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Full Length Research Paper

Factors affecting environmental, economic and social aspects of sustainable agriculture in Iran

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The perception of greenhouse owners about the environmental, economic and social aspects of sustainable agriculture was discussed in this article. The methodology used in this study involved a combination of descriptive and quantitative research and included the use of correlation, regression and descriptive analysis as data processing methods. The target population for this study consisted of greenhouse owners in the Province of Tehran (N=1787). By multi-stage cluster sampling technique, 306 respondents were selected. Data were collected through interview schedules. The regression analysis showed that the farming and policy making factors determined 26% of variance on the perception of respondents regarding the environmental aspect of sustainable agriculture. Also, 19% of the variance on perception of respondents about economic aspect of sustainable agriculture could be explained by economical and policy making factors. In addition, 33% of the variance on perception of respondents about social aspect of sustainable agriculture could be explained by farming and extension/education factors. The results demonstrated that economic factors are the most important factors affecting the different aspects of sustainable agriculture. Successful adoption of sustainable agriculture by greenhouse owners in Iran will depend on the economic, policymaking, farming, extension and education and social factors, respectively.

Key words: Environmental aspect; economic aspect; social aspect; sustainable agriculture, Iran, greenhouse.

INTRODUCTION

Agriculture is considered as a critical sector in the world economy. It contributes 24% of global Gross Domestic Product (GDP) and provides employment to 1.3 billion people or 22% of the world's population (Smith et al., 2007). In many of the developing countries, increasing agricultural production has been one of the most important priorities for agricultural development programs (Subedi et al., 2009).

This is no exception for Iran, since agriculture comprises a considerably high percentage of production and employment in this country. It provides employment to about 25% of the labor force, accounts for 25% of the Gross National Product (GNP), contributes over 4/5 of total domestic food supply, 1/3 of non-oil exports (excluding carpet exports), and 9/10 of the raw material demand of national industries (Karbasiyoon, 2007).

In many developing countries, the emphasis has been on achieving higher agricultural productivity, with little regard for sustainability (Brady 1990; Pretty 1995). This resulted in increasing production without any attention to preserving basic and natural resources. Therefore, large areas of the world have faced severe soil degradation, water erosion, groundwater pollution and natural resource depletion (Hurni, 2000; Rigby et al., 2001; Rasul and Thapa, 2004; Röling, 2005). This condition is more

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obvious in poor and developing countries, which rely on a large extent on agriculture and natural resources for their living (Subedi et al., 2009).

Iran, like other developing countries, depends on agriculture sector to fulfill demand for more foods. In order to increase production, a large amount of chemical inputs have been used by farmers in Iran (Allahyari, 2008). This problem particularly is very serious in production of greenhouse products. Currently greenhouse producers are consuming more than 64 type of chemical pesticide for producing cucumber, tomato, strawberry and other products (Baniameri and Sheikhi, 2006).

Government of Iran in response to the adverse environmental and economic impacts of high chemical usages has proposed several strategies and among them has recommended the adoption of low input sustainable agriculture.

Sustainable agriculture as a practice that meets current and long-term needs for food, fiber and other related needs of society while maximizing net benefits through conservation of resources to maintain other ecosystem services, functions and long-term human development (Rao and Rogers, 2006). Agricultural sustainability is not about technical fixes and expertise. It is development processes that need to integrate ecological and societal knowledge through changes in policy, institutions and behavior (Saifi and Drake, 2008).

The concept of sustainable agriculture is strongly related to the multifunctional role, either explicitly or implicitly, recognized to the primary sector (Parra-Lópeza et al., 2008). This sustainability approach comprises a social, an environmental and to a lesser extent, an economic dimension. It takes into account the needs of rural communities and food safety for consumers as well as the impact of agricultural practices on local ecosystem services and the global environment (Aerni et al., 2009). Not only is strong multi functionality predicated on ensuring the protection of the environment, healthy farming and rural communities, but it can also be seen as the most 'moral' systemi (Wilson, 2009).

Despite the diversity in conceptualizing sustainable agriculture, there is an aspect commonly pointed out, which is its multiple-dimensional characteristic including economic, environmental and social aspects (Shaller, 1993; Conway, 1994; Rossing et al., 1997; Berentsen et al. 1998; Legg, 1999; Cobb et al., 1999; Pretty and Hine, 2001; Pacini et al., 2004; Vandermeulen and Van Huylenbroeck, 2008; Sydorovych and Wossink, 2008; Peacock and Sherman, 2010).

Rasul and Thapa (2004) pointed out to 12 indicators to measure sustainable agriculture. Ecological sustainability was assessed based on five indicators: land-use pattern, cropping pattern, soil fertility management, pest and disease management, and soil fertility. Economic viability was assessed based on five indicators: Land productivity, yield stability and profitability from staple crops were assessed based on fore indicators: input self-sufficiency, equity, food security and the risks and uncertainties.

Although many indicators have been developed, they do not cover all aspects of sustainability. Moreover, due to variation in biophysical and socio-economic conditions, indicators used in one country are not necessarily applicable to other countries. The content of the indicators system is different from each other for different countries, regions, and development stages, and is of great subjectivity (Bellows, 1994).

In Iran, like the other developing countries, where the majority of farmers are smallholders and average land holding size is less than one hectare, farmers' immediate concern for agricultural development is how to increase crop yield, income, and food security and reduce the risk of crop failure (Brady, 1990; Pretty, 1995). The overwhelming majority of farmers lack the capital required for the purchase of inputs, but normally have an adequate labor force. Thus, in view of biophysical and socio-economic conditions in the study area, environmental, economical and social aspects of sustainable agriculture were selected in Iran.

The research question for this study is: what are the perceptions of greenhouse owners about the environmental, economical and social aspects of sustainable agriculture? The study attempts to address the following objectives:

To find out the greenhouse owners' perceptions regarding the influencing factors of sustainable agriculture; to find out the respondents' perceptions about the environmental, economical and social aspects of sustainable agriculture and to determine the factors influencing environmental, economical and social aspects of sustainable agriculture.

MATERIALS AND METHODS

The methodology used in this study involved a combination of descriptive and quantitative research and included the use of correlation, regression and descriptive analysis as data processing methods. Base on the latest statistics of Ministry of Agriculture, the target population was 1787 greenhouse owners in the Province of Tehran. By multi-stage cluster sampling technique, 306 were selected by using Cochran Formula. Data were collected through interview schedules.

A series of in-depth interviews were conducted with some senior experts in the Ministry of Agriculture to examine the validity of questionnaire. A questionnaire was developed based on these interviews and relevant literature.

Measuring greenhouses' attitudes towards the environmental, economical and social aspects of sustainable agriculture has been achieved largely though structured questionnaire surveys. The usual questionnaire approach to measure attitude is to include a range of semantic-differential (with good/bad options, for example) and Likert items (ranging from 1 as strongly disagree to 5 as strongly agree) to operationalize the attitude construct.

The final questionnaire was divided into several sections. The first section was designed to gather information about personal characteristics of respondents. The second section was designed

Table 1. Variables and their measurement scale.

Variables	Measurement scale	Cronbach alpha
Attitudes about environmental aspect	Five- point Likert	93.2
Attitudes about economic aspect	Five- point Likert	94.3
Attitudes about social aspect	Five- point Likert	92.4
Farming factors	Five- point Likert	90.2
Economic factors	Five- point Likert	88.7
Social factors	Five- point Likert	84.8
Extension and education factors	Five- point Likert	83.5
Policy making factors	Five- point Likert	92.9

to measure the attitudes of greenhouse owners about the environmental, economical and social aspects of sustainable agriculture. The respondents were asked to indicate their agreements with statements by marking their response on a five point Likert-type scale. The variables and their measurement scale are presented in Table 1.

Content and face validity were established by a panel of experts consisting of faculty members at Science and Research Branch, Islamic Azad University, and some specialists in the Ministry of Agriculture. Minor wording and structuring of the instrument were made based on the recommendation of the panel of experts.

A pilot study was conducted with 30 greenhouse owners who had not been interviewed before the earlier exercise of determining the reliability of the questionnaire for the study. Computed Cronbach's Alpha score was 90.0%, which indicated that the questionnaire was highly reliable (Table1).

Dependent variables in the study included environmental, economic and social aspects of sustainable agriculture which were measured by perception of respondents. The independent variables in this research study were the knowledge of respondents about farming, economic, social, policy making and extension, and education factors.

For measurement of correlation between the independent variables and the dependent variable correlation coefficients have been utilized and include spearman test of independence.

RESULTS

The results of descriptive statistics indicated that the respondents were all male, with average age of 43.8 years old and more than 46% had degree under diploma. More than 80% greenhouses were non hydroponic and the main production was vegetables. Majority of greenhouse owners had less than 5 years working experience. Also Majority of greenhouses area was less than 5000 m^2 Table 2.

In order to find the perception of respondents about their attitudes towards farming, economic, social, policy making and extension, and education factors influencing the sustainable agriculture, they were asked to express their views. Table 3 displays the respondents' means about the five factors. As can be seen the highest mean number refers to the economic factor (mean = 4.21) and lowest mean number refers to social factor (mean = 3.83).

This shows that greenhouse owners mostly regard economic factors as the main reason to adopt new methods in the sustainable agriculture and social factors is not considered as an important element in adopting sustainable agriculture related methods.

The perception of respondents about environmental, economic and social aspects of sustainable agriculture was displayed in Table 4. In relation to the perception of respondents about environmental aspect of sustainable agriculture, the highest mean refers to maintain or improve health and quality of soil (mean = 4.16) and the lowest mean refers to maintain or improve health and quality of water (mean = 3.98). This implies the quality of water is not very important to their agricultural activities and they are more concerned with the soil quality.

The perception of respondents about economic aspect of sustainable agriculture show that the highest mean refers to the maintenance or improvement of agricultural production yield (mean = 4.09) and the lowest mean refers to the maintenance or improvement of farmers' income (mean = 3.96).

In relation to the perception of respondents about social aspect of sustainable agriculture, the highest mean refers to decrease risk and hazard of production (mean=3.97) and the lowest mean refers to enhance equity between farmer, self-reliance and improve welfare and quality of living (mean = 3.92).

The perception of respondents about sustainable agriculture considering environmental, economical and social aspect of sustainable agriculture was displayed in Table 5. The highest mean refers to environmental aspect (mean = 4.6) and the lowest mean refers to social (mean = 3.93). The results show that although environmental aspect is considered more important than the other two aspects, but the mean score between the three aspects are very close and it can not differentiate among the importance of the aspects.

Spearman coefficient was employed for measurement of relationships between independent variables and dependent variable. Table 6 displays the results which show that there were relationship between perception of respondents about environmental, economic and social aspects of sustainable agriculture as dependent variable and the farming, economic, social, policy making and extension and education factors as independent variables.

Table 7 shows the result for regression analysis by

Table 2. Demographic profile of respondents.

Demographic variables	Number	Percentage, n = 306	Cumulative percentage
Age (years)			
20-30	35	11.4	11.4
31-40	84	27.5	38.9
41-50	93	30.4	69.3
51-60	71	23.2	92.5
Over 60	23	7.5	100.0
Education			
Under diploma	142	46.4	46.4
Diploma	98	32.0	78.4
Associate degree	28	9.2	87.6
Bachelor and above	38	12.4	100.0
Working experience in greenhouses (years)			
Less than 5	176	57.5	57.5
5-10	94	30.7	88.2
11-15	26	8.5	96.7
More than 15	10	3.3	100.0
Kind of production			
Vegetables	290	94.8	94.8
Strawberry	12	3.9	98.7
Vegetable and strawberry	4	1.3	100.0
Kind of greenhouse			
Non Hydroponic	252	82.4	82.4
Hydroponic	54	17.6	100.0
Area of greenhouses (1000 m^2)			
Less than 5	128	41.8	41.8
5-15	126	41.2	83.0
15-25	16	5.2	88.2
More than 25	36	11.8	100.0

Table 3. Means of respondents' views about the factors influencing the sustainable agriculture (1=strongly disagree; 5=strongly agree).

Factors	Mean	Standard deviation
Farming	3.98	0.66
Economic	4.21	0.64
Social	3.83	0.87
Policy making	4.03	0.70
Extension and education	3.97	0.71

stepwise method. Independent variables that were significantly related to perception of respondents about environmental aspect of sustainable agriculture as dependent variable were entered. The result indicates that 26% of the variance in the perception of respondents about environmental aspect of sustainable agriculture could be explained by the farming and policy making factors. Among all variables, "farming factors" (Beta

Table 4. Means of respondents' views about the environmental, economic and social aspects of sustainable agriculture (1 = strongly disagree; 5 = strongly agree).

Environmental	Mean	Standard deviation
Maintain or improve health and quality of soil	4.16	0.81
Maintain or improve health and quality of production	4.12	0.83
Maintain or improve health of producer and consumer	4.00	0.88
Maintain or improve health and quality of water	3.98	0.91
Economic	**Mean**	**Standard deviation**
Maintain or improve production yield	4.09	0.80
Maintain or improve farm profitability	4.08	0.84
Maintain or improve farmers' income	3.96	0.86
Maintain or improve food security for producer and consumer	3.98	0.94
Social	**Mean**	**Standard deviation**
Enhance equity between farmer	3.92	0.96
Enhance self- reliance	3.92	0.94
Decrease risk and hazard of production	3.97	0.95
Improve welfare and quality life	3.92	0.92

Table 5. Means of respondents' views about the environmental, economic and social aspects of sustainable agriculture (1= strongly disagree; 5 = strongly agree).

Aspects	Mean	Standard deviation
Environmental	4.06	0.70
Economic	4.03	0.69
Social	3.93	0.70

Table 6. Correlation coefficient measures between independent variables and depended variable.

	Depended variable		
Undefended variable	**Environmental**	**Economical**	**Social**
Farming factors	0.504**	0.362**	0.553**
Economic factors	0.354**	0.400**	0.397**
Social factors	0.324**	0.320**	0.351**
Policy making factors	0.414**	0.388**	0.398**
Extension and education Factors	0.384**	0.371**	0.484**

**p<0.01.

Table 7. Multivariate regression analysis (environmental aspect of sustainable agriculture as dependent variable).

Parameter	B	Beta	t	Sig.
Constant	1.711	……	6.879	0.000
Farming factors (x_1)	0.410	0.374	6.588	0.000
Policy making factors (x_2)	0.215	0.207	3.654	0.000

R^2=0.26, $Y=0/37x_1 +0/20x_2$.

Table 8. Multivariate regression analysis (economic aspect of sustainable agriculture as dependent variable).

Parameter	B	Beta	t	Sig.
Constant	1.773	……	6.301	0.000
Economic factors (x_1)	0.318	0.276	4.737	0.000
Policy making factors (x_2)	0.243	0.229	3.941	0.000

R^2=0.19, $Y=0.27x_1+0.22x_2$.

Table 9. Multivariate regression analysis (social aspect of sustainable agriculture as dependent variable).

Parameter	B	Beta	T	Sig.
Constant	1.181	……	5.018	0.000
Farming factors (x_1)	0.436	0.384	6.787	0.000
Extension and education factors (x_2)	0.278	0.265	4.695	0.000

R^2=0.33, $Y=0/38x_1+0/26x_2$.

coefficient: 0.374, sig.: 0.000) and "policy making factors" (Beta coefficient: 0.207, sig.:0.000) affect the environmental aspect of sustainable agriculture positively. Other variables were not statistically significant.

Table 8 shows the result for regression analysis by stepwise method. Independent variables that were significantly related to perception of respondents about economic aspect of sustainable agriculture as dependent variable were entered. The result indicates that 19% of the variance in the perception of respondents about economic aspect of sustainable agriculture could be explained by the economic and policy making factors. Among all variables, "economic factors"(Beta coefficient: 0.276, sig.: 0.000) and "policy making factors" (Beta coefficient: 0.229, sig.:0.000) affect the environmental aspect of sustainable agriculture positively. Other variables were not statistically significant

Table 9 shows the result for regression analysis by stepwise method. Independent variables that were significantly related to perception of respondents about social aspect of sustainable agriculture as dependent variable were entered. The result indicates that 33% of the variance in the perception of respondents about social aspect of sustainable agriculture could be explained by the farming and extension/education factors. Among all variables, "farming factors"(Beta coefficient: 0.384, sig.: 0.000) and "extension and education factors" (Beta coefficient: 0.265, sig.:0.000) affect the environmental aspect of sustainable agriculture positively. Other variables were not statistically significant.

DISCUSSION

The development of sustainable greenhouse could be achieved over time. Therefore, certain factors should be identified and need to be carefully examined. Innovative strategies need to be developed that cater specifically in area of environmental, social and economic aspects of sustainable development.

The perception of greenhouse owners about the factors affecting environmental, economic and social aspects of sustainable agriculture was discussed in this article. The results demonstrated that economic factors are the most important factors affecting the different aspects of sustainable agriculture. Successful adoption of sustainable agriculture by greenhouse owners in Iran will depend on the economic, policymaking, farming, extension and education and social factors, respectively.

In order to determine the variance in the environmental, economic and social aspects of sustainable agriculture, all of the variables were entered into a stepwise regression analysis. The regression analysis showed that the farming and policy making factors determined 26% of variance on the perception of respondents regarding the environmental aspect of sustainable agriculture. Also, 19% of the variance on perception of respondents about economic aspect of sustainable agriculture could be explained by economic and policy making factors. In addition, 33% of the variance on perception of respondents about social aspect of sustainable agriculture could be explained by farming and extension/education factors.

Farming factors related to environmental sustainability (Cox et al., 1997; Kochaki et al., 1995; Mazaheri and Hosseini, 2008) and it is consistent with results of this research. Farming factors were the most important factor which affects environmental aspect of sustainable agriculture. Economic factors also contribute to economic sustainability (Sedaghati, 1991) and it is consistent with the results of this study.

As well, farming and extension/education factors affected the social sustainability (Karami, 1998; Hoseini and Shariati, 2003). The results of this research demonstrated that social sustainability will depend on farming and extension/education factors. Karami (1998) and Pereti, (1995) reported that farming, economic, social, policy making and extension/education factors contributed in achieving sustainable agriculture.

Conclusion

The role of sustainable agriculture in improving the agriculture sector has been the subject of debate. It is evident that a large proportion of the rural population in Iran has yet to be familiar about sustainable agriculture. In this regard, factors that affect sustainable agriculture should be carefully identified and examined. The perception of greenhouse owners about factors that affect different aspects of sustainable agriculture was discussed in this article.

In Iran like some of developing countries, there is not

clear understanding about the new methods of farming related to sustainable agriculture and policymakers and researchers have difficulty in prioritizing the policies and strategies.

The results demonstrated that opinion and attitudes toward different aspects of sustainable agriculture to a great extent depend upon farming, policy making, economic and extension factors. There is need for more training and education of farmers about the role of these factors in promoting sustainable agriculture. Government should explore ways to increase the participation of farmers in planning, implementing and evaluating programs related to sustainable agriculture. This could speed up the adoption of new methods of sustainable agriculture and facilitate the exchange of ideas among various stakeholders.

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