

**No-Tillage Wheat - Long Term Effects**  
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**Objective:**

The objective of this experiment was to verify the effects of no-till wheat and tilled wheat on the subsequent yield of soybeans and corn planted after wheat and measure differences in fertility and physical effects on the soil on a long term basis.

**Methods:**

The experiment is at Princeton, Ky on a Pembroke silt loam soil that is moderately well drained. Pioneer 2540 was planted on Oct. 10 at 35 seeds/sq. ft. Wheat was planted no-tilled and with tillage and the tillage plots were chisel plowed and disked twice. The plots were 10 ft x 30 ft. The soil test was pH - 6.3, P - 39, and K-169 and 0-60-50 lbs/ac of N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O was applied before planting. N was applied on wheat at 90 lbs/ac. on ½ of the plots on at 120 lb/ac. on the other half. Gaucho insecticide was coated on all seed at 2 oz/100 wt. and Tilt was sprayed at 4 oz/ac. at heading.

**Results:**

Yields of Succeeding Crops

Both soybeans and corn are no-tilled after the two tillage systems in which wheat is grown. The soybeans are double-cropped after the wheat and the corn is planted the next spring before the wheat is planted in the fall. These crops are harvested for yield to determine if the wheat tillage systems had an effect.

The data (below) indicates that both corn and soybeans tend to yield more (about 5%) where the wheat is planted no-till. However, the differences are not always statistically significant, but the trend has remained consistent since the second year of the experiment.

The data indicates that some changes in the system which have taken place in the two systems is more favorable for these crops when planted after no-till wheat. The reason for the difference is not clear at this time, but might include residue cover, soil moisture, soil physical changes, or others.

## Soil Changes

The soil density and the soil strength have been measured each year and both of these measures show very similar readings with no differences between the two systems indicating that compaction is not a problem in either system.

The amount of soil organic matter found in the two systems was very similar. One would expect the all no-tillage treatment to have more organic matter, but there is no statistical difference. There is also no difference in the soil test pH, phosphorus or potassium between the two systems.

## Temperature and Wheat Growth

Temperature loggers were placed at different heights and depths within the soil and wheat canopy to develop a temperature profile that might help answer questions concerning the differences between tilled and no-tilled wheat on growth vigor and winterkill.

Late winter freeze damage occurred in March of 1998. The data collected indicates that no-tillage conditions may lower the temperatures compared to the tilled wheat. The coldest temperature occurred on March 12 and the temperature at ground level was as low as 13° F in the conventional stand and 7° for the no-till stand. However, the wheat was at Feekes 5, so we did not observe any differences in winter damage. The no-till plants turned yellow and were a little slow to recover, but the number of heads were unaffected.

### **Effect of Wheat Tillage Systems on the Yield of Succeeding Crops**

Year	Wheat Tillage System	
	<u>No-Till</u>	<u>Conventional</u>
		<i>Soybeans (bu/ac)</i>
1998	16.5	15.8 N.S.*
1997	45.1	42.7 N.S.
1996	54.5	50.8 N.S.
1995	24.4	22.2 N.S.
1994	49.5	51.6 N.S.
Avg.	38.0	36.6
		<i>Corn (bu/ac)</i>
1998	203.7	190.2**
1997	211.9	199.3 N.S.
1996		--- Harvest Data Lost ---

1995	186	191 N.S.
1994	206	178 **
Avg.	201.9	189.6

\* N.S. means no significantly statistical differences.

\*\* Statistically different at the 0.1% level.

### **Conclusions:**

No-tillage wheat seems to have a favorable effect on the yields of the subsequent crops (corn and soybeans) planted in the rotation. Yields of these two crops are increased about 5 to 6% on the average when planted after no-till wheat. The reason of this is unclear at this time. The temperature extremes are greater under the no-tillage wheat planting which can increase the changes of freeze damage.