

The Factors Influencing the Application of Organic Farming Operations by Farmers in Iran

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Abstract

The overall aim of this study is to study the factors influencing the application of organic farming operations by farmers. The research's statistical population would consist of all the farmers in Divandarreh city (N=7931). Using the Cochran's sampling formula, 98 individuals were selected as the sample. In order to enhance the validity of findings, a total of 120 questionnaires were distributed using stratified random sampling, with proportionate and finally, 115 ones were completed and analyzed. The research's main instrument was a questionnaire whose viability by a panel of experts and its reliability was confirmed by Cronbach's alpha coefficient ($\alpha > 0.7$). Data analysis was carried out by the software SPSSwin18. The results showed that the study farmers apply organic farming operations at a low and moderate level. Additionally, the results indicated that there is a positive and significant relationship between the application of organic farming operations with the variables of farming-work experience, literacy, use of communicative media, attitude to organic farming, knowledge and awareness of organic farming, participation in educational courses of extension, and use of educational publications. Moreover, the results of regression analysis showed that the three variables of use of information and communicative resources and channels, attitude to organic farming, and use of educational and extensional publications explained 61.2 percent of the changes related to the variance of the study's dependent variable (application of organic farming operations).

Key words

Sustainable Agriculture, Organic Farming, Soil Preservation, Divandarreh City.

Introduction

After World War II, farming sector, especially because of modern technologies utilization, machinery, increasing use of chemicals, and specialization of public policies, has dramatically changed and enhanced the yield and productivity of farming products. Although, the above items have led to considerable variations and have lowered the original risk of farming activities, they've imposed remarkable costs such as surface soil erosion, "underground" waters contamination, decline of family farming, the ever increasing neglect of laborers'

Working and livelihood circumstances, high costs of production, and lack of consistency with socio-economic conditions in rural communities (Shabanali Fami et al, 2010). Modern agriculture has resulted in great achievements in respect of increasing food products, enhancing the productivity of production resources, and improving commonwealth. According to many

scholars (Godfray et al., 2010; Lang & Barling, 2012; Borlaug, 1997) it plays an extremely significant role in providing welfare and food security for communities. Therefore, excessive reliance on the external inputs, especially chemical fertilizers, farming machinery, and immoderate use of them has really damaged the environment (Burn, 2000; Storkey et al., 2011). So that in recent decades, due to the concerns about environmental problems, modern agricultural systems were severely criticized (Alonge et al, 1995; Rodrigues, 2005). In most of the farms as well as in our country, the agricultural products, especially fruits and vegetables, are precipitously sprayed. In an operational period, sometimes a melon-bedis sprayed up to 15 times and it's not acceptable to observe any time distance between spraying and harvesting, thus you didn't need to apply complex and sensitive devices to measure pesticide residues. Consumer taste by itself truly testifies the pesticide taste in product. The current paradigm shift in the production and transition

to sustainable agriculture is undeniable (Maxey, 2007). Over the past two decades, human has sought to find effective solutions to solve these problems one of which has been a movement towards sustainable agriculture that, in recent decades, has caught much attention and popularity in various countries. Sustainable agriculture is not only concerned with many social and environmental problems, but also it creates innovative and economically advantageous opportunities for farmers, growers, workers, consumers, policy makers and other actors involved in the agricultural sector and all the society. Sustainable agriculture which, as cited in Al-Subaiee et al., (2005) aims to produce healthy and sufficient food for the present and future generations through proper use of natural resources is defined by various experts in different ways (Minarovic et al., 2000). Effects of industrial agriculture on the environment in the late 1960s and early 1970's caused the sustainable agriculture to be considered (Harwood, -1990). Moreover, Organic farming or biological agriculture means to use traditional and scientific information to reduce the use of pesticides and chemicals in agricultural production, with regard to the compatible interaction of human activities with the cycles of nature and using it reasonably. This fact will lead to the sustainable balance in the basic water and soil sources (Lampkin, 1990; Fuller, 1997; Guthman, 2004). Organic farming is discussed in terms of biological or biodynamic farming as well, and has four basic principles of health, ecology, fairness and care and is based on ecosystem management (Lockie & Halpin, 2005; Mohammadi, 2008). The philosophy of this agricultural method is based on human goals and long-term effects of human activity on the environment, so that agricultural systems must be equitable, protect natural resources, reduce pollution and enhance productivity. In generally, Organic farming considers food production as a living process in which the health of soil is very important (Anon, 1979). In this way, the farm is managed in such a manner that the maximum advantage is taken out of foods and minimum wastage is left (Malakouti, 2000). Producing the food with acceptable quantity and quality, maintaining and improving soil fertility, reducing the pollution of water and soil, increasing the producers' revenue and decreasing production costs in regions with low yield rate, and protecting the health of farmers and producers by creating a healthy ecosystem in the long run can be referred to as some of the important goals of organic agriculture (Guthman, 2004). This type of

farming improves soil conditions, using minimum tillage, biological fertilizers, the use of crop rotation and cover crops, compost and organic fertilizers. Organic farming is actually in harmony with the ecology and leads to the conservation of the water, carbon and nutrients cycles (Trewaves, 2004). In addition to thinking of food quantity, this type of farming pays specifically attention to the food quality and safety (Jacobsen et al., 2005; Antoine, 2008). With this regard, considering the importance of the subject, several studies have examined the application of organic agricultural operations by farmers and the factors influencing it. Among them, we can mention the following:

In a study on farmers in West Kenya, Makah et al. (1999) showed that farmers' participation in agricultural workshops and seminars, contacting with the Extension Organization and deciding to reduce the use of chemical fertilizers, and specific technological characteristics and the effects of these technologies on crop production has a significant influence on the adoption of conservation farming operations.

According to Beedell & Rehman (1999), such methodologies can be standardized and repeatable, thereby making them useful in monitoring change over time for EU policy-makers. These requirements have contributed to a recent increase in the application of 'behavioral approaches' to investigate issues such as food security and agricultural sustainability. Fakoya et al (2007) shown that there is a significant positive relationship between people's attitudes and use of sustainable agricultural operations. Along & Martin (1995) represented that the perception of farmers towards the compatibility of sustainable agriculture operations with their farming systems are the best predictor of the adoption of these operations. Bagheri et al (2008) illustrate that education level, contact with agriculture experts, and participation in the extensional programs is the best predictors of the attitudes of rice farmers in Haraz region, Mazandaran province, towards the technology application in sustainable agriculture. Comparing the attitudes of male and female rice farmers in a village of Kazeroon city. Mansoorabadi & karimi (2007) concluded that female farmers have a more positive attitude to sustainable agriculture than males and the factors, such as education and access to information, are effective on the farmers' attitudes to the use of sustainable agriculture. In generally, some writers are concerned that organic farming systems are becoming 'conventionalized' in their

production, marketing and distribution methods (Lockie & Halpin, 2005; Rosin & Campbell, 2009), some of them think that they have the potential to 'develop in distinct ways in different national contexts' (Hall & Mogyorody, 2001, p. 401; see also Coombes & Campbell, 1998 and Guthman, 2004).

Therefore, the overall aim of this study was to examine the factors affecting the application of organic agricultural operations by farmers in city of Divandarreh. In order to achieve that, the following specific objectives will be pursued:

1. To identify the individual, social and economic characteristics of the sampled farmers;
2. To evaluate the application of organic agricultural operations and prioritize its constituent items;
3. To analyze the relationships between the studied variables with the application of organic farming operations by the study farmers;
4. To determine the effect of studied variables on the application of organic farming operations by the study farmers.

Materials and Methods

The design of the study was a descriptive survey that done by single cross-sectional study. The survey would contain all farmers in the city of Divandarreh (Kurdistan province), including the central part (4736 subjects) and Saral part (3195 subjects) (N =7931). Using Cochran's sampling formula, 98 individuals were selected as the sample (in Cochran's sampling formula, the application organic farming operations is as dependent variable). To increase the validity of findings, 120 questionnaires were distributed using stratified random sampling method (different parts were considered as classes) with proportionate probability and finally, 115 completed questionnaires were completed and analyzed. The main research instrument was a researcher-made and pre-tested was questionnaire. The questionnaire consisted of three parts, first: 14 items related to individual, social and economic characteristics, second: 14 items to measure the attitudes of farmers to organic farming, third: 12 items to assess their knowledge of organic farming, fourth: 18 items to evaluate the use of information sources and communication channels, and fifth: 17 items to measure the application of organic farming operations. To determine the validity of the questionnaire, a panel of experts, including the experts in the fields of agricultural education

and extension and agricultural development and management of Tehran University, was used and based on their comments and suggestions, necessary amendments were made to the questionnaire. To estimate the reliability of the questionnaire, the Cronbach's alpha coefficient test was used (Table 1). Given that Cronbach's alpha coefficients calculated for each of the questionnaire's sections was above 0.7, it was concluded that the questionnaire had good reliability for conducting research. In order to classify the study farmers according to the application of organic farming operations, Standard Deviation from the Mean (ISDM) was used as follows (Gangadharappa et al., 2007):

Low: $A < \text{mean} - \text{SD}$

Middle: $\text{mean} - \text{SD} < B < \text{mean} + \text{SD}$

High: $C > \text{mean} + \text{SD}$

SD is standard deviation, Adoption of organic farming operations are classified in three parts (high, medium, low). The data analysis implemented in two parts, consisting descriptive and inferential statistics by using SPSSwin18 software. In the descriptive part of the statistical analysis frequency, percentage, mean and standard deviation were used. In the t inferential statistical analysis comparison, correlation analysis and regression analysis were used. The step-by-step iterative construction of a regression model that involves automatic selection of independent variables. Stepwise regression can be achieved either by trying out one independent variable at a time and including it in the regression model if it is statistically significant, or by including all potential independent variables in the model and eliminating those that are not statistically significant, or by a combination of both methods.

Results and discussion

Individual, social and economic characteristics of the study farmers the results showed that the average age of farmers was 42.12 years with a standard deviation of 14.57, the youngest 19 years old and the oldest was 71 years old. Average annual income in terms of results was 7.3 million Toman. Average use of communicative media among farmers was 6.85 hours per day with a standard deviation of 3.7. Average farming experience was 17.12 years, with SD 4.13. Farmers owned an average of 21/11 acres with SD 4.71. Moreover; the farmers owned an average of 7.8 pieces of land. The results of other characteristics

The variables	Number items	The value of Cronbach's alpha
- Attitude	14	0.78
- Knowledge	12	0.81
- Communication channels	18	0.84
Application	17	0.79

Source: authors own processing

Table 1: Calculated Cronbach's alpha coefficients.

Variable	Variable levels	Frequency	Valid percentage	Facade
- Literacy rate	- Primary school	56	48.69	*
	- Guidance school	42	36.52	
	- Diploma	15	13.04	
	- Higher than diploma	2	1.75	
- Participation in extensional courses	- Less than two times	79	68.69	*
	- Two to four times	25	21.72	
	- More than four times	11	5.59	
- Concerns with environmental issues	- Very low	15	13.04	
	- Low	45	39.13	*
	- Middle	23	20	
	- High	15	13.04	
	- Very high	17	14.79	
The use of educational publications	- Very low	31	26.95	*
	- Low	28	24.34	
	- Middle	25	21.72	
	- High	20	21.04	
	- Very high	11	5.95	
Introduction to organic farming	- Very low	51	44.34	*
	- Low	23	20	
	- Middle	25	21.73	
	- High	12	10.43	
	- Very high	4	3.5	

Source: authors own processing

Table 2: The frequency distribution of the individual characteristics of the villagers.

of the study population are given in Table 2.

Evaluation of the application of organic farming operations and prioritizing its constituent items among the study farmers

In order to investigate the application of organic farming operations, ISDM scale was used. The results of this section are shown in Table 3.

The results of Table 3 indicate that only 11 individuals (9.57 %) greatly apply organic farming operations, whilst, 39 individuals (33.91 percent) at a moderate level and 65 subjects (56.52 %) at a low level would apply organic farming operations. Therefore, according to the above, it can be stated that the majority of farmers don't apply

organic farming operations in this city, because 104 subjects (90.43 %) applied organic farming operations on their farm at a low and moderate level. In order to prioritize the items related to the application of organic farming operations by farmers in the study, Mean was used. The results of this section are presented in Table 4. Based on the results of Table 4, it can be stated that the farmers in city of Divandareh use more the operations of "crop rotation on the farm" and "use of shallow culture". However, the operations of "intercropping" and "culture of Leguminosae plants" are used less by them.

Analysis of the relationships between the study variables with the application of organic farming

Application levels	Frequency	Percentage	Cumulative percentage
- Low	65	65.52	65.52
- Middle	39	33.91	43.90
- High	11	9.57	100

Average: 25.9, Min: 11, Max: 49, Standard Deviation 7.21.

Source: authors own processing

Table 3: Classification of farmers based on the application of organic farming operations.

Items	Mean	SD	Rating
- Application of crop rotation	4.06	0.477	1
- Application of plow shallow in farm	3.64	1.25	2
- Application of breeding seeds	3.65	1.31	3
- Application of animal fertilizers on the farm	3.61	1.11	4
- Application of green fertilizers in farming	3.59	0.759	5
- Biological control of pests	3.27	0.857	6
- Application of the principles of sustainable water resources management	3.14	1.12	7
- Application of the trap plants	3.12	1.16	8
- Covering soil surface by vegetation residue	3.02	0.987	9
- Proper management of soil erosion	2.84	1.00	10
- Application of no use in farming	2.76	0.852	11
- Application of varieties resistant to pests and diseases	2.45	0.487	12
- Plowing perpendicular to the slope	2.38	0.931	13
- Application of beneficial insects in farming	2.14	1.15	14
- Application of Leguminosae plants	2.02	1.12	15
- Application of mixed cultivation	1.95	0.974	16

* Scale: 1-very low, 2-low 3-middle, 4-high, 5-very high

Source: authors own processing

Table 4: Prioritizing the items related to application of farming organic operations.

operations by farmers in the study:

In order to investigate the relationship between the research variables (including relative and spatial data) with the application organic farming operations by farmers the study, Pearson and Spearman correlation coefficients were used, respectively. The results of this section are shown in Table 5.

The results presented in Table 5 indicate that there is no statistically significant relationship between the variables of age, income, amount of farming lands, and number of land parcels with the application of organic farming. However, the above results indicate that there is a positive significant relationship between the variables of field work experience, level of education, application of media, attitudes towards organic farming, knowledge of organic farming, participation in extensional courses, and application

of educational publications with the application of organic farming. This means that the farmers who take more advantage of communicative media or enjoy good knowledge of and attitude toward organic farming as well as participate in extensional-educational courses, further apply organic farming operations.

To determine the effect of the studied variables on the application organic farming operations by farmers. In order to determine the effect of the studied variables on the application organic farming operations by farmers, stepwise multiple regression analysis method was used. Stepwise method is a technique in which the most powerful variables, one by one, enter into the regression equation and this continues until the significance test error reaches 5%. In this study, after entering the variables that correlated significantly with the dependent variable of the study

Independent variables	Application of organic farming operations	
	r	Sig
1 - Age	-0.412	0.452
2 - Income rate	0.125	0.475
3 - Work experience	0.524**	0.000
4 - The amount of farming lands	0.414	0.126
5 - Literacy rate	0.458**	0.000
6 - Number of land parcels	0.352	0.254
7 - Application of communicative media	0.625**	0.000
8 - Attitude towards organic farming	0.758**	0.000
9 - Knowledge and awareness of organic farming	0.451**	0.000
10 - Participation in extensional courses	0.213**	0.000
11 - Application of educational publications	0.125**	0.000

** Significance at 1% level

Source: authors own processing

Table 5: Correlation between the study variables with the application of organic farming operations.

Step	Independent variable	R	R2	R2 Ad	Sig
1.	Communicative channels and resources	0.528	0.214	0.157	0.000
2.	Attitude towards organic farming	0.698	0.421	0.396	0.000
3.	The application of educational-extensional publications	0.785	0.612	0.498	0.000

Source: authors own processing

Table 6: Multiple regression to examine the effect of the independent variables on the dependent variable.

Independent variables	B	Beta	t	Sig
- Fixed coefficient	18.625	-	7.658	0.000
- Communicative channels and resources (X1)	3.011	0.625	3.524	0.000
- Attitude towards organic farming (X2)	1.125	0.752	3.985	0.000
- Application of educational publications (X3)	1.236	0.396	3.502	0.000

Source: authors own processing

Table 7: The influence rate of the independent variables on the dependent variable.

(the application organic farming operations), the equation moved 3 steps forward. The results of this section are shown in Table 6.

The results presented in Table 6 show that in the first step, the variable of application of communicative media entered into the equation. The multiple correlation coefficient (R) equals to 0.528 and the coefficient of determination (R2) equals to 0.214. In other words, 21.4 % of the changes of dependent variable (the application organic farming operations) are explained by this variable. In the second step, the attitude towards organic farming entered the equation. This variable increased multiple-correlation coefficient (R) to 0.698 and the coefficient of determination (R2)

to 0.421. In other words, 20.7 % of the changes of dependent variable (the application organic farming operations) are explained by this variable. In the third step, the application of educational-extensional publications in the field of agriculture entered into the equation. This variable increased multiple-correlation coefficient (R) to 0.813 and the coefficient of determination (R2) to 0.612. Therefore, 19.1 % of the changes of dependent variable (the application organic farming operations) are explained by this variable. Based on the results, 61.2 % (R2 = 0.612) of the changes of dependent variable (the application organic farming operations by the farmers) can be explained by these three variables and the remaining 38

percent is due to other factors that have not been identified in this study.

According to the above description and the results of Table 7, the linear regression equation is as follows:

$$Y = 18.625 + 3.011 X_1 + 1.125X_2 + 1.236 X_3$$

The significance of F and t tests showed that regression equation is significant. Regression equation does not express anything about the relative importance of the independent variables to predict the changes of dependent variable. To determine the relative importance of independent variables in predicting the dependent variable, the value of Beta should be noted. These statistics show the impact of each independent variable, out of the impact of other independent variables, on the dependent variable. Accordingly, the most influential independent variable on the dependent variable (application of organic farming operation), is the variable of attitude toward organic farming in which the Beta value is about 0.752. That is, one unit of change is created in the standard deviation of in the variable of attitude towards organic farming and 0.755 unit of change in the standard deviation of the dependent variable (application of organic farming operation). Other variables, in order of importance to influence the dependent variable (application of organic farming operations) include: information and communicative sources and channels with Beta value of 0.625, and the application of educational publications on farming with beta value of 0.396. Therefore, information and communicative sources and channels, attitude toward organic farming and the application of educational-extensional publications have large effects on the application of organic farming operations. That is, the more favorable the farmers' attitude towards organic farming is and the more they enjoy information and communicative sources and channels, literacy, and educational-extensional publications, the more they'll apply the organic farming operations.

Conclusion

An increase in the needs of human communities to food security, increasing population growth and the development of science and new technologies, such as production of high yielding varieties, use of chemical fertilizers and pesticides, genetic engineering and biotechnology has led to a massive imbalance in and promotion of agriculture. Alongside the increase in farm

production and resolving food shortages in many developed and developing countries, new problems have emerged in the field of agricultural ecosystems. Water pollution, affected health of the soil and a decrease in the absorption rate of certain micronutrients, such as zinc, copper and iron, and the disturbance of the biological balance of ecosystems, pest resistance to chemical pesticides and the appearance of new pests, and ultimately reduction of the quality of agricultural products are of great importance among these problems. The set of these factors has caused the environmental protection and security of food health turn into one of the challenges in the present era. The international community considers sustainable agriculture systems as the most appropriate strategy to resolve these problems. In this regard, considering farmers as the farming administrators, responsible for remarkable functions, therefore a prerequisite for any planning by them is to be aware of the current situation. Accordingly, the overall aim of this study was to identify the factors affecting the application of organic farming operations among farmers in city of Divandarreh. The results showed that farmers apply organic farming operations at low and middle levels. The results of correlation analysis showed that there is a positive and significant relationship between the variables of application of organic farming operations with the variables of farming experience, level of education, application of communicative media, attitude toward organic farming, knowledge and awareness of organic farming, participation in educational-extensional courses, and application of educational publications. The results of this section are consistent with the findings of Bagheri et al (2008), Fakoya et al (2007) and Makoha et al (1999). Additionally, the results of multiple regression analysis showed that the variables of application of information and communicative sources and channels, attitude toward organic farming, and application of educational publications are able to predict 61.2% of the variance in the dependent variable (application of organic farming operations). According to the results of this study, it can be recommended that:

1. Since there is a positive and significant relationship between the farmers' attitude and application of organic farming operations by them, we can take steps to change their attitude towards sustainability through holding educational courses on organic farming and its benefits. This will eventually help them with the adoption of organic farming.

2. As there was a significant positive relationship between the knowledge of farmers and application of organic farming operations, it is recommended that the concepts and operations of organic farming should be emphasized in the educational-extensional courses held for the farmers, so that farmers can get familiar with this type farming.

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