Quantitative Sustainability Assessment of Iranian Dairy Farms Based on Water and Energy Consumption

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Abstract

Water is vital for livestock production and should be considered as an integral sector of agricultural water resource management. Energy is considered as an essential production factor in many systems, especially on dairy farms. All farm operations require energy inputs including fuel, nutrition, electricity, labour, machinery, and are all important aspects for evaluating the sustainability because of their consumption are very high and create a concern for the sustainability of dairy farms. These aspects have been used in a multi-indicator modelling approach to evaluate the performance of 30 dairy farms in Khorasan Razavi Province (Iran). Energy rate (ER), energy productivity (EP), and net energy gain (NEG) are 0.53, 0.13 $^{kg}/_{MJ}$ and -3.5 × 1008 MJ, respectively. Total input energy across all farms is 7.5 × 1008 MJ, In order to improve EP, ER, and NEG for dairy farms in this region, the energy consumption (input energy) should be reduced. Water is 3.97 ×1006 liter per day and it also should be decreased.

In order to evaluate sustainability indicator (SI) for dairy farms in this region, we built a sustainability indicator using renewable energy, energy intensity, and water usage were all considered as the main goal, and sustainability indicator was obtained using the arithmetic mean of all. Sustainability indicator across all farms is 0.59 and indicates the sustainability indicator of dairy farms in this area is at the low level. Therefore, in order to raise the level of sustainability indicator of dairy farms, it is obligatory the water and energy consumption be managed and optimised. Our model can be used in various contexts to improve the environmental performance of dairy farms.

Keywords: Arithmetic mean, Dairy farms, energy consumption, Iran, Water consumption

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