Cover Cropping to Improve Soil Moisture Retention and Crop Yield

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INTRODUCTION + HYPOTHESIS

- Increasingly unpredictable weather patterns challenge farmers' ability to manage soil moisture and protect crop yields.
- Cover crops are known to improve water infiltration, but they also use water through transpiration, raising questions about their net impact on soil moisture.
- Research hypothesis: **Cover crops can enhance soil moisture retention throughout the growing season.**

METHODOLOGY

- In Greene County, Ohio, three corn fields were selected for comparison: two no-till fields with cereal rye cover crop and one field with tillage and no cover crop.
- METER TEROS 11 sensors with ZL6 data loggers were installed at depths of 2 inches and 4 inches to monitor soil moisture hourly throughout the growing season of 2024 (Figure 1). Two data loggers were placed in each field and averaged.
- Sensors were temporarily removed during planting and nitrogen sidedress activities and reinstalled immediately after.

Figure 1. Data logger and sensors installed in cover cropped field prior to termination (left) and sensors placed at soil depths of 2 inches and 4 inches (right).

- Sensor data was cleaned and averaged by field and treatment. Hourly data was aggregated across different timescales and visualized to observe differences between treatments.
- Total field yields were estimated from truck weights.

RESULTS + DISCUSSION

Figure 2. Cover cropped field with terminated cereal rye, prepared for planting.

Table 1. Field management information and corn yield on cover cropped field A, cover cropped field B, and Tilled Field.

	Cover Cropped Field A	Cover Cropped Field B	Tilled Field
Cover Crop	Cereal Rye	Cereal Rye	None
Planting date	05/01/2024	04/28/2024	04/28/2024
Harvest date	10/20/2024	10/04/2024	10/20/2024
Tillage History	Fall – Vertical tillage Spring – No-till	Fall – Vertical tillage Spring – No-till	Fall – No-till Spring – Vertical tillage
2024 Corn Yield	164 bu/ac	170 bu/ac	160 bu/ac

At the 2-inch depth, tilled field retained more soil moisture than cover cropped fields, except during extreme drought period (July and August), when cover cropped fields held an average of 2.9% more soil moisture than tilled field, a notable benefit under the dry conditions experienced in Ohio.

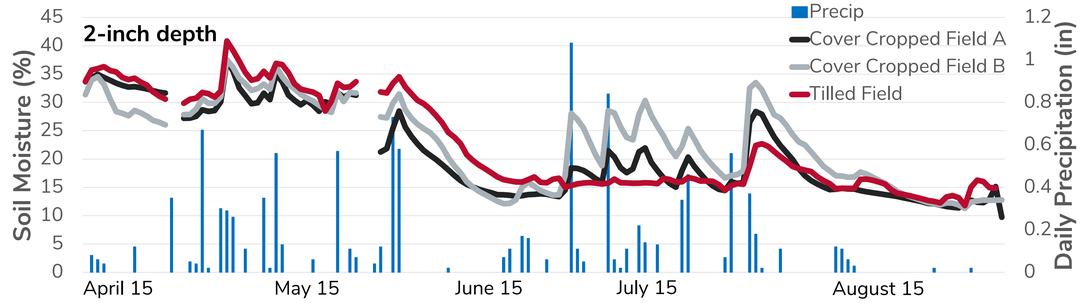

Figure 3. Average daily observed 2-inch depth soil moisture estimates by field management treatment during the 2024 growing season.

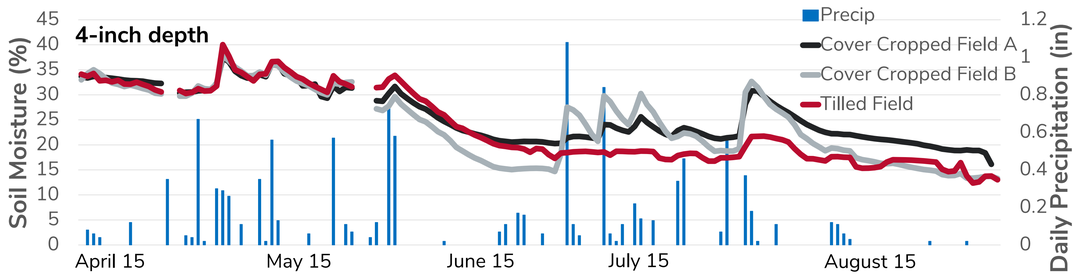

Figure 4. Average daily observed 4-inch depth soil moisture estimates by field management treatment during the 2024 growing season.

At the 4-inch depth, soil moisture levels were generally more stable across all fields, though during extreme drought, cover cropped fields maintained an average of 4.4% higher soil moisture compared to tilled field.

CONCLUSION + ACKNOWLEDGEMENTS

- In comparison to traditional tilled fields, cover cropped fields retained more moisture during drought conditions, enhancing resilience to extreme weather. Additionally, cover cropped fields had higher corn yields, reinforcing the value of sustainable farming practices.
- **This project highlights the potential of integrating cover crops to enhance soil moisture retention and crop yield, particularly under increasingly unpredictable and extreme weather conditions.**
- Acknowledgements to the farm partner, Dan Robinette - Greene County, Ohio, for participation in this project.