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Full Length Research Paper

Iranian agricultural professionals' knowledge on organic farming

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Organic farming is a holistic and sustainable food production system which can be considered as an alternative to conventional agriculture in Iran. Each policy to diffusion of organic farming leads to demands on knowledge of agricultural professionals. This is therefore important to understand professionals' knowledge on organic farming and to identify the key factors influencing it. The main purpose of this research was to investigate factors influencing agricultural professionals' knowledge on organic farming. A survey was conducted among agricultural professionals in the Jihad-e-Keshavarzi Organization of two southern provinces in Iran (Khuzestan and Fars), using stratified random sampling for selection of sample. The results showed that age and access to information on agriculture and environment were two important variables that had a positive and direct effect on the organic knowledge. Other variables such as social norms about organic farming via health attitude, nutrient attitude and general attitude towards environment have weak indirect effects on knowledge of organic farming.

Key words: Organic farming, knowledge, environment, Iran.

INTRODUCTION

Agriculture is an important economic sector in developing countries such as Iran. But, the crisis in agricultural development has demonstrated that conventional development strategies are fundamentally limited in their ability to promote sustainable agricultural development of Iran (Rezaei-Moghaddam et al., 2005). In the past two decades, growing environmental awareness in combination with concerns about safer foods (Asadi et al., 2009) have led to a general consensus among agricultural development practitioners in Iran that agricultural goals should include increasing production (for an ever increasing population), preventing soil erosion, reducing pesticide and fertilizers contamination, protecting biodiversity, preserving natural resources and improving well-being (Rezaei-Moghaddam et al., 2005).

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Nowadays, interests in organically produced foods are increasing throughout the world in response to concerns about conventional agricultural practices, food safety and human health concerns, animal welfare considerations and concern about the environment (Bonti-Ankomah and Yiridoe, 2006).

Codex Alimentarius Commission, a joint body of FAO defines organic agriculture as a holistic food production management system, which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs (Rai, 2005). In organic farming, nature is considered as a whole with its own innate values, and implies a moral obligation to maintain that values (Danish Research Center for Organic Farming, 2000).

Although organic farming represents an innovation in agriculture that is lauded, but there are some ambiguities about its ability to assure sufficient food security.

According to Food and Agriculture Organization (FAO)

of the United Nations, “food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life”. Hence, elemental aspects of food security include global food availability, food self-sufficiency and the distribution of food. One of the principal objections to the proposition that organic agriculture can significantly contribute to the global food security is its acclaimed capacity to produce lower yields and therefore less food in total compared to conventional agriculture (Arponen, 2009). In response to the recent debate over whether organic agriculture can feed the world, the Soil Association in UK has reviewed all the recent published research that makes claims about the global productive capacity of organic agriculture. Overall, studies looking into the comparative yield performance of organic and non-organic systems will surprise many with their findings that organic farming can feed the world. For instance, a research in Northern Ethiopia has shown that organic systems can provide a more drought resistant, nutritionally diverse food supply for local people (Hewlett and Melchett, 2008). Also, Badgley et al. (2006) compare 293 global researches on organic yield levels and find out that organic methods could produce enough food on a global per capita basis to sustain the current population. Likewise, according to International Federation of Organic Agriculture Movement (IFOAM) (2005), in marginalized areas, organic systems can increase food production by managing local resources without having to rely on external inputs or food distribution systems over which they have little control and/or access. Overall, organic agriculture could contribute to total supply and therefore help improve global food security. However, any discussion that deals solely with the yields of a food system risks perpetuating the myth that producing sufficient food globally ensures the end of world hunger. What is certain is that yields alone do not feed human populations. Indeed, sufficient food of the unsafe type can be a curse, not a blessing (Hewlett and Melchett, 2008).

According to the study by Mahmoudi et al. (2009), about 86 percent of farmers in Iran are smallholders which manage near 40 percent of arable lands. A little percent of the smallholders use no chemical inputs in their farms. If they could shift to the certified organic farming, would earn better income and other benefits. Moreover, this can encourage other farmers to shift towards organic farming. For instance, in Estahban region situated in Fars (a southern province of Iran), where is famous for *Ficus carica* products, those framers that shift their production to organic management make a good opportunity in market competition and further profits. As well as, there are the same situation regarding another crops such as Grapefruits in Jiroft, vegetables in north of Iran, Pomegranate in Neyriz. Furthermore, organic operation is labor intensive; therefore organic agriculture can improve the employment especially for woman compared with the conventional production system. Organic agriculture will enables Iranian smallholders to achieve household food security and gain modest incomes while regenerating the land, enhancing biodiversity, and supplying quality food to local communities (Mahmoudi et al., 2009).

It has already been recognized that knowledge is the crucial “fourth factor of production” and sustainable farming practices are more demanding on the skills and knowledge of farmers (Ingram and Morris, 2007). In spite of assertions about the responsibility of farmers as land managers to determination of soil quality and health (Doran, 2001), other actors such as agricultural professionals are also significant in this process. Farmers may lack familiarity with and experience of agricultural sustainable practices. As such there is a clear requirement for more information and on-farm advice to support them in their transition to using knowledge demanding practices which provide environmental and soil benefits such as organic farming (Ingram and Morris, 2007).

Diffusion of organic farming as an innovation in Iran requires to cooperation of agricultural professionals. Indeed, agricultural professionals play a key role in creating and developing agricultural innovations, informing and influencing farmers’ adoption of technologies, and informing or providing information to the public (Wheeler, 2008). Whereas every new policy to diffusion of organic farming will mean demands on knowledge of agricultural professionals, it is important to understand their knowledge. This paper reports the nature and extent of Iranian agricultural professionals’ knowledge on organic farming and key factors influencing their knowledge.

Theoretical background

The centrality of knowledge to agriculture has been highlighted by a number of commentators (Ingram, 2008; Wheeler, 2008; Allahyari, 2009). Knowledge is a system of beliefs, or framework, upon which we base our beliefs and facts (Sanderson, 2004).

One reason researchers have been interested in knowledge is that it has long been assumed that knowledge plays a role in enhancing the value–attitude–behavior relationship by providing individuals with the ability to better formulate alternate views and present arguments to support their beliefs and behaviors (Fabrigar, 2006; McFarlane and Boxall, 2003). According to the “Theory of Reasoned Action”, knowledge determines attitude and attitude with the influence of important others, determines intent, which is reflective of future behavior (Sanderson, 2004). Indeed, attitudes are influenced by beliefs (knowledge) and may change over time, as knowledge changes (Sanderson, 2004). Several

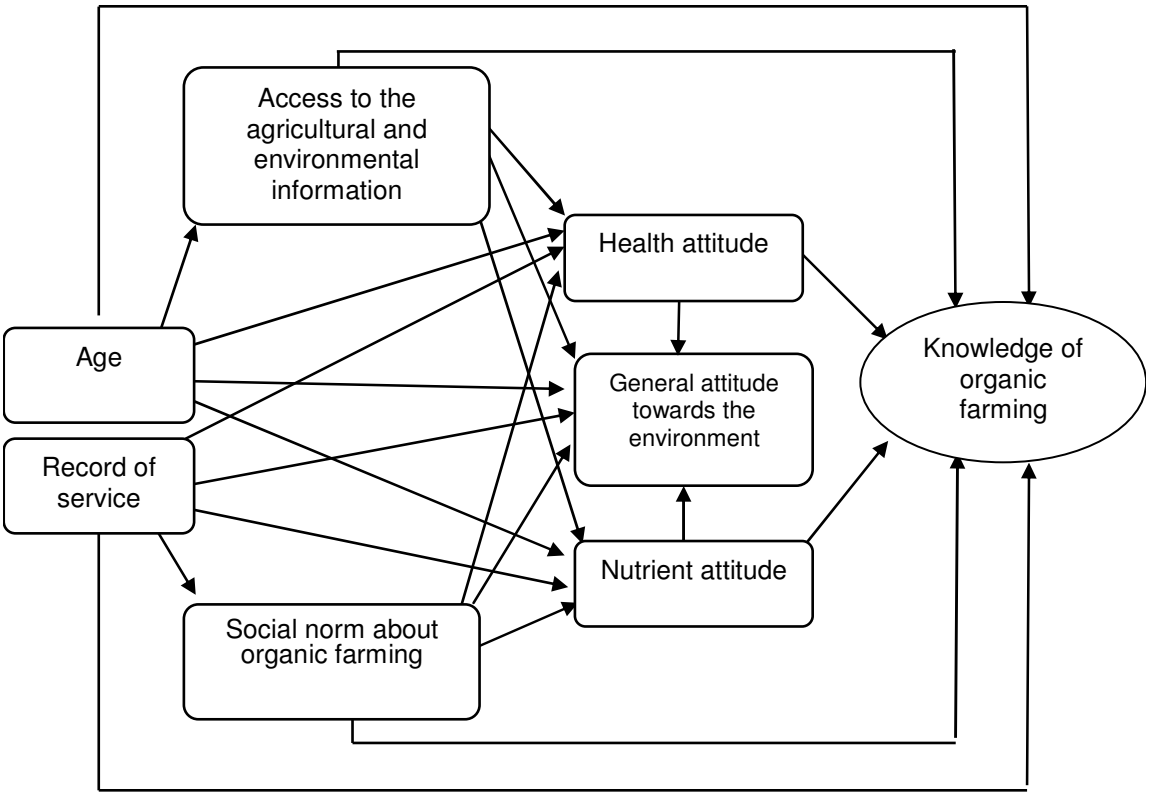

Figure 1. Theoretical framework of the research.

studies have supported this assumption. For example, Wheeler (2008) in her study identified increased organic knowledge plays a positive role on whether professionals believed organic farming produced net benefits. Professionals who were part of the targeted sample were also more likely to be positive towards organic agriculture. Such results help to support organic farmer arguments that professionals who take the time to learn about organic farming are more likely to think favorably about it. As well as, according to study of Fabrigar et al. (2006), Kallgren and Wood assessed attitudes toward protecting the environment and measured attitude-relevant knowledge using an open-ended knowledge listing task. They found that attitudes based on high amounts of knowledge were more predictive of environment-related behavior than attitudes based on low amounts of knowledge. Similarly, according to Fabrigar (2006), Davidson, Yantis, Norwood and Montano found in their studies that intentions were better predictors of behavior when they were based on high amounts of knowledge than when they were based on little knowledge. Likewise, Sapp (2002) found that a lack of knowledge can make one unable to perform certain behaviors.

Although study of agricultural professionals' knowledge is essential in moving the organic farming forward, unfortunately there have been no enough studies identifying the factors affecting professionals' knowledge on organic farming. Wheeler's (2008) study is one of the studies in this context. This study showed variables age, being part of the targeted group and naming scientific information as first main source of information for organics were significant in positively influencing organic knowledge. Also, variables that were significant in negatively influencing organic knowledge were working in natural resource management and naming the media as the first main source of information for organics. A research on adolescents showed differences between higher and lower education were significant about knowledge of organic farming (Stobbelaar et al., 2006).

In present study we attempt to identify some predicator variables and analyze their influence on professionals' knowledge of organic farming. We are trying to determine the nature and extent of professionals' knowledge and connections between knowledge on organic farming and predicator variables. This study will response this question that to what extent does "independent variables" influence "knowledge on organic farming"? The results of this study add to the existing literature on factors influencing agricultural professionals' knowledge of organic farming.

A diagram has been developed to study the effects of independent variables on knowledge of organic farming (Figure 1). In this model, "general attitude towards

Table 1. Reliability analysis (Alpha).

Scale name	Alpha value
Knowledge of organic farming	0.96
General attitude towards the environment	0.67
Social norm about organic farming	0.71
Nutrient attitude	0.63
Health attitude	0.70
Access to the agricultural and environmental information	0.74

organic farming", "health attitude", "nutrient attitude", "social norm about organic farming", "access to agricultural and environmental information", "age" and "record of service" as independent variables are the main factors affecting knowledge towards organic farming.

MATERIALS AND METHODS

A survey was conducted among agricultural professionals in the Jihad-e-Keshavarzi Organization of two southern provinces in Iran (Khuzestan and Fars). These provinces were purposively selected because of their prominence as two of the leading farming communities in the country. Stratified random sampling was used for selection of sample (N = 767). Fars and Khuzestan are two provinces with different situation such as different climate and culture. Therefore the target population divided into two strata according these two provinces. In total, 252 agricultural professionals were interviewed. The survey involved face-to-face interviews for data collection based on a questionnaire in autumn 2007.

To examine the validity and reliability of the questionnaire, a pilot study was conducted on 30 agricultural professionals out of 252 and Cronbach's alpha for the items of Likert type scales were computed at 0.63 to 0.96 (Table 1).

We used frequencies, percentage, mean score, standard deviation, coefficient of correlation and multiple regressions as a mediation test to path analysis to analyze the data. The analysis was carried out using the "Statistical Package for the Social Sciences" (SPSS 11.5). Also, a part of path analysis calculated without any software. Table 2 shows variables definitions and measurements.

RESULTS AND DISCUSSION

Descriptive statistics

The results showed that of 252 respondents, 224 (88.9%) were male and 28 (11.1%) were female. Also, 6.7% were manager and 233 (92.5%) were non-manager experts. The education profile showed that of 248 respondents, 215 (85.3%) were graduates with a BA or BS degree, 32 (12.7 %) were post graduates with an MS.c, MA or MS degree. Only one respondent (0.4%) had doctoral degree (Ph.D.). The employment profile showed that 51 professionals (20.2%) worked in the provinces centres, 106 (42.1%) in district level offices and 95 (37.7%) worked in the agricultural services and extension centers. Table 3 shows agricultural professionals have a high mean score for general attitude towards the environment (16.47). Participants also had a health attitude mean score of 10.49 that is high with attention to spectrum of concession 0-12. Spectrum of concession of variable nutrient attitude (0-20) on the table 3 shows that agricultural professionals have a high nutrient attitude mean (16.34). This shows that the general attitude is to consume fruits and vegetables with less chemical materials and better taste.

As well as, according to Table 3 participants had a mean score 15.7 in social norm about organic farming that was relatively high (spectrum of concession of this variable was between 0 to 24). This finding shows that positive or negative insight of family, friends and colleagues in Jihad-e-Keshavarzi organization toward organic farming affects professionals' knowledge of this agricultural system.

Also, mean score of access to agricultural and environmental information is 7.78 that are low with attention to spectrum of concession 0 to 20. The mean score of professionals' knowledge of organic farming was 59.57, in a spectrum of concession between 0 to 88 for this variable. This determines that participants had low access to information related to organic farming from internet, television, radio, magazines and educational organizations

Path analysis

The model for predicator variables and knowledge of organic farming (Figure 1) was used as a cause and effect chain to work out a path analysis. The path analysis can be viewed as an extension of multiple regressions. In multiple regressions, the researcher is interested in predicting to a dependent variable. The concern in path analysis is with the predictive ordering of variables. The model "X" causes "Y" is a regression model, whereas "X" causes "Y" and "Y" causes "Z" is a path analysis model. In sum the important difference between path analysis and the other multivariate methods is much less powerful of the multivariate methods than path analysis to examine hypothesis about causal relationships between variables (Borg and Gall, 1989).

The path coefficients showed that the direct effects of

Table 2. Variables definitions and measurements.

Variable	Conceptual and operational definitions
Knowledge of organic farming	The variable is an individual's level of information about characteristics, activities and standards of organic farming. This variable is estimated with 22 items related to professional knowledge about the agro-technical aspects of organic farming such as crop nutrition, soil, pests, diseases, weeds and water management, safety for the environment, genetic diversity and animal husbandry. Items are rated on a five point continuum ranging "very high", "high", "average", "low" and "very low".
General attitude towards the environment	This includes the individual's emotions and cognitive attitudes regarding the various aspects of environmental problems of society as a whole (Vogel, 1994). General attitude towards the environment was measured with 5 items such as individual's attitude towards air quality, climate change, emission of agricultural greenhouse gases and their affects on degradation of natural resources such as flood and drought, groundwater contamination and reduction in wildlife. Items are rated on a five point Likert-type scale from ranging ''strongly disagree" to "strongly agree".
Health attitude	This reflects the extent of importance to health for individual, family and community. We provided 3 items related to the health for these groups. Items are rated on a five point Likert-type scale from ranging ''strongly disagree" to "strongly agree".
Nutrient attitude	This means beliefs and the extent of importance by a person for nutrient of individual, family and society. The questions such as individual's worldview towards taste and quality of foodstuffs with less synthetic materials and his intention to buy these foods were asked. Items are rated on a five point Likert-type scale from ranging ''strongly disagree" to "strongly agree".
Social norm about organic farming	Social norm is primarily conceptualized as perceived social pressure that is the expectations of significant reference persons to perform or not perform a behavior. Fear of social exclusion is viewed as a primary motive why people tend to fulfill social norms (Bamberg and Moser, 2007). This variable was measured with 6 items about effects of supporting organic farming diffusion from family, consumers, Jihad-e-Keshavarzi Organization and government on professionals' interests to acquire more knowledge about organic farming. Items are rated on a five point Likert-type scale from ranging ''strongly disagree" to "strongly agree".
Access to the agricultural and environmental information	This variable is the extent of individual's access to new agricultural and environmental information. We asked 5 items about the extent of individual's access to agricultural and environmental information and the type of their information resources (television, radio, internet, journals, magazines and meetings). Items are rated on a five point continuum ranging "very high", "high", "average", "low" and "very low".

Table 3. Descriptive statistics of variables.

Variables	Maximum	Minimum	Mean	Standard deviation
General attitude towards the environment	20	7	16.47	2.47
Health attitude	12	6	10.49	1.3
Nutrient attitude	20	9	16.34	2.27
Knowledge of organic farming	88	16	59.57	13.3
Social norm about organic farming	22	8	15.7	2.5
Access to agricultural and environmental information	18	0	7.78	3.45

Attention : Spectrum of concession of General attitude towards the environment was 0-20, Health attitude 0-12; Nutrient attitude 0-20, Knowledge of organic farming 0-88, Social norm about organic farming 0-24 and access to agricultural and environmental information were 0-20.

some variables on the others were not significant. But, in the final model these paths were not discarded for a better understanding of the relations between independent variables with knowledge of organic farming (Figure 2).

The direct and indirect effects of each independent variable on the dependent variable knowledge of organic farming in Table 5 show that access to the agricultural and environmental information has the strongest direct influence on professional knowledge of organic farming

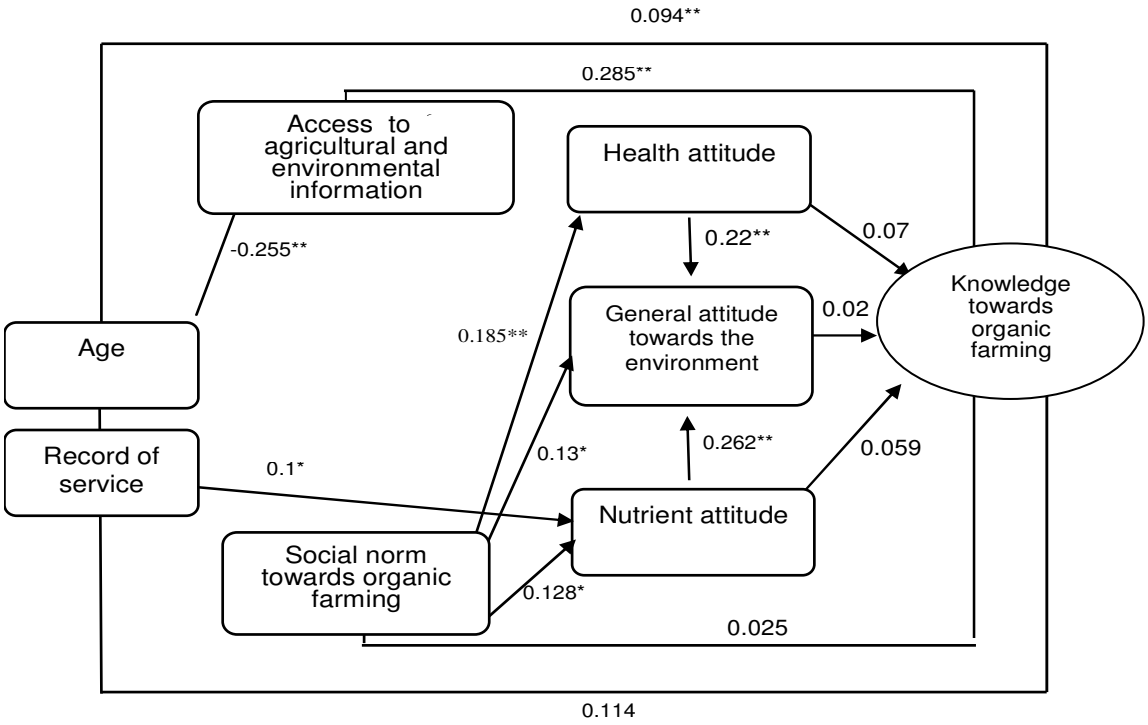

Figure 2. Path diagram of variables influencing knowledge of organic farming. The path coefficients are linear and standardized (ß). The significance of test is: *0.05 ≥ p > 0.01 and **0.01 ≥ p > 0.001.

Table 4. Correlation between different variables.

Variables	(X_1)	(X_2)	(X_3)	(X_4)	(X_5)	(X_6)	(X_7)
Age (X_1)	1						
General attitude towards the environment (X_2)	-0.25	1					
Health attitude (X_3)	0.04	0.3**					
Nutrient attitude (X_4)	-0.13*	0.37**	0.3**				
Knowledge of organic farming (X_5)	0.15*	0.09	0.1*	0.1			
Social norm about organic farming (X_6)	-0.01	0.2**	0.2**	0.1*	0.07		
Access to agricultural and environmental information (X_7)	-0.18**	0.08	0.09	0.1	0.3**	0.08	1

*Significant at 0.05 level; **Significant at 0.01 level.

(0.285) that is significant at the 0.01 level (Figure 2). Table 4 shows that the correlation between access to agricultural and environmental information with knowledge of organic farming is significant ($r = 0.3$, $p < 0.01$). This emphasizes the important role of mass media, educational organizations and other resources in contributing to general awareness and knowledge regarding sustainable agricultural systems, especially organic farming.

Initial assumption was also made regarding certain significant exogenous variable, namely age. It was assumed that age would affect all other variables (health attitude, nutrient attitude, general attitude towards the environment, social norm about organic farming and access to agricultural and environmental information) as well as knowledge of organic farming. Figure 2 determines that age has a direct and positive influence on professionals' knowledge of organic farming (0.094) that means significant at 0.01% level. Indeed, it was explicitly postulated that the older professionals have more knowledge of organic farming activities than young professionals due to the experience gathered in their long exposure to agricultural activities.

In spite of positive and significant correlation between health attitude and knowledge of organic farming ($r = 0.1$, $p < 0.05$) in Table 4, Figure 2 demonstrates that health attitude doesn't significantly influence on agricultural professionals' knowledge of organic farming. It is also depicted in Figure 2 that this variable had a weak influence on knowledge towards organic farming indirectly

Table 5. Direct and indirect effects of the independent variables on knowledge of organic farming.

Variables	Direct effect	Indirect effect	Total effects
Age	0.094	-0.05	0.04
Record of service	0.114	0.04	0.154
General attitude towards the environment	0.02	0	0.02
Health attitude	0.07	0.004	0.07
Nutrient attitude	0.059	0.005	0.06
Social norm about organic farming	0.025	0.025	0.05
Access to agricultural and environmental information	0.285	0.012	0.297

Table 6. Direct and indirect effects of the independent variables on general attitude towards environment.

Variable	Direct effect	Indirect effect	Total effects
Age	0.004	0.055	0.059
Record of service	0.003	-0.2	-0.197
Health attitude	0.22	0	0.22
Nutrient attitude	0.262	0	0.262
Social norm about organic farming	0.13	0.07	0.2
Access to agricultural and environmental information	0.02	0.04	0.06

Table 7. Direct and indirect effects of the variables age, record of service, social norm about organic farming and access to agricultural and environmental information on nutrient attitude.

Variables	Direct effect	Indirect effect	Total effects
Age	-0.1	-0.017	-0.1
Record of service	-0.007	-0/0002	-0.0072
Social norm about organic farming	0.128	0	0.128
Access to agricultural and environmental information	0.109	0	0.109

through the general attitude towards the environment. As demonstrated in Figure 2, direct effect of health attitude on general attitude towards the environment (0.22) is significant at 0.01 level, which is confirmed by Table 4, which shows that the correlation between agriculture professionals' health attitude and general attitude towards the environment is significant ($r = 0.3$, $p < 0.01$).

An important hypothesis was that nutrient attitude can influence knowledge of organic farming directly. This hypothesis was not confirmed by present study, though this variable has direct influence on general attitude towards the environment (0.262) that is significant at 0.01 levels (Figure 2). Table 4 clearly indicates that there is positive and significant correlation between nutrient attitude and general attitude towards the environment ($r = 0.37$, $p < 0.01$).

The variable social norm about organic farming has direct effect on health attitude (0.185) that is significant at 0.05 level (Figure 2 and Table 6). Social norm about organic farming has indirect effect on knowledge of organic farming via health attitude and general attitude towards the environment (Figure 2).

It was assumed that social norm about organic farming would affect knowledge towards organic farming directly, but this hypothesis was not confirmed by the study. The path coefficient or standardized coefficient (ß) of social norm about organic farming on nutrient attitude is 0.128 (Table 7) that is significant at 0.05 levels (Figure 2). Also, social norm about organic farming through nutrient attitude has indirect effect on general attitude towards the environment (Figure 2). Figure 2 shows that record of service has direct effect on nutrient attitude.

Conclusion

Growing need for rational use of agricultural inputs for high quality agricultural production and environmental sustainability has led to development of alternative agricultural systems, of which organic farming is one of the fastest growing alternative agricultural systems in the world.

Modernization of agriculture in Iran has led to the negative impacts, such as contamination of water resources

by pesticides and its transfer to soil and animals, contamination of food and animal forage, air pollution and unsustainable use of natural resources. These concerns have been repeated voiced by agricultural professionals in Iran, who have criticized conventional agriculture for its environmental hazards and emphasized the need for a sustainable agricultural system. Acceptance or rejection of organic farming as an innovation in the society depends on information that farmers acquire from different resources especially agricultural professionals. This emphasizes the important role of agricultural professionals in diffusion of agricultural innovations and importance of their knowledge about agro-technical aspects of this agricultural system. Professionals' knowledge of organic farming has an important role in creating or changing their attitude. Furthermore, less knowledge or incorrect perception of organic farming activities will decrease adoption of this system.

Deriving from the data set, the model presented in this study demonstrates the direct and indirect cause/effect relationship between knowledge of organic farming and some basic variables such as age, record of service, social norm about organic farming, health attitude, nutrient attitude, access to agricultural and environmental information and general attitude towards the environment. The direct and indirect effects of each independent variable on the dependent variable of knowledge of organic farming indicates that access to the agricultural and environmental information has the strongest influence on specialists knowledge of organic farming. This emphasizes the important role of educational organizations and other recourses to improve knowledge about sustainable agricultural systems, especially organic farming, to decrease negative impacts of modernization conventional farming on the human health, animal and environment.

The results show that the variables health attitude and nutrient attitude have no direct effect on knowledge of organic farming. But, these variables have important influence on general attitude towards the environment. The direct effect of social norm on knowledge of organic farming was not confirmed by the study. But, this variable increases general attitude towards environment directly and also indirectly via health attitude and nutrient attitude.

This finding indicates that increasing the support of society for organic practices can stimulate individual attention towards health and nutrient matters and increases individual concern for the environment.

While the results of research showed positive connection between access to agricultural and environmental information and knowledge towards organic farming, but mean score of access to agricultural and environmental information among agricultural professionals is low. Due to limited access to internet, the television and radio take on an increasingly important role as the most conventional tools to provide information to increase general public awareness regarding organic and other alternative systems of farming. The emphasis should be on informing the public about environmental issues and the impacts of non-rational use of inputs in conventional agriculture.

The influence of health attitude and nutrient attitude on general attitude towards the environment emphasizes the role of extension programs. The programs should focus on the negative impacts of consuming genetically modified fruits and vegetables on health. Promotion of the practice of organic farming successfully, depends on specialized knowledge. Therefore facilitating agricultural professionals to acquire correct knowledge of this agricultural system should be a priority with the educational organizations such as universities.

There are different factors that influence knowledge of organic farming directly or indirectly through reciprocal action. Further study is recommended among agricultural professionals at the national level, as it is expected to provide considerable evidences regarding the role of other variables such as moral norms on organic knowledge.

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