



University of Zabol

School of Agriculture

Department of Agronomy and Plant Breeding

Thesis for Master's degree Crop ecology

Title:

Integrated emergy, energy and economic assessment for production systems of pearl millet, alfalfa and barley in Sistan

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Abstract

Analysis of agricultural systems plays a very important role in the development of human perception of the ecosystem of agricultural systems and improves the quality of decisions and planning in the management and development of agriculture. The role of forage plants in creating food security in the country and the need to import livestock and poultry products is evident. Energy analysis technique is an economic and ecological calculation method based on material, energy, information and financial flows to evaluate the ecological sustainability and productivity of inputs of a production system. In this study, ecological sustainability and environmental burden of forage production in three cropping systems of millet, alfalfa and barley were calculated using energy, energy and economic evaluation techniques. The data required for this study were collected using a face-to-face questionnaire from millet, alfalfa and barley forage producers in Sistan region. Sampling was selected to collect data randomly using stratified random sampling method. For this study, information related to energy consumption, energy consumption structure, energy performance ratio index, energy self-support ratio, renewable energy percentage, energy investment percentage index, and environmental sustainability index were calculated. The results showed that the total input energy in the forage barley system had the highest and the total input energy to the millet production system had the lowest forage. In terms of utilization of free renewable environmental inputs, it was observed that millet and fodder barley use these inputs significantly. Comparison of the values of free renewable environmental inputs (R) in three systems of alfalfa, millet and forage barley were $1,03 \times 10^6$, $7,3 \times 10^4$ and $0,10 \times 10^6$, respectively, solar modules per hectare. Indicates the greater benefit of the forage barley production system from environmental renewable flows. The study of energy indices showed that the lowest conversion factor (Tr) is related to the forage barley production system ($2,97 \times 10^6 \text{ sej j}^{-1}$) and the highest is related to the forage millet production system, which indicates higher production efficiency. The barley production system is forage compared to the two systems of alfalfa and millet. In the study of the percentage of renewable energy, the highest value belonged to the forage barley production system (9,03%). In the study of standard environmental load ratio (ELR), it was found that the highest pressure on the environment was in the alfalfa system ($267,177 \text{ sej}$) and the lowest in the forage barley system ($0,790 \text{ sej}$). According to the results, it can be said that the forage barley production system uses higher free environmental inputs among other systems, and at the same time, this system has less use of non-renewable free inputs and the least damage to erosion. Soil enters the region, so this system has a higher stability than the other two systems studied.

Keywords: Environmental load, Energy synthesis, Energy efficiency, Forage crops