Exploring Solutions Regarding Sustainable development agricultural Systems

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Abstract:

Problem statement: The sustainability of agricultural systems has become a major focus for debates about future human survival. Much of the argument appears to rely on simplistic interpretation of ecological models, and fails adequately to define what sustainability objectives are being sought. Studies show that no effective measures have been taken towards sustainable agriculture in Iran. Social, economical and technical agricultural factors and conditions need to be provided to meet sustainable agriculture at the farm, regional and national level. Accordingly, this research aimed at exploring some solutions to protect and conserve agriculture. Approach: To achieve this, of all 100 populations, included both 93 faculty members of college of agriculture at Bu-Ali-Sina University and 20 subject matter specialists in Hamedan's State Agricultural Organization, 35 people were selected based on the criterion type of purposeful sampling. Data were gathered through interviews. Content analysis method was used to analyze textual data. Results: Results of this study showed that the building awareness and culture along with factors such as proper sustainable agriculture practices, effective planning and management and attention to agro-ecological issues are basic factors to promote Sustainable development of agriculture in the surveyed area. Conclusions: Lack of awareness and knowledge of farmers and people towards sustainable agriculture, no adoption of sustainable agriculture by farmers and lack of education and training services for sustainable agriculture were the most important issues that found in this research about sustainable agriculture. Therefore, support the creating of cooperatives to provide necessary services for implementing sustainable agriculture practices is definitely recommended. Key words: Sustainable development, agricultural Systems, farmers, extension services, Hamedan province of Iran, Pesticides, cooperatives, conventional rotations, Farmer Field Schools (FFS)

Introduction:

Forum for the Future’s (2002) definition of sustainable development as: “a dynamic process which enables all people to realize their potential and improve their quality of life in ways which simultaneously protect and enhance the Earth’s life support systems”. This can be seen as a ‘deep green’ approach to sustainability, which gives weight to social equity and human dignity, as well as ecological integrity. The overall goal of sustainable agriculture is to make better use of agricultural resources (than does conventional agriculture) through the integrated management of available soil, water and biological resources such that external inputs can be minimized (Awang and May, 2009; FAO, 2001; Garcia-Torres et al., 2003).

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There are empirical investigations that show benefits and positive impacts of sustainable agriculture at the farm and regional/national scales socially and financially (Knowler, 2003; Nash et al., 2005; Stonehouse, 1997; Sorrensonet al., 2008). This is largely true because of reduced costs for machinery, fuel and labor, combined with unchanged or improved yields overtime. Beyond the practice of sustainable tillage alone, Knowler (2003) and Elobaidet al. (2009) show that a great number of soil conserving practices typically produce net financial benefits for adopters, over one hundred farm-level financial analyses from Sub-Saharan Africa and Latin America/Caribbean.

Cultivation per se is less likely to undermine the sustainability of intensive, high yielding farming systems on highly fertile soils. There are concerns about soil structure for some of these systems (Agricultural Advisory Council, 1970) and excessive use of pesticides can lead to a degenerative downward spiral if the supporting ecosystems become so seriously undermined as to threaten the ability to grow crops at all in a particular area (Thrupp LA, 1995). Also, although intensive farming systems may appear sustainable from the narrow perspective of the farm itself, they may have impacts on the wider environment which are perceived as unsustainable or at least unacceptable (DoE and JNCC, 1997).

Farrell and Hart (Farrell A, Hart M, 1998) have described two different and competing views of sustainability:

- The Critical Limits view arises from concerns about the earth’s carrying capacity and resource limitations and the need to preserve natural assets to provide the services that the human population relies on for survival. This view presupposes that future farming systems must accept these ecosystem-imposed limits on the number of people in the world and the lifestyle they can enjoy.

- The Competing Objectives view of sustainability focuses on balancing social, economic and ecological goals and aims to meet a broad range of human needs, including health, literacy and political freedom as well as a healthy natural environment and other purely material needs. In the agricultural context this view seeks to balance long term agricultural sustainability with economic viability, reduction of environmental harm, and fulfilling public demands for food and landscape benefits derived from agriculture.

There are many factors affecting on developing sustainable agriculture, including social, financial and agricultural technical factors. In terms of social, Knowler and Bradshaw (2007) showed that education, age, experience and sources of information have and affect on farmers' adoption of sustainable agriculture. Among the many factors that reflect the financial conditions, farm size, land tenure, farm income, off farm income and labor sources have taken into attention in studies of sustainable agriculture. Owning to technical agriculture the factors like sustainable tillage, use permanent or semi-permanent organic soil cover, extensive crop rotations and straw mulching and low- input sustainable practices are well known practices help farmers to maintain soil structure and productivity (Bagheriet al., 2008; ECAF, 1992; FAO, 2001; Mahdei, 2010).

While agriculture is one of the most important economic sectors in Iran, which comprises a considerably high percentage of production and employment (Movahedi, 2009), Iran’s agriculture potential has not been met, as available resources have not been used properly. For instance, only 37% of cultivable land and 58 % of acquirable water a recurrently being utilized. In addition, sustainable land and water use has not yet been achieved. Although there is growing concern about the sustainable agriculture in many regions of the world, there are no effective majors towards sustainable agriculture in Iran. Therefore, social, economic and technical agricultural factors and conditions need to be provided to meet
sustainable agriculture at the farm, regional and national level. Accordingly, this research aimed at exploring some efforts to promote and Sustainable development of agricultural Systems

### Purposes and objectives:
The purpose of this study was to improve and develop sustainable agriculture activities. The objectives of the study were:

- Identifying solutions to promote and improve Sustainable development of agricultural Systems
- Determining appropriate sustainable agriculture practices and
- Introducing problems and constraints involved in sustainable agriculture activities

### Materials and Methods:
Statistical population of the study included both 93 faculty members of college of agriculture at Bu-Ali-Sina University and 20 subject matter specialists who were working in Hamadan's State Agricultural Organization. Of all 100 populations, 35 people were selected based on the criterion type of purposeful sampling. Purposeful sampling is an approach that assists the researcher in selecting intentionally specific places, people and phenomena, each of which bear significance in information gathering (Maxwell 2005). Criterion sampling is one of the types of purposeful sampling in which the samples are selected based on specific criterion and standards (Patton, 1990). Both having experience (and being closely related to the studied phenomenon are the main criteria for selecting samples in qualitative research; therefore, the employees used in this research study were selected based on experience and close relations to conservation agriculture activities. Data were gathered through interviews. Interviewing methods as qualitative research have great potential to explore complex situations involving people's constructions of meanings and are therefore appropriate for incremental improvements in understanding (Kirk and Miller, 1986).

While a structured interview has a formalized and limited set of questions, a semi-structured interview method, selected in this study, is more flexible, allowing new questions to be brought up during the interview. According to Flick (2002), semi-structured questions are either oriented to the scientific literature about a given topic (theory driven) or are based on the researcher's theoretical presumptions (hypothesis directed). In this study, semi-structured interviews were developed through different interview guides were constructed in order to collect data from two groups of participants, agricultural experts and faculty members in Bu-Ali-Sina University. During the face-to-face interview process, all of the data was recorded by an mp3 set. Notes also were taken. Content analysis method was used to analyze textual data. Content analysis is a qualitative analysis method that enables the researcher to include large amounts of textual information and identify its properties systematically, e.g. the frequencies of most used Key Words in Context (KWIC) by detecting the most important structures of its communication content (Neuendorf, 2002). In this technique, items with the same concepts and ideas are reduced (first reduction) and common ideas are summarized and categorized (second reduction). The main idea of this technique is the reduction and summarization of the text (Flick 2002).

### Solutions for improving Sustainable development of agriculture system:
The respondents were asked during the interview process about efforts and solutions for improving Sustainable development of agriculture system. After reviewing the responses using the content analysis method, summarized results were emerged into common themes as in Table 1. Using proper agricultural practices, building awareness and culture have been proposed by respondents as the most important solutions to improve Sustainable development of agriculture system status. Some comments of interviewees are given as below:

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Human factor is the most important factor (without understanding the technology is not efficient), we need to have a Culture of Human Resources Management. So, before anything education and training should be offered about agricultural sustainable through public media for all the stakeholders. Make people and farmers aware of the benefits of sustainable agricultural and harmful effects of chemicals and fertilizers has an important role. This should be done by help of extension and education services.

**Table 1: solutions for improving sustainable development of agriculture system**

<table>
<thead>
<tr>
<th>themes</th>
<th>frequency</th>
<th>percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop rotation</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>Mixed farming</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>Low-input practices</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td>Biological control methods</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>Permanent covering by mulching soil</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>No tillage</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Water optimum use</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Conservation plowing</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

According to one of the interviewee’s opinion “people good thinking, management thinking of the state, shifting to private sector, macro-level support and policy and creating powerful cooperatives with government’s support are of required factors to achieve agricultural improvement. Another respondent added that “management of agricultural machinery and implements, water and soil management, integrated pest and diseases management, advisory services and monitoring of farmers practices and creating cooperatives to gain benefit necessary services all with a significant strategy bring sustainable agriculture into best situation.

Focus on eco-friendly methods including sustainable agriculture and organic agriculture was of alternatives mentioned by some of the respondents. For instance, one of them said: “environmental imbalanced is occurred by human intervention through using contaminants like pesticides and fertilizers.

**Table 2: sustainable development of agriculture system practices**

<table>
<thead>
<tr>
<th>themes</th>
<th>frequency</th>
<th>percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural proper practices</td>
<td>12</td>
<td>31</td>
</tr>
<tr>
<td>Building awareness culture and education</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td>Management and planning</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>Environmental methods (organic farming, sustainable agriculture)</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>New technology</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Supportive policy of the state</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Applied research</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>
Table 3: sustainable development of agriculture system problems and constraints

<table>
<thead>
<tr>
<th>themes</th>
<th>frequency</th>
<th>percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of awareness and knowledge towards conservation agriculture</td>
<td>9</td>
<td>22</td>
</tr>
<tr>
<td>Non-adoption of conservation agriculture due to gaining</td>
<td>8</td>
<td>20</td>
</tr>
<tr>
<td>Lack of training about appropriate use of resources and inputs</td>
<td>9</td>
<td>22</td>
</tr>
<tr>
<td>No legislations and state supports</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td>No monitoring and control on</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Gap between academic centers and farmers</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Lack of knowledge to new agricultural issues</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

Sustainable development of agriculture system practices:

The respondents were asked to explain their ideas about sustainable development of agriculture system practices. After content analyzing of respondents’ ideas, the practices including crop rotation, mixed methods of farming, low-input practices and biological control of pests and diseases were categorized into the themes by the highest frequency. Results have given into Table 2. The faculty members and agriculture experts were asked about problems and constraints facing sustainable development of agriculture system. Lack awareness and knowledge towards sustainable development of agriculture system, non-adoption of sustainable agriculture due to gaining short-term benefits, lack of training about appropriate use of resources and inputs were the most problems engaged to sustainable development of agriculture system(Table 3). Some comments of respondents about sustainable development of agriculture system’s problems have directly quoted below:

Most of the major reasons for not using sustainable agriculture practices are lack of understanding and awareness to CA and lack of understanding towards proper use of agricultural resources and inputs. This is due to low knowledge of farmers to agricultural day sciences. Most farmers have low level education so that only 4 percent of farmers in Iran have a college education that this rate is low. Therefore, strengthening training infrastructure for farmers is essential. “I think the dominant agricultural system in Iran is small-scale farming and farmers have accustomed to sustainable cultivation methods, so adoption new farm practices are difficult for them. To solve this problem, the state should support sustainable agriculture through creating cooperatives, financial and legislation protection”. “Considering this point that sustainable agriculture practices have long-term profits, the farmers have low trend to adopt these practices. The farmers are almost looking for more and short-term economic benefits. Therefore, majors should be proposed to provide economic interests of farmers who are interesting to apply sustainable agriculture practices”.

Conclusion:

Reviewing on sustainable agriculture development in the world shows that many factors are involved in this concern. Among the social factors education, building awareness and culture among farmers and people have a determining role in the world. Results of this study showed that the mentioned factor
along with factors such as proper sustainable agriculture practices, effective planning and management and attention to agro-ecological issues are basic factors to promote sustainable agriculture in the surveyed area. There are well-known and empirical tested sustainable agriculture practices in the world. Among these practices, sustainable tillage, use permanent or semi-permanent organic soil cover, crop rotations, straw mulching and low-input practices are practices acceptable and approved by FAO and European sustainable Agriculture Foundation (ECAF). This study also showed that practices such as crop rotation, mixed cultures, low-input usage in particular use of fertilizer and pesticides, No tillage or sustainable tillage and the use of permanent mulch cover are the most sustainable agriculture practices, respectively. Regardless special support policies and plans have been paid to sustainable agriculture in the world currently, but in our country there are many problems and constraints faced to promote and develop sustainable agriculture. Lack of awareness and knowledge of farmers and people towards sustainable agriculture, no adoption of sustainable agriculture by farmers and lack of education and training services for sustainable agriculture were the most important issues that found in this research about sustainable agriculture. Considering the emphasis of sustainable agriculture on using low-input practices, no-tillage and crop rotation to prevent soil structure and quality, these all are not profitable for farmers who look for short-term interests. Therefore is it apparent that the farmers will not adopt the sustainable agriculture. In this regard, the supportive role of government, private sector and NGOs is very imperative. For example, the state can use a policy of removing fertilizer and pesticide subsidies and support conservation agriculture practices instead of it. Also, the state can play an effective role by addressing extension and education services about sustainable agriculture for both farmers and people through encouraging participation of private sector, NGOs and public media. This also is implied by findings of Mazvimavi and Twomlow (2009). Eventually, support the creating of cooperatives to provide necessary services for implementing sustainable agriculture practices is definitely recommended.

From the results of this research, the following recommendations are drawn:

• Expanding culture-building among farmers and people about sustainable agriculture through extension and education services and media
• Informing and building awareness farmers and people towards the harmful effects of fertilizers and pesticides through various media with the support of government
• Promoting the use of integrated pest management and biological control methods
• Eliminating government subsidies for chemical pesticides and avoiding chemical contaminants by laws and instead support the biological control and sustainable agriculture
• Linking between government and research centers for providing facilities necessary for activities related to sustainable agriculture
• Support for applied research in conservation agriculture and sustainable agriculture
• Upgrading level of education and training of farmers using the Farmer Field Schools (FFS) by help of advisory private sectors
• Determining a legal status for sustainable agricultural and sustainable agriculture.
Reference: