Evaluation of social-economic sustainability indicators among all constitutive indicators in some parts of Southern Khorasan Province

Zahra Hatami Sardashti1*, Majid Jami Al-Ahmadi2, Mohammad Ali Behdani2 and Abdolmajid Mahdavi Damghani3

1, 2 and 3-MSc graduated Student in Agroecology, Associate Prof., from College of Agriculture, Birjand University, and Assistant Prof., from Department of Environmental Science, Shahid Beheshti University, Iran, respectively.

*Corresponding Author Email: Zahra.hatamy@yahoo.com

Abstract

This research was conducted during 2009 at a regional scale in Birjand and Qaen counties, Southern Khorasan, as an attempt to develop a sustainability index (SI) for quantifying the sustainability of saffron agroecosystem. The information of these agroecosystems was collected by using questionnaires and was subjected to statistical analyzing. The average of SI (Sustainability Index) in these agroecosystems was 39.46 for whole studied region, and 37.20 and 45.09 for Birjand and Qaen respectively. These low indices are showing the undesirable sustainability condition of saffron agroecosystems. In general, only 9.18 percent of all farmers achieved to a SI equal to or more than 50 and the highest score was 55.12. Area under culture is one the most important factors that determine income in rural communities. This indicator among all constitutive indicators of social sustainability index had the lowest score.

Keywords: Sustainability Index, Saffron, Southern Khorasan.

Introduction

Sustainability, like all technical terms, has more or less different meanings from the perspective of experts in various fields. Thus, by strict definition it is also a problem for agriculture (Afraz, 1997). General agreement is that sustainable agriculture is an environmental foundation (Nasiri Mahalati et al., 2001). Beus and Dunlop (1994) considered agricultural practices such as the use of pesticides and inorganic fertilizers, and maintenance of diversity as indicators of sustainability. The concept of agricultural sustainability has emerged in response to concerns about the adverse environmental and economic impacts of conventional agriculture (Hansen, 1996). In spite of common concerns about sustainable agriculture, there are large differences among the scholars and other stakeholders about the attributes of sustainable agriculture (Rigby & Caceres, 2001). Some (Tisdell, 1996) consider low use of external inputs as a major requirement for agricultural sustainability. Some (Hansen, 1996), with keen interest in enhancing production, find it necessary to increase the use of external inputs to a some extent, so as to maintain soil nutrient levels and crop yields. Despite the diversity in conceptualizing sustainable agriculture, there is a consensus on three basic features of sustainable agriculture (Rasul & Thapa, 2003): (i) maintenance of environmental quality, (ii) stable plant and animal productivity, and (iii) social acceptability. Taking into account these considerations, it is possible to think that sustainability of an agroecosystem could be improved by supporting most of the agricultural production (energy flow) on the natural services (such as decomposition of organic matter eliminating crop residues and restoring soil fertility or reduction of pest outbreaks), which are provided by the wild and naturalized life forms present in the system, and in turn determined by soil and climatic conditions in the region (Odum, 1989). Such a system should aim to obtain levels and stability of food and fiber production in accordance with regional characteristics, and to use optimal input levels, which allow sustainability of production over time without impairing natural services (van Ittersum and Rabbinge, 1997). Several studies has been done on making the sustainability quantitative in Iran and elsewhere. The British Government suggested 34 indicators under 13 themes such as nutrient losses to fresh water, soil P levels, nutrient management practices, ammonia emissions, green house gas emissions, pesticide use, water use, soil
Saffron is one of the major export products and plays a major role in income and employment for saffron producers (Tajiani & Koopahi, 2005; Ghorbani, 2006) and generate substantial revenue for the country's currency (Tajiani & Koopahi, 2005). According to 2005 statistics, the rate of saffron production was 230 tons in Iran, which was equivalent to 93.7 percent of total global production (Ghorbani, 2006). This study determines the sustainability of the cultivation of saffron in ecology of South Khorasan province to infer shortcomings and obstacles in the way of agricultural sustainability has been done in these areas.

Materials and Methods

This survey was done to develop an index for quantifying the ecological sustainability of agricultural systems saffron in regional-scale and the city of Birjand in 2009. In the present study all aspects of agricultural sustainability have been taken into consideration including ecological, social and economic. Accordingly, a sustainability index, which was a compilation of 75 indicators were designed to the saffron crop, the information was collected through questionnaires and then analyzed.

Sustainability index was calculated by using the Weighting Sum (Andreoli & Tellarini, 2000 cited in Mahdavi Damghani et al., 2005). For this, the contribution rate for any specific indicators taken in the final index and rating of all indicators was done from zero to its maximum rated indicators with regard to the most unfavorable situation to the most favorable indicators. After scoring each measure, the total scores of indicators is accumulated and is introduced as the final index score.

After designing the indicators, 98 questionnaires were completed. Among these 70 questionnaires was related to the city of Birjand and 28 questionnaires was related to the city of Qaen. Farms were selected randomly. How to fill out the questionnaires to prevent the receiving of ambiguous information, it has been with the optional choice of saffron fields and a direct questioning and answering (Q & A). Data were analyzed by using Excel, SPSS and Sigma plot software.

Results and Discussion

Average of Sustainability Index in studied agroecosystem was 39.46. The equivalent percentage for the Birjand was 37.20 and for the Qaen was 45.09. Results of the sustainability index is indicating that the studied agroecosystem are not considered in good sustainability condition. Mahdavi Damghani (2005) reported a sustainability index score of wheat - sugar beet and wheat - cotton in Khorasan Razavi 46.1. Research results of Iravani & Darban astaneh (2004) about wheat growers in Tehran province show that 46.7 percent of the operating systems are in highly volatile and unstable, 43.6 percent somewhat stable group and 9.7 percent are in sustainable groups and very sustainable.

Figure 1. Amoeba graph of the Sustainability Indicators for under study saffron farms.

Saffron farmers from a total of 35 rated indicators of social - economic (from the total 100 scores of the final index) were scored 17.49 (or 49.69%) (Table 1). Although the sustainability of agricultural systems should be managed based on ecological principles, it may be the most important barriers to the use of
sustainable farming systems, biological or technological barriers are not but also social or political barriers that hinder the acceptance by the farmers sustainable farming approach and apply the farming operations of these aspects are satisfactory.

Table 1. The mean of score of social-economic indicators in study farms in both Birjand and Qaen regions

<table>
<thead>
<tr>
<th>Region</th>
<th>% Score</th>
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<tbody>
<tr>
<td>Birjand</td>
<td>48.66±0.84</td>
</tr>
<tr>
<td>Qaen</td>
<td>53.21±1.56</td>
</tr>
<tr>
<td>Total</td>
<td>49.96±0.77</td>
</tr>
</tbody>
</table>

The percentage of illiterate farmers is as shown in Figure 2, totally number of farmers in the region of Qaen is lower than in the region of Birjand. This could eventually indicate that this is due to a higher comparative advantage in saffron cultivation at Qaen region and trends of more educated people toward saffron cultivation and finally, due to a higher level of technical knowledge have a positive impact on management saffron systems and on the sustainability index of these agroecosystems.

Hayati and Karami (1999) reported that the literacy rate as a demographic characteristics at significant percentage of 1 % level have a positive correlation (r=0.39) with levels of knowledge of sustainable agriculture variable. According to them, farmers with higher education level can understand the relations between the phenomenon and the effects of various factors on each other in nature. Therefore it is reasonable that such people, to have higher knowledge and information than those activities that ultimately lead to sustainability. Research results of Jannat et al (2008) also shows a positive and significant relationship between education level and range of technical knowledge of cow owners. Results of the study of Hassan Shahi et al (2009) shows a significant positive relationship between education and sustainable farming systems in the 5% level. Also the research that was done by Ali Beigi and Baboly (2008) to estimate the sustainability of irrigated agriculture of wheat growers of Sarpol city. Based on regression analysis revealed that education was the most important factor affecting the sustainability of wheat farming in the region has been studied. Based on this, Can be conclude that the applying proper methods of farming of sustainable agriculture requires higher educational level of farm managers.

This study showed that 77.55% of family farmers of the total area were between 1 to 5 people and about 22.45 percent of them have six persons and more. The equivalent percentage for Birjand are 77.14 and 22.86 and for Qaen 78.57 and 21.43, respectively (Figure 3). Families that are having fewer children, able to provide family's health facilities, food, clothing, housing and better education for themselves, Costs related to training, education and child development is much more than the cost of prevention of his birth, So in this project to calculate the sustainability index is given a higher score to families with low population.

The results were expressed that respectively 80 and 75 percent of the farmers' families in the region of Qaen and Birjand were participated in the process of production and harvest of saffron cultivation. Family participation in farm work is very important in production of saffron, because in this product is almost the highest cost of production related to the labor costs, Partnership with family members in farm work causes much of saffron costs in the product removed and net profit of farm rises.
which are short-term benefits and doesn’t use no long-term plan for the proper use of resources.

Results showed that over 90 percent of farms have private ownership and type of shared ownership and rented one for about 4 percent and 1 percent of farms were owned by the boss (Figure 4) this indicator achieved similar percentage in both of counties. In systems with tenancy (rental) individuals are considered which are short-term benefits and doesn’t use no long-term plan for the proper use of resources.

One reason for the low scores in the indicators of social sustainability, is the low total under culture area (all products) which is owned by farmers, as 88.78 percent of farm land with an area of 4 hectares or less and only 11.22 percent with an area of over 4 hectares of land under their ownership and figure 5 display equivalent percentages for Birjand and Qaen.

![Figure 3. Frequency of number of farmers’ family members in Birjand and Qaen](image-url)

![Figure 4. the mean of distribution of ownership type among under study farmers](image-url)

![Figure 5. Frequency distribution (percent) width of total under culture areas in Birjand and Qaen](image-url)
This indicator among all constitutive indicators of social sustainability index had the lowest score. Considering how much revenue of rural community is dependent on agriculture and the area under cultivation is one the most important factors that determine income in rural communities, it is expected to increase in surface area and looking to overcome the economic problems of families, farmers have tend to implement sustainable farming methods and will do greater efforts to implement these methods. As in this project is obtained the positive relationship between total land area under cultivation and the sustainability index (Table 2).

Availability inputs and sources were in the different circumstances, so about 37.75 percent of them had access to insurance, loans and credit about 67.35 percent to agricultural inputs and 85.71 percent of farmers have been in contact with experts in the promotion and education. Correlation coefficients results in this study suggest a positive and significant relationship between farmers’ Availability to insurance, loans and bank (Table 2). The study results of Hassan Shahi et al. (2009) indicate positive and significant relationship between insurance use and sustainability index of farming systems exist. Access to insurance and bank loans and credits cause to reduce fluctuations in farmers’ incomes and lowering production risks. Followed by reducing the concerns of farmers, farm management practices can result in pushing the new methods of sustainable agriculture. Iravani and Darban Astaneh (2004) have pointed in their study to the a positive relationship with the vast majority of economic variables that have sustainable agriculture.

Tabrai (2004) in their findings stating that concerning the role of promoting recommendations and education in sustainable agriculture in Khorasan province, Comparison tests have shown that between the group benefited from the extension service, with an average overall sustainability index 57.83 percent and non-profit groups from advocacy services with an average overall sustainability index 56.54 percent, there are significant differences in the level of 10%. Transfer of technical knowledge in the fields of the plantation owners on good management practices through education and agricultural extension is possible. Farmers with the proper principles and methods of modern farm management and sustainable agriculture are familiar In applying these methods are more successful to act and achieving the goals of sustainable agriculture.

Damghani Mahdavi et al. (2005b) stated in their research results that a Positive correlation between to access of experts in agricultural education and agricultural inputs with agricultural sustainability index have existed.

Average farm income share of total income of farmers in the area of Saffron in Birjand and Qaen is shown in Figure 6. Studies performed by Saboor Bilandi and Vadii (2007) on economic review of saffron and its impact on farmers’ incomes and livelihoods in Saffron Gonabad showed an essential role about 70 percent on operators lives. 38 percent of saffron growers over 50 percent of their income comes from Saffron that shows Saffron has the main role in providing their incomes. 30.11 % of Saffron growers whose their income is less than 25 percent of their annual income from Saffron. Saffron income is as a byproduct of their income.

Table 2. coefficient correlations of several indicators with social sustainability index in under study agroecosystems

<table>
<thead>
<tr>
<th>Correlation Coefficients</th>
<th>Availability agriculture extension</th>
<th>Availability insurance and loan</th>
<th>Availability agricultural inputs</th>
<th>Total farm size</th>
<th>Each under culture part of farm’s size</th>
<th>Farmer’s literacy</th>
<th>participation of farmer s’ farm family income</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.238*</td>
<td>0.411**</td>
<td>0.211*</td>
<td>0.281**</td>
<td>0.220*</td>
<td>0.527**</td>
<td>0.332**</td>
</tr>
</tbody>
</table>

Figure 6. The mean portion of different annual income sources in (A) Birjand and (B) Qaen

Non-agricultural income sources make sure to provide sufficient income to the farmers. Reduction in rural incomes will lead to different outcomes of the most important, is immigration. Family economic security is directly on the economic sustainability of agriculture. The potential of income at the time of agricultural
income loss can be the family's economic sustainability. Moreover, the economic security of families indirectly affect the overall sustainability of agriculture. In this way the farmer unilateral agricultural activities result in prevention an incorrect application of management techniques. As well as excessive use of inputs, in order to achieve more production, ultimately, more revenue can be inhibited. Zaybt (1999) in their study results produced a positive impact on the non-farm income. The results study of Woodburn et al (1994), show the positive effect of non-agricultural income in the acceptance of new technology.

Conclusions

small arable land for farming are considered a obstacle to the use of useful implements such beneficial planting machine, fertilizer sprayers and pesticides sprayer. To solve the problem of low area of saffron farm can encouraged growers to form cooperatives and changing from yeoman farmer to the integrated management of crop plants to increase the size of their action. It increased with the addition of any single crop cultivation provided to use of heavy equipment and capital that make it up to individual farmers which is hard to get for farmers would be possible and production costs greatly reduced. Since the size of farming units affected by the production structure, types of products, economic and social conditions of each region, Therefore, it is better to determine the optimum size of production units specifically for the saffron product in each region.

References


