Executive Summary Report

Maximizing Soil Warming and Health under Different Tillage Practices in a Corn-Soybean Rotation

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There are many advantages of reducing soil tillage for building soil health. However, reducing tillage creates concerns of yield reductions due to cool and wet soils in the poorly-drained landscape that dominates much of North Dakota and the Red River Valley. The objective of this study is to:

1. monitor soil warming and water contents under chisel plow, vertical tillage, strip till with shank, and strip till with coulter on various soil series
2. evaluate soil health and crop emergence and yields, and
3. transfer information to producers through field days, videos, etc.

This is a multi-state effort, involving North Dakota and Minnesota and is in year two of a four year field study. Four on-farm locations are under a corn-soybean rotation and rotate each year. At each location, the four tillage practices are demonstrated using full-sized equipment in plots of 40 or 66 feet wide by 1800 feet long in a replicated design. Soil series evaluated are Fargo silty clay, Lakepark clay loam, Barnes-Buse loams, Delamere fine sandy loam, and Wyndmere fine sandy loam. These soil series cover over 67 million acres of prime farmland in the Northern Great Plains regions.

Soybean yields from 2015 did not significantly differ among treatment. Soil temperatures and water contents differed among tillage treatments briefly in the spring of 2016 but then converged together during the following cool, dry weeks through planting. In spring of 2016, crop residue cover tended to differ among tillage treatments as expects for farms planted to soybean and farms planted to corn in these corn-soybean rotations. However, stand counts and plant heights did not differ among tillage treatments at any of the farms. One interested observation was the fluffy soil in the chisel plow treatments at some of the farms. This was also observed in spring of 2015 (a relatively dry spring similar to 2016). The planter down pressure and residue managers needed to be adjusted due to this. The residue managers were raised up and the lightest down pressure made for seeding; otherwise the planter dug into the soil about six inches.

Soil samples have been collected to determine soil health and are currently being analyzed in the laboratory. Crop residue cover, crop populations, and yields are also being evaluated in the summer and fall months. One video was produced to deliver study findings to North Dakota producers. Information obtained during this year will be presented at joint NDSU and UMN Extension events including the 2016 Soil Health Tour and the 2016 Conservation Tillage Conference as well as at the joint International America Society of Agronomy, Soil Science Society of America, and Crop Science Society of America Conference in Pheonix, AZ in November, 2016.