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 and soil health.

Materials and Methods

Site-Year 1 | Crop Year–2022

Soil type	Galva, Primghar, Marcus
Previous crop	Varied by crop rotation
Hybrid/variety	Corn: Kruger K4R 9706SS; soybean: Asgrow 21XF1
Planting date	Corn: April 17, 2022; soybean: April 16, 2022
Rowspacing	30 in.
Seeding rate	Corn at 35,077 seeds/acre; soybean at 189,417 seeds/acre
Tillage	Fall ST, CP, DR and MP–November 6, October 25, November 5 and November 4, 2021; Spring soil finisher(except NT and ST)–April 16, 2022
Fertilizer	58 lbs. P_2O_5/acre and 156 K_20/acre on all plots November 20, 2021
Nitrogen	NH3 at 130 lbs. N/acre following soybean and 170 lbs./acre following corn–April 3, 2022 for all corn plots except NT, which received urea April 24, 2022 at 130 lbs. N/acre following soybean and 170 lbs. N/acre following corn
Harvest date	October 10, 2022
Experimental design	Randomized complete block design
Replications	4
Treatments	No-tillage (NT), strip-tillage (ST), chisel plow (CP), deep rip (DR), moldboard plow (MP)

Site-Year 2 | Crop Year–2021

Soil type	Galva, Primghar, Marcus
Previous crop	Varied by crop rotation
Hybrid/variety	Corn: Pioneer P0421; soybean: Pioneer P27A17X
Planting date	Corn: April 23, 2021; soybean: May 3, 2021
Rowspacing	30 in.
Seeding rate	Corn at 35,077 seeds/acre; soybean at 139,089 seeds/acre
Tillage	Fall ST, CP, DR and MP–October 14, 2020; Spring soil disk (except NT and ST)–April 20, 2021
Fertilizer	24-60-80 on all plots November 3, 2020
Nitrogen	UAN at 200 lbs. N/acre–June 2, 2021 for all corn plots
Harvest date	Corn–October 2, 2021; soybean–October 5, 2021
Experimental design	Randomized complete block design
Replications	4
Treatments	No-tillage (NT), strip-tillage (ST), chisel plow (CP), deep rip (DR), moldboard plow (MP)

Results

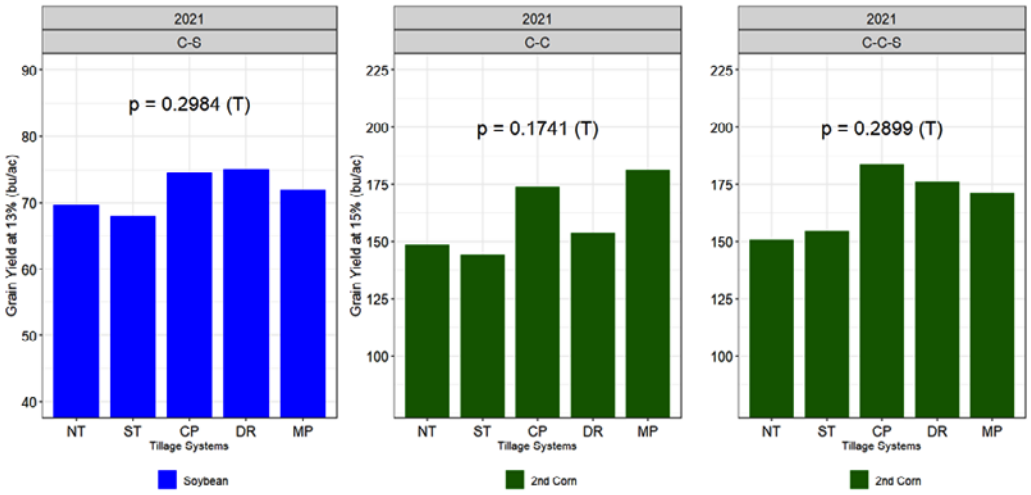
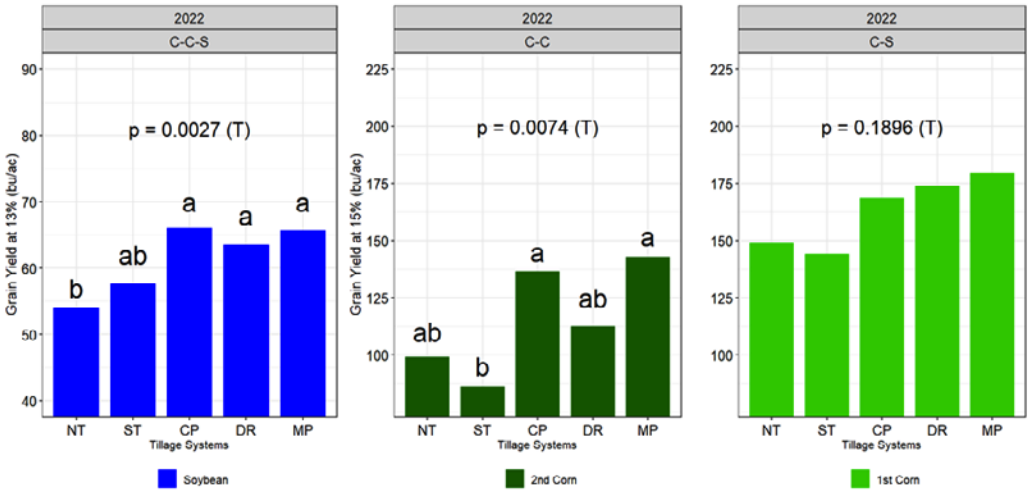


Figure 1. Grain yield in 2021 from the tillage systems within each crop rotation.



Key Takeaways

- In 2021, soybean following corn, tillage system did not affect soybean yields. However, in 2022, the soybean following two years of corn resulted in the NT having a significantly lower grain yield than the chisel plow, deep rip, and moldboard plow system.
- In 2021, the continuous corn and the second year of corn following soybean were not affected by tillage system.
- Corn yields in 2022 were much lower than expected due to extremely dry conditions.
- In 2022, the highest yielding tillage systems in the continuous corn system were the chisel plow and moldboard plow systems. There was no yield difference in the corn following soybean system.

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