



**University of Zabol**

**Graduate School**

**Department of Agronomy**

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**Title**

**Emergy evaluation and economic performance of leafy vegetable  
production systems in Khash**

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## **Emergy evaluation and economic performance of leafy vegetable production systems in Khash**

### **Abstract**

The exergy evaluation method results in the application of proper management to increase these indicators in production systems, when used to evaluate the efficiency and sustainability of production systems. Four leafy vegetable production systems in Khash city were evaluated in terms of production efficiency and sustainability using exergy and economic indicators. The research used a questionnaire and face-to-face interviews with farmers to ascertain the input consumption and performance of leeks, coriander, basil, and spinach production systems. The total exergy required to support the production systems of leek, coriander, basil, and spinach was calculated to be 1.95E+16, 1.71E+16, 1.84E+16, and 2.15E+16 sej/ha, respectively. The highest

proportion of total exergy input in all studied systems was attributed to market inputs, which accounted for 61.44, 64.95, 60.46, and 58.21 percent of total exergy input in leek, coriander, basil, and spinach production systems, respectively. The transformities for leeks, coriander, basil, and spinach are  $4.24\text{E}+06$ ,  $7.44\text{E}+06$ ,  $1.00\text{E}+07$ , and  $3.12\text{E}+06$  sej/J, specific exergy are  $1.95\text{E}+09$ ,  $3.42\text{E}+09$ ,  $4.60\text{E}+09$ , and  $1.43\text{E}+09$  sej/g, respectively; emergy renewability are 4.62, 3.26, 10.04, and 5.12 percent, respectively; emergy yield ratio are 1.63, 1.54, 1.65, and 1.72, respectively; standard emergy investment ratios are 1.59, 1.85, 1.53, and 1.39, respectively; modified emergy investment ratios are 63.84, 84.74, 7.61, and 73.99, respectively; standard emergy loading ratios are 102.90, 129.48, 11.58, and 126.12, respectively; modified emergy loading ratios are 20.65, 29.65, 8.96, and 126.12, respectively; standard emergy sustainability index 0.02, 0.01, 0.14, and 0.01, respectively; modified emergy sustainability index 0.08, 0.05, 0.18, and 0.09, respectively. Additionally, the economic performance of leeks, coriander, basil, and spinach production systems was 16.08, 18.66, 22.86, and 16.47 kg/million rials, respectively. By and large, the basil production system in Khash city was more advantageous than other systems in terms of renewability, economic efficiency, environmental pressure, environmental and economic sustainability, and economic performance efficiency. Additionally, the spinach production system had a higher rate of production efficiency and resource consumption efficiency than other vegetable production systems. Despite the fact that the coriander production system requires less energy, is less efficient, and is less renewable, it places a greater strain on the environment and has significantly less environmental and economic stability than other vegetable production systems in Khash. Thus, based on the set of indicators evaluated in this study, no or reduced coriander planting is recommended, while basil, spinach, and leek planting is expanded, taking into account the management aspects of resource consumption, particularly market and non-renewable resources.

**Keywords:** Environmental load, System analysis, Soil losses, Renewable resources, Natural resources