

Have you ever wondered if deep tillage is superior to shallower tillage or no-till on claypan soils?

A six-year tillage study was established at the East Central Experiment Field near Ottawa to address this question. The site was a Woodson silt loam soil and in a corn-soybean rotation. The five tillage treatments were: no-till; chisel plowing every year at 5-7 inches deep; deep subsoil tillage (8-14 inches deep) every year; deep subsoil tillage every second year; and deep subsoil tillage every third year. All tillage treatments were field cultivated prior to planting or in the off-years the subsoil treatments were disked and field cultivated. Also, all treatments received an in-season cultivation for weed control.

The six-year average corn yield for no-till was 98 bu/a, chisel plow was 100 bu/a, subsoil-every-year was 103 bu/a; subsoil-every-second year was 99 bu/a; and subsoil-every-third year was 105 bu/a. Thus, for corn there was a 7 bu/a difference between the no-till treatment and the highest-yielding tillage treatment. Interestingly, there was only one year out of six when there was a statistically significant yield difference among the tillage treatments for corn. In 2000, due to slow early season growth and subsequent early summer moisture stress, the no-till corn yield was 26 bu/a lower than the chisel plow treatment (112 bu/a).

The six year no-till soybean yield was 35.4 bu/a; chisel plow was 36.6 bu/a; subsoil-every-year was 37 bu/a; subsoil-every-second year was 37.3 bu/a; and subsoil-every-third year was 37.9 bu/a. For soybean, there was a 2.5 bu/a difference between the no-till treatment and the highest-yielding tillage treatment. Like for corn, there was only one year out of six years when there was a statistically significant yield difference among the treatments. In 1998, no-till soybean was 7.8 bu/a lower than the subsoil-every-year treatment (38.2 bu/a).

In the first year of the study (1996) the no-till corn treatment experienced severe nitrogen deficiency because less soil nitrogen was mineralized with no-till and only 70 lbs N per acre were applied. If the 1996 corn data were omitted, the yield difference between no-till and the highest-yielding tillage treatment is only 2.4 bu/a. If you compared the no-till corn treatment (92 bu/a) to the average of the four tillage treatments (92.8 bu/a) you would find little difference.

What is the bottom line?

There was only a slight yield advantage for shallow or deep tillage over no-till for both corn and soybean. There is no clear advantage among the tillage treatments, so if a producer thinks tillage is important to break-up the clay pan, then deep tillage every third year would be an option because it limits tillage costs. Producers need to take into account the cost of these tillage operations and they may find they are spending extra dollars per acre and realizing only a few extra bushels per acre. One option for producers to consider is strip-tillage, which tills only the area where the seed will be placed. Otherwise, no-till appears to be a viable option for these soils. In cool, wet springs corn growth may be slow and that could cause yield reductions.

Probably one reason we aren't seeing differences among the tillage treatments is the fact that there are numerous freeze-thaw and wet-dry cycles which break-up traffic compaction pans to the 4-8 inches depth.

For more details about this research see:

Field Research 2002. Report of Progress 893. P. 15-16. K-State Research and Extension.

Jim Shroyer
Extension Specialist
Crop Production