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Purpose

To determine if the extra tillage and cost associated with a strip-tilled, high residue farming system is needed when compared to no-till planting in the production of sprinkler irrigated sweet corn.

Methods

The field where we did this work is located near George, Washington. The soil is Quincy fine sand. The field is under center-pivot irrigation. The previous crop was strip-tilled sweet corn, grazed after harvest. Residue levels ranged from 5011 lbs/ac between the rows to 9479 lbs/ac in the rows, measured the day before planting.

Soil penetration resistance was measured before and after planting. A hand operated penetrometer, with data logging and depth detection was used. Measurements were taken on March 28, in the old cornrows, 4" to the side of the old rows, and directly between the 30" rows. After planting, measurements were made in the newly planted rows of the strip-till and no-till treatments.

The field was planted on May 4 using a 12-row 1720 John Deere corn planter (30" row spacing) behind a custom-built strip tiller. Planting was done between the old rows. No fertilizer was applied at planting.



Planter behind Strip-till Implement



Custom Strip-till Implement

Four paired strips, each one pass wide and field length long (~2500 ft), were arranged randomly in one section of the field. The strip tiller was lifted separately for the no-till strips, however the row cleaners on the planter moved almost all of the residue, and some soil, out of the row before planting. The corn variety was GSS9299 Jubilee.

An unreplicated comparison of no-till planting with and without row cleaners (6 rows each) was also implemented in this field.

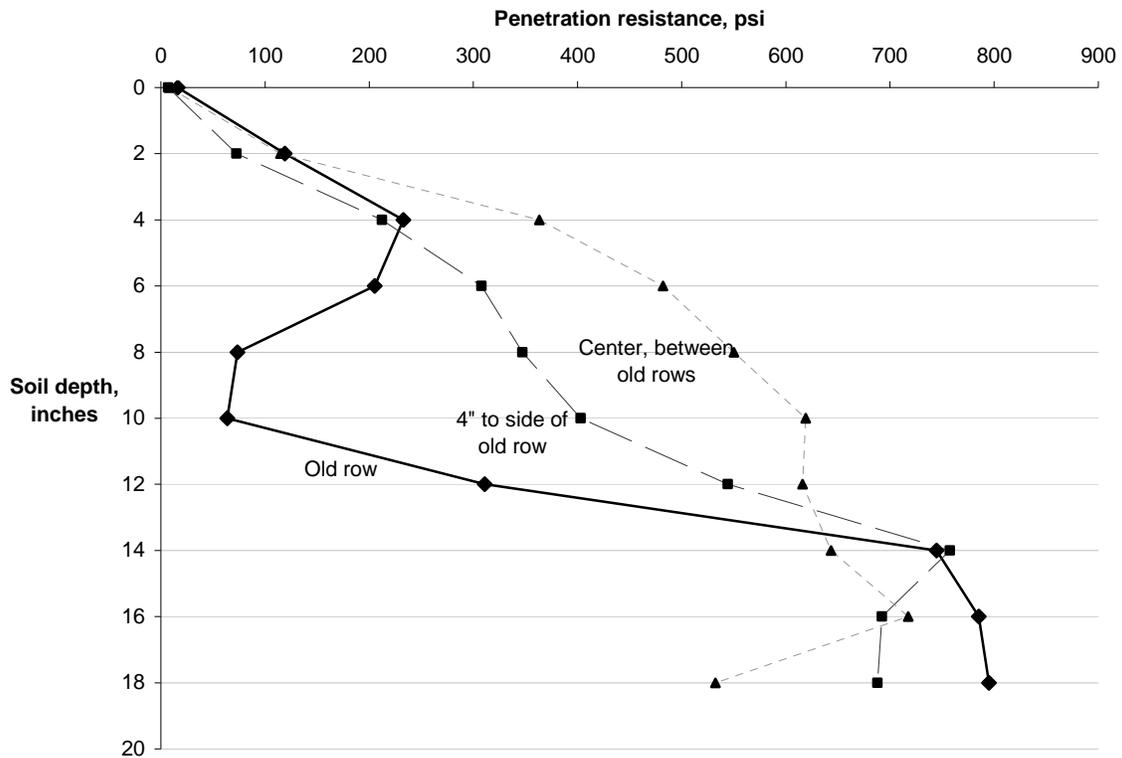
Emergence was assessed on May 23 by measuring the distance between 30 consecutive plants in the same two planter rows for each of the eight strips (four paired comparisons).

Sweet corn harvest was performed by Quincy foods using five-row pickers which picked strips, eight rows wide, from 1370 to 1440 ft long, in each of the eight treatment strips. The harvested corn from each eight-row strip was weighed on loading trucks at a nearby commercial scale.

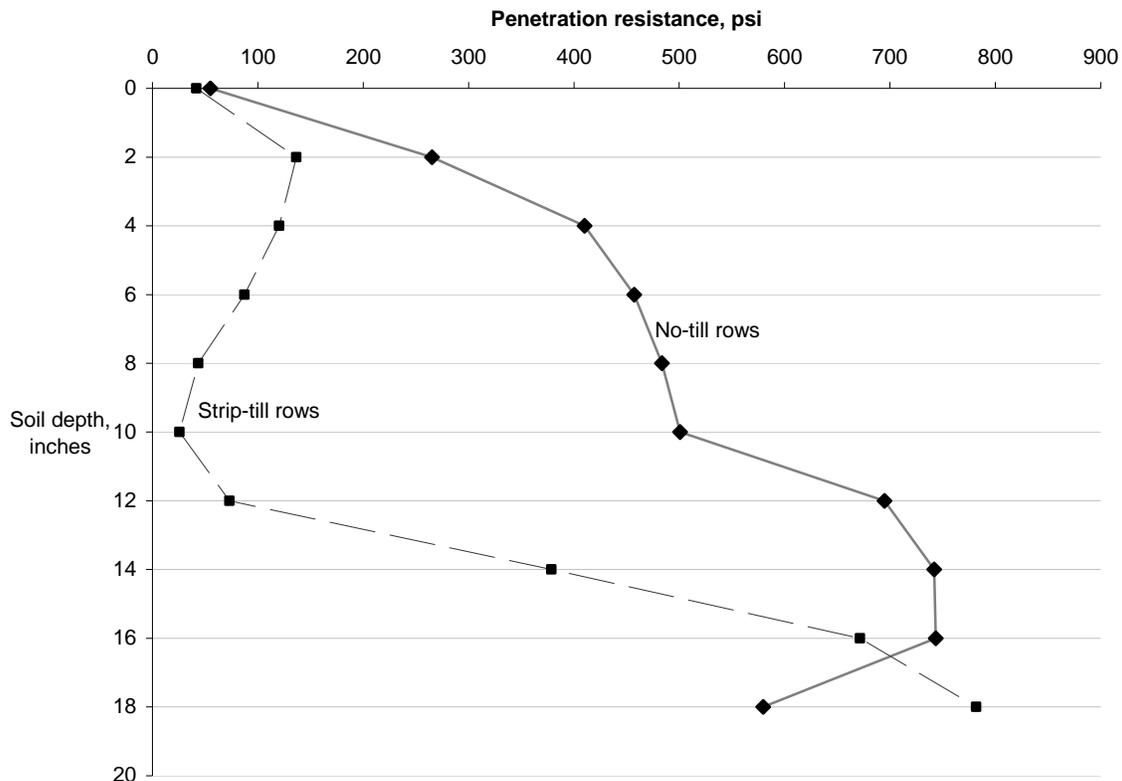
Results

Soil penetration measurements

The pre-plant measurements of soil penetration resistance indicate that the loosening effects of the previous year's strip-tillage under the rows remained. However, between the rows, the resistance levels increased as shown below.



After planting, penetration resistance in the planted rows showed the same effects of the current season's strip-tillage:



Crop emergence/stand

The measured distances between plants (stand count) and the standard deviation of those distances, a measure of stand uniformity, did not differ between the strip-till and no-till treatments. The average stand count was 26,835 plants/ac.

In a side experiment, where the comparison was between no-till corn, with and without row cleaners, there was no significant difference in stand count.

Yield

The average yield of the no-till strips was 10.7 tons/ac, while that of the strip-tilled strips was 11.1 tons/ac. Statistically, these yields were not significantly different.

Discussion

Although all the data shows that no-till sweet corn after sweet corn is possible, the data does not tell the entire story. Several weeks after emergence, patches of plants that were shorter and lighter green to yellow began to appear. Although the patches were distributed across the entire

field, those in the no-till strips looked worse than the others. Several remedies were tried, including adjusting the water applied and applying various nutrients through fertigation. Plants in both the no-till and strip-till recovered and yielded well.

Although the exact cause of the problem was never determined, one prime candidate was over-irrigation – perhaps due to increased soil water resulting from the residues covering the soil and reducing evaporation? This would explain the patches in the no-till looking worse, where because of the denser soil, the plants would suffer more from too much water (too little oxygen).

Why the much denser soil in the no-till plots, as inferred through penetration resistance measurements, did not result in decreased yields is puzzling. Several sources suggest that soils with penetration resistances above 300 psi limit root growth. This does not account for root growth down existing pores, but this is not likely in a sandy soil with little structure. Also, planting between the old rows probably gave us the worst conditions for root growth according to these measurements.

Rooting patterns after harvest were assessed by digging root balls and comparing them visually. It appeared that the no-till corn roots did not go as deep as plants in the strip-till plots, but were possibly more dense in the upper 6”.



No-till plants on left, strip-till plants on right

One explanation could be that the roots did not need to go very deep because they were “spoon-fed” a sufficient supply of water and nutrients through the irrigation system. If this was the case, although the corn in the denser soil (no-till) might produce nearly equal yields, other considerations,

such as how the corn would do if stressed by either an interruption in water supply or by disease, might argue against no-till in this situation.

Another consideration is compaction during sweet corn harvest. Sandy soils like that in this trial, with low organic matter levels and small proportions of silt and clay particles, do not easily form a soil structure that would help them resist such compaction, especially if the soil is wetter than the producer would like it to be when the corn is harvested. This also would argue for a strip-till over a no-till high residue farming system in this situation.

Finally, the trial shows that high residue farming, whether in a no-till or strip-till system, can produce acceptable yields while also gaining the benefits of keeping the soil covered.

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