

## Establishment of a field school for weed ecology and management

**Abstract:** Multiyear field experiments using three crop rotations, two of which were low-external-input (LEI) systems, showed that cropping systems can be designed to achieve large reductions in agrichemical use while providing effective weed control and high yields and profits.

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### More details:

[www.leopold.iastate.edu/research/grants/2009-1/E2004-06.pdf](http://www.leopold.iastate.edu/research/grants/2009-1/E2004-06.pdf)

*Diversified LEI systems can produce yields and profits that match or exceed those obtained from conventionally managed corn-soybean systems. Ecological processes such as weed seed consumption by rodents and insects can promote effective weed control in LEI systems, while allowing substantial reductions in herbicide use.*



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### What was done and why?

*Iowa farmers are looking for ways to produce enough food and income while protecting the environment. Using large quantities of synthetic fertilizers and herbicides helps yields, but also pollutes surface and groundwater. Investigators for this project sought to determine whether weed suppression, crop yield, and profit characteristics of diversified, low-external-input (LEI) systems can match or exceed those of a conventionally managed system.*

### Objectives:

- Determination of the impacts of three contrasting crop rotation systems on weeds, crop yields, and economic costs and net returns, using large-scale field plots established at the ISU Marsden Farm.
- Establishment of small plots for demonstration of the effects of a cultural management practice (stubble mowing) and an ecological process (weed seed predation) on weed seed production and seed survival.
- Organization and delivery of in-field and indoor learning activities focused on weed ecology, cropping system diversity, and economic costs and returns of conventional and alternative management systems.

### What did we learn?

This study showed that productive and profitable LEI cropping systems are based on optimizing overall system performance by fitting together individual crop components. For example, though triticale and oat themselves added little revenue to the four-year rotation system, they served as effective nurse crops for establishing alfalfa. This minimized erosion, suppressed velvetleaf growth without herbicides, and provided habitat for the seed predators that attacked velvetleaf and giant foxtail seeds. Alfalfa was less profitable than corn, but its inclusion in the rotation system allowed significant reductions in N use for corn, while also suppressing velvetleaf seed production and fostering weed seed predators.

In both field experiment and demonstration trials, insect and vertebrate seed predators were shown to remove large quantities of weed seeds in both warm and cold seasons. Modeling analyses of weed population dynamics indicate that these weed seed removal rates could suppress weed densities, especially in low-external-input systems.