Long-Term Tillage and Crop Rotation Trial

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Objective

Evaluate the long-term effects of tillage systems and crop rotations on grain yields.

Materials and Methods

Site-Year 1: Ames (AEA) | Crop Year–2021

Soil type	Nicollet, Harps, Canisteo
Previous crop	Varied by crop rotation
Hybid/Variety	Corn–P1185Q
Planting date	May 6, 2021
Row spacing	30-in.
Seeding rate	Corn–34,000
Tillage	ST, CP, DR, MP–November 9, 2020 preceding fall treatments
Fertilizer	Applied in fall 2020 for both trials; analysis of 17-58-87-14.5-1.45 applied in early November. Phosphorus was applied in the MESZ formulation.
Nitrogen	32% UAN applied with planter at 78 lb. N/acre on all plots. As sidedress on June 8, 2021, at 100 lb./acre on corn following corn plots, and 78 lb./acre on corn following soy plots to achieve total nitrogen credit of 175 lb./acre
Harvest date	September 29, 2021
Experimental design	Randomized complete block design
Replications	Four
Treatments	No-tillage (NT), strip-tillage (ST), chisel plow (CP), deep rip (DR), moldboard plow (MP)

Site-Year 2: Ames (AEA) | Crop Year–2022

Soil type	Nicollet, Harps, Canisteo
Previous crop	Varied by crop rotation
Hybid/Variety	Corn–P1108Q; soybean–21EE62
Planting date	Corn–May 24, 2022; soybean–June 21, 2022
Row spacing	30-in.
Seeding rate	Corn–34,000; soybean–140,000
Tillage	ST, CP, DR–November 9, 2021; MP–November 10, 2021; leveled off with field cultivator in CP, DR, and MP early May, 2022, and once more before planting.
Fertilizer	MESZ phosphorus applied to both plots April 27, 2022 at 200 lb./acre; potash applied to both plots April 27, 2022 at 422 lb./acre; effective actual rate of 24-80-253-20-2 of N-P-K-S-ZN
Nitrogen	UAN 32% at 70 lb./acre applied May 24, 2022 and 95 lb./acre sidedress June 21, 2022
Harvest date	October 20, 2022
Experimental design	Randomized complete block design
Replications	Four
Treatments	No-tillage (NT), strip-tillage (ST), chisel plow (CP), deep rip (DR), moldboard plow (MP)

Results

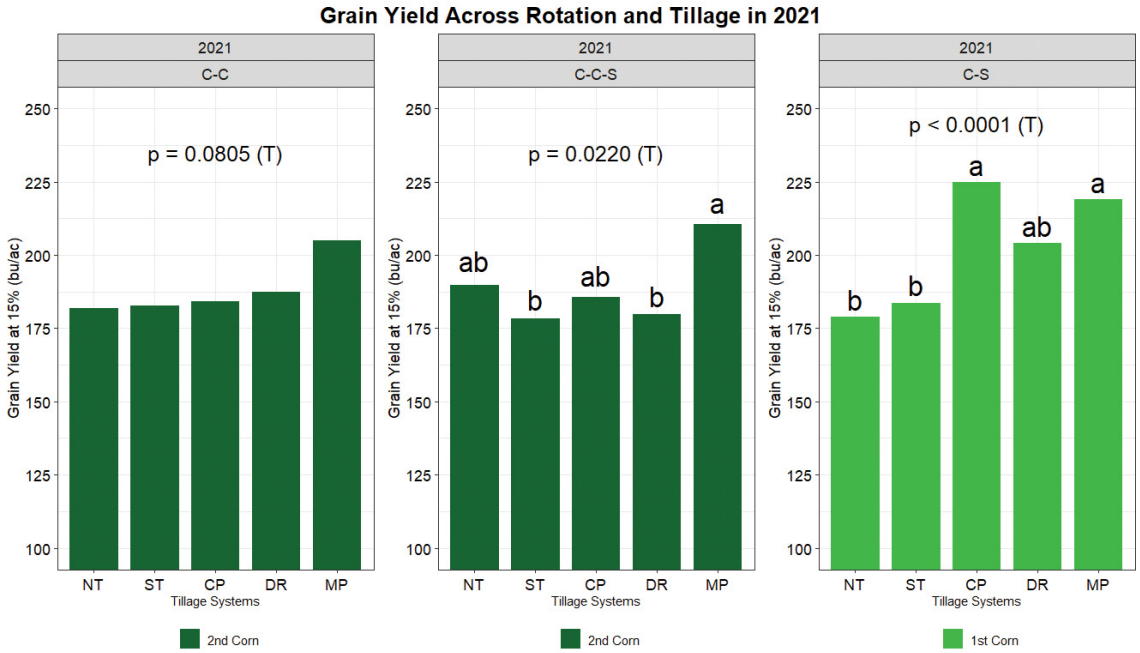

Figure 1. Grain yield in 2021 from the tillage systems within each crop rotation. Yields that are significantly different at P < 0.05 have different letters.

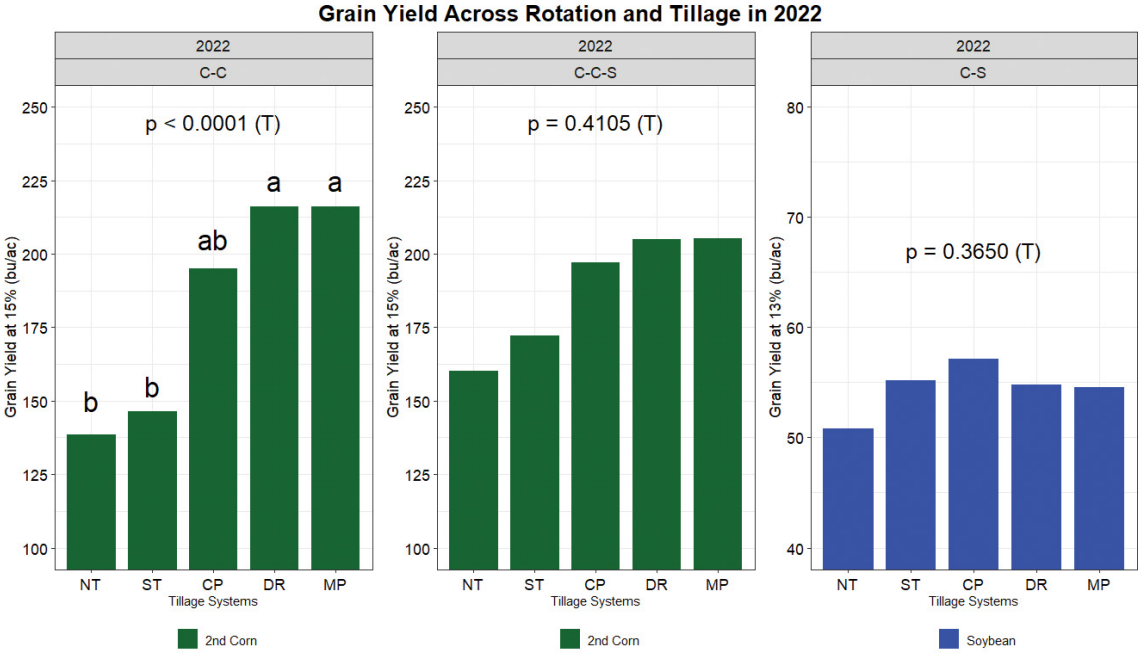

Figure 2. Grain yield in 2022 from the tillage systems within each crop rotation. Yields that are significantly different at P < 0.05 have different letters.

Key Takeaways

- In both years, the second year corn and continuous corn had a trend of improved yields with more intensive tillage practices. In two of them, MP was statistically superior to the other tillage practices ($p = 0.0220$ in 2021 and $p < 0.0001$ in 2022).
- The corn-soybean rotation in 2021 also had higher corn yield with the MP tillage system, however, in this rotation-year, CP performance also was superior ($p < 0.0001$).
- There was no improvement from tillage practices on soybean grain yield in 2022. Although CP performed higher than the other practices, it was not statistically significant ($p = 0.3650$).