Dryland Corn Production Decisions Impact on Potential Yield and Profit

Trial Objective

- Testing dryland production systems is crucial to understanding how to manage corn under environmental conditions to meet the farmer's needs and achieve a successful outcome.
- The objective was to establish a long-term study of how management practices (i.e., cover crops, crop rotation, maturity selection, planting rate, and tillage practices) influence productivity in tough dryland environments.

Experiment/Trial Design

Location	Soil Type	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield (bu/acre)	Seeding Rate (seeds/acre)
Gothenburg, NE	Hord silt loam	Corn	No-till, Strip-till, Conventional	05/04/2023	09/18/2023	180	16,000 & 24,000

- The trial was arranged as a split-split plot with tillage as the main plot and corn product as the sub-plot. The trial had two replications, four tillage systems, four corn products with relative maturities (days) of 95, 103, 109, and 115, and two planting rates (seeds/acre).
- A rye cover crop was planted in early spring of 2023. However, establishment of the cover crop prior to planting the corn was poor.
- Tillage treatments were completed on 05/02/2023 with 29 lb nitrogen/acre, 60 lb phosphorus/acre, and 25 lb sulfur/acre incorporated through strip-tillage, surface applied for no-till, or incorporated in conventionally tilled treatments.
- The corn products were planted on 05/04/2023 at 16,000 and 24,000 seeds/acre into 70 x 10 ft plots on a 30-inch wideow spacing.
- On 05/30/2023, pre-emerge herbicides were applied consisting of Roundup PowerMAX® 3 Herbicide (30 fl oz/acre), Atrazine 4L Herbicide (32 fl oz/acre), Harness® Herbicide (32 fl oz/acre), Balance® Flexx herbicide (5 fl oz/acre), and DiFlexx® herbicide (8 fl oz/acre).
- On 06/15/2023, a sidedress application of 32-0-0 was applied at a rate of 120 lb nitrogen/acre.
- On 06/15/2023, post emergence herbicides were applied consisting of Laudis® herbicide (3 fl oz/acre), Atrazine 4L Herbicide (32 fl oz/acre), Harness® Herbicide (24 fl oz/acre), and DiFlexx® herbicide (12 fl oz/acre).
- Final stand counts, intactness ratings, lodged plants, and ear height were measured at harvest time.
- The total rainfall accumulated during the 2023 corn-growing season was 13.5 inches.
- Study was harvested on 09/18/2023 for total plot weight, test weight, and moisture content.

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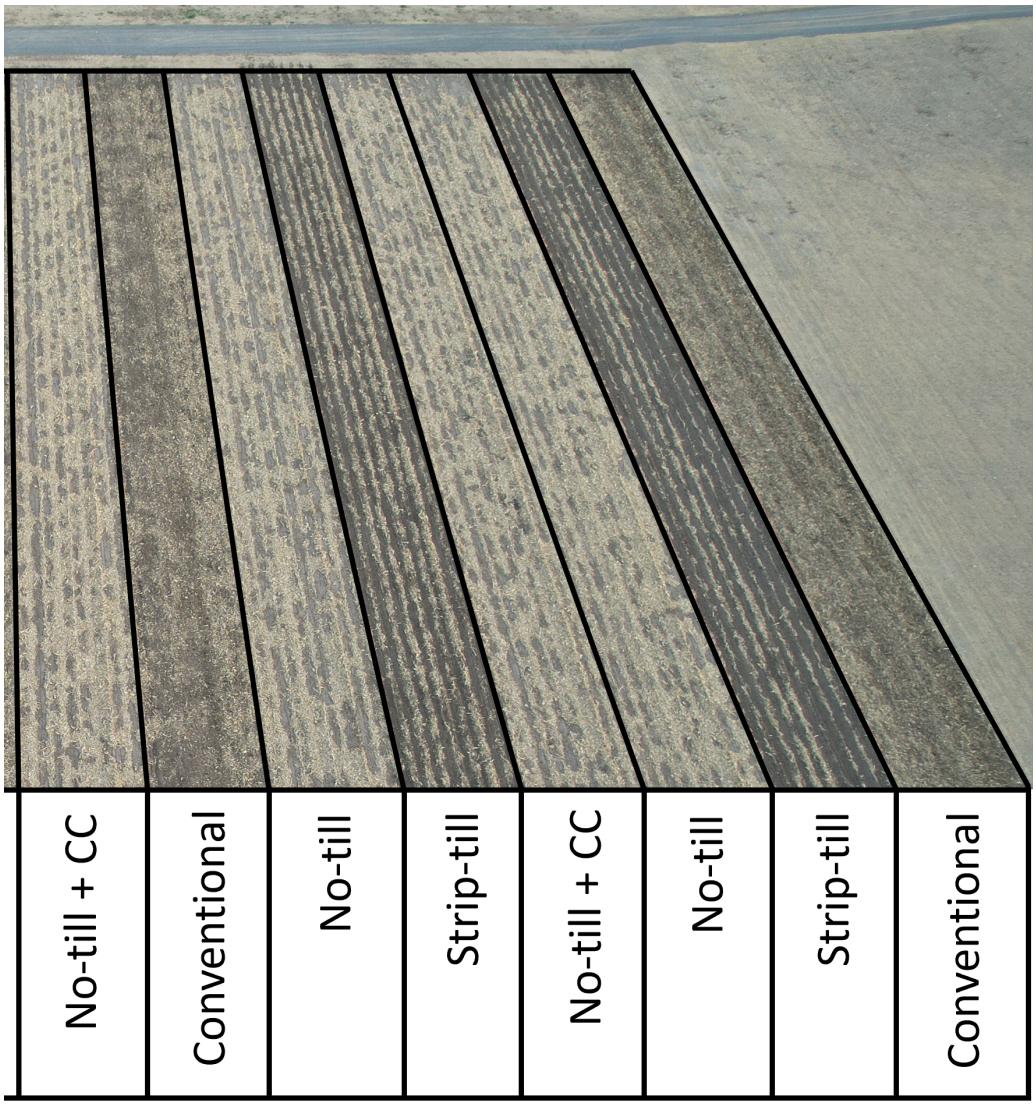

Figure 1. Tillage strips set up for planting. Note that the cover crop (CC) strips have limited growth because they were seeded in the spring rather than fall.

Table 1. Relative Maturity and Trait of the Four Corn Products Planted.	
Product Relative Maturity (days)	**Product Trait**
95	VT Double PRO® RIB Complete® corn blend
103	SmartStax® RIB Complete® corn blend
109	DroughtGard™ Hybrids with VT Double PRO® RIB Complete® corn blend
115	DroughtGard™ Hybrids with VT Double PRO® RIB Complete® corn blend

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Understanding the Results

- At an average of 202.4 bu/acre, the 109 RM product had the highest yield of any corn product (Figure 2). Compared to the other products in this study the 109 RM product was 42.1, 26.3, and 29.9 bu/acre greater than the 95 RM, 103 RM, and 115 RM products, respectively.

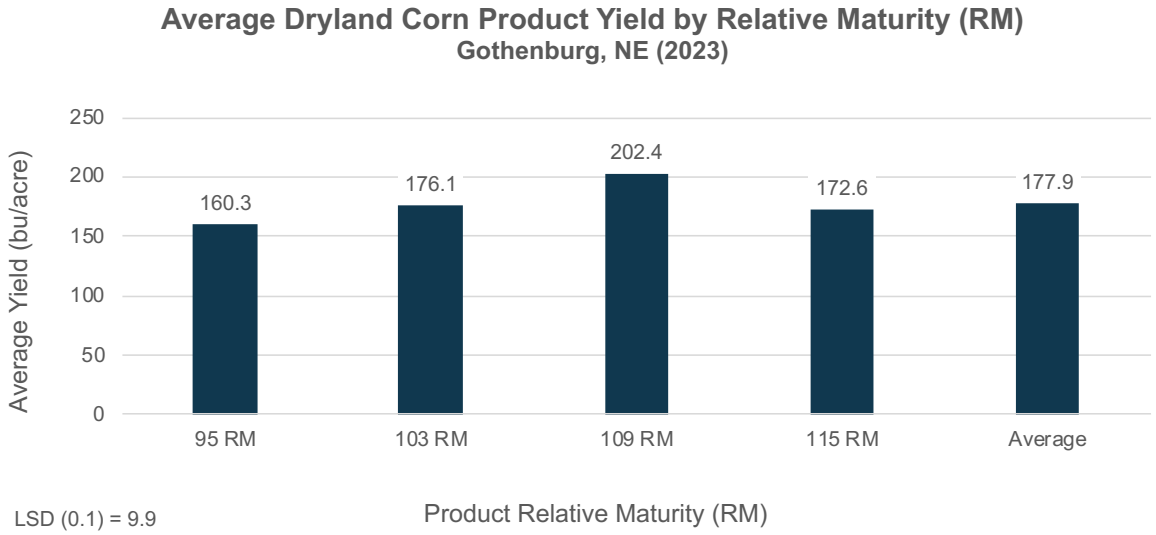

Figure 2. Average yield of corn products by relative maturity.

- The conventional tillage treatment averaged the highest overall yield at 180.9 bu/acre (Figure 3). This was not significantly different compared to the no-till treatment (178.91 bu/acre). Conventional tillage treatments did have a significant yield advantage over no-till + cover crop and strip-till treatments averaging greater than 5 bu/acre more.

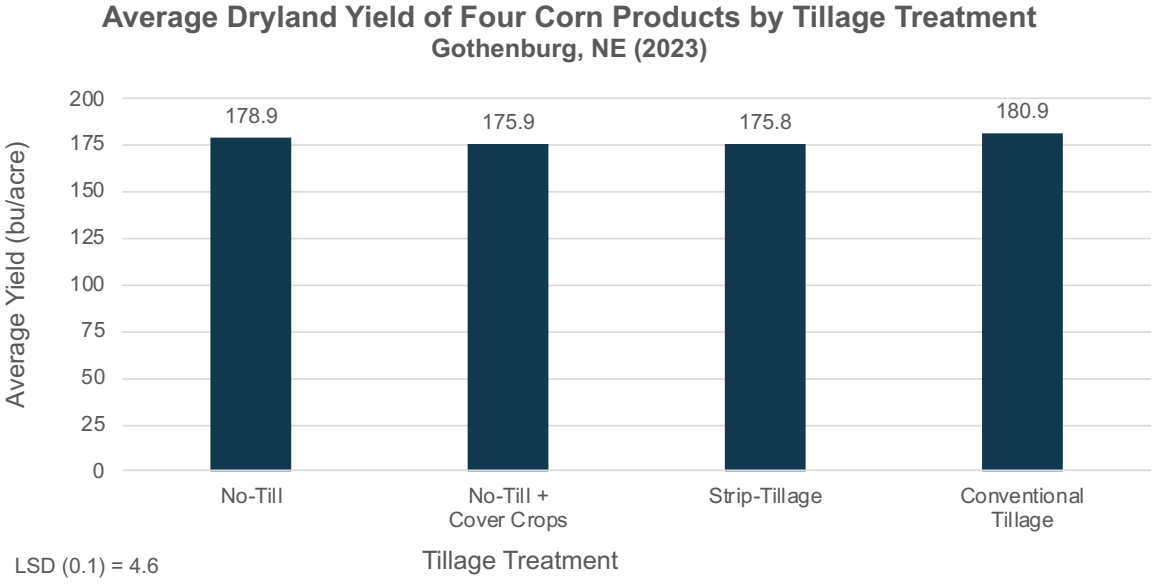

Figure 3. Average yield (bu/acre) of four corn products by tillage treatment.

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- Increasing seeding rates from 16,000 to 24,000 seeds/acre provided a significant yield increase of 38.3 bu/acre averaged across the four products. (Figure 4)

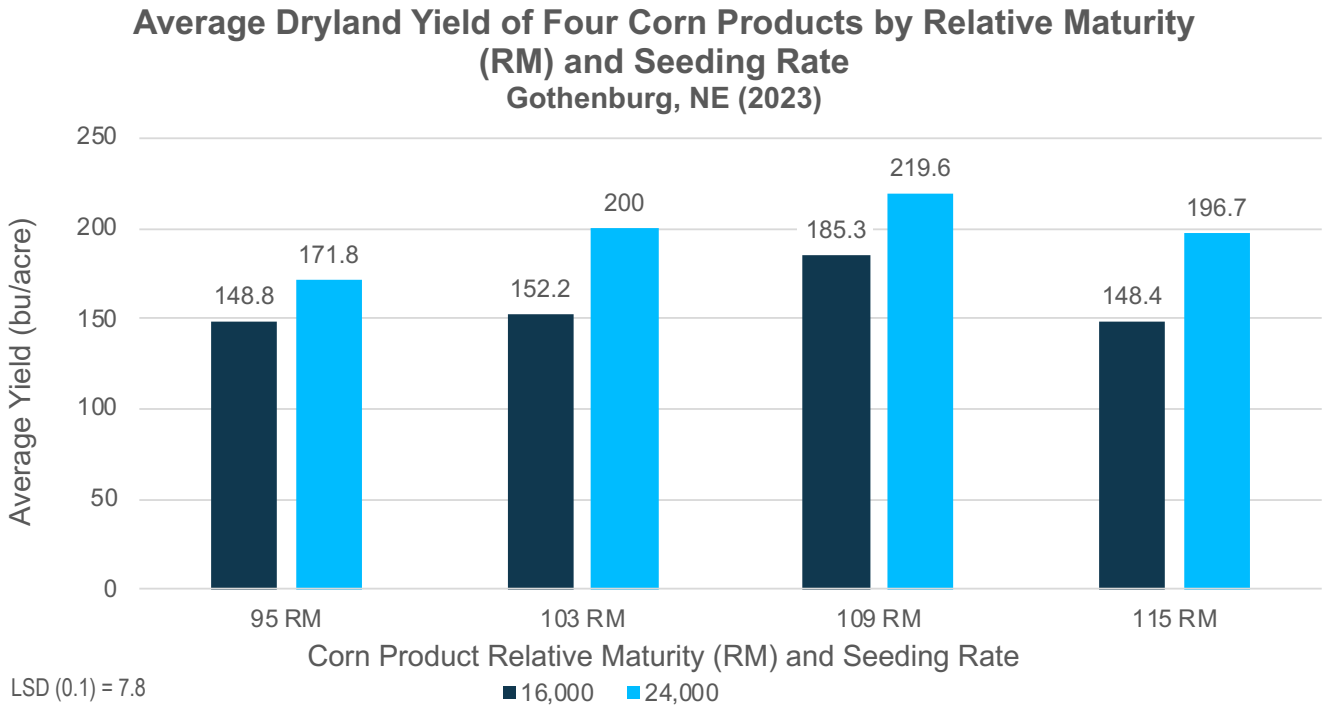

Figure 4. Average yield of four corn products by relative maturity and two seeding rates.

- Except for the 95 RM product, treatments seeded at 24,000 seeds/acre were one to two percent drier at harvest than the 16,000 seeds/acre treatments (Table 2).

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Table 2. Harvest Data

Product Relative Maturity	Tillage	Seeding Rate (seeds/acre)	Harvest Population (plants/acre)	Moisture Content (%)	Average Yield (bu/acre)	Yield Delta (bu/acre)
95	No-Till	16,000	14,455	12.4	143.5	--
		24,000	21,619	13.4	176.3	+ 32.8
	No-Till + Cover Crop	16,000	14,197	12.5	145.9	--
		24,000	22,006	12.3	183.1	+37.2
	Strip-Till	16,000	14,778	12.3	146.9	--
		24,000	22,393	12.5	163.3	+ 16.4
	Conventional	16,000	14,261	12.9	159.0	--
		24,000	21,038	12.3	164.6	+ 5.6
103	No-Till	16,000	15,165	16.9	153.0	--
		24,000	22,458	14.6	197.6	+ 44.6
	No-Till + Cover Crop	16,000	14,972	17.5	156.7	--
		24,000	22,780	13.9	194.5	+ 37.8
	Strip-Till	16,000	15,488	16.8	149.3	--
		24,000	23,103	13.8	201.8	+52.5
	Conventional	16,000	15,811	15.6	149.9	--
		24,000	23,167	13.8	206.9	+ 57.0
109	No-Till	16,000	15,165	20.8	188.4	--
		24,000	22,070	18.8	229.6	+ 41.2
	No-Till + Cover Crop	16,000	15,359	20.4	190.1	--
		24,000	23,232	18.0	223.0	+32.9
	Strip-Till	16,000	14,972	18.8	175.2	--
		24,000	22,070	16.7	205.7	+ 30.5
	Conventional	16,000	15,746	18.5	187.5	--
		24,000	23,555	16.6	220.1	+ 32.6
115	No-Till	16,000	14,197	21.4	147.9	--
		24,000	20,844	21.5	195.9	+ 48.0
	No-Till + Cover Crop	16,000	13,939	22.1	144.3	--
		24,000	21,038	21.5	169.3	+ 25.0
	Strip-Till	16,000	15,488	21.9	152.1	--
		24,000	23,038	20.8	212.0	+ 59.9
	Conventional	16,000	14,907	21.5	149.4	--
		24,000	23,103	19.8	209.8	+ 60.4
Products Combined	No-Till	16,000	14,746	17.9	158.2	--
		24,000	21,748	17.1	199.9	+ 41.7
	No-Till + Cover Crop	16,000	14,617	18.1	159.3	--
		24,000	22,264	16.4	192.5	+ 32.2
	Strip-Till	16,000	15,181	17.5	155.9	--
		24,000	22,651	16.0	195.7	+ 39.8
	Conventional	16,000	15181	17.1	161.45	--
		24,000	22,716	15.6	200.35	+38.9

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- Based on an average seed cost of $325/unit of seed (1 unit = 80,000 seeds), the cost of the seeding rate, and a $4.00/bu cash price, the increase in profitability was $120.90/acre for seeding at 24,000 seeds/acre instead of 16,000 seeds/acre when averaging the treatments (Table 3).

Table 3. Seeding Rate Profitability of 16,000 seeds/acre vs 24,000 seeds/acre. Gothenburg, NE.

	$3.077/bu[1]	$4.00/bu	$4.696/bu[1]	$5.00/bu	$6.00/bu	$8.135/bu[1]
	August 3, 2020	Cash Price	December 29, 2023	Cash Price	Cash Price	April 25, 2022
Net Profit 16,000 seeds/acre ($/acre)	$ 488.37	$ 634.76	$ 745.30	$ 793.45	$ 952.14	$ 1,290.94
Net Profit 24,000 seeds/acre ($/acre)	$ 606.39	$ 788.16	$ 925.42	$ 985.20	$ 1,182.24	$ 1,602.92
Gross Profit 16,000seeds/acre ($/acre)[2]	$ 423.37	$ 569.76	$ 680.30	$ 728.45	$ 887.14	$ 1,225.94
Gross Profit 24,000 seeds/acre ($/acre)[2]	$ 508.89	$ 690.66	$ 827.92	$ 887.70	$ 1,084.74	$ 1,505.42
Gross Profit Delta ($/acre)	$ 85.52	$ 120.90	$ 147.61	$ 159.60	$ 197.60	$ 279.48

[1]Corn prices taken from historical data from www.tradingeconomics.com/commodity/corn
[2]Gross Profit calculated as net profit minus seeding cost: seeding cost based on $325/unit (1 unit = 80,000 seeds), 16,000 seeds/acre Seed Cost = $65.00/acre, 24,000 seeds/acre Seed Cost = $97.50/acre

Key Learnings

- This study demonstrates a minor increase in seed cost can provide an exponential return on investment in tough acre situations.
- Tillage seemed to have little effect on the average corn yield in 2023.
- The 109 RM corn product was favored in 2023, but climate and weather conditions may change that outcome depending on the growing season.
- Product selection and placement for dryland environments is critical; therefore, please contact your local Bayer seed provider for local recommendations.
- This research will be continued in 2024 and will include continuous corn and rotated soybean-corn treatments.

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The recommendations in this material are based upon trial observations and feedback received from a limited number of growers and growing environments. These recommendations should be considered as one reference point and should not be substituted for the professional opinion of agronomists, entomologists or other relevant experts evaluating specific conditions.

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