"How Do Tillage, Drainage, and Crop Residue Shape Soybean-Corn Yield and Soil Traits?"

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INTRODUCTION

Understanding the impacts of soybean [*Glycine max* (L.) Merr.] cultivation on soil quality is crucial as we address resource scarcity and environmental concerns. While enhancing yields, traditional tillage raises questions about sustainability, and soil drainage is vital for high-yield growth. Our study explores the effects of tillage and drainage on soybean yield and soil properties in early-planted scenarios.

Principal Objectives:

1. Evaluate the short-term impact of different tillage practices on grain yield and soil properties in a soybean-corn rotation.
2. Assess the influence of artificial subsurface drainage and cover residue on soybean crop performance and soil conditions.
3. Explore the combined impact of tillage practices and artificial drainage on grain yield and soil properties in early-planted soybeans.

METHODS

- **Study Site and Farming Methods:** The study was conducted in Wells, Minnesota, on a 5-hectare field with tile drainage installed. Agronomic practices followed University of Minnesota guidelines, and different soybean cultivars and corn were planted.
- **Experimental Design:** The study used a split-plot treatment structure with drainage and tillage treatments. Soil characteristics, weather conditions, and plant data were collected.
- **Grain Yield and Nutrient Concentration:** The yield and nutrient concentrations of soybean grain were measured, focusing on protein and oil content. Data was analyzed for the effect of tillage, drainage, and crop residue management.
- **Soybean Root Growth and Morphology:** Soybean root growth and morphology were analyzed using RhizoVision Explorer at V2 and R1 growth stages.
- **Soil Data:** Soil compaction, penetration resistance, moisture content, and nutrient supply data were collected, assessing the impact of tillage, drainage, and tractor traffic.

Despite variations in **tillage** systems, inconsistent rainfall limits the full potential of soil **drainage** and **crop residue** management.

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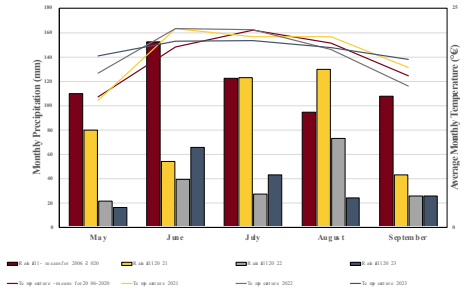
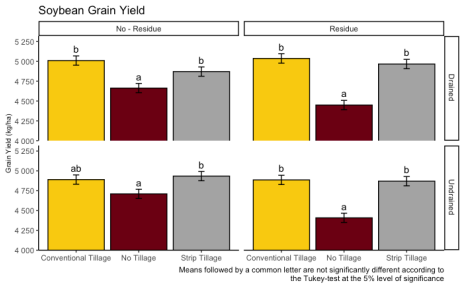
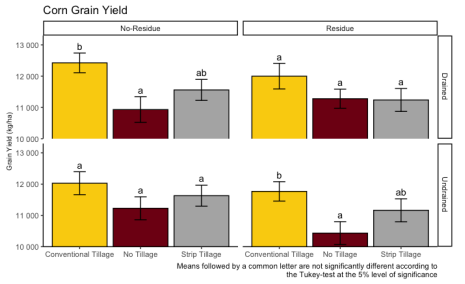
RESULTS



Monthly rainfall (mm) and temperature (°C) compared to the 2006-2020 normal for the study area (Wells, MN)





CONCLUSIONS

1.Enhancing Crop Management: Effective tillage practices and artificial drainage use can boost soybean yield and soil quality, promoting sustainable agriculture.

2.Balancing Techniques: The right mix of conservation tillage and drainage systems is key to improving soil conditions and crop productivity.

3.Local Adaptation: Tailored tillage and drainage strategies adapted to local conditions are essential for long-term soybean cultivation success.

ACKNOWLEDGMENTS

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