Dr. W. B. Gordon and R. E. Lamond

Strip Till: An Attractive Alternative to No-Till?

In Kansas corn studies, strip-till plots yielded 16 bu/A mor ethan no-till plots.

Summary: *Even though grain yields were low in the hot and dry 2003 growing season, strip-till improved early-season growth and nutrient uptake. Strip-till shortened the time from emergence to mid-silk by 7 days and also reduced grain moisture content at harvest. Strip-till plots yielded 15 bu/A more than no-till plots. Yields in the 2004 growing season were very good. Strip-till increased yields by 16 bu/A over no-till corn. Soil temperature was consistently warmer in strip-till than in no-till in both 2003 and 2004.*

Production systems that limit tillage are being used by an increasing number of producers in the central Great Plains because of several inherent advantages. These include reduction of soil erosion losses, increased soil water-use efficiency, and improved soil quality. However, early-season plant growth can be poorer in reduced-till systems than in conventional systems. The large amount of surface residue present in a no-till system can reduce seed zone temperatures. Lower than optimum soil temperature can reduce the rate of root growth and nutrient uptake by plants. Soils can also be wetter in the early spring with no-till systems. Wet soils can delay planting. Early-season planting is done in order for silking to occur when temperature and rainfall are more favorable. Although early-season plant growth and nutrient uptake can be poorer in no-till systems than conventional-till, strip-till may provide an environment that preserves the soil and nutrient-saving advantages of no-till while establishing a seedbed that is similar to conventional-till.

Field studies were conducted in 2003 and 2004 at Belleville, Kansas, to compare the effectiveness of strip-till to no-till and assess the effects of fall versus spring or split applications of NPKS fertilizers on growth, nutrient uptake, and corn yield.

2003

Due to a very dry growing season in 2003, grain yields were very low and response to applied N was variable.

Early-season growth. Strip-till improved early-season growth, nutrient uptake, and grain yield of corn compared to no-till. The early season growth advantage seen in the strip-till plots carried over all the way to harvest.

Mid-silk. When averaged over fertility treatment, strip-till plots reached mid-silk 7 days earlier than no-till plots. Grain moisture in the strip-till plots was 2.8 percent lower than in no-till plots.

Yield. In this very dry year, yield advantage of strip-till over no-till may have been the result of increased rate of development in the strip-till system.

Pollination. The corn plants reached the critical pollination period sooner in the strip-till plants while some stored soil water was still available. The soil water reserve was depleted one week later when the plants in the no-till plots reached mid-silk.

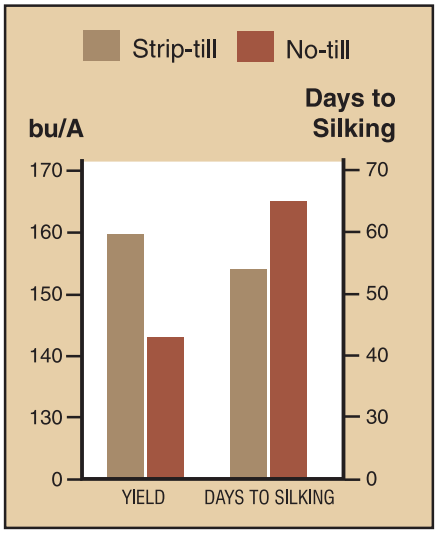

Figure 1. Number of days from emergence to mid-silk and corn yield, averaged over fertility treatments, Belleville, 2004.

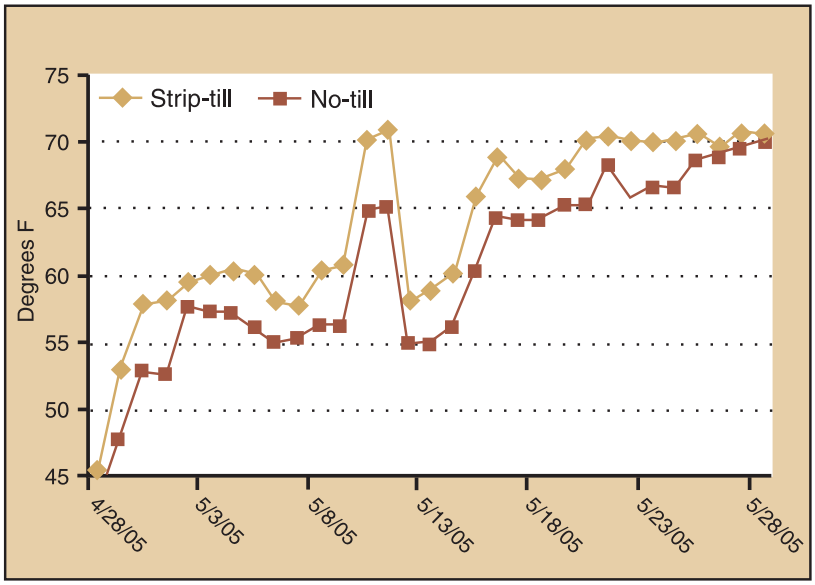

Figure 2. Soil temperature at planting depth, Belleville, 2004.

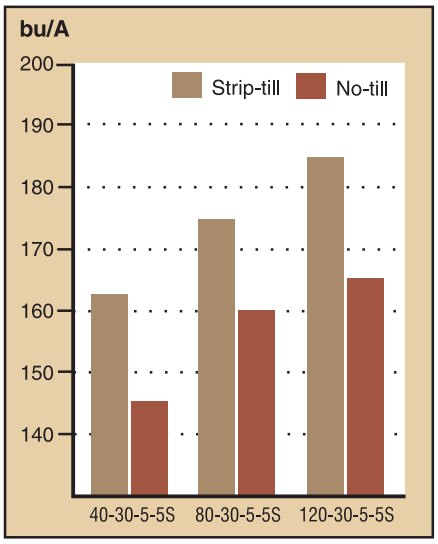

Figure 3. Corn grain yield as affected by tillage and spring-applied fertilizer, Belleville, 2004.

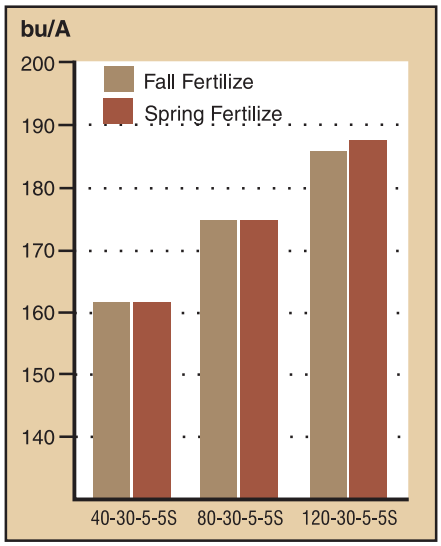

Figure 4. Corn grain yield as affect by fall- or spring-applied fertilizer in the strip-till system, Belleville, 2004.

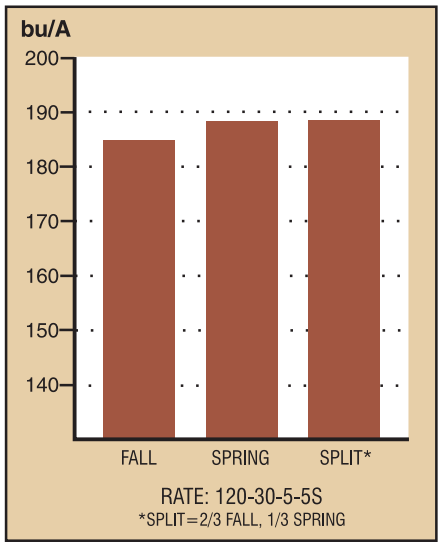

Figure 5. Corn grain yield as affected by timing of fertilizer application in the strip-till system, Belleville, 2004.

Soil temperature in the early growing season was warmer in the strip-till system than in the no-till system.

Final stand. Although final stand did not differ in the two tillage systems, plant emergence in the strip-till system reached 100 percent 3 days sooner than in the no-till system.

Timing. Under Kansas conditions, fall-applied fertilizer was as effective as spring-applied.

Split applications of fertilizer did not significantly improve yields over applying all in either the spring or the fall.

2004

In 2004, rainfall was above normal in May, June, and July. A hail storm in early June did reduce plant population by an average of 12 percent but surviving plants developed normally and grain yields were very good. When averaged over fertility treatment, strip-till plots yielded 16 bu/A more than no-till plots (Figure 1). As in 2003, early-season growth was increased and days from emergence to mid-bloom were decreased in the strip-till system.

Soil temperature in the early growing season was warmer in the strip-till system than in the no-till system (Figure 2). Soil temperature differences between the two tillage systems persisted into late May.

Final stand. Although final stand did not differ in the two tillage systems, plant emergence in the strip-till system reached 100 percent 3 days sooner than in the no-till system.

Yields in the strip-till system were greater than no-till at all levels of applied fertilizer (Figure 3).

Timing. Under Kansas conditions, fall-applied fertilizer was as effective as spring-applied (Figure 4).

Split applications of fertilizer did not significantly improve yields over applying all in either the spring or the fall (Figure 5).

Conclusion

Strip-till proved to be an effective production practice in both low- and high-yielding environments. Strip-till does provide a better early-season environment for plant growth and development, while still preserving a high amount of residue on the soil surface. This system may solve some of the major problems associated with conservation-till, thus making it more acceptable to producers.

Methodology

Location. This experiment was conducted at the North Central Kansas Experiment Farm near Belleville, Kansas.

Soil was a Crete silt loam to compare strip-till and no-till systems for dryland corn production.

Fertilizer treatments consisted of 40, 80, or 120 lbs/A of N with 30lbs/A of P_2O_5, 5 lbs/A of K_2O, and 5lbs/A S. An unfertilized check plot was also included.

Timing. In the strip-till system, fertilizer was applied in the fall at the time of strip tilling or in the spring at planting. In the no-till system, fertilizer was applied in the spring at planting.

Tillage. Strip-till was performed in wheat stubble in early October in both years of the study. The zone receiving tillage was 5 to 6 inches wide.

Placement. Fertilizer was placed 5 to 6 inches below the soil surface in the fall with the strip-till system. Spring-applied fertilizer was place 2 inches to the side and 2 inches below the seed at planting.

Nutrient sources were 28% UAN, 10-34-0, and potassium thiosulfate.

Dr. Gordon is professor in the Department of Agronomy at KSU. ❑