

Funding Impact Brief #1: Low-Input High-Diversity (LIHD) Systems



About LIHD

Principal investigator: Matt Liebman, Professor of Agronomy, Iowa State University

Replicated plots were established in 2002 at the Iowa State University Marsden Farm to compare three cropping systems varying in length of crop sequence and inputs. Included within the experiment were a conventionally managed 2-year corn-soybean rotation and two Low-Input High-Diversity (LIHD) rotations: a 3-year corn-soybean-small grain + red clover rotation and a 4-year corn-soybean-small grain + alfalfa-alfalfa rotation. Triticale was used as the small grain crop in 2003-2005; oat was used in 2006-2012. The LIHD cropping systems minimize the use of fossil fuels and rely heavily on ecological processes for soil fertility and pest management, but can include some use of synthetic fertilizers and pesticides.

By the Numbers

- \$357,479 awarded by the Leopold Center (2004-2012)
- \$1,555,962 externally leveraged funds
- 6 key organizational, agency and institutional partners
- 4 farmers changed their farming practices so far

What did we learn?

Corn and soybean yields in the LIHD cropping systems exceeded yields in the conventional system, with corn yields on average 4 percent greater and soybean yields on average 9 percent greater. The LIHD cropping systems also produced similar profits on a land area basis compared to the conventional system.

Weed control in LIHD systems was enhanced by delaying soil tillage to allow rodents and insects time to consume weed seeds, which reduced the need for herbicides. Comparison data will focus on new measurements such as nitrate leaching and greenhouse gas emissions from soil sequestration.

Why does it matter?

1. Practical Farmers of Iowa's Sarah Carlson connected Dr. Liebman to member farmers to present his findings at a field day in 2011, many of whom expressed interest in using LIHD practices on their own farms.
2. PFI formally solicited members to implement LIHD practices; 10 farmers responded and 4 implemented some version of LIHD cropping systems in 2012.
3. Currently, PFI staff are discussing cover crops and LIHD concepts with an estimated 1,000 farmers each year.

**Principal investigator Matt Liebman
examines a corn plot at ISU Marsden Farm**

Credit: Leopold Center

Photo on back:
**Red clover, corn and
soybean in experimental plots**
Courtesy of Matt Liebman





About this series

Purpose: To communicate the impacts of long-term Leopold Center investments made in sustainable agriculture research, education and outreach on Iowa's communities, economies and landscapes. This brief is the first in a series of six featuring:

1. Low-Input High-Diversity Systems (\$357,479; 2004-2012)
2. Long-Term Agroecological Research (\$900,000; 1998-2012)
3. Hoop Houses for Alternative Hog Production (\$526,451; 1997-2012)
4. Regional Food Systems Working Group (\$922,837; 2003-2012)
5. Bear Creek Riparian Buffer Project (\$900,000; 1990-2012)
6. Practical Farmers of Iowa (\$100,000; 2011-2012)

Each brief was prepared based on data gathered from project publications, and 2012-13 interviews with principal investigators and/or key partners.

The analysis showed that for every dollar invested in these six projects, an additional \$4.60 was leveraged complement or expand the work. Get all briefs: www.leopold.iastate.edu/change

Personnel supported

- 3 ISU faculty
- 1 faculty member at University of Illinois at Urbana-Champaign
- 9 graduate students partially or fully funded
- 2 international student learning opportunities/positions

Products

- 62 presentations to scientific, farm and student audiences
- 17 scientific abstracts
- 16 peer-reviewed articles and 2 book chapters
- 2 Master's theses
- 1 online lesson module developed for crop advisers
- 1 Extension publication
- 6 other non-peer reviewed publications
- 20 popular press exposures

Research partners

- 4 public sector partners:
Michelle Wander, University of Illinois at Urbana-Champaign; Mark Tomer and Tom Sauer, USDA - Agriculture Research Service; Steven Hallett, Purdue University
- 1 civic sector partner:
Practical Farmers of Iowa
- 1 private sector and industry partner:
Iowa Soybean Association
- 5 Collaborating Iowa State University Staff:
Robert Hartzler and Paula Westerman, Agronomy; Brent Danielson Ecology, Evolution, and Organismal Biology; Craig Chase, Extension; Tom Sauer; National Lab for Agriculture and the Environment

Leverage

LIHD projects funded by the Leopold Center leveraged substantial amounts of additional funds totaling \$1,555,962. Some of the funders include:

- USDA – National Research Initiative
- Bi-national Agriculture Research and Development Fund
- Iowa Soybean Association

Future opportunities

The nonprofit Practical Farmers of Iowa has a grant from the Walton Family Foundation to promote the use of cover crop and LIHD crop rotations. As part of this project, PFI is working to create a market for small grains. PFI hopes to partner with Liebman to encourage LIHD crop rotations as a way to develop small grain markets in Iowa.

Leopold Center for Sustainable Agriculture

209 Curtiss Hall - ISU
Ames, Iowa 50011-1050
(515) 294-3711

www.leopold.iastate.edu

Prepared by Laura Kleiman and Corry Bregendahl



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