

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 in a wheat, double-cropped soybean and corn rotation 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. 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 - 6.0, P - 39, and K - 247 and 0-60-30 lbs/ac of N-P₂O₅-K₂O was applied before planting. Soybeans are planted no-till immediately after wheat harvest and no-till corn is planted the following year and wheat (tilled and no-tilled) is again planted after corn harvest.

RESULTS:

Yields of Succeeding Crops

The data (below) indicates that both no-till corn and no-till soybeans tend to yield more (3.8% for soybeans and 6.3% for corn) 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 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 little or 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. There is also no difference in the soil test pH, phosphorus or potassium between the two systems. The total no-tillage system 0.24% more organic matter in the top 3 inches of the soil than the one with tilled wheat.

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.

In 1998-99, there was no difference in the vegetative growth between the two tillage systems and there was also little difference in temperatures most of the time. The temperatures in both tillage systems declined in December at the same rate and began rising in late January at the same rate.

EFFECT OF WHEAT TILLAGE SYSTEMS ON THE YIELD OF SUCCEEDING CROPS

Year	Wheat Tillage System	
	No-Till	Conventional
	<i>Soybeans (bu/ac)</i>	
1999	14.9	15.4 N.S.*
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 **
Average	34.2	33.1
	<i>Corn (bu/ac)</i>	
1999	196.0	165.7 **
1998	203.7	190.2 **
1997	211.9	199.3 **
1996		--- Harvest Data Lost ---
1995	186.0	191.0 N.S.

1994	206.0	178.0 **
Average	200.7	184.8

* 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 4 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.