

# Soil Compaction and Subsoil Tillage Effect on Crop Production

Alan Sundermeier, Ohio State University Extension Educator, Agriculture & Natural Resources  
Randall Reeder, Ohio State University Extension Specialist, Conservation Tillage

## Objective

To evaluate the effect of soil compaction and subsoil tillage on crop production.

## Background

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|----------------|---|----------------|--|
| Cooperator:    | O.A.R.D.C. NW Branch                            | Fertilizer:    | corn sidedress 50 gal/ac 28%                 |
| County:        | Wood  | Planting Date: | corn & bean – 5-20-09                        |
| Nearest Town:  | Hoytville                                       | Planting Rate: | corn- 30,000, bean- 180,000                  |
| Drainage:      | Tile, well-drained                              | Row Width:     | corn- 30 in, bean- 7.5 in                    |
| Soil type:     | Hoytville, clay                                 | Herbicides:    | corn – Lexar, Roundup, 2,4-D,<br>Makaze, AMS |
| Tillage:       | No-till vs subsoil                              |                | Bean – Canopy, Showdown, 2,4-D               |
| Previous Crop: | corn/soybean rotation                           | Harvest Date:  | corn- 11-10-09    bean 10-5-09               |
| Variety:       | corn – Pioneer 35F44<br>soybean - Pioneer 93Y10 |                |  |

## Methods

The entries were replicated four times in a randomized complete block design. Plot size- 10 x 50 feet each entry. Harvest data was collected from the center rows.

All treatments received the same seed variety, herbicide, and pre-season fertilizer applications.

On November 17 & 18, 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. On November 20, 2008 subsoil tillage was done on subsoil plots. This tool has a single straight shank spaced 30 in. apart, operated at depth of 12- 18 inches. No further tillage was performed. No-till plots have not received any tillage since 2001.

## Results

2009 Soybean Yield – bu/ac

| Treatment | Compaction | Tillage      | Harvest Population | Yield Bu/acre |
|-----------|------------|--------------|--------------------|---------------|
| 1         | None       | No-till      | 185,600            | 54.8 A        |
| 2         | None       | Fall Subsoil | 179,200            | 53.9 A        |
| 3         | 10 ton     | No-till      | 153,600            | 51.6 A        |
| 4         | 10 ton     | Fall Subsoil | 166,400            | 45.6 B        |
| 5         | 20 ton     | No-till      | 163,200            | 52.0 A        |
| 6         | 20 ton     | Fall Subsoil | 185,600            | 39.0 C        |

LSD (.05) 4.19

## 2009 Corn Yield – bu/ac

| Treatment | Compaction | Tillage      | Harvest Population | Yield Bu/acre |
|-----------|------------|--------------|--------------------|---------------|
| 1         | None       | No-till      | 27,500             | 157.0 A       |
| 2         | None       | Fall Subsoil | 27,000             | 143.7 AB      |
| 3         | 10 ton     | No-till      | 26,500             | 143.1 AB      |
| 4         | 10 ton     | Fall Subsoil | 27,750             | 141.0 B       |
| 5         | 20 ton     | No-till      | 27,250             | 142.8 AB      |
| 6         | 20 ton     | Fall Subsoil | 25,000             | 125.9 C       |

LSD (.05) 15.54

### Summary

In both the corn and soybean plots, the long-term No-till treatments did not have significant difference in yield regardless of compaction amount.

Subsoil tillage compared to No-till had significantly lower yields in the corn and soybean plots for both 10 ton and 20 ton compaction. This disadvantage for subsoiling continues a trend since 2003.

Long-term No-till may be able to withstand the compaction pressure due to improved soil structure compared to annual subsoiling. Subsoil tillage did not improve crop yields after compaction has occurred at 20 ton (full grain cart).

The loosened soil structure created by subsoiling means that heavy axle loads that follow, even months or years later, may compact the soil and reduce yields. Repeating the subsoiling treatment after intentional compaction did not correct the problem.

Late fall subsoil tillage may not be the best time to perform compaction correction, due to wet soil. Planning to subsoil after wheat harvest instead means that soil is more likely to be drier and conducive to good shatter. We have not conducted research to make this comparison.

For more information, contact:  
Alan Sundermeier  
OSU Extension, Wood County  
639 S. Dunbridge Rd, Suite 1  
Bowling Green, Ohio 43402  
[sundermeier.5@osu.edu](mailto:sundermeier.5@osu.edu)

