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Effective factors that influence agricultural sustainability-A case study of the Greater Dezful rural system in Iran

Farzaneh Afzalinia[1*], Najaf Hedayat[2] and Mohammad Reza Bosshaq[3]

1. Department of, geography, Payam nour university, Dezful, Iran
2. Department of Water Engineering, Islamic Azad University, Dezful Branch, Dezful, Iran
3. Department of Geography & Rural Planning, University of Isfahan, and Young Research Club Isfahan Branch, Iran

Corresponding author: Farzaneh Afzalinia

ABSTRACT: Agricultural sustainability is emerging as one of the pre-requisites for socio-economic and rural regeneration. This is to ensure crop production while taking appropriate measures to protect the environmental integrity. The paper aims at investigating the factors in which influence the sustainability of crop production and rural regeneration in the Greater Dezful rural system. The methodology involved descriptive-survey of a random sample consisting of 220 selected from the crop growers by administration of survey questionnaires, the data of which were analyzed by application of Cochran' formula within the SPSS environment Results show that measures to achieve crop production sustainability with an strong emphasis on environmental protection and eco-system integrity is very crucial from the points of view of the stakeholders in the rural system. It was found that the whole constellation of factors that can contribute to rural growth through institutionalization of the crop production sustainability can be achieved by measures to enhance five agricultural-production-related components namely, social-participation, infrastructural support services, ecological, agronomical and economical productivity that comprised of 22 associated variables in Greater Dezful rural system showing over 75% variance.

***Keywords*:** Agricultural sustainability, Greater Dezful, rural system, factors, variables

INTRODUCTION

Development is associated with the economic growth and prosperity which many macro-planners in the developing and developed world attach a great importance. There are various ways to perceive the development conceptually. Some view it as the mere progress in a particular field or domain. Other sees it as concerted efforts to propel the socio-economic and cultural advancement in the under-developed societies. However, from the point of view of Lee (1993), the development is seen as describing the perspectives, while Clark (1989) thinks of it as exchanging values, providing moral development and social reorganization, which is expected to bring about changes in the existing infrastructures that yield a better future.

Hedayat (2011) considers the development in its sustainability context, which in his view; crop production has to be enhanced while simultaneously taking measures to protect the physical environmental integrity. This is in line with the view expressed by other scholars (Avijit, 1998: Overton, 1999). Still others view the concept from the bottom up approach, which views the development as instrumental in empowering people by enabling them to increase their skills and professional capacities through education, research and other training and extension programs. In a nut shell, all of these are thought to be materialized by developing a knowledge-based institutional framework which is now beginning to emerge as one of the most influencing single factor propelling the development locomotive (Uphoff, 1991).

Some still see the development as paving the way for institutionalization of knowledge exchange and ready access to opportunities for enhancing the professional careers of most people particularly the women (Axinn, 1997: Uphoff, 1991). All of these socio-economic variables are considered as the pivotal ideas for sustainable development. As pointed out elsewhere, development in reality is thought to lay the foundation for meeting the requirements of the present generation with a view to ensure the provision of vital resources for a decent livelihood of the future generation"(WCED, 1987).

The framework of this concept is based on the theoretical concepts represented by the libertarian and egalitarian principles which perceive the world in its progressive and more humanized socio-economic relations such as "common future" and "equality between generations "(Batie, 1989: Karami, 1995). Still others take an environmental-oriented view for agricultural development and stress that sustainable development is impossible without taking measures to protect the physical environment within which the crop-production system can sustain itself (Taylor, 2002, 2). The development is considered as a fundamental ingredient of environmental theory, and from such a perspective, the process by which the society organizes itself to make the development a sustainable enterprise is lucidly explained. Sustainable development is therefore a synthesis of the economic and social dimensions with the environmental dimension (Newman and Rowe, 2003: Doody et al, 2009: Cirella& Tao, 2010: Tanguay et al, 2010: Moldanet al, 2011).

An important off-shoot of sustainable development is agricultural sustainability which emphasizes on maximization of food and fiber production on one hand while ensuring the physical heath and integrity of the environment within which the food production factory operates. Despite its wide-spread use in the technical literature, there is not a universally-conclusive definition agreed by experts for sustainable agriculture (Hedayat 2005: Hedayat, 2013: Sadati et al., 2010: Gomez-Limon &Riesgo, 2009: Hedayat et al 2013). Some experts regard sustainable agriculture on the basis of ecological perspective (Senanayake, 1991: Williams, 1991) while others view the concept to have a more broader involvement beyond than the mere ecological aspects with a moral emphasis on development that takes the growth which can be sustainable to ensure the economic well-being of the crop producers through systematical rural regeneration by enhancing the institutional frameworks within the rural community. Thus, the three main goals of sustainable agriculture can be summarized as economical productivity, environmental quality and social responsibility which should be meticulously balanced to yield an optimum outcome (Hua-jia et al., 2007: Karami & Mansoorabadi, 2008: Tatlidil et al, 2009: Hedayat, 2005: Hedayat, 2013: Hedayat et al 2013).

There is a school of thought which predominantly focuses on the basic biophysical processes that support and enhance the sustainability. One of its distinctive features is to substitute intra-field supplies for extra-field inputs (Taylor et al, 1993). This is based on the philosophy that views ready access to financial support and credit facilities as the most crucial ingredients for the sustainable crop production agricultural factory that is based on most advanced agronomical operations that incorporates integrated management and pressurized irrigation and efficient tillage operations (Uri.2001: Hedayat, 2005:Saifi & Drake, 2008:Hedayat ,2013).

The most important factors which determines the agricultural sustainability is assessed by the area under cultivation, crop yield and quality ,management of plant residues, income , ready-access of the growers to education and extension programs and rural regeneration and social integrity and information communication (Hedayat, 2005:Mahdavidamghani et al, 2006: Hedayat ,2013: Hedayat et al, 2013).

Finally the importance of education, income, total land under cultivation are the most important ingredients of sustainable development is lucidly and vividly expressed by Bosshaq et al in their study undertaken in Ravansar, western region of Iran (Bosshaq et al, 2012).

To summarize the arguments, there is a vast range of ecological, participative, economical, and social variables that influence the agricultural sustainability. Identifying these factors and determining their real contribution to agricultural sustainability can play a crucial role in the policy-making process at the macro-level. The aim of this paper is to investigate the important factors that influence the crop-production sustainability in rural regions of the Greater Dezful, in south western Iran. Figure (1) shows the theoretical model consisting of the factors that impinge upon the agricultural sustainability in the area under study.

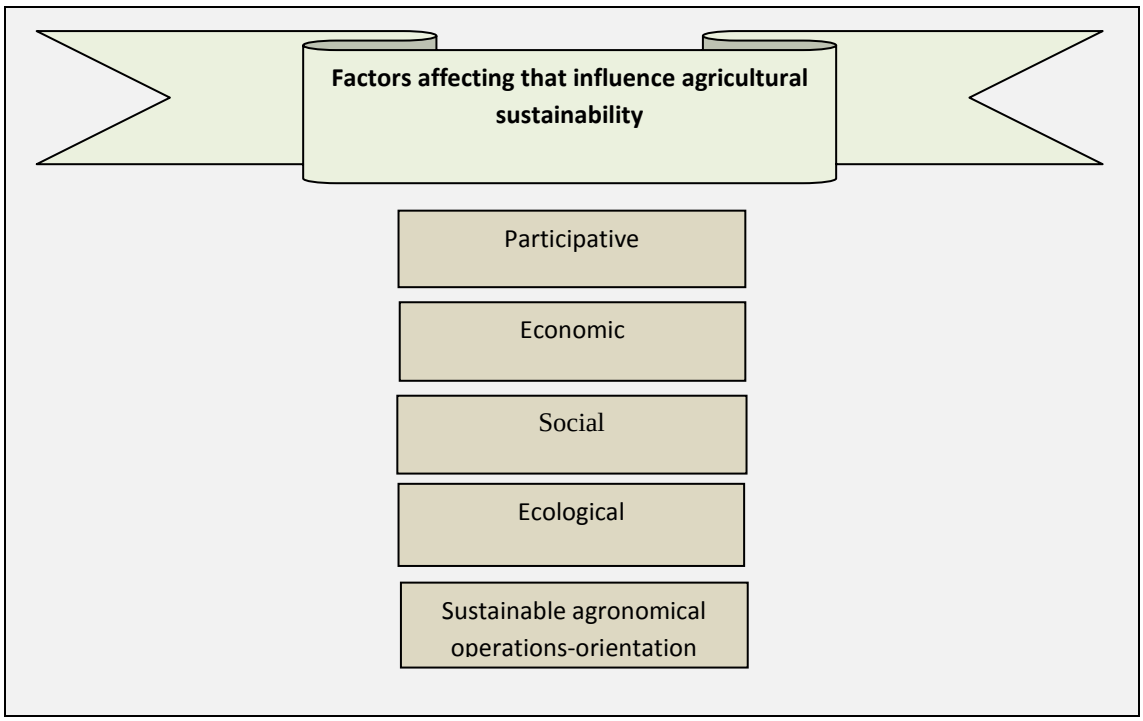

Figure 1. The theoretical model consisting of the factors that impinge upon the agricultural sustainability

MATERIALS AND METHODS

The research involved the administration of questionnaires aimed at the heads of producers' families consisting of a sample population amounting to 11013 people who were randomly selected from the Greater Dezful foo-producing bastion, most of which is within the Dez command area in southwestern Iran.

A trial test on 25 questionnaires was initially conducted in several rural crop-growing units, some of which were located in croplands outside the geographical domain of the research area and outside the sample population. This was undertaken as a means of enhancing the validity component of research. This was compounded by inclusion of the Cochran formula for obtaining 95.5% safety, t= 2 and for q, p 80 and 20 were used respectively. 220 family heads were selected randomly for the survey.

The Cronbach' Alfa statistical technique was also applied in order to verify the validity of the questionnaires and results yielded by the adopted methodology showed a reliability coefficient of over 75%. This was incorporated to ensure a relatively sound result. The questions were arranged on the Likert rankings, the data of which were then analyzed using the SPSS program.

RESULTS AND DISCUSSION

Results on the personal and professional characteristics of the subjects show that the average age of those subjects was 44.1 that included a range between 22 and 68 years-old individuals. Other personal and professional characteristics are presented in table (1).

Results (table 2) shows that the "Consumption of micronutrient fertilizers" scoring a mean of 4.08 which suggest the highest variable whereas the "Ratio of water-logged lands to total arable lands" with a mean statistical score of 2.04 shows the lowest variable. The situations of other research indices are summarized in table (2).

KMO and Bartlett statistical test are used to measure the internal integrity of data and ascertain their suitability for factorial analysis technique. Calculations show that the internal coherence of data is appropriated (KMO=0.827) and Bartlett statistics of 3564.641 was also meaningful at 1% level, indicating (factorial model).

By applying the Kaiser criterion, five factors have been extracted with an eigenvalue greater than one. Results show in table 3, with eigenvalue and percentage of variance for each factor.

Results table (4) suggest that by and large factors such as social-participation, infrastructural support services, ecological, sustainable agronomical operations-orientation and economical productivity have the greatest contribution to enhancement of sustainability in the agricultural system of the region under investigation.

The study of factors determining the sustainability of agricultural system shows that social participative factors play the greatest role in the sustainability of agricultural system, which is consistent with results of similar studies (Den Biggelaar and Suvedi, 2000, D'souza et al. 1993).

Results obtained from characteristics of the infrastructural support-services show that sustainability of agricultural system has a direct relation with rural development as well as poverty alleviation and there exists an interweaving link between them. It can therefore be deducted from these analysis that what is referred to as sustainability in the literature, is likely enhanced by provision and institutionalization of appropriate infrastructural support-services (Hedayat, 2005). These findings are also substantiated by research studies on agricultural sustainability elsewhere which are attained in such a manner to optimize crop production with a simultaneous measure to protect the integrity of the physical environment within which the food-production factories operate (Hedayat, 2013). Both the land and water use are so important crop production considerations which have to be incorporated in the decision-making equation. Ecological factor is another crucial parameter which from the point of view of this researcher crucial factor needed to ensure sustainability in the agricultural system in general and crop-production regime in particular.

Results obtained from the analysis of variable like "sustainable agronomical operations-orientation" show that application of a suitable crop scheduling including crop rotation regime, optimum utilization of the water and soil resources by the use of the plant and animal remains as well as the use of green fertilizer. Consideration of these agro-parameters is likely to pave the way for conditions that are instrumental in bringing about sustainability in the crop-production system. These results are substantiated by research elsewhere (Saifi& Drake, 2008) and (Taylor et al, 1993).

Economical productivity is another crucial factor in explaining agricultural sustainability. As pointed out by Tatlidil et al, on-farm economic performance in general and economic productivity in general are the most determining variables in assuring agricultural sustainability, most of which has to be carried out by the farmers themselves (Tatlidil et al, 2009, Hedayat ,2013).

Table 1. Individual-Agricultural farmers

Variables	Mean	Std.Deviation	minimum	Maximum
Age(year)	44.1	12.35	22	68
Education(year)	6.24	3.78	0	13
Agricultural history(year)	27.88	6.23	4	49
Total amount of lands(hectare)	5	1.94	3	25
Revenue from crops(10,000 Rls)	219.45	20. 62	180	330

Table 2.Indicators and factors of sustainability of agricultural system

Variable	Mean	Std.Deviation	Rank
Consumption of micronutrient fertilizers	4.08	1.11	1
Rate of access to agricultural inputs (seed, fertilizer...)	4.03	1.18	2
Rate of participation in promotional & training course	3.92	1.15	3
Availability of water resources	3.87	1.13	4
Condition of facilities& services of village (educational, hygienic…)	3.80	0.98	5
Rate of soil fertility	3.77	0.93	6
Rate of tend to invest in agricultural works	3.63	1.20	7
Access to cooperative of production &selling	3.58	1.17	8
Rate of access to products' insurance	3.44	1.26	9
Rate of access to facilities& credits	3.41	1.21	10
Use of communication channels	3.29	1.03	11
Satisfaction of farming job	3.13	1.11	12
Performance from crop rotation	3.09	0.89	13
Hope to job's future	2.86	1.29	14
Planting green manure to improve & increase lands fertility	2.84	1.10	15
Satisfaction from crops performance	2.75	1.11	16
Integrated pest management	2.23	1.31	17
Ratio of water-logged lands to total arable lands	2.04	1.14	18

Table 3. Eigenvalues and percentage of variance of factors extracted

Row	Factor	Eigen value	Percentage variance	Percentage of cumulative variance
1	Social-participation	5.075	29.851	29.851
2	Infrastructural support	2.969	17.466	47.318
3	services	2.355	13.854	61.171
4	Ecological	2.021	11.891	73.062
5	Sustainable agronomical	1.389	8.168	81.231
	operations-orientation			
	Economical productivity			

Table 4. Identify of effective factors in sustainable of agricultural system

Factor	Variable	Factor loading
Social-participation	Education	0.834
	Rate of participation in promotional & training course	0.827
	Satisfaction of farming job	0.814
	Hope to job's future	0.805
	Use of communication channels	0.792
	Agricultural history	0.546
Infrastructural support services	Rate of access to agricultural inputs (seed, fertilizer...)	0.891
	Rate of access to credits facilities	0.870
	Educational and hygiene quality	0.859
	Availability of cooperative production &selling services	0.711
	Availability of crop insurance services	0.706
Ecological	Total amount of lands	0.911
	Availability of water resources	0.882
	Soil fertility	0.853
	Ratio of water-logged lands to total arable lands	0.787
Sustainable agronomical operations-orientation	Performance of crop rotation	0.922
	Planting green manure to improve & increase lands fertility	0.818
	Consumption of micronutrient fertilizers	0.779
	Integrated pest management	0.733
Economical productivity	Rate of tend to invest in agricultural works	0.728
	Income	0.694
	Satisfaction from crops performance	0.517

CONCLUSION

Results show the importance of encouraging farmers to participate in activities that lead to sustainable agricultural development. They further indicate the importance of community culture in enhancing the values and benefits of agricultural sustainability in the region. This can clearly be manifested in the ways in which training and extension programs can play a role in internalizing the benefits of agricultural sustainability for achieving rural regeneration and economic development in the so called deprived regions affected by high unemployment among the young population.

Results manifestly show that emphasis on provision and sustenance of rural services as well as making production resources of the farming community readily available to the food production factories or croplands is likely to lead to the on-farm economic performance and improvement of their life quality.

Analysis of the variables shows that emphasis on service development and production resources in the rural area under universal support system can pave the way for the condition in achieving the agricultural sustainability.

Results further indicate that systematic planning and policy- making in line with optimum resource use, land and water management and integrated pest management are the fundamental prerequisites for emergence of agricultural sustainability.

Results show that training and extension programs aimed at internalization of logical on-farm elements are very crucial parameters that can lead to sustainable agricultural development. They include on-farm practices such as efficient tillage operations including timely soil preparation, application of organic manures, observation of crop rotation techniques and integrated pests' management. Results further suggest that mere ecological-approach to crop production is not a credible strategy. This is because simultaneous consideration of agronomical, economical, ecological, environmental, socio-political and cultural aspects of rural life is a necessary requirement in ensuring agricultural sustainability and rural regeneration.A holistic rather than an atomistic approach has to be cultivated as a crop-production culture in the decision-making processes of the farming community of the Greater Dezful food-production bastion. Under such circumstances, one can imagine the sustainability to be guaranteed for the

vulnerable crop-producing lots whose economic well-being has been under serious threat in the last few cultivating season due to serious draughts and universal spread of the pests and diseases. The latter have reportedly consumed a significant chunk of economic resources of the growers to overcome.

In a nut shell, the overall conclusion of this paper is that no single variable can in itself be able to guarantee food-production sustainability in any command area, and as such, the Greater Dezful region is by no means an exception. It is therefore, suggested that measures to strive at sustainability has to have a logical balance between the production elements on one hand and efforts to protect the physical environment and integrity of eco-system. No sustainable crop-production regime can be cited in the arid and semi-arid regions without having to have their two important aspects being considered on an egalitarian basis. For these very reasons, the paper views the agronomic and economic performance of the farmers on one hand and the environmental considerations on the other, as the two sides of the same sustainability coin.

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