Ordinal Factor Analysis of Constraints in Iran's Sustainable Agricultural Development (Case Study: Greenhouse Production)

Seyed Jamal Hosseini [1], Floria Mohammadi [2], Seyed Mehdi Mirdammadi [2]

[1.] Department of Agricultural Extension and Education, Science and Research Branch, Islamic Azad University, Tehran,Iran
[2.] Department of Agricultural Development, Science and Research Branch, Islamic Azad University, Tehran,Iran
jamalfhosseini@srbiau.ac.ir

Abstract: Greenhouse Owners in the Province of Tehran were surveyed in order to explore their perception about the constraints in developing sustainable agriculture. The methodology used in this study involved a combination of descriptive and quantitative research. The total population was 306 greenhouse owners in the Province of Tehran. As the ordinal factor analysis showed, the constraints were categorized into four groups, namely economic, social, regulatory and technical, ordered by the magnitude of their impact.
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1. 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. 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).

Agriculture is essential to human survival and societal development. With worldwide human population growth and economic development, increasing demand for agricultural products has placed substantial pressures on agriculture and natural resources; this in turn has caused environmental pollution and ecological degradation. Agricultural sustainability has become a critical problem that is central to the sustainable development of complex socio-economic–natural systems (Zhao et al. 2007).

To be sustainable, agriculture has to move beyond these limited economic ideologies and seek creative solutions to the questions of fair pricing, cost internalization, food security, the right to an adequate livelihood, and the multifunctional role of agriculture. Modernization has created a social “black hole,” mindlessly destroying anything that smacks of rural culture. To be sustainable, agriculture has to be culturally sensitive and empowering and should nurture the cultural renaissance of the countryside (Perlas, 2011).

For sustainable agriculture to succeed, policy formulation must arise in a new way. Policy processes must be enabling and participatory, creating the conditions for sustainable development based more on locally available resources and on local skills and knowledge. Effective policy processes will have to bring together a range of actors and institutions for creative interaction and address multiple realities and unpredictability. What is required is the development of approaches that put participation, negotiation, and mediation at the centre of policy formulation so as to create a much wider common ownership in the practices. This is a central challenge for sustainable agriculture (Roling and Pretty, 1997).

This is no exception for Iran and government of Iran in response to the adverse environmental impacts of high chemical usages has proposed several strategies and the adoption of sustainable agriculture is considered as a major recommendation.

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 (Karbasiyoon, 2007).

Although, sustainable agriculture offers tremendous impacts on increasing production and eventually enhancing the food security in the developing countries, but it presents challenges that impede its progress and development. Potential challenges are lack of training for farmers; lack of knowledge and skills among farmers; financial

constraints and legislative, policy and regulatory impediments.

Poor funding in the research and development of sustainable agriculture technologies in the developing countries is considered another major challenge and financial helps from developed countries and donor agencies can not fulfill their needs.

Among the challenges in developing sustainable agriculture is poor regulatory environment which with no doubt affect the successful application of technologies related with sustainable agriculture. Developing societies will need to develop and implement regulatory measures to manage any environmental, economic, health and social risks associated with new technologies (Ozor, 2008).

Most successes in sustainable agriculture, though, are still localized. They are simply islands of success. This is because an overarching element, a favorable policy environment, is missing. Most policies still actively encourage fanning that is dependent on external inputs and technologies. It is these policy frameworks that are one of the principal barriers to a more sustainable agriculture (Roling and Pretty, 1997).

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 (Jitsanguan, 2001).

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.

Ommani and others ((2009) citing chizari, Lindner and Lashkarara (2001) reported that major barriers hampering adoption of sustainable agriculture practices in Iran 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.

It is important to point out that even small effort to informing farmers and increasing their knowledge about the sustainable agriculture can have big results. However, the promise has yet to be realized due to the lack of information among rural communities. Therefore, it is necessary to identify the constraints and remove the impediments faced by rural population.

Poursaeed and others (2010) citing Karami and Mansoorabadi (2008) indicated that much of the research effort in (adoption of) sustainable agriculture has been fragmented, with little coordination and integration. Little substantive research has investigated the beliefs and motivations that drive farmers' decisions about adoption of sustainable agricultural practices. Thus, in view of biophysical and socio-economic conditions in the study area, It is important to examine constraints in development of sustainable agriculture were selected in Iran.

The purpose of this study is twofold. First, it determines the key constraints in development of sustainable agriculture in Iran. Secondly, it provides suggestions for policy recommendations to overcome these constraints.

2. 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 constraints in developing 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 constraints in developing sustainable agriculture. The respondents were asked to indicate their agreements with statements by marking their response on a five point Likert-type scale.

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 91.3%, which indicated that the questionnaire was highly reliable.

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).
of least important species and E is the evenness index.

3. 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.

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 2 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.

Table 1. 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
Education	3.97	0.97

Implementation of "ordinal factor analysis" along the structural equation model (SEM) summarizes all constraints into four factors; economic, social, technical and regulatory given by Table 4. Goodness of the model has been verified by several statistics such as the goodness of fit-test (p-value=0.00) and the RMSEA (p-value=0.041). As the ordinal factor analysis showed, the constraints were categorized into four groups, namely economic, social, regulatory and technical, ordered by the magnitude of their impact.

Table 2. Classification of constraints in developing sustainable agriculture by Using Ordinal Factor Analysis

Factor	Variance
Social	11.90
Regulatory	11.40
Economic	22.25
Technical	10.99
Total	56.54

4. Discussions

A wide range of economic, social, physical and technical constraints influences adoption of agricultural production technology. Wheeler citing

Rogers and Pannell pointed the factors such as perception about risk and profitability; uncertainty and certainty about adoption; amount of required information and attitude about risk and uncertainty.

Economic factors also contribute to sustainability and it is consistent with the results of study by Ommani and others (2009) 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.

The findings also show that social and cultural constraints in some developing countries impede the development of sustainable agriculture. Public confidence, trust and acceptance are key factors which determine the success or failure of sustainable agriculture. It is well known that uncertainties and lack of knowledge of potential effects and impacts of new technologies, or the lack of a clear communication of risks and benefits can raise concern amongst public.

Based on the perception of respondents, the one of the constraint in development of sustainable agricultural was regulatory constraints. The findings reflect an important fact, namely that a sound regulatory and policy environment is a necessary prerequisite for developing sustainable agriculture

A regulatory process should ensure the initiation of a wide range of participatory processes to enable direct input from the general public into assessment and determination of priorities and principles for public policy, R&D and legislation.

Because sustainability is a function of various economic, environmental, ecological, social, and physical goals and objectives, it must inevitably involve multi-objective tradeoffs in a multidisciplinary and multi-participatory decision-making process (Ommani etal., 2009).

The perception of greenhouse owners about the constraints in developing sustainable agriculture was discussed in this article. The results demonstrated that regulatory, economic, technical and social issues are the main constraints in developing sustainable agriculture. Successful development of the sustainable agriculture in Iran will depend on the appropriate regulatory environment and the authorities should develop policies that would overcome the constraints in developing sustainable agriculture.

In Iran like some of the developing countries, there is not a clear understanding about the sustainable agriculture and policy makers have difficulty in prioritizing the policies and strategies. In this regard, public involvement will enhance the development of sustainable agriculture.

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Corresponding Author:
Dr. Seyed Jamal Hosseini
Department of Agricultural Extension and Eductaion Science and Research Branch, Islamic Azad University, Tehran, Iran
E-mail: jamalfhosseini@srbiau.ac.ir

References

1. Subedi M, Hocking TJ, Fullen MA, McCrea AR, Milne E, Mitchell DJ, Bo-Zhi WU. An evaluation of the introduction of modified cropping practices in Yunnan Province China, using surveys of farmers' households. Agriculture Science in China. 2009; 2: 188-202.
2. Zhao J, Luo Q, Deng H, Yan Y. Opportunities and challenges of sustainable agricultural development in China. Philos. Trans. R. Soc. Lond. B. Biol. Sci. 2008; 1492: 893–904.
3. Perlas N. Seven dimensions of sustainable agriculture. Center for Alternative Development Initiatives, 2011.
4. Roling N, Pretty N. Extension role in sustainable development, in: Swanson BE, Bentz RP, Sofranko AJ. (Ed.), Improving Agriculture Extension: A Reference Manual. FAO, Rome, 1997.
5. Karbasiyoon M. Towards a competency profile for the role of instruction of agricultural extension professionals in Esfahan. PhD thesis, Wageningen University and Research Centre, The Netherlands, 2007.
6. Ozor N. Challenges and impacts of agricultural biotechnology on developing societies. African Journal of Biotechnology. 2008; 4: 322-30.
7. Jitsanguan T. Sustainable agricultural systems for small scale farmers in Thailand: Implication for the environment, Thailand: Food and Fertilizer Technology, 2001.
8. Brady NC. Making agriculture a sustainable industry. in: Edwards CA, Lal R, Madden P, Miller RH, House G. (Eds.), Sustainable Agricultural Systems. Soil and Water Conservation Society, Iowa, 1990.
9. Pretty JN. Regenerating Agriculture: Policies and Practice for Sustainability and Self-Reliance. Vikas Publishing House Pvt. Ltd., New Delhi, India, 1995.
10. Ommani AR, Chizari M,. Salmanzadeh C, Hosaini JF. Predicting adoption behavior of farmers regarding on-farm sustainable water resources management (SWRM): comparison of models, Journal of Sustainable Agriculture. 2009; 5: 595-616.

11. Chizari M, Lindner JR, Lashkarara F. Perceptions of Lurestan Province, Iran wheat farmers with respect to sustainable agricultural practices. Journal of International Agricultural Extension and Education. 2001; 3: 65–71.
12. Poursaeed A, Mirdamadi M, Malekmohammadi. I, Hosseini JF. The partnership models of agricultural sustainable development based on Multiple Criteria Decision Making in Iran. African Journal of Agriculture Research. 2010; 23: 3185-3190.
13. Karami E, Manosoorabadi A. Sustainable agricultural attitudes and behaviors: a gender analysis of Iranian farmers. Journal of Environmental development sustainability. 2008; 10: 883–898.

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