Long-Term Tillage and Crop Rotation Trial

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Objective

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

Materials and Methods

Crop Year–2021

Soil Type	Kenyon, Floyd, Clyde
Previous Crop	Varied by crop rotation
Hybrid	Corn: Kruger K4R 9706SS, Soybean: Asgrow 21XF1
Planting Date	Corn: April 17, Soybean: April 16
Row Spacing	30-in.
Seeding Rate	Corn at 35,077 seeds per acre Soybean at 189,417 seeds per acre
Tillage	Fall ST, CP, DR and MP: November 6, October 25, November 5, and November 4, 2020 Spring soil finisher (except NT and ST): April 16, 2021
Fertilizer	58 lbs. P_2O_5 per acre and 156 K_20 per acre on all plots November 20, 2020
Nitrogen	NH_3 at 130 lbs. N per acre following soybean and 170 lbs per acre following corn: April 3 for all corn plots except NT which received urea on April 24 at 130 lbs. N per acre following soybean and 170 lbs. N per acre following corn
Harvest Date	October 9
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

Table 1. Corn and soybean grain yields for 2021 crop rotation by tillage system.[a]

Tillage System	Continuous Corn Rotation	Corn-Soybean Rotation	Corn-Soybean Rotation	Corn-Corn-Soybean Rotation
	corn yield (bushels/acre)		soybean yield (bushels/acre)	
No-tillage	198.6 B	218.5	57.3 AB	67.8
Strip-tillage	211.7 AB	210.9	57.7 A	67.5
Chisel plow	217.6 AB	228.2	49.6 B	66.7
Deep rip	220.2 A	221.2	55.0 AB	72.7
Moldboard plow	220.0 A	217.0	50.7 AB	67.3
	P = 0.0177	P = 0.4686	P = 0.0168	P = 0.2465

[a] P-values within crop rotation column are used to compare yields within a crop rotation. Yields that are significantly different at $P < 0.05$ have different letters following the yield values within each box.

Key Takeaways

- In the continuous corn system, moldboard plow and deep rip had significantly higher yields (22.4 bushel per acre) than no-tillage. All other tillage comparisons had similar yielding. In the corn phase of the corn-soybean rotation, all tillage systems had similar yields.
- The average continuous corn yield penalty was 5.5 bushel per acre (5%).
- All tillage systems in the soybean phase of the corn-corn-soybean rotation had similar yields. However, in the soybean phase of the corn-soybean rotation, strip-tillage had higher yields compared with chisel plow, while other tillage system comparisons had similar yields.
- There was an average soybean yield bump of 14 bushels per acre (27%) for soybean yields following two years of corn compared with one year of corn production.