CFAES

Quantifying Impact of Soil Management on Moisture and Temperature

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RESEARCH HYPOTHESIS

This research stemmed from farmer concerns about how field management strategies impact soil moisture and temperature at planting. Our hypothesis was that both tillage and cover crops can be utilized to dry soil in the spring in preparation for planting.

METHODOLOGY

Sensors were placed in neighboring fields under conventional tillage (tilled), no-till (NT), no-till with a cover crop (CC). There were three paired sites with each treatment in Champaign, Fayette, and Madison counties (Figure 1). METER TEROS 11 sensors with ZL6 data loggers were placed in the same soil types in different fields with two sensors per treatment. Sensors were placed at 3" and 6" depths and the data logger recorded soil temperature and moisture estimates once every hour (Figure 2). The sensors were installed in the winter, removed for spring field activities (planting and nitrogen application), and reinstalled to allow observation of soil conditions throughout the growing season.

Sensor data was aggregated by location and treatment. Daily, weekly, and monthly averages were compared to identify if differences between treatments were observed.

Figure 1. Three paired field sites in Central Ohio.

Figure 2. Left- TEROS 11 sensors at 3" and 6" depths. Right- The ZL6 data logger recorded measurements every hour. Cereal rye was the cover crop used in all CC fields at a seeding rate of 20-25 lbs/ac and terminated just before or after planting.

RESULTS AND RECOMMENDATIONS

Figure 3 shows the average weekly soil temperatures for each of the field management treatments, averaged across both seasons. No significant differences were observed during the planting season. Figure 4 shows the weekly soil moisture estimates by year. Due to large variation in weather differences between the 2022 and 2023, soil moisture trends were unique in each year. Despite these differences, the observed differences between treatments were minimal.

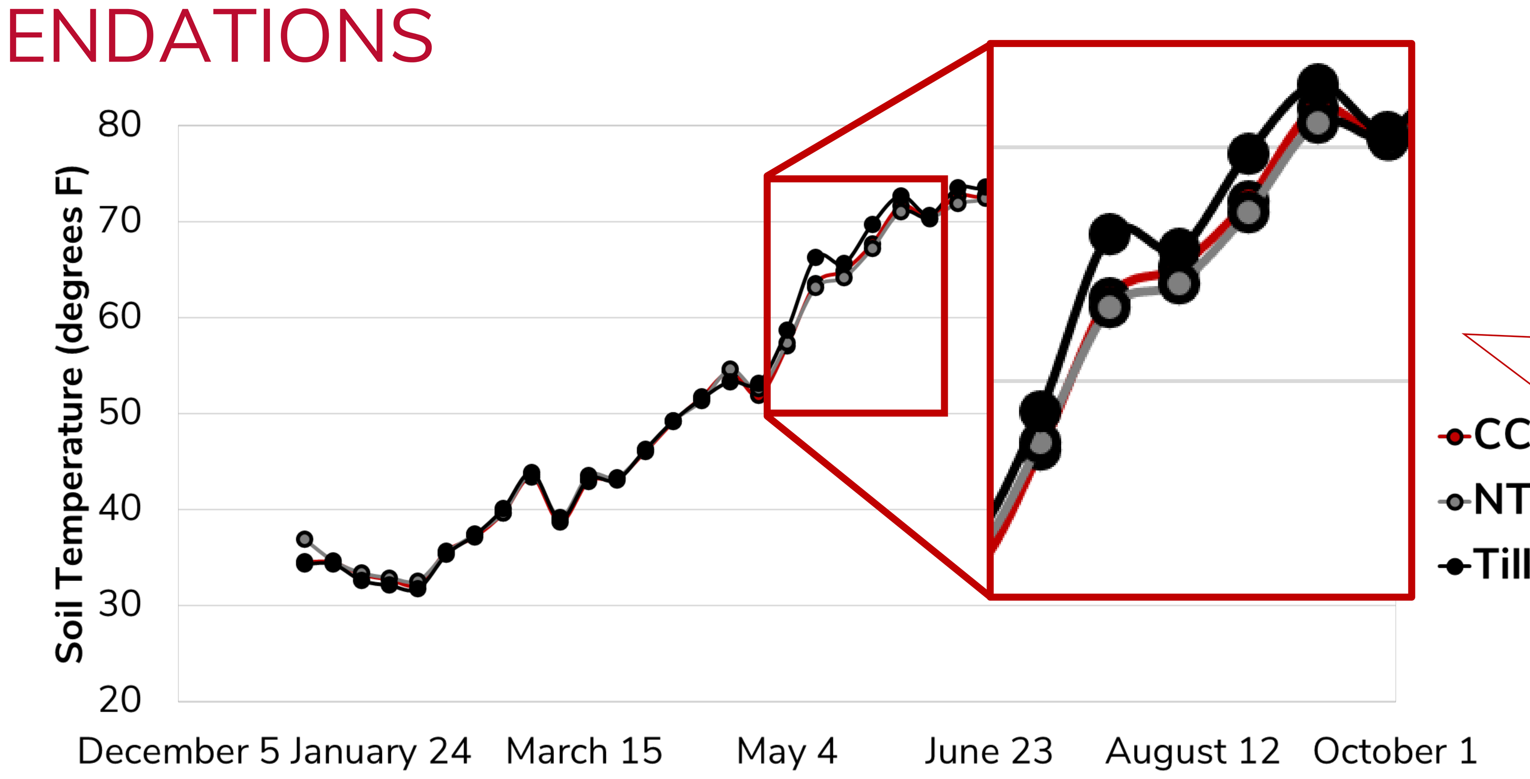

Figure 3. Weekly observed 3-inch soil temperature by field management treatment, averaged over the 2022 and 2023 seasons.

Observed soil temperatures were very similar across all treatments through late spring.

Treatments did not impact planting date. Soil moisture varied minimally during planting season with the widest spread of 5% occurring in May.

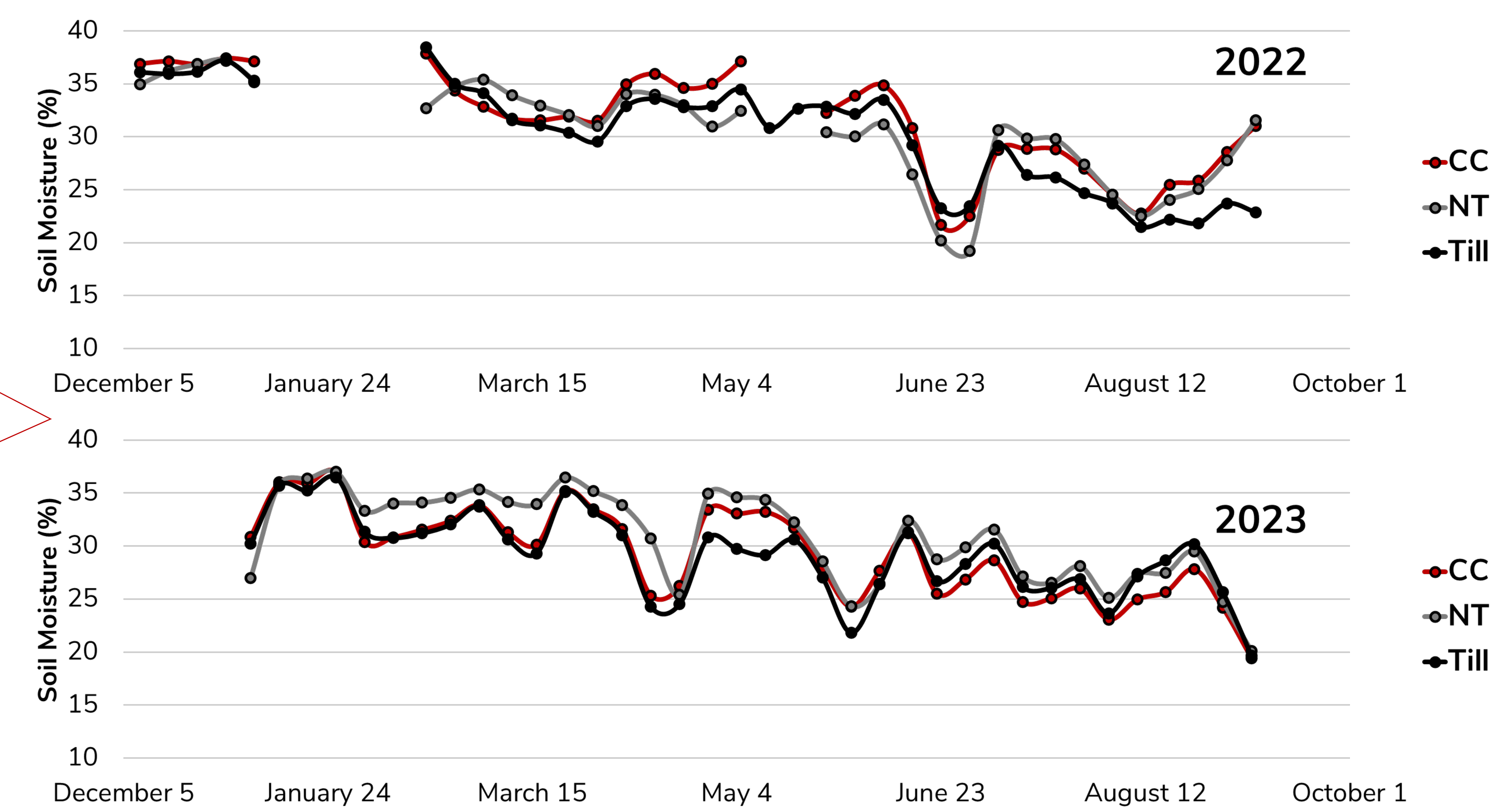

Figure 4. Weekly observed 3-inch soil moisture estimates by field management treatment during the 2022 and 2023 seasons.

CONCLUSIONS

Farmers were able to manage their soil within each treatment to meet desired planting dates regardless of treatment. While NT and CC treatments did retain more moisture, it was not enough to delay planting. Significant temperature differences between treatments were not observed. These results can help farmers considering adoption of cover crops understand the impact to soil conditions during the planting window and throughout the growing season.

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