

NO-TILL WHEAT LONG-TERM EFFECTS

Lloyd Murdock, Jim Herbek, Jim Martin, John James, and Dottie Call
Department of Agronomy

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-till 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 – 6.2, P – 5, and K – 189 and 0-70-40 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 (3.7% for soybeans and 7.1% for corn) where the wheat is planted no-till. However, the differences are not always statistically significant, but the trend has been consistent since the second year of the experiment.

These yield differences indicate that changes between the two systems have taken place with time and the changes favor the system which has only no-tillage wheat plantings in it. The reason for the difference is not clear at this time, but research which is taking place indicate that the differences may be due to residue cover, soil moisture, soil physical changes and more specifically a change in pore size distribution.

Soil Changes

There is no difference in the soil density between the systems. This indicates that there was no compaction of significance in either system. The soil strength, as indicated by penetrometer measurements was higher in the exclusively no-tillage system. This indicates that the soil structure has changed and probably has larger aggregates than the system that is tilled every second year for wheat planting.

Moisture measurements taken during the 1999 growing season on the no-till corn and in 2000 on the no-till soybeans found more moisture available for plant growth in the treatments where tillage was not used for wheat. This resulted in an 18% and 6.2% higher grain yields, respectively, for these treatments during these years. There was little difference in measured soil moisture in the 2000 no-till corn. However, the corn planted in the no-till wheat rotation had more vegetative growth and more kernels per ear, indicating that more water was available to the plant, early in the growing season.

EFFECT OF WHEAT TILLAGE SYSTEMS ON THE YIELD OF SUCCEEDING CROPS		
Year	WHEAT TILLAGE SYSTEMS	
	No-Till	Conventional
	<i>Soybeans (bu/ac)</i>	
2000	45.6	42.9 N.S.*
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	35.8	34.5
	<i>Corn (bu/ac)</i>	
2000	169.5	170.7 N.S.
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	195.5	182.5
* N.S. means no significantly statistical differences.		
** Statistically different at the 0.1% level.		

SUMMARY AND CONCLUSIONS:

A true no-tillage system seems to have a favorable effect on the crops grown on the yields of soybeans and corn. When no-till wheat was grown, the no-till corn and soybeans had 7.1% and 3.7% greater yields, respectively, than when these crops were grown after tilled wheat. The changes which are taking place are unclear at this time, but it appears that they result in more plant available moisture for these crops. Research is continuing to try to better understand the differences.