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Energy Use Analyses in Iranian Wheat Project

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Abstract

The study attempts to analyse the energy input-output relationship during Iranian Wheat Project from 1990 to 2005. Findings revealed that total energy inputs and output have increased from 26 503.5 and 20871.5 MJ ha⁻¹ in 1990 to 35 466.3 and 30 259.8 MJ ha⁻¹ in 2005, indicating a 25.27 and 31.03 % increase, respectively. Averagely diesel had the highest share, of 37.08 %, followed by electricity (21.23 %), chemical fertilisers (20.21 %), water (8.39 %), seed (7.94 %), machinery (2.33 %) and human labour (2.18 %), respectively. There was a significant increase in electricity usage (about 74 % increase), and an associated decrease in the diesel usage (about 34 % decrease) during 1990–2005 period because electric pumps replaced diesel pumps. Chemical fertilisers rose from 4 353.25 to 8 659.80 MJ ha⁻¹, or by nearly 50 %. In the studied period, the share of nitrogen and potassium in the total fertiliser energy input increased from 72.00 to 84.79 % and from 0.00 to 0.65 %, respectively, while the share of phosphorus shrunk from 28.31 to 14.56 %. There were not significant changes regarding the human labour and machinery annually and seedbed preparation required the maximum energy, followed by harvesting. Pesticides increased extensively in the last year under study, particularly in case of herbicides, and of which 2,4-D/MCPA and Clodinafop-propargyl had the highest share. Values of energy use efficiency (0.70–1.00), specific energy (14.70–21.04 MJ kg⁻¹) and energy productivity (0.05–0.07 kg MJ⁻¹) showed an intensive use of inputs not accompanied by increase in output during Wheat Project. Most of the total energy inputs were supplied in the non-renewable and direct forms. Also, regression analysis indicated the impact of indirect and non-renewable energy on output was statistically significant.

Keywords: self-sufficiency, *Triticum aestivum*, wheat