

EFFECTS OF TILLAGE ON CORN YIELD

Bill Wiebold, Travis Belt
Multi-year project

Justification:

Because of a variety of conditions, including weather and soil properties, many of Missouri's soils are highly erosive. Until recently, Missouri ranked second among all states for average soil loss. Soil conservation is essential to continued productivity of Missouri cropland. No-tillage is an excellent method for soil conservation. Plant residues left on the surface of the soil intercept falling rain drops, dissipating their energy, and reducing their ability to dislodge soil particles.

This experiment is part of a long-term study conducted on plots that were first established in 1991. Tillage treatments have been applied to the same plots in each year for 15 years. The objective of this experiment is to determine if corn grain yield is affected by the use of no-tillage practices.

Methods:

The experimental design was a randomized complete block with four replications. Two tillage treatments were imposed. Tilled plots were chisel plowed on February 28 followed by a field cultivator operation. No-tillage plots were planted without tillage. Hybrid DKC61-45 was planted in plots of both tilled and no-tillage treatments on April 21 at a seeding rate of 27,700 seeds/acre. The previous crop was soybean. Plots were 100 feet long and eight 30-inch rows wide.

Pre-emergence herbicides were Dual II Magnum and Aatrex. Roundup WeatherMax was used as a burndown and for post emergence weed control. Nitrogen fertilizer was top-dressed at 160 pounds/acre as ammonium nitrate.

Stand counts were made at about the 5-leaf stage in four 20-foot lengths of row in each plot. Before harvest rows 2, 3, 6, and 7 were end-trimmed to 90 feet. These four rows were harvested with a plot combine and yield was corrected to 15% moisture.

Results:

The no-tillage treatment resulted in a smaller stand density than the tilled treatment (Figure 1). Sometimes soils remain cool and wet under the residue of no tillage. This can reduce emergence percentage. Because corn yield is greatly affected by stand density, reduced stands is a concern for farmers considering no-tillage. However, the difference between the treatments was small – about 1500 plants/acre.

Grain for the tilled plots was 91.8 bushels/acre and 90.3 bushels/acre for no-tillage plots (Figure 2). Weather for much of the growing season was hot and dry, which reduced yield below normal. These conditions should have benefited no-tillage, but that was not the case. Figure 3 presents yield data from this field site since 1992. Averaged over all years for which data are available the no-tillage plots yielded 6.3% more than the tilled

plots. The soil type for this site is a Mexico silt loam with a shallow claypan. This soil is considered poorly drained so these data are encouraging for the yield potential of corn grown without tillage.

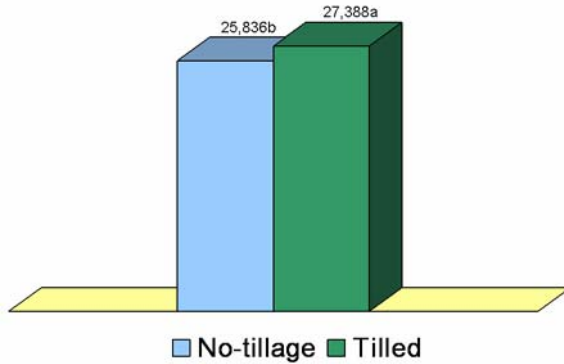


Figure 1. Effect of tillage choice on stand density determined at 5-leaf stage.

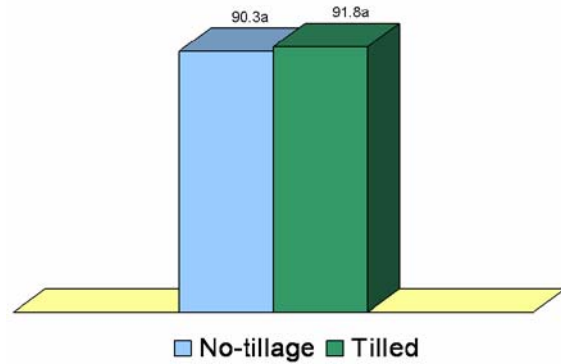


Figure 2. Effect of tillage choice on corn grain yield.

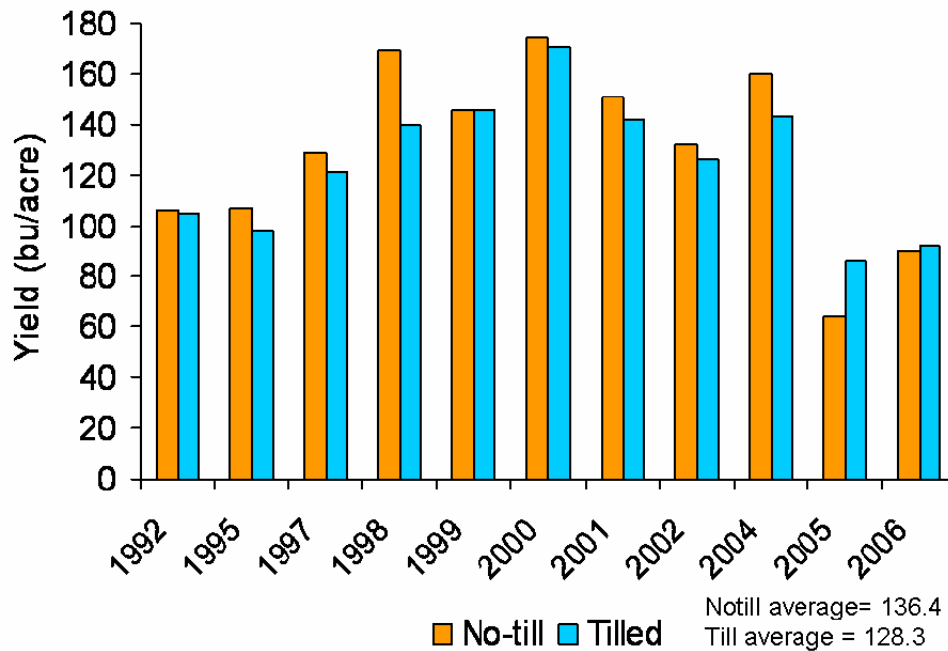


Figure 3. Effect of tillage choice on corn grain yield since 1992. Plots have been maintained with specific tillage treatment since 1992. Average yields are in bushels/acre.

Conclusions:

1. Long term yield averages show 6.2% yield advantage for no-tillage over tilled
2. In 2006, no-tillage and tilled treatments yield the same, but yields of both treatments were reduced because of weather stress.