

Keeping yields, profits and water quality high

One of the key questions facing agriculturalists in the 21st century is how to produce adequate amounts of food and farm income while protecting environmental quality. Diversified, low-external-input (LEI) farming systems offer one possible approach for maintaining adequate productivity and profitability while reducing pollution by agrichemicals and still improving water quality. LEI systems rely heavily on ecological processes for soil fertility and pest management, but can include some use of synthetic fertilizers and pesticides.

A team of investigators based at Iowa State University conducted a multiyear field experiment in Boone County, IA, to determine whether the yield, weed suppression, and profit characteristics of LEI systems can match or exceed those of a conventional system. Results from the study were published in the May-June 2008 issue of *Agronomy Journal*.

The experiment included a two-year, corn-soybean rotation, a three-year corn-soybean-small grain-red clover rotation, and a four-year corn-soybean-small grain-alfalfa-alfalfa rotation. Conventional rates of synthetic fertilizers were applied in the two-year rotation, whereas composted cattle manure and reduced rates of synthetic fertilizers were applied in the three- and four-year rotations. Weed management in the two-year rotation was based on conventional rates of herbicides, whereas in the three- and four-year systems, herbicides were applied in bands in corn and soybean, greater reliance was placed on cultivation, and no herbicides were applied in small grain and forage legume crops.

Over the period of 2003-2006, both synthetic Nitrogen fertilizer and herbicide use was lower in the three- and four-year LEI systems than in the two-year conventional system. Corn and soybean yields were as high or higher in the LEI systems as in the conventional system, and matched or exceeded average yields on commercial farms in Boone County. Further, lower herbicide inputs did not lead to increased weed problems.

Without government subsidy payments, net returns were highest for the four-year LEI system, lowest for the three-year LEI system, and intermediate for the two-year conventional system. With subsidies, differences among systems in net returns were smaller, as subsidies favored the conventional system, but rank order of the systems was maintained.

“The results suggest that large reductions in agrichemical use can be compatible with high crop yields and profits,” says Dr. Matt Liebman, an agronomy professor at Iowa State University.

The project was supported by the USDA National Research Initiative (Biology of Weedy and Invasive Species Panel), and the Leopold Center for Sustainable Agriculture and the Department of Agronomy at Iowa State University. The project is continuing with additional investigations of energy use, soil quality, and weed population dynamics. Additional economic analyses will be conducted to determine the impacts of rapidly changing crop prices and input costs.

Source: American Society of Agronomy

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