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A study of factors influencing the adoption of sustainable agriculture among the beet growers in South Khorasan

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Abstract

This study is carried out to identify those factors that affect the adoption of sustainable agriculture among sugar beet growers in South Khorasan. Its statistical society constituted of beet growers in South Khorasan that are over 6220 people, which between them sample of 200 people have been studied by stratified random sampling method. The field data was collected using a researcher made questionnaire. This study data were analyzed using spss software and in two descriptive and inferential parts. Findings from descriptive analyzes showed that the adoption of sustainable agriculture in this region is in an average level. In addition, the findings of the correlation analysis showed that there is a significant and positive relationship between education level, type of farming systems, type of ownership, type of agriculture, type of used seed, the total amount of cultivated land, land under cultivation of sugar beet, social participation, yield and income, source of income other than agriculture, the promoters calls, resolved crops issues, attending training classes - promotion, knowledge, attitude and adoption of sustainable agriculture, and there is a significant and negative relationship between age, experience in agriculture and adoption of sustainable agriculture. Regression analysis also showed that four variables: attitudes, knowledge, age, and the total amount of cultivated land is explained about 93/5% of the variability of adoption dependent variable.

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Introduction

In the 1980s, population growth and food shortages in many countries were considered as a crisis, to deal with this deficiency states widely began activities in different fields, such as increased production the prevention of pests and diseases and spread of mechanized cultivation (Rawson, 1995). Although use of new technologies in the short term in most parts of the world could bring increased agricultural production , but due to lack of attention to environmental, social and ethical issues, led to the soil erosion and degradation of natural resources, increasing rural to urban migration, agricultural huge debt, surface water and groundwater (Martin and Willams, 2001). The researchers and agricultural experts after observed adverse consequences of conventional farming decided to find a solution to this problem. Agricultural researchers acknowledged the fact that sustainable agricultural development is the best solution for dealing with this problem (Zoghi, 1998), which Sustainable utilization of natural and agricultural resources. This stable system in addition to attention to economic, social, and environmental and ecological dimensions be exploit of the available resources as fair and equitable and respect the rights of other entities and future generations. In this type of farming systems, efficiency, equity and sustainability are closely integrated, where efficiency ensures optimum use of natural resources, equity, guarantees poverty reduction and reduce the gap between rich and poor, and the goal of sustainability, is protecting the livelihood of future generations by preserving natural resources (Padaryamchy, 2006). This type of agriculture is pursue goals such as providing food security, conservation of energy resources, environmental protection, maintaining Vital force of rural communities, using renewable resources as much as possible and to maintain and improve profitability and farmers' incomes (Sheikh Baradaran, 2001). In general, sustainable agriculture can be considered as a form of agriculture in which produces high quality food, enhancing environmental protection, reducing the use of pesticides and chemical pesticides, as well as use of organic fertilizer and also observing crop rotation in order to make an appropriate life, along with economic development for rural farms and communities are of its main objectives (Earles, 2002). Center of integrative agriculture system (CIAS) represents a comprehensive definition of sustainable agriculture. It is not just in relation to environmental aspects, but it also includes social and economic problems. This center is considered the sustainable agriculture as a system including agricultural profitability by reducing soil erosion and improving land productivity, developing methods for effective use of field internal resources, developing strategies to improve the quality of rural communities and the application procedures with minimal impact on the degradation of environmental resources (CIAS, 2000). Stable farming systems have many differences with other farming systems. This type farming systems establish a balance between economic and social and environmental concerns, up to guide the system to the one side that can provide a desirable quality of human life for all farmers. Sustainable agricultural is different of other economic systems biology and culture, and this difference provides the opportunity for sustainable agricultural system that been developed as an ideal model among farmers (Allong and Martin, 1995). Expansion of system and thought of sustainable agricultural as a process that leads to stable changes in the activities of social, economic, cultural and environmental of community and will lead to increasing of long-term prosperity to the entire society, can be considered as a strategy for achieving sustainable development (Moseley, 2002). However, due to the lack of thought of sustainable agricultural and the non-utilization of its techniques in Iran has led to more than 100 million hectares of the country farmlands exposed to water and wind erosion, and destruction physico-chemical. Take a look at the facts and figures mentioned above can be easily found that the degradation of natural resources, environmental pollution, destruction of forests and pastures, erosion of natural resources of the problems that our country has faced with in recent years (Khazaei, 1998). To transition from conventional farming step towards achieving sustainable agricultural, should be occurs a fundamental change

in strategy, theory, alarmed, ability to labor organizing and specialization among farmers. These changes in knowledge, insight and attitude of farmers in rural communities should be done through promotion as an educational institution and conducted some research in this area. It is necessary to mention promotion when will be success to establish these changes that the procedures and methods of work be compatible with the culture of the people who have been trained. Also promotion should by creating a consistent relationship between research and educational institutions, as a two strains bridge establish a reasonable and bilateral relationship between the new findings of the research centers and farmers' real needs. Among the stimuli that can help a society in achieving sustainable agriculture can be cited to factors such as economic consultations, specialization in agricultural activities, appropriate government policies, increasing the farmers' knowledge and skills in the areas of sustainable agriculture, sustainable agriculture continued economic profitability and non-profitability of conventional farming for a long time (Tabraee, 2005). In contrast to the above mentioned stimuli such as population growth, the need to produce more food and energy demand, are of challenges that are in the way of the adoption of sustainable agriculture in the world (Mahler, 1997). Furthermore cases such as low knowledge of farmers about sustainable agriculture, the problem of soil erosion, water shortages, poor economic condition of farmers, improper patterns of consumption and waste issues, introduction of free trade and the need to prepare for presence in global markets, the issue of investment security, unemployment in rural areas and poor management of rural development are the other problems and challenges that the agricultural sector in Iran is facing with them (Dinpanah and Zamany, 2004). Cropping area this crop in the southern Khorasan province is more than 5183 hectares and the average yield per hectare is equal to 25,488 kg. The number of farmers who are engaged in beet cultivation in the southern Khorasan province are more than 6220 people, which is allocated a large share of the agricultural population of the province to it (agricultural statistical letter, 2004-2005). In South Khorasan Province, uncontrolled use of fertilizers and chemical pesticides has led to the environmental damage and consequently degradation of arable land and soil erosion and water pollution. According to resource degradation, in the not too distant future we will see the chaos in system farming in terms of sugar beet crop production, unless we have paid special attention to the protection of existing resources and increased efficiency in the use of inputs and population control. So far, research has been done in the field of sustainable agriculture principles and practices as well as investigating the attitude and training needs of extension professionals toward sustainable agriculture, and also researches regarding the factors influencing adoption of low input sustainable agriculture and sustainable agriculture in some other provinces and some other products. But now no research in this area and in Southern Khorasan province has been conducted on this product. The general aim of this study was to investigate the factors influencing the adoption of sustainable agriculture among sugar beet growers in southern Khorasan.

Materials and methods

This study was conducted through a survey method and is of descriptive-correlation type. The population of the study consisted of 6220 people of sugar beet farmers in South Khorasan, which between them 200 were selected using Cochran formula and were selected by randomly stratified as statistical samples of this study. Sample size was determined based on cochran formula (cochran). 200 received questionnaires were evaluated and processed. The dependent variable was comprised of the adoption of sustainable agriculture among sugar beet growers in southern Khorasan. To determine the questionnaire validity was used of content validity, construct validity and Face validity, the validity of the questionnaire was obtained using the comments panel of experts after several revised steps. The pioneering test was conducted to determine the validity of the questionnaire and using Spss Software reliability mean coefficient of Cronbach alpha was obtained 0/83 which shows that the questions have a high

degree of validity. The data collected were analyzed in two descriptive statistics and inferential statistics parts, and in order to study the effect of one or more independent variables in predicting dependent variable changes was used of stepwise regression.

Results and discussion

Descriptive statistic

The results (table 1 and table 2) showed that the mean ages of study population was 45/5 years, SD was 10/81 and highest frequency was related to age group of 35-45 years. Most farmers studied had elementary education. And most of them agricultural work experience for 10-20 years and mean years of their farming work was about 21/9 years. Also majority of farmers have cultivation history of sugar beets for 10-15 years with an average of 13/1 years. Also majority of them (27/5%) had farming systems of agriculture, horticulture and animal husbandry. Also study subjects had an average of 7 hectares of cultivated land, which an average of 3/4 hectares were devoted to the cultivation of sugar beet. Predominant property type in the area was of personal type, which 53/5% of people who have this type of property, also majority of farmers (67/5%) used of rotation and fallow simultaneously. Dominant culture type of sugar beets in the area was traditional, and most farmers 66/5% were used of modified seeds. Most farmers surveyed (42/5%) had a low level of social participation and 39% were in average level and 18/5% had a high level of social participation, that shows the low levels of social participation of persons studied. Also majority of farmers (33%) were introduced the rural cooperative as a source that transmitted the highest technical information and majority of them stated that the average calls of promoters per year was equals 2/2 times and the rate resolving their problems by extension agents and extension service centers was very low. Also 71 percent of farmers studied so far have not participated in training - extension classes and 29% who have participated in training - extension classes evaluate that the efficacy of this class are very low level. Also majority of study subjects (54/5%) had an intermediate level of agricultural knowledge, also majority of them had attitudes toward sustainable agriculture in middle level that this range was about 43/5% of the farmers. Also majority of sugar beet farmers (46/5%) had adoption of sustainable agriculture in medium level.

Table 1. Indicators of tend to center and distribution of respondents

No	Variable name	Mean	SD	Median	Minimum	Maximum
1	Age	45/5	10/81	43	20	79
2	Agricultural work experience	21/9	11/41	20	3	5
3	History of sugar beet cultivation	13/1	7/53	12	1	40
4	The total amount of agricultural land	7	4/3	7	0/5	20
5	area under sugar beet cultivation	¾	2/3	3	0/2	15
6	The amount of product performance	20	5/3	20	10	35
7	Income	22 million rials	1/55	20	2 million rials	70 million rials
8	the amount of promoters contact	2/2	2/2	2	0	12

Table 2. Frequency distribution of study subjects according to qualitative variables

No	Variable name	Items	Frequency	*Percent frequency*
1	Level of education	Illiterate	42	21
		Primary	47	23/5
		Guidance	43	21/5
		High School	41	20/5
		Diploma and above	27	13/5
2	Type of farming systems	Agriculture	34	17
		Agriculture – animal husbandry	55	27/5
		Agriculture – horticulture	49	24/5
		Agriculture, horticulture and animal husbandry	62	31
3	Type of Ownership	Rental	49	24/5
		Personal	107	53/5
		Collaborative	24	12
		Endowment	15	7/5
		Mixed	5	2/5
4	Type of Agriculture	Rental	49	24/5
		Fallow	24	12
		In rotation	18	9
		Rotation and fallow	135	67/5
		Continuous culture	23	11/5
5	Mode of sugar beet cultivation	Traditional	115	57/5
		Mechanized	85	42/5
6	Type of used seed	Local seed	71	35/5
		Improved seeds	129	64/5
7	Social participation	Low	85	42/5
		Average	78	39
		High	37	18/5
8	Use of agricultural laborers	Yes	131	65/5
		No	69	34/5
9	Source of income other than farming	Yes	150	75
		No	50	25
10	type of non-farming income	animal husbandry	93	62
		Carpet weaving and animal husbandry	12	8
		Carpet Weaving	22	14/6
		Purchase and sale of agricultural products	11	7/3
		Labor	12	8
11	Type of connection	Radio and TV	32	16
		Books and journals farming	3	1/5
		Newspaper	0	0
		City Agriculture Management	51	25/5
		Extension service center	28	14
		Rural production cooperative	66	33
		Centers and research stations	2	1
		Videos and Educational pamphlets	1	0/5
		Educational institutions Sellers	17	8/5
12	Crops problems resolve by promoters	Very low	86	43
		Low	53	26/5
		Average	38	19
		High	10	5
		Very high	13	6/5
13	Effectiveness of extension training courses	Very low	17	29/3
		Low	15	25/9
		Average	10	17/2
		High	9	15/5
		Very high	7	12/1
14	Presence in training - extension classes	Yes	142	71
		No	58	29
15	Agriculture knowledge level	Low	67	33/5
		Average	109	54/5
		High	24	12
16	Attitude levels toward sustainable agriculture	Low	71	35/5
		Average	95	47/5
		High	34	17
17	Adoption level of sustainable agriculture	Low	39	19/5
		Average	93	46/5
		High	68	34

Bivariate Analysis

Correlations between independent variables with the adoption of sustainable agriculture showed in table 3.

The research findings showed that there is a meaningful relationship between the total amount of cultivated land, land under cultivation of sugar beet, Sugar beets yield, proceeds from the sale of sugar beets, the promoters exposure, age, experience in agriculture, the history of sugar beets cultivation, social participation, attitude to sustainable agriculture, farmers knowledge about sustainable agricultural with dependent variable (adoption of sustainable agriculture).

Table 3. The relationship between research variables

No	independent variables	Correlated with each other (level of significance)		
		Dependent variable	Correlation Coefficient	significance level(sig)
1	The total amount of cultivated land	Acceptance of sustainable agriculture	0/187*	0/008
2	The amount of land cultivated sugar beet		0/192**	0/006
3	Product yield		0/195**	0/006
4	The amount of revenue from product sales		0/237**	0/001
5	Call of promoters		0/281**	0/000
6	Age		-0/805**	0/000
7	Agricultural work experience		-0/508**	0/000
8	History of sugar beet cultivation		0/051	0/472
9	Social participation		0/606**	0/000
10	attitude to sustainable agriculture		0/954**	0/000
11	Knowledge of sustainable agriculture		0/921**	0/000

The results in Table 3 indicate that there is a significant and positive relationship between the total amount of cultivated land and the amount of land under cultivation with sugar beet and adoption of sustainable agriculture. These findings indicate that whatever level of agricultural lands and lands under cultivation of sugar beet be higher acceptance rate is higher. In explaining these findings can be concluded that farmers who have less lands, due to weakness financial strength and the lack of enough land are not able to observe the principles and pillars of sustainable agriculture. However, there is a significant and positive relationship between the yield of sugar beet and the proceeds from the sale of sugar beet and adoption of sustainable agriculture. This finding confirms the fact that whatever yield and consequently the income of farmers has been higher, also acceptance rate of sustainable agriculture has been higher. This is because that the rich farmers have higher risks and greater ability to observe the principles of sustainable agriculture. The findings indicate that there is significant and positive relationship between the degree of the promoters' exposure and the acceptance of sustainable agriculture. This finding is consistent with findings of many researchers who believe that promoted by advocates can improve farmers' knowledge towards innovation and therefore acceptance of innovation. There was a significant and negative relationship between age and experience of farming with the adoption of sustainable agricultural. These findings have revealed that whatever age and experience of farmers be less acceptance rate would be higher in operation. Young farmers due to its characteristics such as bold and risk having higher strength and higher education levels and more communication with the outside world more often they feel there is a need to change. Results showed that there is a

significant and positive relationship between social participation of farmers and adoption of sustainable agriculture. In expression reason for this result can be stated that in rural communities, many of information convection currents occurring during the interaction and participation of farmers in different parts of the community, it causes a lot of farmers who have higher social participation have more chances to learn about new findings. The results indicate that there is a significant and positive relationship between attitudes toward adoption of sustainable farming and sustainable agriculture. Positive attitudes towards an innovation can be considered as the engine of innovation in the move towards acceptance. Finding of this study showed that there is a significant and positive relationship between sustainable agricultural knowledge and acceptance of sustainable agriculture. Improving farmers' knowledge of the production process can open a new window in front of them, because unawareness or low awareness about innovations put more confusion in front of people and therefore people are more interested in achieving the topics that have very little information about it (Table,4)

Table 4. Chi-square values and significance levels between the study variables

No	independent variable	Dependent variable	X2	Significance level (Sig)
1	Type of farming systems	Acceptance of sustainable agriculture	39/126	0/009
2	Type of Ownership		36/81	0/000
3	Type of Agriculture		89/09	0/000
4	Mode of sugar beet cultivation		11/66	0/112
5	Type of used seed		32/03	0/000
6	use of agricultural laborers		10/81	0/147
7	Source of income other than agriculture		16/89	0/018
8	Participation in educational – extension programs		19/213	0/008
9	Sources of technical information receiving		43/91	0/0008

Regression analysis

To investigate the effect of independent variables on the dependent variable of the study was used of stepwise regression analysis (stepwise) using statistical software (Spss). Test results showed that the set of independent variables were entered into the equation were clarified about 93/5% of the variability (Table 5). As Table 6 indicates according significance of the final model of stepwise regression with the following equation can describes the role of each of the variables in adoption of sustainable agriculture (Table 6)

Y = constant ta (x_1) + b (x_2) + c (x_3) + d (x_4)

Acceptance of sustainable agriculture

Variables of equation which are given in

Table 6 = $_1 x_2$ ، x_3 ، x_4 ، x

Coefficients of the equation' variables = a, b, c, d

Table 5. R^2 rate changes acceptance of sustainable agriculture with stepwise entry of independent variables

No	Variables in order of enter to the model of stepwise regression	R2 rate	Rate of change in R2
1	Attitude to sustainable agriculture	0/911	0/954
2	Knowledge of sustainable agriculture	0/927	0.016
3	Age of farmer	0/933	0.006
4	The total cultivated land	0/935	0.002

Table 6. Regression analysis (final model) and the acceptance by independent variables

Model variables	B	Beta	t	sig
Constant	0/912	-	2/654	0/009
attitude to sustainable agriculture	0/238	0/611	13/321	0/000
knowledge of sustainable agriculture	0/153	0/270	5/974	0/000
Age of farmer	-0/015	-0/119	-4/004	0/000
the total cultivated land	0/014	0/042	2/276	0/024

Conclusion

1. The majority of the subjects had a mean age of 45/5 years of age , indicating that middle-aged subjects. On the other hand, due to the significant and negative relationship between age and work experience in agriculture and the adoption of sustainable agriculture, pay special attention to providing the necessary infrastructure and greater attention to rural Logic which are considered as undeveloped or less developed areas is essential. Because without create a necessary space and context and facilities will be facing with migration of young people from rural to urban areas and consequently increasing mean age or inefficiency in agricultural sector.
2. Social participation was low in the study population and since there is a positive relationship between social participation and adoption of sustainable agriculture, this low variable can be as a key challenge in the way of adoption of sustainable agriculture in the region.
3. Technical data transmission resources in the region have not been able to assist to transmit the information to farmers in sustainable agriculture. So design and develop programs and strategies in order to convey meaningful information to farmers is necessary.
4. The results indicated that the promotion sector of the region in terms of extension workers deployed to the region, and resolve issues of farming and holding training and extension and in terms of effectiveness of these classes has failed to act properly and lack of proper and logical planning in this regard is quite evident.
5. Attitude, knowledge and adoption of sustainable agriculture in the region is moderate, indicating the major role of farmers' knowledge and attitude toward sustainable agriculture and the adoption of sustainable agriculture. These three factors were associated with each other. And enhance farmers' knowledge and attitudes have a direct relationship with increasing the adoption of sustainable agriculture
6. Since the four-variable attitude to sustainable agriculture, sustainable agricultural knowledge, farmers' age and the total amount of cultivated land, can explain most of the variation in the dependent variable (acceptance), therefore, this variable can play a major role in the adoption of sustainable agriculture.

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