panel of experts. Reliability for the overall instrument was estimated at 0.84. The results indicated that the majority of respondents' skill toward OFWM is classified "medium and good" range. The results showed that, the between the some independents variables (respondents' personal, farming, economical and social characteristics) linked with their skill about OFWM were significantly correlative and differences. Utilizing Stepwise method indicated that 73.8% (R^2= 0.738) of the variance in farmer's skill toward OFWM could be explained by the respondents' personal, farming, economical and social characteristics.

Key words: Skill · On-Farm Water Management (OFWM) · Wheat Farmers · Nahavand Township

INTRODUCTION

We depend upon water for our very existence. Water and food security are intimately connected. Water shortage in many countries of the world, is very serious. So, there is a need to better identify the factors that could enhance the water use efficiency. Many scientists and researchers in those studies stated that, global water situation is becoming critical, as water resources grow increasingly scarce and demand continues to climb. Also, they points out, agricultural sector is the largest user of water resources and water use in agricultural section was recognized as the major cause of groundwater decline [1,2].

On the other hand, it is essential to meet food and fiber needs of ever increasing world population. Enhancing production of cereals is strategically very important to ensure food self-sufficiency [3]. World wheat production is 588 million tons, the total area planted to wheat is 224 million ha and average wheat yield is 2624 kg ha^{-1} [4]. Because wheat production is the major cause of water table drawdown, measures should be taken to limit water use in the wheat-growing season [5,6]. The improvement of water-conserving agricultural practices is essential in order to limit agricultural water use [7].

Continuously, changing the knowledge and skill level of targets as well as bringing attitudinal change is often emphasized, in many agricultural development plans. In attention to, attitude is an intrinsic concept; hence, difficult to measure quantitatively. However, descriptive information may not convince different stakeholders involved in the program, particularly program planners [8]. To measure attitude item score-total score method, the method of Cronbach's alpha, inter item correlation matrix, intra-class correlation and two dimensional scaling techniques were used. Each of these methods has been helpful to examine the different items used to estimate attitude [9].

Traditional management practices of the irrigation supply often contribute to high water losses. Many of farmers generally lack technical and economic information on improved on-farm water management (OFWM) methods. Therefore, proper training and capacity building at all levels of OFWM would be useful [10]. Concept of OFWM is concerned with how these

Corresponding Author: Omid Noroozi, Agricultural Extension and Education Department, College of Agriculture, Tarbiat Modarres University, Tehran, Iran

tools and resources are used and made available to provide water for plant growth. Furthermore, it includes the use of respective practices and tools to improve site conditions and to protect crops and farming property from excessive water [11,12]. Practices of OFWM can be defined as the manipulation of water within the borders of an individual farm, a farming plot, or field. For example, in canal irrigation systems, OFWM starts at the farm gate and ends at the disposal point of the drainage water to a public watercourse, open drain, or sink. Also, OFWM seeks to optimize soil-water-plant relationships in order to achieve a yield of desired products [10].

Iran is concerned with wheat yield stability because wheat is its main source of food [13]. On the other hand "Iran is water scarce country with a mean annual precipitation of 250 mm (30 % of global mean)". Therefore, drought is a recurring phenomenon in Iran. So, OFWM practice has key roles in accretion of agricultural production. Increasing water use efficiency through promotion of OFWM practice can help the country increase agricultural production.

Purpose and Objectives: The purpose of this study was to assess the effective factors involved in applying skills toward OFWM by wheat farmers of Nahavand Township, Hamadan Province, Iran. Specific objectives were:

- To determine the wheat farmers' professional and demographic characteristics;
- To determine the wheat farmers' skill, attitude and knowledge toward OFWM;
- To determine the relationship and differences between independent variables and wheat farmers' skill toward OFWM;
- To determine how much of the variance in wheat farmers' skill toward OFWM could be explained by independent variables of the study.

MATERIAL AND METHOD

Population and Sample: Wheat farmers (N=15365) in the Nahavand Township from Iran were the target population for this study. The population frame was obtained from Nahavand agricultural organization. Sample size and method were determined and supported by the studies of Krejcie and Morgan [14]. The sample obtained through proportional stratified sampling (n=375).The Ministry of Agriculture's Extension Organization Directory was used to locate the wheat farmers.

Description of the Study Region: Nahavand is one of the largest Township of Hamadn Provinces in western Iran and produces many agricultural crops; such as: Wheat, rye, barley, potato, tomato, corn and different fruits. It has 85,000 hectares of arable land. The Nahavand Township has a population of 184,160 of which 80,152 live in rural areas. With respect to the climatic, in the Nahavand Township, winters are temperate with moderate rainfall and summers are mild with very low rainfall. The average annual rainfall is between 370 and 480 mm.

Variables and Instrumentation: From a review of literature, the researchers developed an instrument to collect data. This study was descriptive-correlation in design and was carried out using a survey methodology. Both questionnaires and interviews were used for data collection. The survey instruments and interview schedules were divided into several sections. The first section was designed to gather data on personal, farming, economical and social characteristics of wheat farmers.

A brief discussion of some of the variables used in this study is presented below:

Respondent's Economical Status: Responses' economical status was measured by assessing their level of variables such as: return of garden, return of dams, size of farm, land size of irrigated farming, size of irrigated wheat cultivated land holding, return of avenue from main job and secondary job, wheat yield per hectare.

Respondent's Social Status: Responses' level of social status were categorized using a five-point Likert-type scale: 1=very low, 2= low, 3=medium, 4= high and 5=very high. The range in responses to two appropriate questions for this section was 2-10.

Respondent's Social Participation: Responses' level of social participation were categorized using a five-point Likert-type scale: 1=very low, 2= low, 3=medium, 4= high and 5=very high. The range in responses to six appropriate questions for this section was 6-30.

Contact with Information Sources: Farmers' access and contact with different mass and interpersonal communication media that provide information about OFWM measured by asking 12 appropriate questions regarding these sources. Response's level for this section was categorized using a five-point Likert-type scale: 0=not at all, 1= low, 2=medium, 3= high and 4=very high. The range in responses to 12 appropriate questions for this section was 0-48.

Respondent's Extensional Contacts: Responses' level of extensional contact were categorized using a five-point Likert-type scale: 0 =not at all, 1= low, 2=medium, 3= high and 4=very high. The range in responses to six appropriate questions for this section was 0-24.

Respondent's Knowledge Toward OFWM: Respondents' knowledge were determined by examining their general knowledge concerning OFWM, A 26 questions consisting of multiple choice responses were designed for this purpose. Each correct response worth one-point and farmer's knowledge scores ranged from 0 to 26, which were obtained by adding the correct responses on this section.

Respondent's Attitude Toward OFWM: Response's level for this section were categorized using a five-point Likert-type scale: 1=disagree, 2= slightly disagree, 3=no opinion 4= slightly agree and 5=agree. The range in responses to 20 questions for this section was 20-100.

Respondent's Skill Toward OFWM: Response's level for this section were categorized using a five-point Likert-type scale: 1=very low, 2= low, 3=medium, 4= high and 5=very high. The range in responses to 15 appropriate questions for this section was 15-75.

The researchers verified the list before distribution of the survey to control for frame and selection threats to external validity. Content and face validity were established by a panel of experts consisting of faculty members in irrigation, agronomy and extension and education at the Tarbiat Modares University of Iran. Further, the questionnaire was validated by agricultural officers of Nahavand Township. A pilot test was conducted with 30 wheat farmers in the Malayer Township in the Hamadan Province three weeks before the study. As a result of the pilot test, minor changes in wording were made in the questionnaire. Reliability for the overall instrument was estimated at 0.84.

Data Collection and Analysis: Two graduated student researchers through personal interviews collected data with 330 wheat farmers in the field from September to November 2004, for a response rate of 88%. Because of the lowest literacy rates, instructions concepts, terms and the Likert-type scales were carefully explained to participants to ensure they understood the purpose of the research, the questionnaire and how their response were being categorized. Most interviews lasted approximately 50 minutes.

Statistical data were coded and analyzed using the Statistical Package for the Social Sciences (SPSS 11.5) for windows. Descriptive statistics (Frequencies, Means, Standard Deviation, Maximum and Minimum) were used to analyze data. Factor analysis by means of principal component method was performed on the responses to the items of the questionnaire. In this case, several factors were extracted. Stepwise multiple regression, Spearman correlation coefficient, Pearson correlation coefficient, T-Test, F-Test, Tukey`s Honestly Significant Difference, The Kruskal-Wallis Test and The Wilcoxon-Mann-Whitney Test were employed to analyze the relationships between and among variables.

RESULTS

To Determine the Wheat Farmers' Professional and Demographic Characteristics: The mean age of wheat farmers in this study was 45 years, as shown in Table 1. While 28.5% of wheat farmers (n=94) were illiterate, 34.8% (n=115) had a primary school education. About (16.7%) of wheat farmers (n=55), had guidance level education and less than (20%) of wheat farmers (n=66) had high school or post secondary education. On average, wheat farmers had 22 years of experience in farming wheat and 25.5 years of experience in agriculture. A majority of respondents (90%) farmed 10 hectares or less of agricultural land. In other word, the farmers owned 7 hectares of land that they devoted 5.5 hectares to wheat farming and also, they devoted 4.8 hectare to wheat irrigated farming. A majority of households (80%) had more than 5 household members. Sixty percent of wheat farmers had secondary job. The average wheat yield per hectares was 4.7 kg/ha, which was significantly above the national average. The average distance between the farm and the agricultural service center was 3.3 Km. seventy five percent of sample (n=246) lived in rural villages. Nearly, majority of respondents were married (86%).

Table 2 divided wheat farmers with respect to their irrigation methods and their water sources that they used for irrigation. According to irrigation methods, about 60% of wheat farmers (n=197) had basin irrigation. Nearly thirty percent of them had border irrigation and the remaining about 10% (n=32) of them had sprinkler irrigation. According to their water sources that used for irrigation, about 47% of wheat farmers (n=156) used from river for irrigation, nearly twenty percent (n=67) of them from spring, 3% (n=10) of subterranean canal and approximately 30% of them (n=97) used from water well for lands irrigation.

Table 1: Respondents' Professional and Demographic Characteristics Wheat Farmers' of Nahavand Township, Hamadan Province, Iran, 2004 (n=330)

Variables	Items	f	%	Variables	Items	f	%
Age (Year)	Below 30	59	17.9	Household Members	3-5	67	20.3
	30-40	66	20.0		5-8	174	52.7
	40-50	88	26.6		8-11	74	22.4
	50-60	63	19.1		Above 11	15	4.5
	Above 60	54	16.4				
Literacy	Illiterate	94	28.5	Marital Status	Single	45	13.6
	Primary school	115	34.8		Guidance	55	16.7
	High school	45	13.6		Married	285	86.4
	Post secondary	21	6.4				
Experience in Farming	1-10	75	22.7	Farm Land (Hectare)	1-5	160	48.5
Wheat (Year)	10-20	110	33.4		5-10	119	36.0
	20-30	63	19.1		10-15	29	8.8
	Above 30	82	24.8		Above 15	22	6.7
Experience in Farming	1-10	57	17.3	Size of wheat Irrigated	1-5	197	59.7
Agriculture (Year)	10-20	103	31.2	Farming (Hectare)	5-10	97	29.4
	20-30	70	21.2		10-15	24	7.3
	Above 30	100	30.3		Above 15	12	3.6
Distance Between the	1-3	150	61.0	Wheat Yield Per	Below 3	28	8.5
Farm and the	3-5	123	37.3	Hectare (kg/ha)	3-4	124	37.6
Agricultural	5-8	44	13.4		4-6	166	50.3
Service Center	Above 8	13	3.9		Above 6	12	3.6

Table 2: Respondents' Type of Irrigation Methods and Type of Water Resources Wheat Farmers' of Nahavand Township, Hamadan Province, Iran, 2004 (n=330)

Variables	Items	f	%
Type of Irrigation Method	Basin irrigation	197	59.7
	Border irrigation	101	30.6
	Sprinkler irrigation	32	9.7
Type of Water Resource	River	156	47.3
	Spring	67	20.3
	Subterranean canal	10	3.0
	Water well	97	29.4

Table 3: Social Characteristics of Respondents Wheat Farmers' of Nahavand Township, Hamadan Province, Iran, 2004 (n=330)

Variables	*Mean*	*SD*	*Range*
Extension Contact	7.75	5.38	0-24
Information Source	16.53	4.58	0-48
Social Participation	20.16	4.58	6-30
Social Status	6.04	6.00	2-10

Table 4: Level of Respondents Social Characteristics Wheat Farmers' of Nahavand Township, Hamadan Province, Iran, 2004 (n=330)

Variables	Items	Frequency	Percent
Social participation	Low	-	-
	Medium	78	23.6
	High	252	76.4
Information Sources	Low	61	18.5
	Medium	249	75.4
	High	20	24.6
Extension Contacts	Low	105	31.8
	Medium	164	49.7
	High	61	18.5
Social Status	Low	36	10.9
	Medium	50	16.5
	High	129	39.0

As shown in Table 3, the wheat farmers' social status ranged from 2 to 10 (M=6.04; SD=1.30). The respondents' extension contacts ranged from 0 to 24 (M=8.33; SD=4.45). The respondents' social participation ranged from 6 to 30 (M=20.43; SD=2.46). The respondents' use of information sources ranged from 0 to 48 (M=10.53; SD=3.87).

Also as Table 4 shows, level of respondents social characteristics as described on the methodology section and for the purpose of characterization the score was transformed into three levels as "low", "medium" and "high". As table 5 shows, majority of wheat farmers' (252) had a “high” level of social participation with social institutes. About 75.4% of respondents’ (n=249) had a “medium” level use of information sources. About 49.7% of respondents’ (n=164) had a “medium” level of extension contacts and majority of wheat farmers' (n=129) had a “high” level of social status.

To Determine the Wheat Farmers’ Knowledge Toward OFWM: The wheat farmers’ knowledge toward OFWM ranged from 5 to 24 (*M=12.69* and *SD=3.34*). Table 5 shows the detail information on the farmer’s knowledge frequency and characterization. Thus, about 17.3% of the wheat farmers (n=57) had a “weak” level of knowledge toward OFWM. Thirty three percent of them (n=109) had a “medium” level of knowledge OFWM. Nearly thirty four percent of them (n=114) had a “good” level of knowledge toward OFWM and approximately 15% of them (n=50) had an “excellent” level of knowledge toward on farm water management. The result indicated that the majority of farmers’ knowledge toward OFWM is classified “mediate and good” range. This indicates that the farmers have a great potential to succeed in fulfillment the goals of OFWM.

To Determine the Wheat Farmers’ Attitude Toward OFWM: The wheat farmers’ attitude toward OFWM ranged from 5 to 24 (*M=12.69* and *SD=3.34*). Table 6 shows the detail information on the wheat farmer’s attitude frequency and characterization. Thus, about 17.3% of the wheat farmers (n=57) had a “negative” level of attitude toward OFWM. Approximately thirty four percent of them (n=114) had a “relatively negative” level of attitude toward OFWM. Nearly twenty nine percent of them (n=85) had a “relatively positive” level of attitude toward OFWM and approximately 22% of them (n=74) had a “positive” level of attitude toward on-farm water management. The result indicated that the majority of wheat farmers’ attitude toward OFWM is classified “relatively negative” range. This indicates that the wheat farmers have a weak attitude to succeed in fulfillment the goals of OFWM.

To Determine the Wheat Farmers’ Skill Toward OFWM: The wheat farmers' skill toward OFWM was determined as described on the methodology section and for the purpose of characterization the score was transformed into four levels as "weak", "medium", "good" and "excellent". After computing the mean and standard deviation of the skill score, the four categories were determined by scores fallen within the two standard deviation on the left of the mean on a normal cave and also on two standard deviation on the right of the mean Sadighi and Mohammadzadeh [15].

A= *weak*: A< Mean-Sd
B= *medium*: Mean-Sd ≤ B ≤ Mean
C=*good*: Mean < C ≤ + Sd
D=*excellent*: Mean + Sd < D

Table 5: Respondents’ Knowledge toward On-Farm Water Management Wheat Farmers’ of Nahavand Township, Hamadan Province, Iran, 2004 (n=330)

Variables	Items	Frequency	Percent
Wheat Farmers’ Knowledge toward OFWM	Weak	57	17.3
	Medium	109	33
	Good	114	34.5
	Excellent	50	15.2

Table 6: Respondents’ Attitude toward OFWM Wheat Farmers’ of Nahavand Township, Hamadan Province, Iran, 2004 (n=330)

Variables	Items	Frequency	Percent
Wheat Farmers’ Attitude toward OFWM	Negative	57	17.3
	Relatively Negative	114	34.5
	Relatively Positive	85	25.8
	Positive	74	22.4

Table 7: Distribution of Respondents' Skill in OFWM Practices Wheat Farmers' of Nahavand Township, Hamadan Province, Iran, 2004 (n=330)

Variables	Items	Frequency	Percent
Wheat Farmers' Skill toward OFWM	Weak	51	15.5
	Medium	137	41.5
	Good	90	27.3
	Excellent	52	15.8

Table 8: Correlation Level between Respondents' Skills toward OFWM Wheat Farmers' of Nahavand Township, Hamadan Province, Iran, 2004 (n=330)

	wheat farmers' skill toward OFWM	
variables	r	p
Age	-0.510***	0.000
Number of household individuals	-0.160**	0.003
Education Level	0.560***	0.000
Distance Between the Farm and the Agricultural Service Center	-0.257***	0.000
Years of Experience in Farming Wheat	-0.481***	0.000
Years of Experience in Agriculture	-0.490***	0.000
Size of Farm	0.275***	0.000
Size of Irrigated Farming	0.314***	0.000
Size of Irrigated Wheat Cultivated Land Holding	0.301***	0.000
Economical Status	0.273***	0.000
Wheat Yield Per Hectare	0.706***	0.000
Knowledge toward OFWM	0.661***	0.000
Attitude toward OFWM	0.671***	0.000
Social Status	0.043	0.438
Social Participation	0.359***	0.000
Contact with Information Sources	0.531***	0.000
Extensional Contacts	0.511***	0.000

p= 0.001: ***, p= 0.01: **, p= 0.05: *

The wheat farmers' skill toward OFWM ranged from 5 to 24 (*M=12.69* and *SD=3.34*). Table 7 shows the detail information on the wheat farmer's skill frequency and characterization. Thus, about 15.5% of the wheat farmers (n=51) had a "weak" level of skill toward on-farm water management. Approximately 41.5% of them (n=137) had a "medium" level of skill toward on-farm water management. Approximately twenty seven percent of them (n=90) had a "good" level of skill toward OFWM and nearly 16% of them (n=52) had an "excellent" level of skill toward on-farm water management. The results indicated that the majority of wheat farmers' skill toward OFWM is classified "medium and good" range. This indicates that the wheat farmers have a great potential to succeed in fulfillment the goals of OFWM.

To Determine the Relationship Between Independent Variables and Wheat Farmers' Skill Toward OFWM: The correlation between wheat farmers' skill toward OFWM and their professional characteristics showed that there is a negative relationship between their skill toward OFWM and wheat farmers' age (r=-0.510). This relationship based on the Davis [16] convention is characterized as a "substantial association", which means, as the farmers get older, their skill concerning the OFWM decreases substantial. There was a low association and negative relationship between respondents' land distance from agricultural service center (r=-0.257) and number of household individuals (r=-0.160) with their skill toward OFWM.

Similarly, there was a significantly correlative and negative relationship between the years of experience in farming wheat (r=-0.481) and years of experience in agriculture (r=-0.490), with their level of skill will respect OFWM. This relationship based on the Davis [16] convention is characterized as a "moderate association", which means, as the wheat farmers get experience, their skill concerning the OFWM decreases substantial.

In contrast there was a statistical very strong significant relationship between the wheat yields per hectare (r=0.706), with their level of skill toward OFWM. This relationship based on the Davis [16] convention is characterized as a "very strong association". There was a significantly correlative and positive relationship between the size of farm (r=0.275), their size of irrigated farming (r=0.314), size of irrigated wheat cultivated land holding (r=0.301) and their economical status (r=0.273), with their level of skill will respect OFWM. The wheat farmers' level

Table 9: Davis (1971) Convention on Characterization of Correlation

The Magnitude of a Correlation	Characterization
±0.70	A Very Strong Association
± 0.50 to ± 0.69	A Substantial Association
± 0.30 to ± 0.49	A Moderate Association
± 0.10 to ± 0.29	A Low Association
± 0.01 to ± 0.09	A Negligible Association
0.000	No Association

Table 10: Differences Level between Independent Variables and Respondents' Skill toward OFWM Wheat Farmers' of Nahavand Township, Hamadan Province, Iran, 2004 (n=330)

Independent variables	U	Z	P
Marriage Status	3403.000	-5.332	0.000***
Use of Extension Services	6668.500	-5.882	0.000***
Membership on Production Cooperative	9363.500	-4.323	0.000***
Membership on Rural Institutes	8404.500	-6.173	0.000***

p= 0.001: ***, p= 0.01: **, p= 0.05: *

Table 11: Differences Level Between Independent Variables and Respondents' Skill toward OFWM (n=330) Wheat Farmers' of Nahavand Township, Hamadan Province, Iran, 2004 (n=330)

Independent variables	Df	X^2	P
Method Irrigation	2	167.648	0.000***
Water resource	4	37.937	0.000**

p= 0.001: ***, p= 0.01: **, p= 0.05: *

of education (r=0.560) showed to have positive and substantial association relationship with their skills in OFWM. The result showed a "moderate" association (r=0.359) between the wheat farmers' extent of social participation and their skills in OFWM. The result showed a substantial association between the wheat farmers' knowledge (r=0.661) and attitude (r=0.671) toward OFWM with their skill in this regard. The result showed substantial association between the wheat farmers' access to information sources (r=0.531) and wheat farmers' extent of extensional contacts (r=0.511), with their skill in OFWM. Table 8 shows the strength and significant level between skills toward OFWM and wheat farmers' professional characteristics.

To Determine the Differences Between Independent Variables and Wheat Farmers' Skill Toward OFWM: The results of the Wilcoxon-Mann-Whitney Test showed that significant differences are found among the averages of the wheat farmer's skill toward OFWM in relationship with their marriage status, membership and non membership on production cooperative and rural institutes and also, users and no users of extension services (Table 10). The results of the Kruskal-Wallis Test showed that significant differences are found among the averages of the wheat farmer's skill toward OFWM in relationship with their the type of irrigations method and their type of water resources (Table 11)

Determine How Much of the Variance in Wheat Farmers' Skill Toward OFWM Could Be Explained by Independent Variables of the Study: The independent variables with interval data were used in multivariate linear regression. Utilizing Stepwise method indicated that 73.8% (R^2= 0.738) of the variance in wheat farmer's skill toward OFWM could be explained by the wheat farmers' yield per hectare, their size of irrigated farming, wheat farmers' knowledge toward OFWM, their contact with information sources, wheat farmers' distance between farm and the agricultural service center, respondents' age, their extensional contacts and their years of experience in farming wheat. This implies that there are other factors that may have contributed to variation in respondents' skill toward OFWM scores that were not investigated in this study. Table 12 provides detail analysis of the regression result.

Table 12: Multivariate Linear Regression Analysis (Respondents' Skill toward OFWM as Dependent Variable) Wheat Farmers' of Nahavand Township, Hamadan Province, Iran, 2004 (n=330)

	Unstandardized Coefficients	Standardized Coefficient		
Independent Variables	B	Beta	T	Sig
Constant	23.949	-	8.466	0.000
Yield Per Hectare (X_1)	2.522	0.325	6.467	0.000
Size of Irrigated Farming (X_2)	0.665	0.315	9.095	0.000
Knowledge toward OFWM (X_3)	0.576	0.248	5.427	0.000
Contact With Information Sources (X_4)	0.315	0.185	4.311	0.000
Distance Between the Farm and the Agricultural Service Center (X_5)	-0.319	-0.093	-3.173	0.002
Wheat farmers' age (X_6)	-0.174	-0.316	-3.263	0.001
Extensional contacts (X_7)	0.155	0.108	2.475	0.014
Wheat farmers' age (X_8)	-0.110	-0.196	-2.113	0.035

F=111.626 Sig t= 0.000 R= 0.859 R^2= 0.738 Adjusted R^2= 0.731

The regression analysis provided variables with statically significant level (as shown in Table 12), so the following predication equation was formulated to estimate the wheat farmers' skill toward OFWM.

Y= a + b1x1 + b2x2 + … +bnxn

Y= wheat farmers' skill toward OFWM

$$Y= 23.949 + 2.522 (X_1) + 0.665 (X)_2 + 0.576 (X)_3 + 0.315 (X_4)-0.319(X_5)-0.174(X_6) + 0.155(X_7)-0.110(X_8)$$

Conclusion and Recommendations: This study has provided insight into improving and increasing wheat farmers' skill toward OFWM in the Nahavand township of Iran. Based on the finding of this study, the following conclusion were drawn and recommendation given. Considerable numbers of wheat farmers (57%) have a "weak and medium" level of skill concerning OFWM practice. This implies that substantial practical education needed to be carried out by the extension personnel in order to increasing and improve skill of wheat farmers concerning OFWM practice.

There is a negative and substantial relationship between the wheat farmers' skill toward OFWM and their age (r=-0.510). As the wheat farmers get older their skill toward OFWM substantial decrease, which implies that a considerable attention should be paid to older wheat farmers in regards to their OFWM practice. The result showed substantial association between the wheat farmers' access to information sources (r=0.531) and wheat farmers' extent of extensional contacts (r=0.511), with their skill toward OFWM. As the wheat farmers' access to information sources and extensional contacts increased, their skill regarding OFWM increased at a "substantial" rate. Given a substantial association and statically significant relationship between these variables, it is important to point out that accessible information to farmers must be written and presented at their level of skill and understanding in order to be effective only then it could impact the farmers' skill and knowledge base.

There was a significantly and negative relationship between years of experience in farming wheat (r=-0.481) and years of experience in agriculture (r=-0.490), with their level of skill will respect OFWM. Considering the statistical significant relationship between these two variables, measures should be taken to increase and improvement the responds' motivation, skill and their involvement with OFWM, in order to improvement their skill in this regard. Also, this implies that there should be a continuous practical training program for farmers in order to update their knowledge level and maintain their motivation, interest and improvement of their skills in this regard. The responds' level of knowledge and attitude toward OFWM showed to have a substantial and positive association with their skills toward OFWM. This implied that increasing responds' knowledge and improve their attitude concerning OFWM activities is necessary in order to increasing their skill in this regard. In multivariate linear regression it was determined that social, personal, farming and economical characteristics of subject were four factors which brought about 73.8% of changes in the skill of responds toward OFWM. Therefore, it is recommended in their social, personal, farming and economical characteristics should be taken in to consideration.

Educational Importance: The study showed that a substantial educational works need to be carried out by the extension personnel in order to increase skill of wheat farmers toward OFWM practice. Improving skill of wheat farmers toward OFWM practice among farmers is main step and an effective approach in accretion of irrigation and agricultural productivity. Based on the effectiveness ratings found in this study, farmers stated that extension agents should be able to improve their availability and contacts with the farmers. Direct contacts with extension agents appear important to wheat farmers suggesting that field-dependent learning styles need to be taken into consideration when planning dissemination efforts and seeking increased adoption rates. There has been little research done on OFWM practice in Iran. Therefore, the result of this research will guide agricultural organization to enhance educational foundation of change agents as well as farmers through pre-and-in-service training and workshops. In order to reverse the negative consequences of conventional agriculture different forms of sustainable agricultural systems should be recommended by extension agents to farmers as alternatives for achieving the goal of an economically profitable and environmentally sound agricultural production system.

REFERENCES

1. Xevi, E. and S. Khan, 2005. A multi-objective optimization approach to water management. J. Environ. Management. Volume, 77(2005): 269-277.
2. Sharma, B.R. and P.S. Minhas, 2005. Strategies for managing saline/alkali waters for sustainable agricultural production in South Asia. Agricultural Water Management, Volume, 78(2005): 136-151.
3. Sezen, S.M. and A. Yazar, 1996. Water-yield relations on winter wheat under Cukurova conditions. Turkish J. Agric. For., 20: 41-48.
4. FAO, Yearbook, 1999. Production. Food Agricultural Organization of the United Nations, Rome.
5. Yang, Y.H., M. Watanabe, C.Y. Tang, Y. Sakura and S. Hayashi, 2002. Groundwater table and recharge changes in the piedmont region of Taihang Mountain in Gaocheng City and its relation to agricultural water use. Water SA. Volume, 28: 171-178.
6. Zhang, X.Y., D. Pei and C.S. Hu, 2003. Conserving groundwater for irrigation in the North China Plain. Irrigat. Sci., 21: 159-166.
7. Yang, Y.H., M. Watanabe, X. Zhang, J. Zhang, O. Wang and S. Hayashi, 2005. Optimizing irrigation management for wheat to reduce groundwater depletion in the piedmont region of the Taihang Mountains in the North China Plain. Agricultural Water Management,Volume 82, Issues, 1-2: 25-44.
8. Betaz, F.J., J.K. Peters and W. Janssen, 1999. The influence of technology characteristics on the rate and speed of adoption in Agricultural Economics. 21 pp: 121-130.Elsevier Science, B.V.
9. Beyene, F., 2003. Estimating attitude on farmers toward maize extension package program: [on-line], available: http://www.aiaee.org/2003/beyene90-98.pdf.
10. Wolf, P. and T.M. Stein, 2003. Improving on-farm water management-a never ending challenge. J. Agric. Rural Development in the Tropics and Subtropics. Volume 104, No.1. 31-40.
11. Abu-Zeid, M., 1979. On-farm water management improvement programs; in: Water management for arid lands in developing countries, edited by BISWAS, A.E.A.; Pergamon Press, Oxford, UK; 1979.
12. Izuno, F.T., 1997. Principles on-farm water management. Florida, IFAS Extension [on-line]. available: http://edis.ifas.ufl.edu.
13. Chizari, M., F. Lashkarara and J.R. Linder, 2001. Identification Barriers to Sustainable Agricultural Practices: Perceptions of Wheat Farmers in Iran. [on-line], available: http://www.aiaee.org/2001/ap01.pdf.
14. Krejcie, R.V. and D.W. Morgan, 1970. Determining sample size for research activities. Educational and Psychological Measurement, 30: 607-610.
15. Sadighi, H. and J. Mohammadzadeh, 2002. Extension Professional Staffs' Attitudes toward Participatory Approach of Extension Activities and Rural Development. Proceeding of the 18th Annual AIAEE Conference, Durban, South Africa. Available [On Line] at: http:// www. aged. tamu. edu/aiaee/ 2002/ sadighi521-528.pdf.
16. Davis, J.A., 1970. Elementary Survey Analysis. Englewood Cliffs, NJ. Prentice-Hall.