



Rotational Cropping Sequence Affects Yield of Corn and Soybean

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Corn following corn

Corn following oat



Key Findings:

- Small grains as preceding crops increased the grain yields of corn and soybean versus corn and soybean.
- Two consecutive years of growing small grains significantly increased soybean grain yields versus two years of growing either soybean, corn, or corn-soybean.

Background

Diversified crop rotation improves soil condition, boosts crop productivity, and improves the efficiency of farming systems. Emerging evidence indicates that both crop identity and crop sequence within the diversified crop rotation affect soil health and crop productivity. However, it is unclear how the preceding crop influences the current crop performance and their associated microbiomes, and how long the effects last after the removal of a crop.

Objective

To evaluate the impacts of various preceding crops on corn and soybean performance.

Methods

The plant-soil feedback field trial was established with six monocultural rotation crops, including corn, soybean, spring wheat, oat, pea, and sunflower, planted in an east-west row orientation in Spring 2022. In Spring 2023, each crop plot was divided into six subplots, where all the six corresponding crops were planted in a north-south row orientation so that all combinations of preceding crop/subsequent crop were present. Soybean was planted in all 36 subplots in Spring 2024. The field trial is overlaid on a no-till cropping system with reduced fertilizer inputs. In every growth season, the crop biomass and soil surrounding crop roots were harvested at seedling, flowering, and near-maturing stages. The grain yields were measured at maturity.



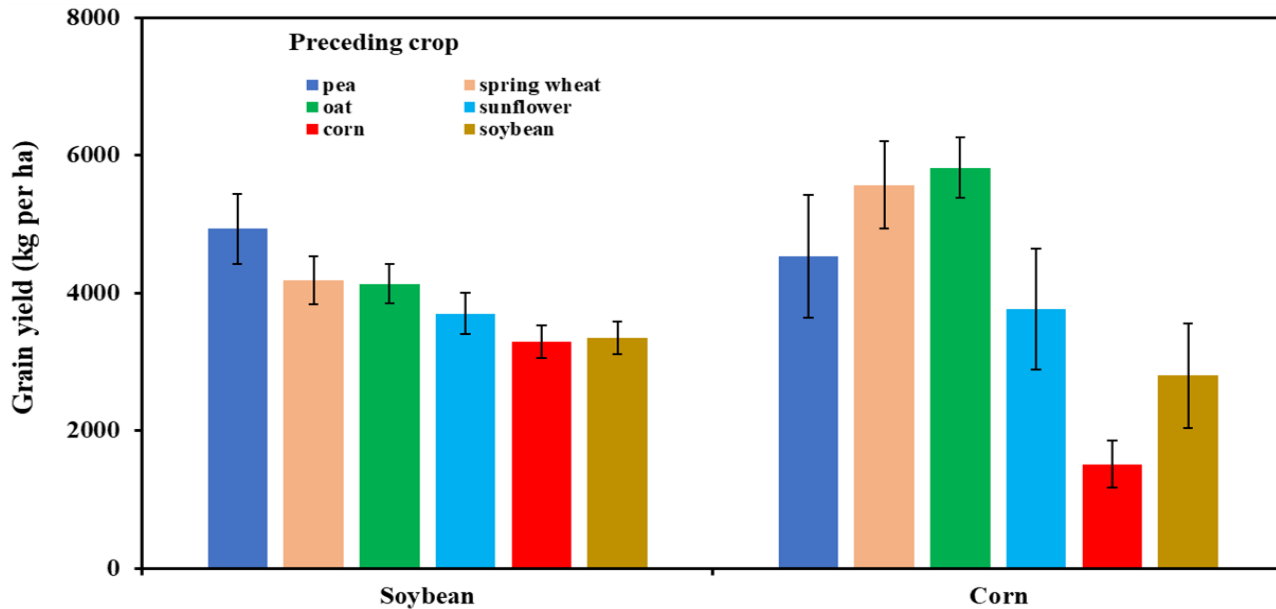
Year 1: Six monoculture plots



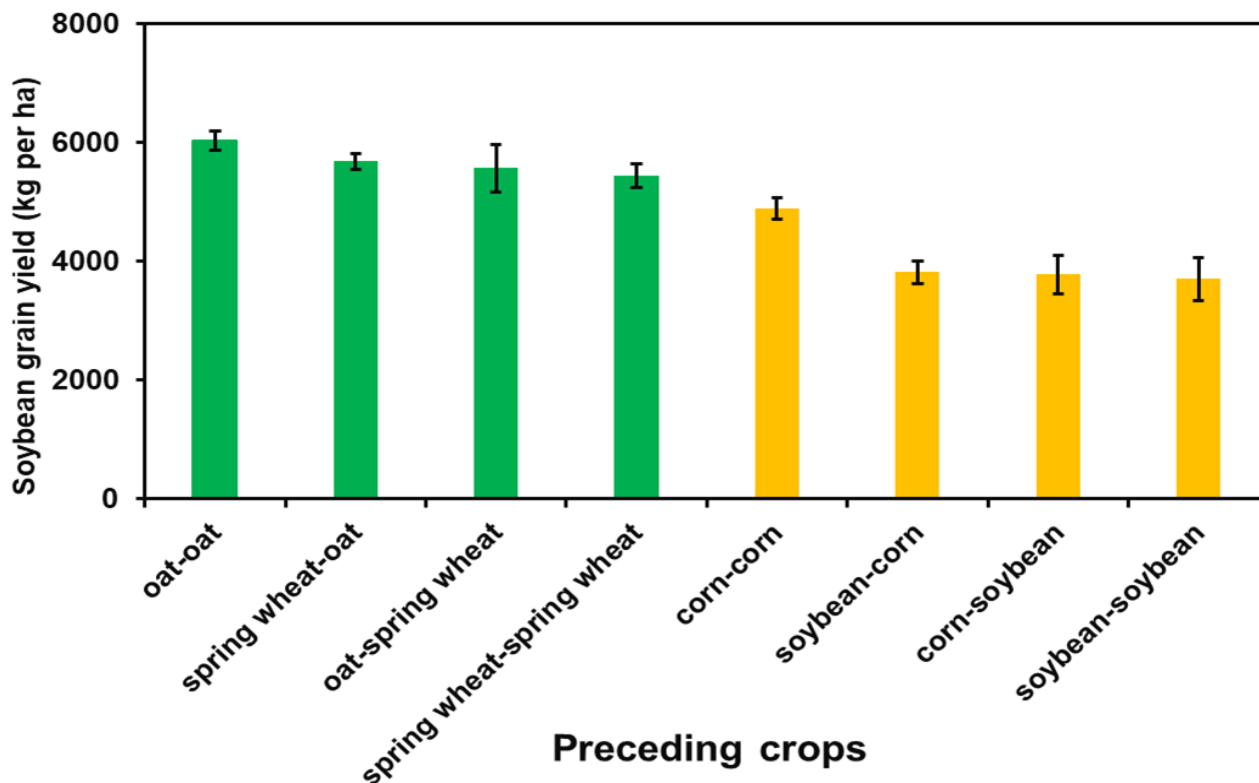
Year 3: Soybean plots after 36 various preceding/subsequent crops

Results

1. Small grains (oat and spring wheat) as preceding crops within crop rotation increased the grain yields of corn and soybean versus corn and soybean (results from year 2, 2023).



2. Two-year small grain planting increased the grain yield of soybean versus the planting of corn and soybean (results from year 3, 2024).



This study highlights crop sequence within crop rotation significantly affected the grain yields of corn and soybean. The selection of an appropriate rotational crop sequence is important for subsequent crop production.



Next Steps

This Research Brief includes research findings from a three-year plant-soil feedback field trial evaluating the effects of crop sequence on corn and soybean yields. In the next step of these studies, we will investigate the effects of various crop sequences on subsequent crop-associated rhizosphere microbiomes and explore the relationships between crop sequence, crop performance, and soil microbiomes.

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Questions or comments?

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About NCARL

The North Central Agricultural Research Laboratory (NCARL) is a USDA-Agricultural Research Service laboratory located in Brookings, SD. The goal of NCARL is to develop, document, and promote soil, crop, and pest management practices that are ecologically sustainable while maintaining producer profitability.

