NO-TILL WHEAT INCREASES YIELDS OF CORN AND SOYBEANS IN THE CROPPING ROTATION

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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 began in the fall of 1992 at Princeton, Ky on a Huntington 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 trial was soil tested each year and fertilizer and lime applied according to University of Kentucky recommendations. N was sidedressed on corn at 150 lb/ac. 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 (table) indicates that both no-till corn and no-till soybeans tend to yield more (5.0% for soybeans and 3.5% for corn) where the wheat is planted no-till. Over the 17 years of the trial, either corn or soybean yields have been statistically higher 8 of the 17 years (about 50% of the years) when planted after no-till wheat compared to tilled wheat. The actual yield increase has been 2.0 bu/ac. for soybeans and 6.5 bu/ac. for the corn. With prices for corn at $4.00/bu and soybean at $10.00/bu, this would mean a $52.50 increased return over the two year rotation for planting no-till wheat. However, there has been no statistical difference between the corn yields in the two tillage systems for 11 years.

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. Research indicates that the reason for the difference is due to residue cover, soil moisture, soil physical changes and more importantly a change in pore size distribution. There are more medium sized pores in the upper few inches of the soil that hold more plant available water.

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 and other soil measurements indicate that the soil structure has changed and has larger aggregates and more

medium sized pores than the system that is tilled every second year for wheat planting. An advantage for this change in pore size was seen in 2004. The wet soil conditions after wheat harvest for planting double-cropped soybeans were different for the two tillage systems. The soil with no-till wheat had better drainage and better planting conditions than the tilled wheat treatment. This resulted in 30% more plants than the tilled wheat treatment.

Soil moisture measurements taken during the latter part of the growing season are higher in the true no-till system about half of the years and about the same as tilled the other years. When the soil moisture is higher, corn and soybean yields are usually higher in the no-till system. In the years when there is no difference in soil moisture, the yields are similar. The no-tilled soil can hold more plant available water but the rain must fall at the proper time for the advantage to express itself. In some years, it does and others it does not.

SUMMARY AND CONCLUSIONS

A true no-tillage system seems to have a favorable effect on the corn and soybean crops grown in rotation with the no-till wheat. When no-till wheat was grown, the average yields of no-till corn and soybeans had 3.5 and 5.0% greater yields, respectively, than when these crops were grown after tilled wheat. This increase in yield results in about a $53/ac. increase in profits for the 2 year rotation of wheat, double-cropped soybeans and corn. The soil changes include larger aggregates and more medium pores which result in more plant available moisture for these crops.

EFFECT OF WHEAT TILLAGE SYSTEMS ON THE YIELD OF SUCCEEDING CROPS

Year	Wheat Tillage Systems			
	No-Till	Conventional	No-Till	Conventional
	Soybeans (bu/ac)		Corn (bu/ac)	
2010	40.9	38.9 N.S.*	210.6	206.2 N.S.*
2009	72.8	73.3 N.S.*	245.1	240.7 N.S.*
2008	31.2	27.0**	222.1	216.9 N.S.
2007	27.4	25.5 N.S.	188.1	175.1 N.S.
2006	58.0	59.4 N.S.	201.4	207.3 N.S.
2005	46.0	44.4 N.S.	156.0	144.7 N.S.
2004	61.1**	53.1	217.7	216.3 N.S.
2003	66.6**	63.6	171.2	172.5 N.S.
2002	30.7**	26.8	136.0	135.6 N.S.
2001	35.3	34.1 N.S.	208.3	215.1 N.S.
2000	45.6	42.9 N.S.	169.5	170.7 N.S.
1999	14.9	15.4 N.S.	196.0**	165.7
1998	16.5	15.8 N.S.	203.7**	190.2
1997	45.1	42.7 N.S.	211.9**	199.3
1996	54.5	50.8 N.S.	-- Harvest Data Lost --	
1995	24.4	22.2 N.S.	186.0	191.0 N.S.
1994	49.5	51.6 **	206.0**	178.0
Avg.	42.4	40.4	195.6	189.1

* N.S. means no significantly statistical differences. ** Statistically different at the 0.1% level.