

## Abstract

This study was conducted to analyze the sustainability of wheat, barley and rapeseed production systems using energy analysis technique in Shahid Arbabi Rashid Research Complex in Sistan area. The total energy consumed in the three wheat, barley and rapeseed production systems were 5.88 E16, 5.26 E16 and 6.14 E18 sej. ha<sup>-1</sup>, respectively. The share of environmental inputs of total energy consumption for wheat, barley and rapeseed was 73%, 74% and 66%, respectively. The shares of renewable resources for these systems were 26%, 23% and 28%, respectively. For all three systems, the manure and nitrogen fertilizer had the highest share in purchased inputs. The transformity of studied products were determined as 1.31 E6 sej j<sup>-1</sup>, 1.42 E6 sej j<sup>-1</sup> and 1.57 E6 sej j<sup>-1</sup> respectively. The renewability index (R%) were 25.68 for wheat, 22.57 for barley and 27.92 for canola respectively. The energy yield ratio (EYR) for wheat, barley and rapeseed were 3.69, 3.9 and 2.97, respectively. The modified energy investment ratio (EIR<sup>\*</sup>) for these systems were 1.59, 1.67 and 2.09, respectively. The modified environmental loading ratio (ELR<sup>\*</sup>) was 2.89 for wheat, 3.43 for barley and 2.58 for canola, indicating the difference of three systems in terms of environmental pressure. The analysis of ESI and ESI<sup>\*</sup> indices for these systems showed that rapeseed production has less economic and ecological stability than the other two systems. In addition, according to the product safety index based on energy (PSI), it was found that the health value for rapeseed was higher than wheat and barley since the chemical pesticides and fertilizers were less used in the production process.

**Keywords:** Natural resources, Sustainability quantification, Sustainable agriculture, System analysis



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Title

**Evaluation of Arbabi Rashid Research Farm agroecosystem health using emergy synthesis**

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