Exploring Soil Health and Agronomic Impacts of Cover Crops: On-Farm Results

ABSTRACT

In partnership with twelve farmers across the state, Iowa Learning Farms and the Iowa Cover Crop Working Group are conducting the longest running on-farm cover crop research and demonstration project in the state of Iowa. Established in 2008 and 2009, these on-farm sites include randomized, replicated strips with and without cereal rye cover crops, all managed within corn/soybean cropping systems. This poster explores project findings related to the on-farm soil health and agronomic impacts of cover crops, including above-ground cover crop biomass, crop yield impacts, soil health measurements, and earthworm midden counts. On-farm results will be compared with research farm results related to cereal rye cover crops conducted by USDA-ARS and Iowa State University Extension and Outreach.

OBJECTIVES

① Establish on-farm, field-scale replicated strips with and without cereal rye cover crop

② Evaluate the soil health and agronomic impacts of cereal rye cover crops in Iowa's corn and soybean cropping systems, looking at the following metrics:

- Cash Crop Yield
- Cover Crop Biomass
- Soil Organic Matter
- Soil Carbon
- Soil Nitrogen
- Soil pH
- Water Infiltration/Runoff
- Earthworm Midden Counts

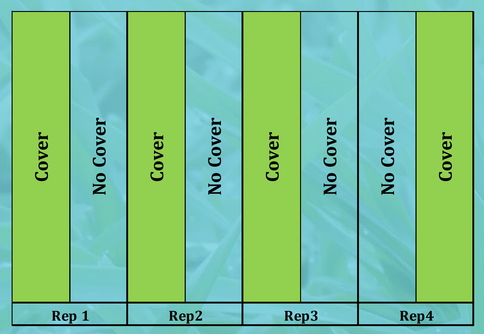
MATERIALS & METHODS

Twelve farmers across Iowa have participated in this study, the longest on-farm, field-scale demonstration project of its kind in the state of Iowa. All sites are in corn-soybean rotations, with farmers establishing in-field replicated strips with and without a cereal rye cover crop.

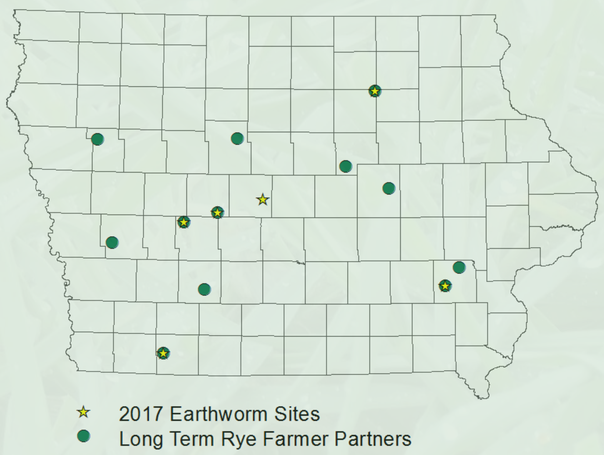
Planting Method:
Drill or Aerial Seed

Cereal Rye Seeding Rate:
56-60 lb/acre

Spring Management:
Herbicide Termination, 7-10 days before planting



PROJECT SITES



The twelve on-farm demonstration sites are strategically distributed to include the different soil regions of Iowa as well as climatic variation across the state.

PARTNERS

The Iowa Cover Crop Working Group is a collaboration of the following:

- Iowa Learning Farms
- Practical Farmers of Iowa
- Iowa State University Extension and Outreach
- Iowa Dept. of Agriculture and Land Stewardship
- USDA-Agricultural Research Service, National Laboratory for Agriculture and the Environment
- USDA-Natural Resources Conservation Service
- Midwest Cover Crops Council

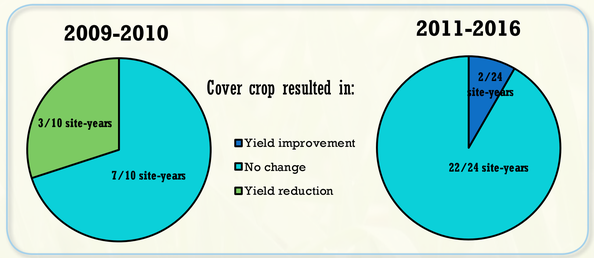
Funding for this demonstration project has been provided by Iowa's State Soil Conservation Committee, Iowa Department of Agriculture and Land Stewardship, Leopold Center for Sustainable Agriculture, Iowa State University Extension Water Quality Program, and NRCS Conservation Innovation Grant 69-6114-15-005.

RESULTS & DISCUSSION

AGRONOMIC IMPACTS

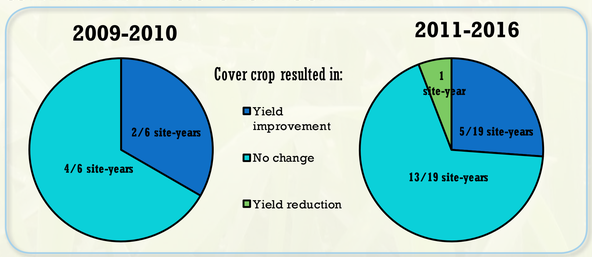
Farmers reported that in **55 OF 59 SITE-YEARS,** properly managed cereal rye cover crops were found to be **YIELD NEUTRAL** or even led to increases in crop yields.

CORN YIELD IMPACTS FOLLOWING CEREAL RYE



Farmers identified insufficient cover crop termination and improper planter settings as reasons for the corn yield reductions in the learning years of 2009-2010.

SOYBEAN YIELD IMPACTS FOLLOWING CEREAL RYE

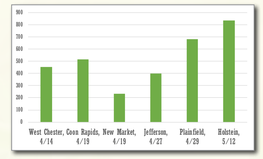


Planter settings were identified as the reason for reduced soybean yield in 1 site-year following the rye cover crop.

COVER CROP BIOMASS

Above-ground cover crop biomass was collected in the spring at the time of cover crop termination, typically 7-10 days ahead of planting.

SPRING 2016 COVER CROP BIOMASS (LB/AC)
TERMINATION DATES NOTED FOR EACH SITE



Biomass ranged from trace amounts up to 2,475 lb/acre over the course of this study. Variations occur by site and by year - termination timing matters!

SOIL PROPERTIES

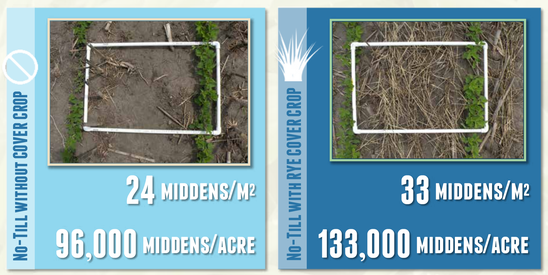
Comparing the strips with and without cereal rye cover crops,

STATISTICALLY SIGNIFICANT DIFFERENCES WERE NOT OBSERVED

in soil organic matter, total C, total N, pH, infiltration, and runoff. A greater intensity of sampling and additional time (years) may be required to quantify significant changes.

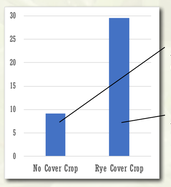
EARTHWORMS & SOIL HEALTH

Middens of *Lumbricus terrestris* (common nightcrawler) were counted at rye sites (5 on-farm and 1 research farm) in June 2016:



Across all sites (with rye for 7+ years), **38% MORE EARTHWORMS WERE PRESENT WITH A CEREAL RYE COVER CROP** compared to strips without cover crop.

These midden counts are consistent with earthworms counts (*L. terrestris* and *Aporrectodea* spp.) conducted via electrical extraction at the same research farm site in April 2015:



No Cover Crop:
9.2 earthworms/m^2

Rye Cover Crop:
29.6 earthworms/m^2

Earthworms are a **TANGIBLE, EARLY BIOLOGICAL INDICATOR OF SOIL HEALTH!**

CONCLUSIONS

Eight years of data from Iowa's longest running on-farm cereal rye cover crop demonstration project indicate the following:

- With proper management, corn and soybean yields can be maintained or improved with cover crops
- Greater sample intensity + additional time required to quantify significant changes in soil properties
- Earthworms populations respond positively to rye cover crops - tangible indicator of soil health
- Cover crops can be readily integrated into corn/soybean cropping systems!