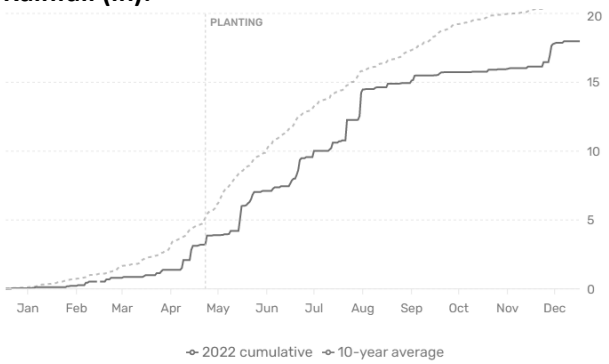
Evaluating Nitrogen Fertilizer Rates on Irrigated Corn

Study ID: 0881161202201
County: Sheridan
Soil Type: Dunday loamy fine sand 3-9% slopes; Tuthill fine sandy loam 0-3% slope; Tuthill fine sandy loam 3-6% slopes
Planting Date: 5/7/22
Harvest Date: 10/30/22
Seeding Rate: 35,000
Row Spacing (in): 30
Hybrid: Pioneer® P9840Q®
Reps: 7
Previous Crop: Corn
Tillage: Vertical-till and strip-till
Herbicides: ***Pre:*** 1 oz/ac Sharpen® and 32 oz/ac Roundup® on 5/9/22 ***Post:*** 32 oz/ac Roundup®, 6 oz/ac Status® and 1.5 oz/ac Zidua® SC on 6/18/22

Irrigation: Pivot, Total: 18-20"
Rainfall (in):



Baseline Soil Samples, 0-12": February 2022

	pH	CEC meq/100g	OM LOI %	Nitrate – N ppm N	Bray P1 P ppm	Sulfate-S ppm S	-----Ammonium Acetate----- K	Ca	Mg	Na	Zn	Fe (DTPA ppm)	Mn	Cu
Sample	7.4	9.8	0.9	5	13	5	194	1663	108	20	0.8	34	9	0.4

Introduction: The entire field received 76 lb/ac potash dry spread, 13 gal/ac 17.6-17.4-0-3.4 S (25 lb N/ac) applied 2x2, and 4 gal/ac 8.8-17.5-4.4-0.8 S-0.37 Zn (3 lb N/ac) applied in-furrow at planting, 23.5 gal/ac 26-0-0-2.5 S (67 lb N/ac) topdressed on June 18, 2022, and 21.2 gal/ac 25.4-0-0-8.4 S (60 lb N/ac) applied by injections on 7/1/22-7/30/22. Total N contribution was 155 lb N/ac.

A variable-rate nitrogen prescription was developed to apply blocks of nitrogen rates approximately 400' long by 120' wide (Figure 1). The nitrogen prescription was implemented with the strip-till application on April 22, 2022. The blend used contained 24.6% N, 7.8% P, and 2.3% S. Three rates were evaluated:

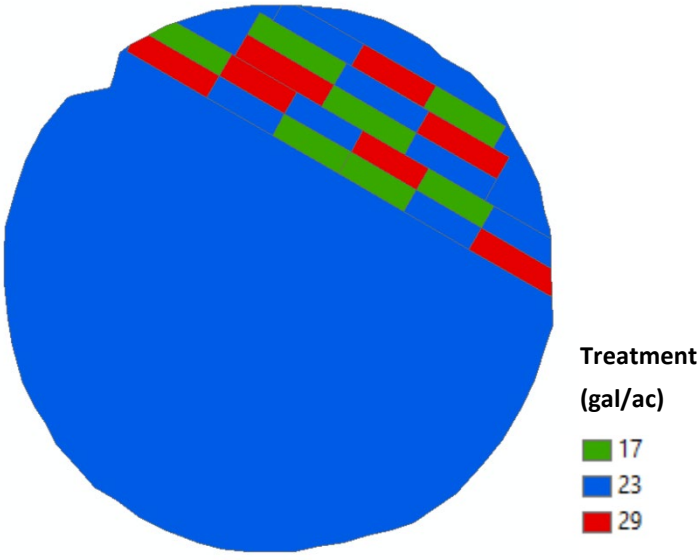


Figure 1. Nitrogen treatment map showing N rates applied with strip-till application.

17 gal/ac: contributing 47 lb N/ac, 15 lb P/ac, and 4 lb S/ac (total N is 202 lb/ac)

23 gal/ac: contributing 63 lb N/ac, 21 lb P/ac, and 6 lb S/ac (total N is 218 lb/ac)

29 gal/ac: contributing 80 lb N/ac, 26 lb P/ac, and 8 lb S/ac (total N is 235 lb/ac)

Yield monitor data were collected at the end of the growing season and post-processed to remove errors. Additionally, yield data points that correspond to areas where the fertilizer application rate was more than 10% above or below the target rate were eliminated.

Results:

	Total N (lb/ac)	Moisture (%)	Yield (bu/ac)†	Nitrogen Efficiency (lb N/bu grain)	Marginal Net Return‡ ($/ac)
17 gal/ac	202	13.3 A*	226 A	0.90 B	1,424 A
23 gal/ac	218	13.1 A	212 A	1.04 A	1,315 A
29 gal/ac	235	13.4 A	223 A	1.06 A	1,363 A
P-Value	-	0.603	0.239	0.004	0.147

*Values with the same letter are not significantly different at a 90% confidence level.
†Yield values are from cleaned yield monitor data. Bushels per acre corrected to 15.5% moisture.
‡Marginal net return based on $6.57/bu corn and $3.84/gal of fertilizer applied at strip-till.

Summary:

- There were no differences in grain moisture, yield, or net return among the three fertilizer rates evaluated, indicating that the lowest rate (17 gal/ac) was sufficient for optimum yields. The actual optimum rate may have been lower.
- Nitrogen use efficiency was greater for the 17 gal/ac fertilizer treatment compared to the 23 and 29 gal/ac treatments.

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