NO-TILLED VS. TILLED WHEAT (15 YEARS)

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No-till wheat production has been practiced in Kentucky for many years. As of 2007, about 40-45 percent of the harvested wheat acres in Kentucky were no-till planted. More farmers are adopting the practice, but long term information is needed.

The trial was established in the fall of 1992. No-tilled and tilled wheat have been compared using high yield management practices. The objective of this study was to compare the yield potential of both tilled and no-tilled wheat on well-drained limestone derived soils in Kentucky. A secondary objective was to compare different nitrogen rates in the two tillage systems.

Research Approach:

A replicated trial was established on a Huntington Silt loam soil at Princeton, Kentucky, in the fall of 1992. Two small adjacent fields were placed in a three-crop, two-year rotation of corn, wheat, and double-cropped soybeans. Both no-till and tilled (chisel-disk) wheat were planted and compared with different nitrogen, fungicide, and herbicide treatments. The corn and double-cropped soybean crops were planted no-till. Stand counts, weed control ratings, disease, and insecticide ratings, as well as yield and compaction results, were obtained for wheat. The long-term effects of the two different wheat tillage practices on the succeeding soybean and corn crops and on soil changes were also measured and are included in another report.

Results:

Fifteen ears of results (1993-07) are presented in this report.

Weeds, Diseases and Insects

The first 11 years, diseases and insects were monitored in the two tillage treatments. During this time there were no significant insect infestations between tillage treatments.

There was no significant difference in diseases between the two tillage treatments except for Barley Yellow Dwarf virus the first year which was more prominent in the no-tillage treatment. After this, an insecticide was applied each fall to control aphids, which spread the Barley Yellow Dwarf. The disease was not a problem after that.

Weed control treatments over the first 11 years, showed a 13 to 15 bu/ac. yield advantage for the application of herbicides. Good weed control was obtained in no-till wheat by three treatments: 1) Harmony Extra applied in late fall, 2) a contact herbicide at planting plus Harmony Extra in spring about jointing, and 3) Harmony Extra in spring about jointing.

Yields

The fourteen year average yields have been high (Table 1). There is only 1.6 bu/ac. difference between the tillage treatments over the 15 years. On a yearly basis, tilled wheat had significantly higher yields 5 of

the 15 years, no-till 3 of the 15 years and no significant difference the other 7 years.

The tilled yields tend to be higher when there is freeze damage or cool conditions.

The 1.6 bu/ac. advantage for tilled wheat would certainly not be profitable considering the price of fuel and the numerous extra trips over the field for tilled wheat.

During the last 9 years the yields of the tillage treatments have almost been identical (Table 1). On a yearly basis, tilled yields were significantly higher 2 years, no-till 3 years and no significant difference 4 years. This may indicate that yields of the 2 tillage systems are now equivalent. If this is the case, it may be due to better soil quality under no-till, a better understanding of no-till wheat management, or years without unfavorable weather.

Stands

The number of emerged plants is usually lower with no-till. Planting at the rate of 32 viable seeds/sq. ft., the final stands averaged 27.0 and 28.9 plants/sq. ft. for no-till and tilled wheat, respectively over fifteen years. Both stands were high enough for maximum yields. Seeding rates may need to be increased by ten percent as one moves from tilled to no-till seeding.

Nitrogen Rates

No-till wheat may require more nitrogen than tilled wheat. Nitrogen in this trial was managed for intensive production with one-third applied at Feekes stage 3 (February) and the remainder at Feekes stage 5 (mid-March). The no-till wheat sometimes appeared to be slightly nitrogen deficient before the second application, but in most years this had little effect on yield. Increasing the nitrogen rate from 90 to 120 lbs/A had only a small effect on yield for the fifteen years (Table 1). Although more nitrogen is recommended for no-till plantings, it may not always be justified. The years that the high rate of nitrogen resulted in higher yields were usually when late winter freezes resulted in wheat damage or when excessive amounts of rain fell after the first application of spring nitrogen. The 90 lb/ac rate has been as good as the 120 lb/ac rate 9 of the fifteen years for no-till. The cost of the extra 30 lb/ac N compared to the returns for the extra yields would be a breakeven situation on the tilled wheat and only a small gain with no-till wheat over the fifteen year period.

Summary:

No-till wheat can produce as well as tilled wheat when properly managed. Stand establishment and weed control appear to be where the greatest changes in management are necessary. Yields for the last 9 years have been almost identical for the two tillage systems. Soil structure and management changes may have reduced the earlier yield reductions found with the no-tillage wheat.

TABLE 1. SUMMARY OF FIFTEEN-YEAR WHEAT RESULTS (1993-07)

Treatment Comparison	Yield (Bu/Ac)	Wheat Stands (Plants/sq ft)
Tillage Effect		
Conventional	96.1	28.9
No-Till	94.5	27.0
Tillage Effect (Last 8 yrs)		
Conventional	98.0	
No-Till	99.1	
Nitrogen Rate (lb/ac)		
No-Till (90)	92.7	
No-Till (120)	96.6	
Conventional (90)	94.4	
Conventional (120)	97.3	