



# Fossil Energy Use in Conventional and Low-External-Input Cropping Systems

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## ABSTRACT

Conventional agriculture production systems in developed countries rely heavily on fossil energy, but emerging uncertainties in energy supply indicate a need to better understand energy efficiency in conventional and alternative systems. We used 6 yr of data from a cropping systems experiment conducted in Iowa to compare energy use of a conventionally managed corn (*Zea mays* L.)–soybean [*Glycine max* (L.) Merr.] system (a 2-yr rotation) with two low-external input (LEI) cropping systems that used more diverse rotations and manure, but substantially lower quantities of synthetic N fertilizer and herbicides. Depending on how fossil energy costs were assigned to manure, the two LEI systems (a 3-yr rotation of corn-soybean-small grain/red clover [*Trifolium pratense* L.], and a 4-yr rotation of corn-soybean-small grain/alfalfa-alfalfa, *Medicago sativa* L.) used between 23 and 56% less fossil energy than did the conventional system. In general, the primary category for fossil energy use in all systems was grain drying. The conventional 2-yr system used substantially more fossil energy embodied in synthetic fertilizers and pesticides than did the LEI systems. Economic return, harvested crop weight, and potential energy production of the conventional 2-yr and LEI 4-yr systems were similar. Efficiency ratios, including crop energy output and economic return per unit of fossil energy invested, were significantly higher in the LEI 4-yr rotation than in the conventional system. In coming years, if fossil energy prices rise significantly without concomitant increases in crop value, diversified LEI systems may become preferable to conventional cropping systems and used more widely.