Agronomic, economic, and ecological characteristics of conventional and low-external-input cropping systems in the U.S. Corn Belt

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We conducted a 9-ha field experiment in central Iowa to test whether low-external-input (LEI) cropping systems can produce yields and profits that match or exceed those obtained from conventional systems. During 2003-2005 we compared a conventionally managed 2-year rotation (corn-soybean) with two more diverse LEI rotations: a 3-year corn-soybean-triticale + red clover system, and a 4-year corn-soybean-triticale + alfalfa-alfalfa system. Despite substantial reductions in agrichemical inputs, corn and soybean yields were as high or higher in the LEI systems as in the conventional system. Weed biomass production and fecundity were suppressed effectively in all systems. Net returns to land and management were highest for the 4-year rotation ($435 ha⁻¹ yr⁻¹), lowest for the 3-year rotation ($356 ha⁻¹ yr⁻¹), and intermediate for the 2-year rotation ($390 ha⁻¹ yr⁻¹). Biological nitrogen fixation, nutrient cycling, and weed seed predation by rodents and insects were three ecological processes that promoted cost reductions and maintenance of agronomic productivity of the LEI systems.