

Tillage, Cover Crop, and Compaction Effect on Soybeans

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Objective

To evaluate the effect of soil compaction, cover crops, and tillage on soybean yields.

Background

Crop Year: 2013	Tillage:	see below
Location: O.A.R.D.C. NW Ag Research Station	Planting Date:	May 17, 2013
County/Town: Custar, OH , Wood County	Nitrogen:	none
Soil Type: Hoytville clay loam	Seeding Rate:	175,000
Drainage: systematic subsoil	Harvest Date:	September 26, 2013
Previous Crop: corn/soybean rotation	Fertility:	no fertilizer added

Methods

The treatments were replicated four times in a randomized complete block design. Plot size was 10 x 50 feet for each treatment. Harvest data was collected from the center 7 feet. All treatments received the same herbicide application. On October 25, 2012, cereal rye was drill seeded into corn residue on selected treatments. On October 29, 2012, subsoil tillage was done on selected treatments. This tool has a single straight shank spaced 30 inches apart, operated at depth of 12 inches. No further tillage was done. The following spring, all treatments were no-till and drill seeded to Pioneer 92Y92 soybeans. Glyphosate herbicides were applied on May 6, 2013 and July 15, 2013.

On November 17, 2008, a single axle grain cart was used with half full 10 ton/axle weight and full 20 ton/axle weight. Compacted plots were driven over the entire area of those plots once with tractor and grain cart. The same plots were previously compacted in a similar way in 2002 and 2005.

No-till plots have not received any tillage since 2001.

Cover crops have been planted on the same treatments since fall of 2009.

Results

2013 Yields

Treatment	Compaction	Tillage	2013 Yield
1	None	No-till	53.6 C
2	None	Fall Subsoil	47.8 ABC
3	None	Cover Crop	49.5 BC
4	10 ton	No-till	54.2 C
5	10 ton	Fall Subsoil	48.4 BC
6	10 ton	Cover Crop	51.4 C
7	20 ton	No-till	48.8 BC
8	20 ton	Fall Subsoil	42.7 AB
9	20 ton	Cover Crop	40.8 A

LSD (0.10) = 7.6

4 YEAR AVERAGE YIELDS (2010 – 2013)

Treatment	Compaction	Tillage	4 yr. Ave. Yield
1	None	No-till	58.6 D
2	None	Fall Subsoil	52.4 BC
3	None	Cover Crop	55.8 CD
4	10 ton	No-till	58.3 D
5	10 ton	Fall Subsoil	53.9 BC
6	10 ton	Cover Crop	55.6 CD
7	20 ton	No-till	54.0 BC
8	20 ton	Fall Subsoil	46.2 A
9	20 ton	Cover Crop	50.5 B

LSD (0.5) = 3.8

Summary

The highest yields over all treatments were no-till with not any cover crops but were not significantly different from cover crops in the 4 year comparison. The addition of a cover crop increased soybean yield when compared to fall subsoil tillage.

No-till was not significantly different from cover crop treatments in the 4 year yield comparison. The 20 ton compaction treatments had lower yields compared to long-term no-till treatments without compaction.

Long-term no-till and no-till with cover crops may be able to withstand the compaction pressure due to improved soil structure compared to annual subsoiling. This disadvantage for subsoiling continues a trend since 2003. The loosened soil structure created by subsoiling means that heavy

axle loads that follow may compact the soil and reduce yields. Repeating the subsoiling treatment after compaction did not correct the problem. Late fall subsoiling may not be the best time to perform compaction correction due to wet soil conditions. Another advantage of no-till is avoiding concerns for wet soils after harvest since tillage is eliminated.

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