



Strategies of Transition to Sustainable Agriculture in Iran II- Inputs Replacement and Designing Agroecosystem

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Introduction

Sustainable agricultural development is an important goal in economic planning and human development worldwide. A range of processes and relationships are transformed, beginning with aspects of basic soil structure, organic matter content, and diversity and activity of soil biota. Eventually, major changes also occur in the relationships among weed, insect, and disease populations, and in the balance between beneficial and pest organisms. Ultimately, nutrient dynamics and cycling, energy use efficiency, and overall system productivity are impacted. Measuring and monitoring these changes during the conversion period helps the farmer evaluate the success of the conversion process, and provides a framework to determine the requirements for sustainability. After improving resource use efficiency, replacement of ecological inputs with chemical inputs as second step and redesign of agro-ecosystems is as final step in transition of common to sustainable agriculture. The study was investigated to evaluation of Iran's agricultural systems status.

Materials and Methods

Using organic and ecological inputs than chemicals is the second step for transition to sustainable agriculture. This study was performed to assess and measure the status of inputs replacement and agro-ecosystem designing based on ecological principle in Iran. For this purpose, we used 223 studied researches on agronomical and medicinal plants. After, they analyzed based on functional and structural characteristics and then used. Considering to the importance of multi-functionality in sustainable agriculture, in this study we considered the multiple managements for inputs replacement. The using functions in the study were: improving fertility and bio-chemical characteristics of soil, ecological managements of pest and diseases, reducing the energy usage, and increasing biodiversity. Using the organic and biological inputs, remaining the plant residual on soil, using the allelopathy, reduced and conservation tillage, crop rotation and intercropping were the main approaches for inputs replacement. In section of agro-ecosystem designing, we designed the replaced systems based on increasing inputs efficiency approach (first step) and also replacement of conventional inputs with ecological inputs (second step). We considered the parameters about water, soil, pest management, biodiversity, climate change, low inputs systems, margin regions and environmental hazards in designing section. In designing sustainable agroecosystems, the designing of each component was considered in relation to others components and finally designed the total of agroecosystem as on society.

Results and Discussion

The results of studies showed that in most cases, mechanical control of weed in addition to environmental benefits can be most effective than chemical control. Crop rotation can be considered as a suitable replacement method than chemical herbicides. Intercropping was found as an appropriate approach for pest control. Using the

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allelopathic properties of plants had a positive role for pest and weed control in Iran.

Increasing the biodiversity must be considered in transition to sustainable agriculture. Crop rotation, organic fertilizers and intercropping were found the effective approaches for improving biodiversity in agro-ecosystems. Sustainability of agro-ecosystem is closed with soil sustainability. The studies showed that using organic chemical, remaining residual on soil, conservation tillage, crop rotation and intercropping spatially with legumes are the improving approaches for physical-chemical characteristics of soil and replacement for chemical fertilizers. Based on the researches, one main goal for achieving to sustainable agriculture was found minimizing energy consumption. Efficient use of energy in agriculture will prevent destruction of natural resources, and promote sustainable agriculture as an economical production system. Thus, natural resources could be used more efficiently. Eliminate the use of nonrenewable off farm human inputs that have the potential to harm the environment or the health of farmers, farm workers, or consumers. Mitigation and adaptation strategies in relation to climate change and quantization of transition period from common to sustainable agriculture to reduce economic risks for farmers were regarded in the agro-ecosystem design.

Conclusion

In general, although different studies were performed in the replacement of ecological inputs instead of common inputs in Iran, needed policy is necessary to transfer findings of these researches to fields. Although the complete studies were not carried out about designing agro-ecosystem, the existence of enough results for two previous steps (increasing inputs efficiency and its replacement) could be basic for this step. Therefore, deep researches and studies based on site potential in the ecosystem level should be done in the final step of transition to sustainable agriculture.

Keywords: Biodiversity, Climate Change, Multifunctional, Recreation, Rural Development, Soil Stability