

## Impacts of conventional and diversified rotation systems on crop yields, profitability, soil functions, and environmental quality

**Abstract:** New questions and technologies are considered in a long-running ISU crop rotations study. The results continue to show remarkable adaptability exhibited by rotations that are more diverse and spread out over longer periods of time.

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*Comparisons were made among contrasting cropping systems within a long-term, large-scale field experiment in Boone County, Iowa. Combining crop diversity with lower herbicide inputs and non-transgenic crops was effective in reducing requirements for nitrogen fertilizer; maintaining or improving weed suppression, grain yields, and profits; and increasing several soil quality indicators.*



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### What was done and why?

Since 2002, a research team led by ISU agronomist Matt Liebman has conducted a 9-hectare (22-acre) field experiment at Iowa State University's Marsden Farm in Boone County, Iowa. The study is assessing agrichemical input use, yields, weed dynamics, economic characteristics and soil functions of diversified and simpler crop rotation systems.

#### Objectives:

1. Measure crop yields, weed growth, and weed seed densities in conventional and more diverse cropping systems, including sub-plots in each rotation system containing transgenic and non-transgenic corn and soybean genotypes treated with contrasting herbicide regimes
2. Assess labor requirements, input costs, and net returns for conventional and more diverse cropping systems and for different technology packages of crop genetics and herbicides
3. Determine the impacts of conventional and more diverse cropping systems on soil functions and concomitant impacts on soil carbon storage, nitrogen transformation, nitrate leaching and carbon dioxide and nitrous oxide emissions
4. Distribute results and insights from this project to farmers, agricultural industry professionals, extension personnel, scientists, policy makers and members of the general public through scientific and extension publications, field days, winter meetings, news articles and websites.

### What did we learn?

Results of this study indicate that diversified crop rotation systems produced high yields of corn and soybean and suppressed weeds effectively, while receiving only a fraction of the synthetic N fertilizer and herbicides used for a conventionally managed corn-soybean rotation. Among the six rotation system and technology package combinations evaluated during 2008-2012, the highest level of profitability (\$1101 ha-1 yr-1, \$446 acre-1 yr-1) was obtained from the 3-year corn-soybean-oat/red clover rotation that did not employ transgenic crops.