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Factors affecting in sustainability of agricultural production systems in Iran

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ABSTRACT

The purpose of this study is to identify factors affecting the sustainability of production systems in Shushtar township. Since agricultural production cooperatives have special importance in the region economy, identifying factors that threaten the sustainable and continuous production is of great importance. This survey has been conducted in crop year 2011 and the required data have been collected through questionnaires. The dominant approach of this investigation is surveying. The statistical population is the cooperative members of the province which has 1200 people. About 160 people have been selected as a sample via a multistage sampling method. The collective data using SPSS 11.5 software have been analyzed in a couple of descriptive and analytical sections. Descriptive results showed that most of farmers are illiterate and old. The results show that 66.78 % of production cooperatives lie in the relatively stable group. This study shows that there is a positive and significant relationship between age, farming experience, type of agriculture, agricultural land area, and area of cultivated land, ecological characteristics, social status, knowledge and attitudes for sustainable agricultural production cooperatives with stability. In multivariable regression analysis for identifying the influencing factors to sustainability has been showed that six variables of total production, attitude to sustainable agriculture, the amount of intake facilities, social association, and relational properties indicate about 81% of dependent variable of production cooperatives.

Key words: potato cultivation, sustainability of cultivation, sustainable agriculture

INTRODUCTION

During the past 30 years, while increasing amount of agricultural productions has met part of increasingly populations needs, but today it is clear that modern technology leads to erosion of natural resources [1].

Agriculture is considered 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 [2].

Environmental degradation and the destruction and conversion of forest areas and range-lands to agricultural lands, soil erosion and water pollution resulting from the unlimited exploitation and uncontrolled use of chemicals and increase of agricultural waste has taken extremely serious dimensions [3]. The question is whether this is sustainable agricultural development and natural resources will stay or not?

Unfortunately, in many countries especially in developing countries, increasing population, rapid urbanization, lack of knowledge about importance of natural resources along with inappropriate planning resulted in rapid degradation of forests and range-lands [4].

Today the concept of sustainable development is an inseparable part of the development and in this time agricultural developments are the preconditions necessary for economic development and while the obstacles to development in

this sector is not resolved, other sectors including the industrial sector would not flourish and development would not achieve [5].

Common definition of sustainable agriculture is that to intake all aspects of social, economic, ecological dimensions. In other words, agriculture will be sustainable when: (1) Socially possible and consistent; (2) Economically justifiable; (3) Politically appropriate; (4) the applicable management and (5) consistent with environment [6].

Some experts see sustainable agriculture from ecological point of view [7-8] and others have supposed this term beyond the ecological aspects, so it includes aspects of ethics, sustainable development, sustainability of institutions and rural communities [9-10].

Sustainable agriculture as a practice that meets current and long-term needs for food, fiber, and other related needs of society while maximizing not benefits through conservation of resources to maintain other ecosystem services, functions, and long-term human development. 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 [2].

Sustainable agriculture considers not only the future requirements of production increase, but also maintains the quality of environment and water and soil. The process of editing concept of sustainable development and following it, sustainable agriculture suffers from a variety of shortcomings, which include the incomplete understanding of the issue of environmental degradation and poverty and some type of confusion about the role of economic growth as well as the concept of Partnership [11].

Various specialists presented different assessment criteria for assessing the stability. The experts have analyzed stability assessment in different levels. The Japan Ministry of Agriculture (1998) uses the following criteria to measure the stability. Nitrogen consumption, Use of pesticides, Land and soil conservation, Soil quality, Water quality, Greenhouse gases, Wildlife habitat, Agricultural landscape, Farm Management, Farm financial resources, Cultural and social subjects, Water consumption and Biodiversity[12].

Saltiel et al (1994) showed that alternative crops, the use of various products, to observe the protective operations and crop alternation to control weeds, perennial ground cover and ignore the follow system and the use of organic fertilizers and reduction of herbicide use are some of stability indicted [13].

Iravani and Darbanastane (2004) concluded that the amount of generated product and total productivity in manufacturing and technical knowledge has the greatest effect on the sustainability of farming systems [11]. Hosseini et al (2007) showed that there is no significant relationship between farm system instability and personal variables [14].

A successful program of sustainable agriculture includes goals such as providing food security with quality, water, soil and natural resources conservation, biodiversity, conservation of energy resources inside and outside the farm, maintenance and improvement in ranch profitability, being accepted by the community and improving the quality of human life.

In order to achieve these goals it must use activities that conduct us towards the stability. The main activities of this class are used of tillage to reduce soil erosion and loss of energy, use of cover crops, use of manure fertilizers to replace chemical fertilizers to increase soil nutrients, change of flooding from sprinkler method to drip irrigation methods to reduce the amount of water consumption and soil erosion [15].

Various elements of sustainability in agriculture have made it even varies from region to region. Main elements to evaluate the sustainability of farming systems, including:

(1) Soil conservation by using cover crops, plowing perpendicular to the slope, crop rotation and crop residue management [16-17]. Minimum tillage techniques, use of manure fertilizers and crop rotation and conservation tillage systems are carried out and stability is considered one of the most important elements. (2) Water quality is possible by reducing chemical consumption and use of appropriate methods of irrigation. (3) Integrated pest management using biological methods, agronomic, and physical and chemical interactions (Allelopathic) is operational [18]. (4) nutrient management using appropriate management practices on the nutritional needs of plants and increased use of resources within the field such as fertilizers, livestock, crops and fertilizers Leguminous and green fertilizers lead to lower manufacturing costs and increase the usefulness[19].

(5) Forest Farm, which has good compatibility with annual and perennial herbaceous crop production and can be integrative with livestock [20].

Experts believe that using the proposed method depends on the farmer's knowledge and understanding of these methods and their effects on unit operation. Sustainable agriculture demands for knowledgeable human resources knowing the principles and sustainability operations who are capable of its using.

Human resource development for sustainable agriculture will be operational through education and a combination of sustainability topics and extension programs. One of the goals of agricultural extension is supporting the rural users in steady use of renewable natural resources by providing information and communicates with the villagers. Considering the Factors are affecting agricultural knowledge also shows that age, educational level, participation in organizational activities related to agriculture and access to mass media are effective in this recognition [21].

Also, variables such as age, formal education, farming experience, farm size and level of full time activity on the farm influence the amount of familiarity with aspects of sustainable agriculture [8].

The literature confirms the fact that in previous studies overlay the level of sustainable farming systems are linked with individual factors of farmers, agronomic characteristics, economic factors and farmers' attitudes towards sustainable agriculture. Whether the personal, professional, social and economic characteristics and attitude of cooperation members is effective on the level of sustainability of their farming systems? This study is trying to answer this question.

MATERIALS AND METHODS

The methodology used in this study involved a combination of descriptive and quantitative research and included the use of correlation and descriptive analysis as data processing methods. The total population for this study was all members of production cooperatives in Shushtar Township, where their population is equal to 1200. In the present study due to the need and necessity in various stages of research the multistage is sampling for all the inhabitants of rural farmers in the study area has been used. In this study, sample of study is made of two parts, the central and Shadravan and 6 village Sardarabad, Shahid Modarres, Mianab, the northern Mianab, The eastern Shoaybieh and western Shoaybieh and city of Shushtar. Altogether the study includes 196 village containing inhabitants in the area. Sample size have been found by using Cochran's formula and then do the pretest and completing 25 questionnaires using the variance obtained from the stability variable of production cooperative with the insertion of a variable in the formula of Cochran was estimated about 160 people. Revealing sample size, at first three villages, Shahid Modarres, northern Mianab and western Shoaybieh were selected randomly and secondly with regard to potato growers in each district in proportion to population the sample is assigned. In the third stage after determining sample size in each district, based on an available list of villages in each district were assigned and at the village surface collecting data in a random manner has been done. In this study, a questionnaire was used for data collection, which is set based on the objectives and research hypotheses. Different parts of the questionnaire include: individual, agronomic, socio – economic characteristics and related questions with sustainable production cooperatives. In order to assess the sustainability, public variables have been used that may affect agricultural productions and the international association of Natural Resources and Conservation in 1980, has suggested these indicated to estimate the amount of cultivate sustainability has proposed. Researches also were used (Sisk, 1995, Williams, 2000, Adams, 2009, Al-Subaiee, and et al, 2005, Tourdonnet, et al.2006) in order to complete these indicated. Stability is a function of algebraic calculations of effective positive and negative variables that are classified in 20 indicated in table 1.

Table 1- evaluation indicators of sustainable agriculture

indicator	Effects on sustainability	indicator	Effects on sustainability
Using minimum tillage	+	using animal fertilizers	+
The use of cover crops	+	change of irrigation methods	+
Soil conservation	+	tillage perpendicular to the slope	+
Using crop rotation	+	following cultivate alternation	+
Maintenance of cultivate production residues	+	water resources management	+
Amount of fertilizers consumption	-	Application of pesticides	-
IPM integrated pest management	+	nutrient management	+
Nitrogen consumption	-	Replacing products crops	+
Mechanization level	-	use of green manure	+
Integrated management of the field	+	Use of fallow system	+

In the present study to form determination and content validity, the panel of experts, including faculty members in fields of agriculture, promotion, economy has been used. In order to investigate its reliability criterion the alpha

Cronbach Coefficient has been used to calculate the internal coordination of questionnaires, where the rate for the attitude scale (0.79) and for the stability scale of farming systems (0.85) were calculated. In order to analyze data collected SPSS11.5 software was used.

RESULTS AND DISCUSSION

Personal and professional characteristics

The data shows among the total of 160 members of the production cooperative in study, the mean age was 46.57 years and about 8.53% of them was illiterate. The average farming experience was 29 years and 83.1 per cent of their cultivation has been associated with follow period. Each of the underlying farmers had an average of nine hectares of land and 46.3 percent of people has between 1-5 hectare of land and about 45.6 % devote less than one hectare annually to these crops. Based on information obtained 36.3 % is between 5-1 pieces of land, and on average each person has 11 pieces of land 50% of farmers use leguminous plants in their crops rotation 38% of them use pesticides in low scale, 7.5 % of farmers use chemical fertilizers very low scale and 41.3 % use chemical pesticides in moderate scale. The data shows that 44.4 % of respondents believe that during the exploitation of soil its cultivated quality has decreased and 35.6% of them believe that their use of water sources are better than the former operation. 32.5% of farmers annually earn between 100 and 500 dollars from selling potato.

Sustainability of farming systems

Sustainable agriculture is a type of agriculture steps towards benefits more people, more efficient utilization of resources and environmental balance. Sustainable agriculture must be accompanied with proper management of agricultural resources to meet the changing needs of people and at the same time maintains or improves natural resources and prevent environmental degradation.

Factor scores of each beneficiary were calculated based on factor analysis results and with the help of cluster analysis, subjects were classified in three groups. Based on information obtained (Table 2) level of stability is divided into three groups of unstable, relatively stable and very stable. Based on the table results about 14.37% of beneficiaries has a poor condition from the viewpoint of stability, most of them (107 beneficiary) enjoy a medium conditions and only 18.76% of beneficiaries is located in a desirable conditions.

Table 2 - Status of sustainable farming systems among operators

Sustainability of farming	Frequency	percent
Unstable	23	14.37
Relatively stable	107	66.87
very stable	30	18.76

In order to study the research relation the coefficient of Pearson and Spearman correlation was used. The results show that age, history of agricultural work, which is part of the individual variables, has a positive and significant stability relationship. Among the crops variables amount of crop land under cultivation, use of follow, has a positive and significant relationship with the stability, but chemical fertilizer has a negative and significant correlation with the stability. Correlation analysis results are observed in Table (3).

Table 3 – Relationship between stability of potato cultivation with some explanatory variables

Variable name	Correlation	Variable name	Correlation
Age	**0.316	Goodness of input prices	**0.604
History of agricultural job	**0.393	Amount of cultivate land	**0.347
Use of fallow system	**0.226	Green manure	**0.295
Consumption of chemical fertilizer	**_0.245	Legume plants	*0.199
Social status	**0.407	Sales revenue	**0.464
Use of communication devices	**0.206	yield	**0.537
Participation in extension classes	**0.383	Use of farm workers	*_0.160
Appropriateness of educational activities	**0.413	adequate crop loans	**_0.283
Attitude to sustainable agriculture	**0.427	Land under cultivation	**0.461
<i>Crop Type</i>	**0.215	knowledge of sustainable agriculture	**0.459

** > 0.01

* > 0.05

To identify the predictor variables of growing stability the stepwise multivariable's regression was used. Regression analysis is shown in table (4) and table (5).

Another factor that influences on sustainability is operator's attitude to this issue that the resources are as a trust in their hands and because of positive and significant relationship between these two variables their relationship is confirmed.

Based on regression analysis results showed 80.2 percent of variables predicting the stability of cultivation are related to the six variables of the total production, the attitude, the receiving facility, knowledge of sustainable agriculture, social participation and communicative characteristics that were about 32.9 percent, 15.8 percent, 15.2 percent, 5.8 percent, 5.3 percent and 5.2 percent of the total variance explained variables affecting their sustainability, and only 19.8 percent of the residual variance is related to other variables. Accordingly, it is including:

- Due to the positive relationship between educational - extension activities and stability it is recommended that for more stability, volume and quality of services of educational - extension activities improved.
- Given the positive relationship between attitudes to sustainable agriculture and sustainable cultivation it is recommended for more sustainable agriculture. First, improve farmers' attitudes towards sustainable agriculture in collaboration with relevant organizations to promote agricultural extension, secondly pay more attention to those farmers who have attitudes favorable toward sustainable agriculture.
- Known as the most effective variable is the total variable production which emphasis on better economic status as well as greater land. The more production of a farmer the better sustainability so it is a good idea to focus on poorer and low land farmers to increase the stability of cultivation and the programs and investments to be inclined toward these groups.
- Intake facilities from consulting to marketing services refer to services provided to farmers during the process of production. Given the importance of this variable in stability it is recommended to centralize specialized centers to provide these services.
- It is better to pay more attention to all groups of farmers and their association during developing programs. As increased participation of farmers in society, they can better enjoy of input, financing and consulting services.

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