Evaluation of Deep Tillage on Corn in the Midsouth

Corn production can be challenging on some of the less productive soils in the Midsouth. Deep tillage or subsoiling in the fall has been shown to improve the productivity of soils by reducing adverse effects caused by compaction. A demonstration was conducted to help define when conditions are most beneficial for deep tillage for corn production.

Study Guidelines

A demonstration trial was conducted by the Monsanto Learning Center at Scott, MS at a grower's farm to evaluate the effect of deep tillage on corn yield potential. A strip trial demonstration was established on Bertain or Calhoun silt loam soils with two replications. Treatments were deep tillage (Short Line Manufacturing parabolic subsoiler/buster to a depth of 19 inches) and no tillage (Figure 1). The field received tillage in October 2012 only for the deep tillage plots. Both treatments were bedded and rolled. DEKALB® brand corn products were planted the following spring in twin rows (spaced 7.5 inches apart) on a 38-inch raised bed system at 33,500 seeds/acre. Corn yield data from the no tillage and deep tillage treatments was collected by a Case IH Advanced Farming Systems™ yield monitoring system.

Figure 1. A parabolic subsoiler was used for deep tillage treatments.

Figure 2. Effect of deep tillage on corn emergence, corn emerged 5 to 7 days earlier in deep tillage plots (left) versus no tillage plots (right) - 2013 Scott Learning Center.

Results and Conclusions

The 2013 growing season started with abnormally wet conditions due to excessive rainfall. Even before the trial was planted, it was observed that the areas which received deep tillage allowed rainfall to better infiltrate the soil, reducing the ponding effect. The soil within areas that received deep tillage dried considerably faster than areas with no tillage. Plots with no tillage experienced more ponding after rainfall events. Corn plants in the deep tillage plots emerged approximately 5 to 7 days before the no tillage plots (Figure 2).

Corn yields were 237 and 244 bu/acre in plots that did not receive tillage, and 247 and 250 bu/acre in plots with deep tillage. When averaged across replications, deep tillage conducted in the fall resulted in a yield of 8 bu/acre more compared to no tillage (Figure 3). Corn stand counts were taken at the V6 to V8 growth stage; both no tillage and deep tillage plots were planted at 33,500 seeds/acre. The no tillage plots had an average stand count of 27,969 plants/acre and deep tillage plots had an average stand count of 31,316 plants/acre. The deep tillage plots averaged 3,347 plants/acre more than the no tillage corn plots (Figure 4). It was visually observed that plants in the deep tillage plots were substantially larger in height and girth and corn roots were larger when compared to plants in the no tillage plots (Figure 5).

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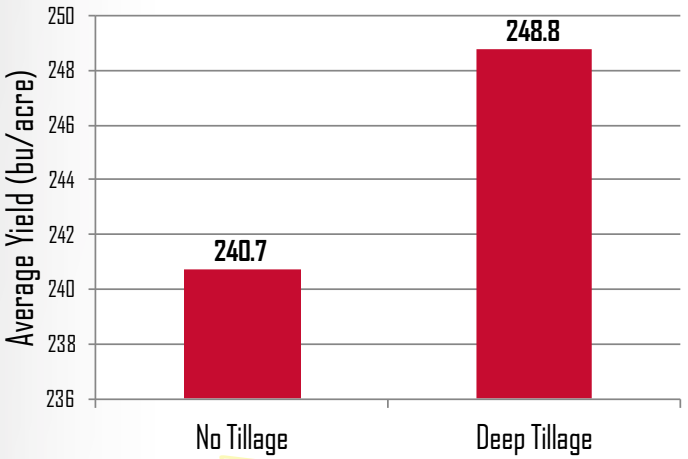

Figure 3. Effect of deep tillage on corn yield potential.

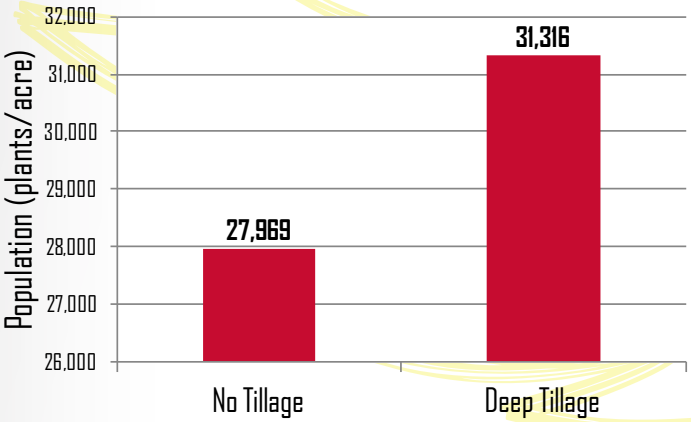

Figure 4. Average plant population at V6 to V8 growth stage in no tillage and deep tillage systems.

Figure 5. Difference in corn plant size and root system between no tillage and deep tillage treatments.

In 2007, a similar study was conducted by the Monsanto Learning Center near Leland, MS to evaluate the effect of soil compaction on corn yield.[1] To evaluate soil compaction within the plots; a penetrometer was used to determine the resistance in pounds per square inch (PSI) of the compacted and non-compacted soils. Water infiltration and root growth are highly inhibited when PSI is above 300.[2] Results from the study showed that soil compaction decreased corn yield under both irrigated and non-irrigated agronomic conditions. Even in irrigated plots yields were reduced by 30% when compared to the non-compacted plots.

Summary

Compaction of soil from large equipment or other causes can alter soil structure and reduce its productivity. Compaction can also adversely affect the amount and movement of air, water, heat, and nutrients in the soil, thereby affecting plant growth.[3] Deep tillage in the fall can help minimize the adverse effects of soil compaction. By loosening up the soil material, deep tillage can enhance water infiltration and allow for higher rates of internal water movement. Loose soil can help store more water, allow for better drainage of excess water, improve soil aeration, and allow soils to warm more quickly in the spring. Surface runoff and soil erosion can also be reduced.[4]

This demonstration showed that deep tillage conducted in the fall can help enhance soil productivity and corn yield potential under Midsouth growing conditions. Testing should continue in future growing seasons to further define the benefits of deep tillage, and under what conditions subsoiling would be beneficial in corn production.

Sources and Legals

[1] Effect of soil compaction on corn yield. 2007. Monsanto Learning Center Research Summary. Leland, MS. [2] Rooney, D., M. Stelford, and D. Landolt. Site-specific soil compaction mapping using a digital pentrometer. Site-specific Management Guidelines. SSMG-34. Potash and Phosphate Institute. [3] Raney, W.A. 1971. Compaction as it affects soil conditions. In K.K. Barnes et al. (ed.) Compaction of agricultural soil. p. 125-222. ASAE, St. Joseph, MI. [4] Wesley, R.A., Smith, L.A. and Spurlock, S.R. 2000. Residual effects of fall deep tillage on soybean yields and net returns on Tunica clay soil. Agronomy Journal 92:941-947.

The information discussed in this report is from a replicated, one-year demonstration. This information piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

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