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Factors Influencing the Economic Aspects of Sustainable Agriculture in Iran

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Abstract: The perception of greenhouse owners about factors affecting the economic 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 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 economic and policy making factors determined 19% of variance on the perception of respondents regarding the economic aspect of sustainable agriculture. The results of ordinal factor analysis indicated that the factors were categorized into five groups, namely economic, social, farming, extension education and policymaking factors ordered by the magnitude of their impact.

Key words: Economic 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 and provides employment to 1.3 billion people or 22% of the world's population [1]. In many of the developing countries, increasing agricultural production has been one of the most important priorities for agricultural development programs [2].

Economic changes, significant rises in agricultural productivity, globalization and exposure to world markets have impacted agriculture sector in Iran. In Iran, like many developing countries, the emphasis has been on achieving higher agricultural productivity, with little regard for sustainability [3, 4]. This resulted in increasing production without any attention to preserving basic and natural resources. Therefore, large areas of the world have faced sever soil degradation, water erosion, groundwater pollution and natural resource depletion [5, 6, 7, 8]. This condition is more obvious in poor and developing countries, which rely on a large extent on agriculture and natural resources for their living [2].

One solution that has been offered for this problem is that the farmers change their methods of farming which can augment their production level and allow them to continue to live on the land. It is this 'solution' of farmers becoming more sustainable oriented that is the focus of this paper.

Nevertheless, many people express serious doubts about the profitability of sustainable agriculture, in terms of the costs and returns from each farming system. It is rather difficult to draw a conclusion as to whether sustainable agriculture is economically viable. The profitability of farming may depend on which factors are taken into account, notably market and shadow prices, static and dynamic time dimensions and positive and negative externalities. However, for agricultural systems to be sustainable implies that farm investment and other input costs will yield a flow of monetary (market) and non-monetary (non-market) benefits in the long term [9].

The purpose of this study is twofold. First, it determines the key factors that influence economic aspects of sustainable agriculture in Iran. Secondly, it provides suggestions for policy recommendations.

The paper is structured as follows. Following this introduction we provide a background to the Islamic Republic of Iran. The paper then introduces a context to different aspects of sustainable agriculture, before

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discussing the methodological approach taken. Results are provided and then some policy recommendations are offered.

Iran: Agriculture comprises a considerably high percentage of production and employment in Iran. 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 [10].

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 [11]. 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 [12].

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.

Context: 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 [13]. 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 [14].

The concept of sustainable agriculture is strongly related to the multifunctional role, either explicitly or implicitly, recognized to the primary sector [15]. 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 [16]. 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 [17].

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 [18-27] (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; Peacock and Sherman, 2010).

A more recent definition of sustainability is meeting the needs of the present, without compromising the ability of future generations to meet their own needs. That definition is quite complex and can have a wide-range of interpretations. Most university experts and business leaders see sustainable agriculture as being sustainable environmentally, economically and socially. The environmental and economic aspects of sustainability have been around for decades, even centuries, in agriculture.

Rasul and Thapa 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 considered the indicators of. Social acceptability was assessed based on fore indicators: input self-sufficiency, equity, food security and the risks and uncertainties [7].

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 [28].

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 [3, 4]. 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.

MATERIAL AND METHODS

The methodology used in this study involved a three stage combination of descriptive and quantitative research. Stage one involved a series of in-depth interviews 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. 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.

Measuring greenhouses' attitudes towards the economic 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 to measure the attitudes of greenhouse owners about the economic 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.

Stage two involved a pilot study 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 88.8%, which indicated that the questionnaire was highly reliable (Table1). Dependent variables in the study included economic 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, economical, social, policy making and extension and education factors.

Stage three involved a survey held in May 2010. The research population included all greenhouse owners, i.e., those owners who were registered in the Ministry of Agriculture as the owners of greenhouse, in the provinces of Tehran (N = 1787). By multi-stage cluster sampling technique, 306 were selected by using Cochran Formula. Data were collected through interview schedules.

The data was also analyzed by using ordinal factor analysis technique. The basic idea of factor analysis is the following. For given set of observed variables $Y_{1,...,}$ Yn one wants to find a set of latent variables $\xi_1...\xi_k$, k<n that contain essentially the same information. The last version of their statistical software, named LISREL 8.8 can handle such analysis. Briefly, we used: 1) Goodness of fitness which its null hypothesis indicates that the model is valid (we prefer to accept the null hypothesis, i.e., p-value>0.05); 2) RMSEA (Root Mean Square Error of Approximation) which takes into account the error of approximation in the population and asks "How well would the model fit the population covariance matrix if it were available?" (p-value less than 0.05 indicates good fit and higher than 0.08 represents reasonable errors of approximation in the population).

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 percent had degree under diploma. More than 80 percent 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).

Table 1: Variables and their measurement scale

Variables	Measurement Scale	Cronbach Alpha
Attitudes about Economic Aspect	Five- point Likert	93.2
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

Table 2: Personal Characteristics of respondents

Variables	
Sex	Male =100%
Age (years)	Mean = 43.8
Work experience (years)	Mean = 5
Main production	Vegetable= (94.8%)
Size of Greenhouses	Less than 5000 m^2 (41.8%)
	More than 5000 m^2 (58.2%)

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

Factors	Mean	SD
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

Table 4: Means of respondents' views about the economic aspects of sustainable agriculture (1=strongly disagree; 5=strongly agree)

Perception	Mean	SD
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

Table 5: Correlation coefficient measures between independent variables and depended variable

Independent Variables	Depended Variable economic Aspects
Farming Factors	0.362**
Economic Factors	0.400**
Social Factors	0.320**
Policy Making Factors	0.388**
Extension & Education Factors	0.371**

**p<0.01

Table 6: Multivariate Regression Analysis (economic aspect of sustainable agriculture as dependent variable)

	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

$0.22x_2 + x_1\ 0.27 = Y$

Table 7: Classification of factors that affect the Economic aspects of sustainable agriculture by Using Ordinal Factor Analysis

Category	Variables	Variance by Factor
Farming	Using organic fertilizers, Application of integrated pest management, Planting varieties prone to less pesticide and fertilizers, Reducing the use of chemical fertilizers and pesticides, Using modern equipment in the greenhouse, Replacing fossil energy by solar energy, Utilization of sprinkler irrigation system	8.40
Economic	Appropriate prices for products, Stable economic policy, Financial support by government, Providing insurance, Private Investment, Promoting exports, Development of processing industries, Allocating appropriate facilities for marketing	13.07
Policy making	Coordinated and interactive program planning and policy making, Determining standards and supportive regulation, Establishing appropriate infrastructure, Approving the new rules and regulations	6.73
Extension/education	Extension classes, On farm education, Visit the sample farms, Preparing films, Publication of printed materials, Changing the attitudes and beliefs of greenhouse owners, Improving the knowledge and skills of greenhouse owners	7.23
Social	Accepting risks by producers, Beliefs of producers, Cooperation of greenhouse owners with other stakeholders, Establishing local organizations, Collective action by greenhouse owners, Application of indigenous knowledge	8.74
Total		44.18

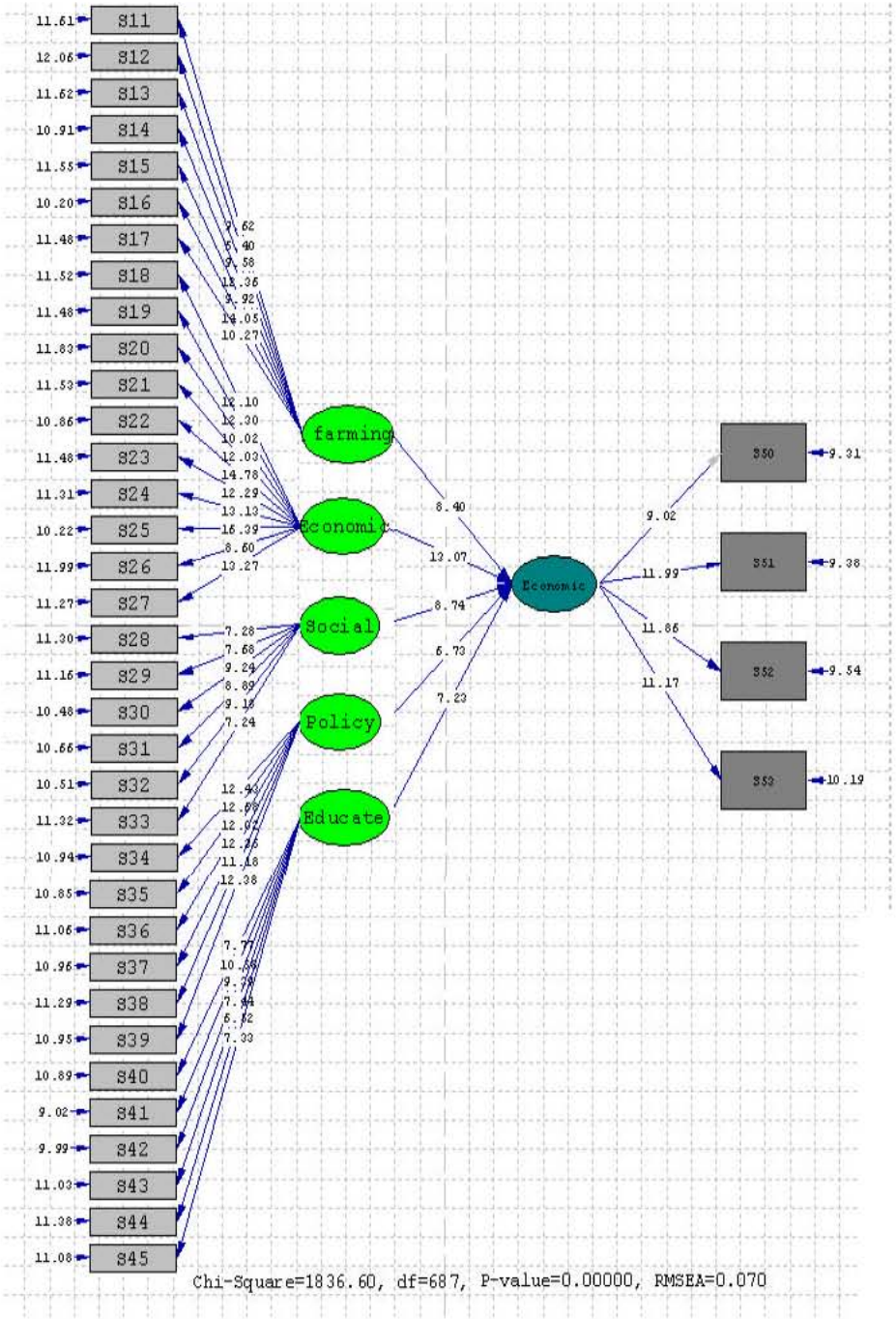

Fig. 1: T Value Model

In order to finding the perception of respondents about their attitudes about farming, economical, 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 are mostly regarded 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 economic aspects of sustainable agriculture was displayed in table 4. The perception of respondents about economic aspect of sustainable agriculture show that the highest mean refers to maintain or improve yield of agricultural production (mean=4.09) and the lowest mean refers to maintain or improve farmers' income (mean=3.96).

Spearman coefficient was employed for measurement of relationships between independent variables and dependent variable. Table 5 displays the results which show that there were relationship between perception of respondents about economic aspects of sustainable agriculture as dependent variable and the farming, economic, social, policy making and extension and education factors as independent variables.

Table 6 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.

As one may observe, the economic factors affected the economic aspects of sustainable agriculture more than other factors. The results of ordinal factor analysis along the structural equation model (SEM) presented in Table 7. As the ordinal factor analysis showed, the factors were categorized into five groups, namely economic, social, farming, extension education and policymaking factors ordered by the magnitude of their impact (Figure 1).

The Goodness of the model has been verified by the goodness of fit test (p-value=0.10) and the RMSEA (p-value=0.070).

DISCUSSION

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

In order to determine the variance in the economic aspects of sustainable agriculture, all of the variables were entered into a stepwise regression analysis. The regression analysis showed that the economic and policy making factors determined 19% of variance on the perception of respondents regarding the economic aspect of sustainable agriculture.

The results of this study show that farming factors affect the economic sustainability and it is consistent with findings of studies by Cox and others; Kochaki and others and Mazaheri and Majnoon Hosseini (2008) [29-31].

Extension/education factors also affected the economic aspects of sustainable agriculture [32]. Karami (1998) reported that extension/education factors contributed in achieving sustainable agriculture [33].

Economic factors also contribute to sustainability and it is consistent with the results of study by Ommani and others that income level of farmers and their poverty would affect sustainability in rural areas of Iran. Developing countries have to invest in the sustainable agricultural related technologies and meanwhile considering whether the target audience are effectively reached or are interested in the technology [34].

Ommani and others cited the research by Chizari, Lindner and Lashkarara that, major barriers hampering adoption of sustainable agriculture practices included: limited financial returns for farmers, limited farmer knowledge of sustainable agriculture principles and methods, low levels of farmer education, government rules and regulations, problems with soil erosion and lack of water and a low level of extension agent knowledge with respect to sustainable agriculture [34, 35].

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.

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 economic aspects of sustainable agriculture to a great extent depend upon extension/education 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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