Original Article

The Factors Influencing the Application of Sustainably Farming Operations by Farmers in Abdanan City

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ABSTRACT: The overall aim of this study is to study the factors influencing the application of sustainably farming operations by farmers. The research's statistical population would consist of all the farmers in Abdanan 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 sustainably farming operations at a low and moderate level. Additionally, the results indicated that there is a positive and significant relationship between the application of sustainably farming operations with the variables of farming-work experience, literacy, use of communicative media, attitude to sustainably farming, knowledge and awareness of sustainably 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 sustainably 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 sustainably farming operations).

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1. 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 (Shaban-Ali 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 (Alauddin et al., 1991 & 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 (Bylin et al, 2004), 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-bodies sprayed up to 15 times and it's not acceptable to observe any time distance between spraying and harvesting, so that, you need not apply complex and sensitive devices to measure pesticide residues. Consumer taste by itself truly testifies the pesticide taste in product. So, the current paradigm shift in the production and transition to sustainable agriculture is undeniable (Vahabzadeh, 1998). Over the past two decades, human has sought to find effective solutions to solve these problems one of which has been 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 (Unknown, 2009).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).Lockeretz (1990) believes that sustainable agriculture has firstly been summarized in the concept of sustainably farming which was related to 1940s.Effects of industrial agriculture on the environment in the late 1960s and early 1970s caused the sustainable agriculture to be considered(Harwood, 1990).Sustainably 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, 2002).Sustainably 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 (Mohamadi, 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. Sustainably farming is a production management that enhances and develops the health of culture and environment mechanisms, biodiversity and soil biological activity (Pirmoradi and Tavousi, 2009).Sustainably 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 sustainably agriculture (ajorlou, 2008).This type of farming improves soil conditions, using minimum tillage, biological fertilizers, the use of crop rotation and cover crops, compost and sustainably fertilizers. Sustainably 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 (Antoine, 2008).In this regard, considering the importance of the subject, several studies have examined the application of sustainably agricultural operations by farmers and the factors influencing it. Among them, we can mention the following:

In a study on farmers in West Kenya, Makoha 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. Fakoya et al (2007), showed that there is a significant positive relationship between people's attitudes and use of sustainable agricultural operations. Along & Martin (1995) showed 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) showed 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. Therefore, the overall aim of this study was to examine the factors affecting the application of sustainably agricultural operations by farmers in city of Abdanan. 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 sustainably agricultural operations and prioritize its constituent items;

3- To analyze the relationships between the studied variables with the application of sustainably farming operations by the study farmers;

4- To determine the effect of studied variables on the application of sustainably farming operations by the study farmers.

2. MARTIAL AND METHODS

This study is quantitative in respect of the nature, applied in respect of the aim, and descriptive in respect of data collection. The survey would contain all farmers in the city of abdanan (Ilam province).Using Cochran's sampling formula, 98 individuals were selected as the sample. 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 sustainably farming, third: 12 item to assess their knowledge of sustainably farming, fourth: 18 items to evaluate the use of information sources and communication channels, and fifth: 17 item to measure the application of sustainably 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 a farmer according to the application of sustainably farming operations, Standard Deviation from the Mean (ISDM) was used as follows (Gangadharappa et al., 2007):

Low: A<mean- 1/2Sd
Middle: mean- 1/2Sd<B<mean+ 1/2Sd
High: C>mean+ 1/2Sd

In order to analyze data on both the descriptive and inferential sections, the software SPSS version 18 was used. Thus, frequency, percentage, mean and standard deviation for descriptive statistics and mean comparison, correlation analysis and regression for inferential statistics were used.

Table 1- Calculated Cronbach's alpha coefficients

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

3. CONCLUSION 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 Tomans. 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 44/13. Farmers owned an average of 21/11 acres with SD 4.71.Moreover; the farmers owned an average of7.8 piece of land. The results of other characteristics of the study population are given in Table 2.

Table 2- The frequency distribution of the individual characteristics of the villagers

Variable	Variable levels	Frequency of	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 sustainably farming	- Very low	51	44.34	*
	- Low	23	20	
	- Middle	25	21.73	
	- High	12	10.43	
	- Very high	4	3.5	

Evaluation of the application of sustainably farming operations and prioritizing its constituent items among the study farmers In order to investigate the application of sustainably farming operations, ISDM scale was used. The results of this section are shown in Table 3.

Table 3–Classification of farmers based on the application of sustainably farming operations

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

The results of Table 3 indicate that only 11 individuals (9.57 %) greatly apply sustainably farming operations, whilst, 39 individuals (33.91 percent) at a moderate level and 65 subjects (56.52 %) at a low level would apply sustainably farming operations. Therefore, according to the above, it can be stated that the majority of farmers don't apply sustainably farming operations in this city, because 104 subjects (90.43 %) applied sustainably farming operations on their farm at a low and moderate level. In order to prioritize the items related to the application of sustainably 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 Abdanan 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.

Table 4- Prioritizing the items related to application of farming sustainably 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

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

Table 5- Correlation between the study variables with the application of sustainably farming operations

Independent variables	Application of sustainably 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 sustainably farming	0.758**	0.000
9-knowledge and awareness of sustainably 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

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

To determine the effect of the studied variables on the application sustainably farming operations by farmers: In order to determine the effect of the studied variables on the application sustainably 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 (the application sustainably 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 sustainably farming operations) are explained by this variable. In the second step, the attitude towards sustainably 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 sustainably 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 sustainably farming operations) are explained by this variable. Based on the results, 61.2 % (R2 = 0.612) of the changes of dependent variable (the application sustainably 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.

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

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

Table 7- The influence rate 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 (X_1)	3.011	0.625	3.524	0.000
-Attitude towards sustainably farming (X_2)	1.125	0.752	3.985	0.000
-Application of educational publications (X_3)	1.236	0.396	3.502	0.000

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

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

The significance of F and t tests showed that regression equation is significant. Regression equation dose 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 sustainably farming operation), is the variable of attitude toward sustainably 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 sustainably farming and 0.755 unit of change in the standard deviation of the dependent variable (application of sustainably farming operation).Other variables, in order of importance to influence the dependent variable (application of sustainably 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 sustainably farming and the application of educational-extensional publications have large effects on the application of sustainably farming operations. That is, the more favorable the farmers' attitude towards sustainably farming is and the more they enjoy information and communicative sources and channels, literacy, and educational-extensional publications, the more they'll apply the sustainably farming operations.

4. 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 sustainably farming operations among farmers in city of Divanddarreh.The results showed that farmers apply sustainably 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 sustainably farming operations with the variables of farming experience, level of education, application of communicative media, attitude toward sustainably farming, knowledge and awareness of sustainably 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 sustainably farming and application of educational publications are able to predict 61.2% of the variance in the dependent variable (application of sustainably 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 sustainably farming operations by them, we can take steps to change their attitude towards sustainability through holding educational courses on sustainably farming and its benefits. This will eventually help them with the adoption of sustainably farming.

2-As there was a significant positive relationship between the knowledge of farmers and application of sustainably farming operations, it is recommended that the concepts and operations of sustainably 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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ETHICAL CONSIDERATION

Authenticity of the texts, honesty and fidelity has been observed.

AUTHOR CONTRIBUTIONS

Planning and writing of the manuscript was done by the authors.

CONFLICT OF INTEREST

Author/s confirmed no conflict of interest.

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