Abstract

In this study different sources of energy supply and important indices of sustainability and environmental loading were evaluated for three cropping systems of wheat, Yaghoti grape and greenhouse cucumber using emergy synthesis. Total emergy input for wheat, grape and cucumber were 1.06 E16, 1.94 E16 and 1.094E18 sej, respectively. The greatest emergy contribution in wheat was for irrigation water with share of 28.96 percent, in grape for labor with share of 41.34 percent and in cucumber for diesel fuel with share of 72.21 percent. The share of natural resources from total emergy for wheat, grape and cucumber were 29.38, 23.47 and 0.047 percent, respectively and the share of purchased resources from total emergy for wheat, grape and cucumber were 70.62, 76.67 and 99.95 percent. Emergy Yield Ratio (EYR) for wheat, grape and cucumber were 1.41, 1.31 and 1, respectively. Emergy Investment Ratio (EIR) for wheat, grape and cucumber were 2.4, 3.25 and 2.89, respectively. Emergy Loading Ratio (ELR) for wheat, grape and cucumber were 2.41, 0.541 and 4.34, respectively, indicating different environment load by evaluated systems. Emergy self-sufficiency for wheat, grape and cucumber were 0.294, 0.234 and 0.0004, respectively. Emergy Sustainability Index (ESI) for wheat, grape and cucumber were 0.585, 2.42 and 0.23, respectively, indicating the greatest sustainability belongs to grape and the sustainability belongs to cucumber. Total energy input for wheat, grape and cucumber were 33485, 37957 and 78311 MJ/ha, respectively. In wheat the greatest share of energy input was for nitrogen fertilizer (27.14 percent) and electricity (18 percent), in grape the greatest share of energy input was for electricity (24.03 percent) and irrigation water (22.30 percent) and in cucumber the greatest share of energy input was for diesel fuel (93 percent). Energy efficiency ratio for wheat, grape and cucumber were 2.85, 3.35 and 0.028, respectively. Energy productivity index, indicating produced output per unit of consumed energy for wheat, grape and cucumber were 0.115, 0.28 and 0.035 kg/MJ, respectively. Benefit to cost ratio for wheat, grape and cucumber were 1.6, 3.08 and 1.39, respectively. These results suggested that although greenhouse cucumber gives more income to farmers, had the least benefit to cost ratio and the least productivity index.

Keywords: **Sustainability Index; Energy Analysis; Energy Efficiency; Citrus Grapes**

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