Practical Farmers of Iowa

Healthy Food, Diverse Farms, Vibrant Communities

Cover Crop Effect on Cash Crop Yield: Year 2

Abstract

Cover crops are an important tool farmers may use to decrease soil erosion, improve nutrient cycling and increase soil organic matter. However, many farmers are concerned about the negative effects of this cultural practice on their cash grain yields. After year two of this five-year study, a winter cover crop positively affected soybeans, had no effect on corn silage and negatively affected corn yield in 2010 and at one location in 2009 but did not affect corn yield in 2009 on three locations.

Cooperators

Bill Buman, Harlan
Devan Green, Conrad
Jim Funcke, Jefferson
Randy Caviness, Greenfield
Rick Juchems, Plainfield
Larry Ness, Whiterock Conservancy, Coon Rapids
Mark Pokorny, Clutier
George Schaefer, Kalona
Rob Stout, Westchester
Jerry Sindt, Holstein
Gary & Dave Nelson, Fort Dodge
Kelly Tobin, New Market

Project Timeline

2008–2013 (Year 2 Report

Web Link

www.practicalfarmers.org

Contact

Sarah Carlson, 515.223.5661
sarah@practicalfarmers.org

Funding

Iowa Department of Ag and Land Stewardship; Walton Family Foundation; NCR-SARE and in partnership with the Iowa Learning Farm

Background

Cover crops provide multiple benefits to any farming system. Incorporating more "green" plants into the "brown" months will help to protect water quality and maintain natural cycles for water, carbon, nutrients and soil organisms.

Although cover crops are an excellent practice for farmers to incorporate, few currently use cover crops. Iowa farmers planted cover crops on approximately 17,000 acres of the 23 million corn and soybean acres in the state in 2008. Farmers have not adopted cover crops as a part of their farming system on a broad scale due to timing constraints in the fall following harvest and concerns about cover crop's potential negative effect on the following year's cash crop yield. Research on cover crops' effect on cash crop yield from PFI cooperators' projects since 1987 and refereed journal articles has been mixed. Several studies have been conducted but few have planted the cover crop in the same location for consecutive years. This five-year study will measure the yield of corn and soybeans in cover and no cover plots that are planted in the same place every year to determine if the cover crop has a negative effect on the cash grain yield and if consecutive years of cover crops change any negative effects of the cover crop on the cash crop's yield.

Materials and Methods

To study this question, six sites were established in the fall of 2008 and six more in 2009. These sites were located at Harlan (SW), Greenfield (SW), Coon Rapids (West Central), Jefferson (West Central), Plainfield (NE), Conrad (East Central), Clutier (East Central), Fort Dodge (Central), Kalona (SE), West Chester (SE), Holstein (NW), and New Market (SW). Table 1 describes each location's cash crop and cover crop management.

Depending on when they initiated the study all sites planted a winter hardy rye cover crop in the fall of 2008 and/or 2009. Winter rye planted was either sourced through local seed retailers, or farmers used the improved variety 'wheeler,' a variety bred at Michigan State University. Farmers planted cover and no cover strips in a randomized, replicated complete block design in the fall of each year in the same location. Farmers either aerial seeded into standing cash crops, drilled the cover crop following cash grain or corn silage harvest, or broadcast the cover crop seed with dry fertilizer. In the spring, to terminate the cover crop, farmers either used an herbicide as a "burn-down" before

or after cash crop planting; mowed plus an herbicide application and then planted the cash crop into a cover crop mulch, or used tillage or a combination of tillage plus an herbicide application before cash crop planting. In the spring before the cover crop was killed, four 1ft2 quadrates per plot were used to collect samples of the above-ground biomass which were dried and weighed. Nitrogen concentration of the cover crop biomass was measured in spring 2009 to estimate how much nitrogen the cover crop held on the farm. In the fall, farmers combined and weighed grain from individual plots using a weigh wagon or a yield monitor. Yields are reported as: corn in bu/A at 15.5% moisture content; soybeans in bu/A at 13% moisture content; and corn silage in T/A at 35% moisture content. At West Chester, in 2010, the cover and no cover plots were split and an additional sidedressing and no sidedressing of 50 lbs nitrogen/A was applied to the corn June 7, 2010.

Table 1

On-farm Research Location Description

Location	2009 Crop	2010 Crop	Cover Crop Planting	Cover Crop Termination
Harlan	Corn	Soybeans & Corn	Aerial Seeded	Herbicide
Greenfield	Corn	-	Drilled	Herbicide
Jefferson	Corn	Soybeans	Drilled	Herbicide
Conrad	Corn	Soybeans	Drilled	Tillage
Plainfield	Soybeans	Corn Silage	Drilled	Herbicide & Tillage
Coon Rapids	Soybeans	Corn	Drilled	Herbicide & Tillage
Clutier	-	Corn	Drilled	Herbicide & Soil Finisher
Kalona	-	Soybeans	Aerial Seeded	Mowed & Herbicide
Holstein	-	Soybeans	Broadcast w/ Dry Fertilizer	Herbicide
Fort Dodge	-	Soybeans	Drilled	Herbicide
West Chester*	-	Corn	Aerial Seeded	Herbicide
New Market	-	Corn	Drilled	Herbicide

* Data were analyzed separately because an additional Sidedress N treatment was added to the original study. **Indicates a significant difference between the treatments (P<0.05).

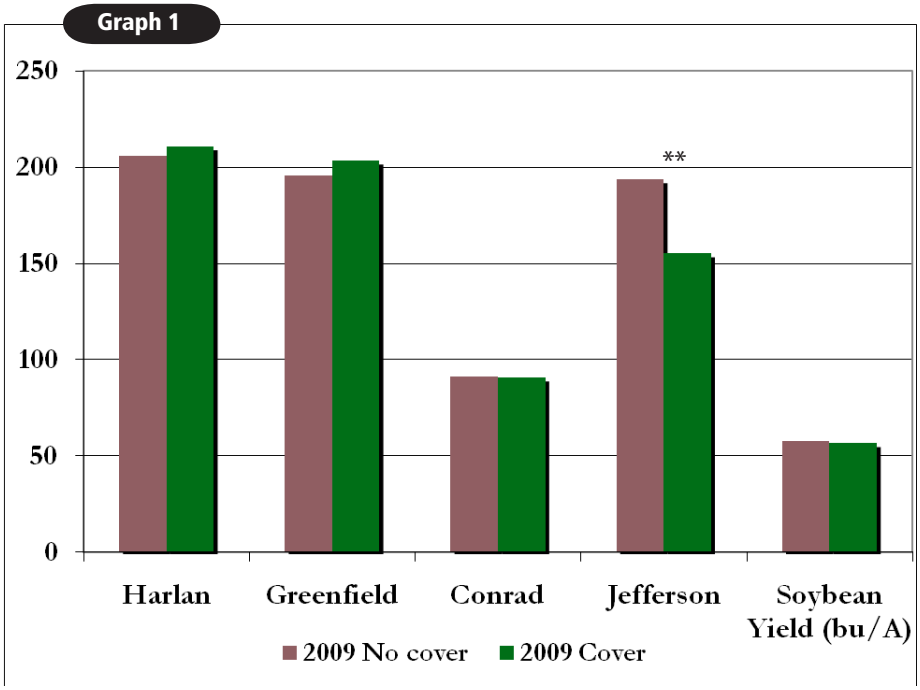
Analysis

The data were analyzed using a mixed model to determine treatment effects. When effects were significantly different with a P<0.05, means comparisons were determined using the Student's T test at a P<0.05. All statistical analyses were performed using JMP8. Data from the West Chester site were analyzed and reported separately from the other locations' results.

Results

In 2009, cover crop did not have a significant effect on corn or soybean yield except at Jefferson where poor control by the herbicide Liberty© did not terminate the cover crop. On the cover crop plots the corn yielded 39 bu/A less than on the no cover plots. But all other plots, where the cover crop was terminated did not show a significant difference in corn or soybean yield (Graph 1).

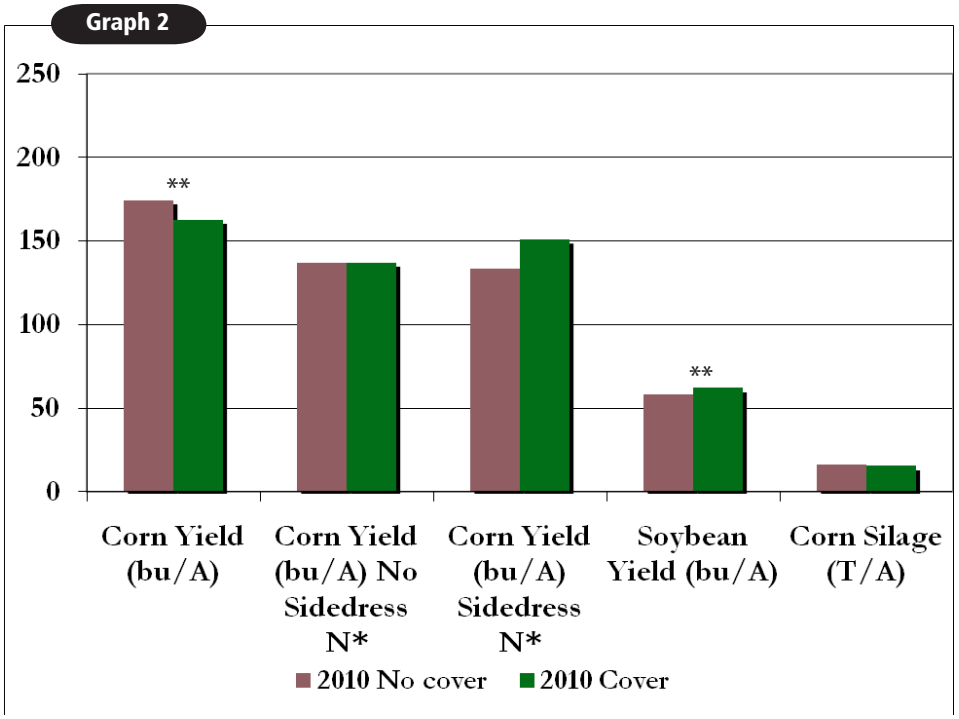
Graph 1



**Indicates a significant difference between the treatments (P<0.05).

In 2010, corn yield was significantly reduced on the cover plot (163 bu/A) versus the no cover plots (175 bu/A). Soybean yield was positively affected by a winter rye cover crop yielding 4 bu/A greater where cover crops were present. Corn silage yield was not affected by a winter rye cover crop yielding similarly in both the cover crop (15 T/A) and no cover crop (16 T/A) treatments. Corn yield at West Chester, although no statistical differences were measured, where cover crops and an additional application of 50 lbs nitrogen/A were present, corn yield was 15 bu/A greater than without the sidedress or a cover crop treatment (Graph 2).

Graph 2



* West Chester added an additional split plot with 50 lbs N/A sidedress application.
**Indicates a significant difference between the treatments (P<0.05).

Conclusion

Yield

Soybeans planted following a winter rye cover crop were positively affected in 2010 and showed no difference in 2009 while corn yield was negatively affected at one location in 2009 and negatively affected at all locations in 2010. Corn silage yield was not affected. The majority of the locations in this experiment that planted corn in 2009 and 2010 had never planted a cover crop on these farms. Our results, that corn yield was negatively affected by a winter rye cover crop in its first couple years of usage on a farm is supported by other university research where a winter cover crop treatment is only planted one year before measuring the following year's cash crop yield. We hypothesize that with additional years of cover crops planted to the same area the affect on corn yield will change.

Extending Cover Crop Coverage

Our results for soybean yield and corn silage yield are supported by the published literature. In addition, at Jefferson, soybeans were planted on 04/23/10 into a living cover crop and then the cover crop was terminated using an herbicide on 05/15/10. Soybean yield was not affected and the cover crop was allowed to continue growing, covering the soil and scavenging nutrients. An average 2000 lbs/A additional biomass was returned to the soil through this management technique. Also at planting, four farms are aerial-seeding cover crops into a standing corn or soybean field to improve fall cover crop growth, which further covers the soil and also increases spring growth.