Long-Term Tillage and Crop Rotation Trial

Mark Licht—associate professor, Department of Agronomy

Fernando Marcos—research scientist, Department of Agronomy

Objective

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

Materials and Methods

Site-year 1 | 2021

Soil type	Clarion, Nicollet, Webster
Previous crop	varied by crop rotation
Hybrid/variety	corn–Golden Harvest G03R40-5222; soybean–Golden Harvest GH2011E3
Planting date	corn–April 27, 2021; soybean–April 30, 2021
Row spacing	30 in.
Seeding rate	corn at 35,000 seeds/acre; soybean at 150,000 seeds/acre
Tillage	stalk chop of CP, DR and MP–October 18, 2020, fall ST, CP, DR and MP–November 3, 2020; spring soil finisher (except NT and ST)–April 23, 2021
Fertilizer	250 lb. MAP (11-52-0), 250 lb. potash (0-0-60), 50 lb. elemental sulfur (0-0-0-90)/acre–October 20, 2020; 2,600 lb. pelletized ag lime–November 2, 2020
Nitrogen	NH3 at 184 lb. N/acre following soybean and 241 lb. N/acre following corn–April 22, 2021
Harvest date	corn–October 10, 2021; soybean–September 28, 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)

Site-year 2: | 2022

Soil type	Clarion, Nicollet, Webster
Previous crop	varied by crop rotation
Hybrid/variety	corn–Dekalb 52–99 RIB; soybean–Brevant B211EE
Planting date	corn–May 19, 2022; soybean–May 22, 2022
Row spacing	30 in.
Seeding rate	corn at 35,000 seeds/acre; soybean at 150,000 seeds/acre
Tillage	stalk chop of CP, DR and MP–October 20, 2021, fall ST, CP, DR and MP–November 2, 2021; spring soil finisher (except NT and ST)–May 18, 2022
Fertilizer	360 lb. MAP (11-52-0), 480 lb. potash (0-0-60)/acre: October 19, 2021
Nitrogen	UAN 32% at 184 lb. N/acre following soybean and 246 lb. N/acre following corn–May 11, 2022
Harvest date	corn–October 12, 2022; soybean September 29, 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)

Results

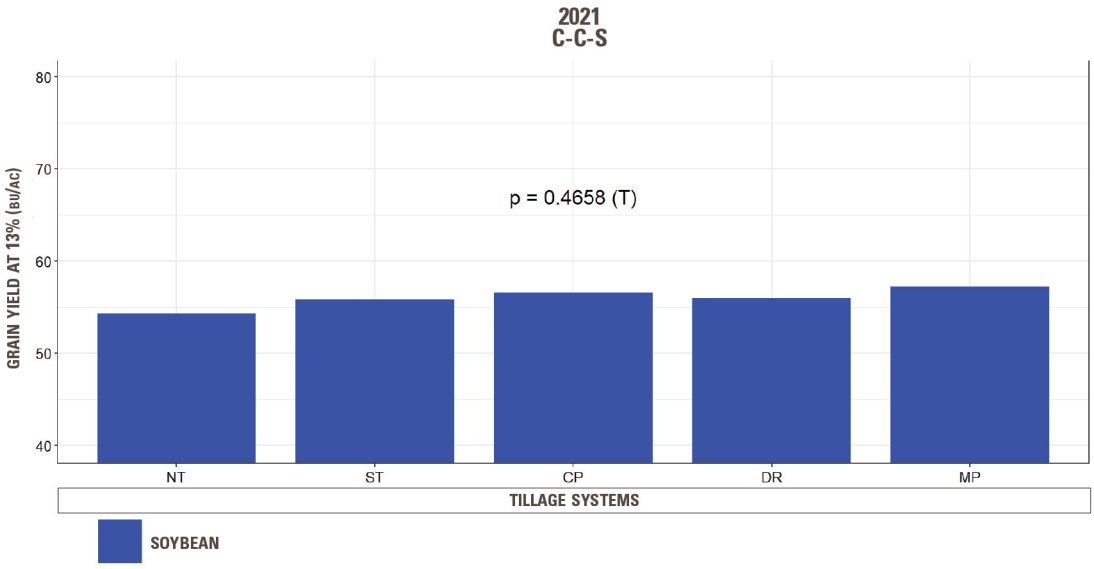

Figure 1. Soybean grain yield in 2021 from the C-C-S system. Corn yields were impacted by severe lodging in 2021 and thus are not included.

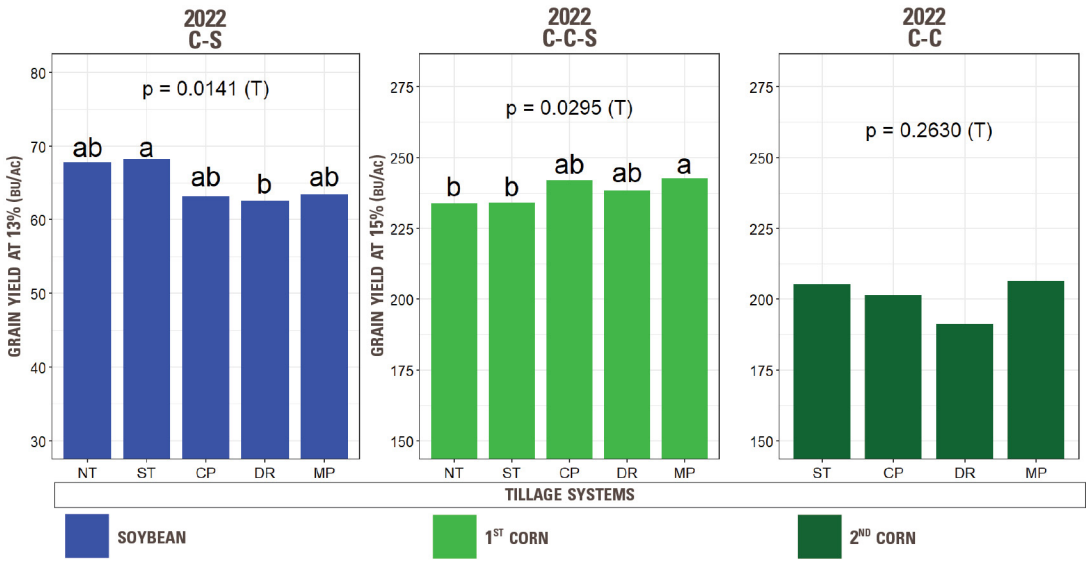

Figure 2. Corn and soybean grain yields in 2022 from the tillage systems within each crop rotation (C-S, corn-soybean; C-C-S, corn-corn-soybean; C-C, continuous corn).

Key Takeaways

- In 2021, soybean yield was not affected by tillage treatments. No corn yields were reported because of severe lodging.
- In 2022, continuous corn yields were not affected by tillage; however, the no-tillage plots had severe lodging and thus yields were not reported.
- The corn-corn-soybean rotation in 2022 resulted in no-tillage and strip-tillage having significantly lower corn yields than the moldboard plow treatment.
- The corn-soybean rotation in 2022 resulted in lower no-tillage and strip-tillage having marginally higher yields than full width tillage. However, only strip-tillage was higher yielding than the deep-rip system.

Acknowledgements

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