Integrating Cover Crops on Sandy Soils to Improve Water Quality and Soil Health

Study ID: 737119201701
County: Madison
Crop: Soybean
Soil Type: Boel sandy loam 0-1% slope
Planting Date: 4/24/17
Harvest Date: 11/14/17
Population: 150,000

Variety: Asgrow 2733
Reps: 6
Previous Crop: Corn
Tillage: No-Till
Irrigation: Pivot, Total: 5.23"
Rainfall: 28.14"

Figure 1. High clearance applicator planting cover crops into standing corn on September 19, 2016.

Introduction: The objective of this study was to evaluate the potential for cover crops to reduce water erosion of nutrients, improve water quality by reducing nitrate leaching, and enhance soil health in Nebraska corn/soybean production systems on sandy soils. This report includes data from year one of the three-year project. The treatments will remain in the same locations each year so we can monitor changes in water erosion, water quality, and soil health over time. This study consists of three treatments with six replications: check (no cover crop), pre-corn harvest planted cereal rye cover crop, and post-corn harvest planted cereal rye cover crop. The pre-harvest rye was broadcast on September 19, 2016 into standing corn using a high-clearance seeder *(Figure 1)*. The post-harvest planted rye was drilled on November 3, 2016. Rye cover crop was planted at a rate of 56 lb/ac. Plots are 40 feet wide for the check and the post-harvest planted cover crop; 60 feet wide strips were used for the pre-harvest planted cover crop. In the spring of 2017, cover crop biomass was measured and soil samples were collected to determine nitrate concentration change with depth and to test soil biological activity through the Solvita® 24-hour CO_2 Burst test. In the fall of 2017, we hand harvested a 17.5-foot long soybean row in the center of each plot to determine grain yield. The plants plus the beans were harvested, dried in a forced-air oven, and then threshed. Grain was corrected for moisture content. Additional data on water erosion and quality will be collected in 2018.

Results:

	Soybean Yield† (bu/ac)	Spring Cover Crop Biomass (lb/ac)	Marginal Net Return‡ ($/ac)
Check	82 A*	N/A	733.49 A
Cover Crop - Pre-harvest Planting	65 B	254.14 A	556.71 B
Cover Crop - Post-harvest Planting	66 AB	121.21 B	560.55 B
P-Value	0.0575	0.014	0.031

*Values with the same letter are not significantly different at a 90% confidence level.
†Yield values are from cleaned yield monitor data. Bushels per acre corrected to 13% moisture.
‡Marginal net return based on $8.90/bu soybeans, $0.16/lb cereal rye seed cost, $8.13/ac high clearance applicator cost, and $17.16/ac drill cost.

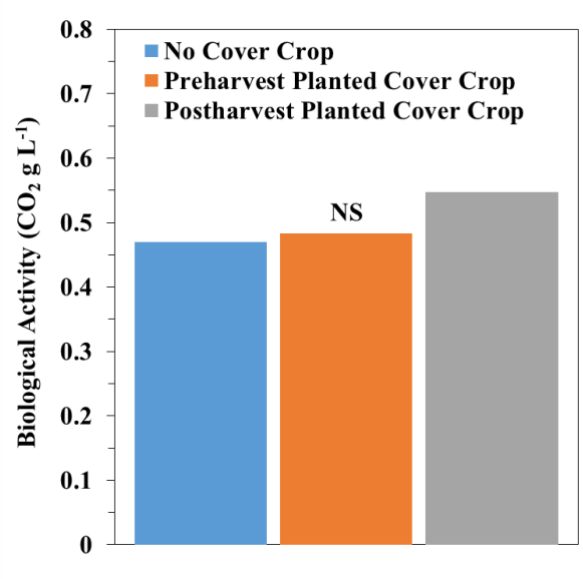

Figure 2. Rye cover crop planting date effect on soil biological activity in a sandy loam soil in Nebraska. NS denotes no significant differences among the three treatments.

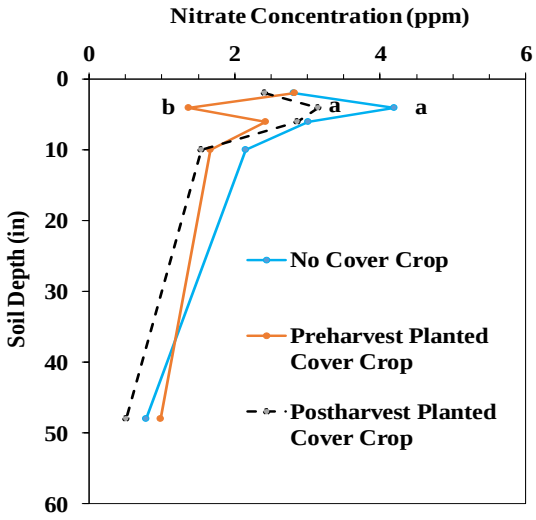

Figure 3. Cover crop planting date effect on nitrate concentration on a sandy site.

Summary:

- Spring cover crop biomass was significantly greater in the pre-harvest broadcast compared with post-harvest drilled treatment.
- Soybean yields were significantly less in the pre-harvest cover crop treatment when compared with the check whereas no differences occurred between the post-harvest treatment and the check.
- The yield reduction and increased costs for establishing cover crops resulted in significantly lower marginal net return for both cover crop treatments compared with the check.
- There were no significant differences in biological activity across treatments *(Figure 2)*.
- Significant differences in nitrate concentration were only observed at the 4-8" depth *(Figure 3)*. At this depth, pre-harvest planted cover crop had significantly less nitrate concentration when compared with the post-harvest planted cover crop and the check. This suggests that at this site, the greater cover crop biomass produced by the pre-harvest planted cover crop reduced nitrate concentration in the 4-8" depth.

Sponsored by: University of Nebraska Lincoln; Nebraska Corn Board; Nebraska Soybean Checkoff

In Partnership with: Nebraska Corn Growers Association; Nebraska Dry Bean Commission