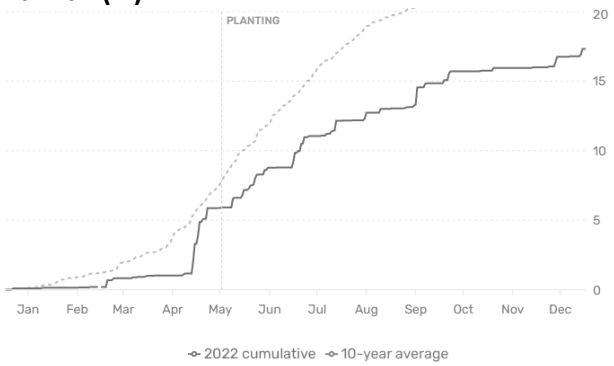
Evaluating Adapt-N Nitrogen Management on Irrigated Corn

Study ID: 1408143202301
County: Polk
Soil Type: Hastings silt loam 0-1% slope; Hastings silt loam 1-3% slope
Planting Date: 4/24/22
Harvest Date: 10/10/22
Seeding Rate: 34,000
Row Spacing (in): 30
Hybrid: DEKALB® DKC59-82 (east half) and DEKALB® DKC63-91 (west half)
Reps: 4
Previous Crop: Soybean
Tillage: No-till
Herbicides: ***Pre:*** 24 oz/ac Roundup PowerMAX® 3 (not applied on NE corner) burndown on 4/22/22 ***Post:*** 2 oz/ac Balance® Flexx, Redlock AMS, and 2 qt/ac Degree Xtra® on 4/27/22; 22 oz/ac Roundup PowerMAX® 3, 1 pt/ac atrazine 4L, 8 oz/ac DiFlexx®, and 3 oz/ac Callisto® on 6/14/22
Foliar Insecticides: 6 oz/ac Bifenture® applied via helicopter on 7/18/22
Foliar Fungicides: 8 oz/ac Delaro® applied via helicopter on 7/18/22
Irrigation: Pivot, Total: 11.62"
Rainfall (in):



Baseline Soil Samples, 0-6" (May 11, 2022):

	pH	BpH	OM LOI %	Melich-III P ppm	Nitrate – N ppm N	Bray P1 ppm	Sulfate-S ppm S	-------Melich III------- K	Ca	Mg	Na	CEC me/100g	Sand (%)	Silt (%)	Clay (%)
Zone 1	6.4	6.8	3.2	29	7.5	22	13	304	1995	247	20	14.2	34	51	14
Zone 2	6.4	6.8	3	42	7.5	32	12	329	1872	265	27	13.7	34	45	20
Zone 3	6.2	6.7	4.1	88	9.8	67	12	335	2281	287	28	16.8	32	51	16

Introduction: Nitrogen fertilizer is a significant input in corn systems. Additionally, N losses through leaching, volatilization, and denitrification pose environmental concerns and reduce profit. There are several digital agriculture tools available to provide site-specific, variable-rate, in-season N recommendations. This study utilized Adapt-N from Yara International, a crop model-based N tool for in-season N application and compared it to the grower's typical N management. The whole field received:

1) 2 ton/ac chicken litter (57 lb N/ac) on 12/24/21
2) 30 lb/ac as 32% UAN on 4/22 and Kickoff starter fertilizer (3 lb N/ac) applied at planting on 4/24
3) 1.5 qt/ac Symbol® Release Plus and 5-0-0-2S-0.5B-2Mn-0.05Mo-2Zn on 6/14/22
4) 18 lb/ac as 32% UAN fertigated on 6/27/22
5) 30 lb/ac as 32% UAN fertigated on 7/3/22
6) 40 lb/ac as 32% UAN/thiosulfate fertigated on 7/10/22
7) 42 lb/ac as 32% UAN/thiosulfate fertigated on 7/12/22, and Redstar Elevate+ 30oz/ac applied with fungicide on 7/18.

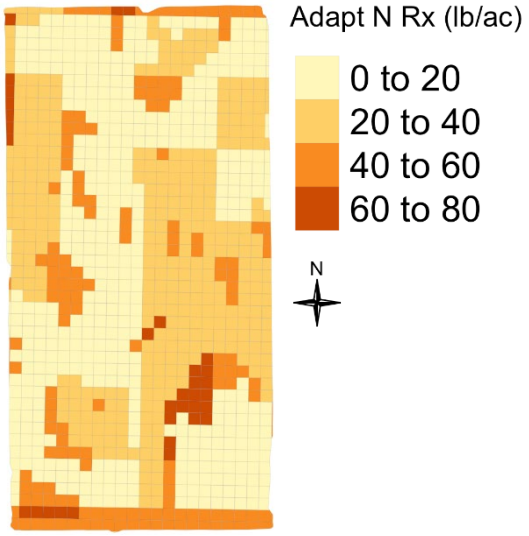


Figure 1. Adapt-N model in-season variable rate prescription.

Urea and monosmmonium phosphate (MAP) were topdressed on June 24. The MAP was flat rate and contributed 5.3 lb N/ac. The urea was variable-rate according to the Adapt-N recommendation and the grower's traditional management. The strips with the grower's traditional management received 40 lb N/ac

flat rate. The strips with the Adapt-N management were applied variable-rate (Figure 1) and received 24 lb N/ac on average. An irrigation of 0.23" was applied within 12 hours following the urea application.

Results and Summary:

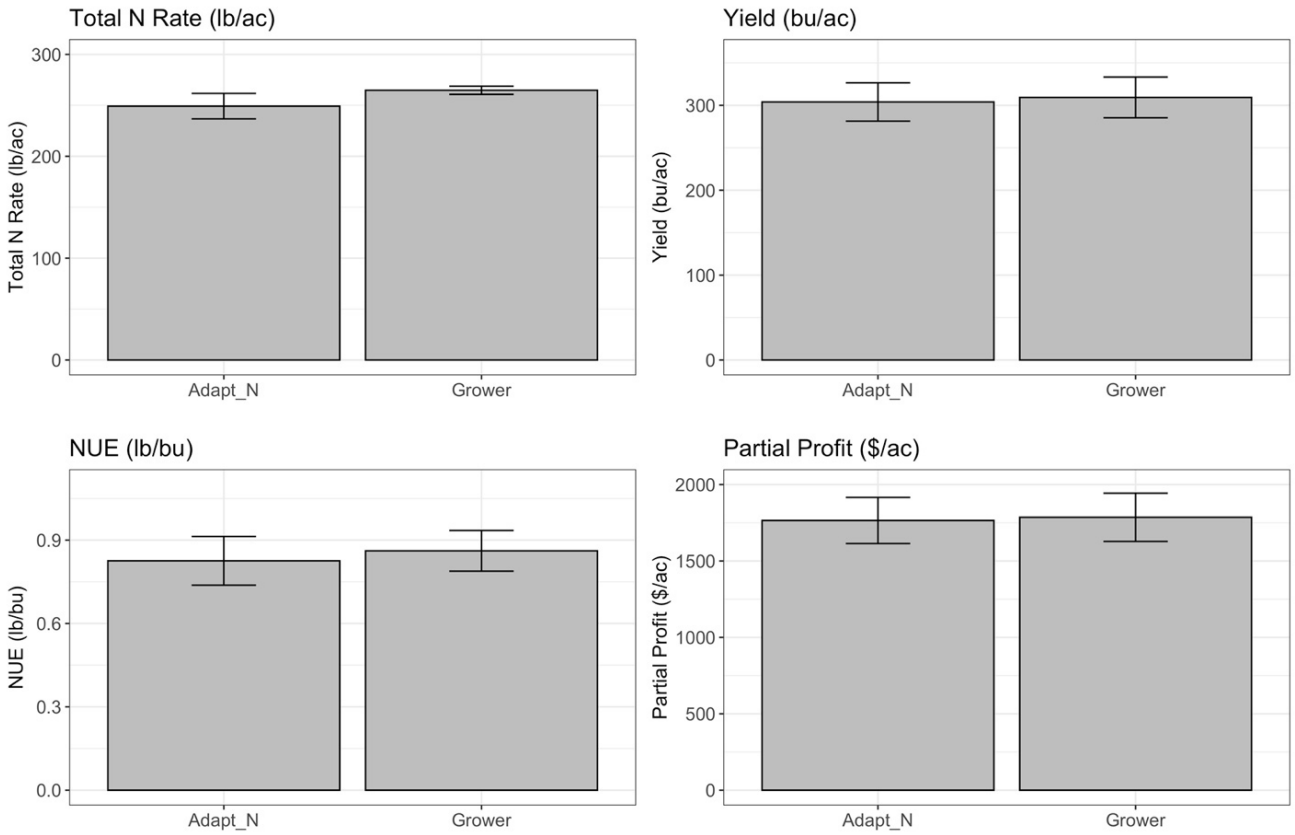


Figure 2. Total N rate, yield, nitrogen use efficiency (NUE), and partial profit for Adapt-N model and the grower's traditional management.

	Total N rate (lb/ac)	Yield (bu/ac)†	Nitrogen Efficiency (lb N/bu grain)	Partial Profit‡ ($/ac)
Grower N Management	265 A	309 A	0.86 A	1786 A
Adapt-N Management	249 B	304 A	0.83 B	1765 A
P-Value	<0.0001	0.439	0.1	0.688

*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 $0.93/lb N fertilizer.

Summary:

- The total N rate for the grower's traditional management was 16 lb/ac higher than the Adapt-N model on average. In addition, the Adapt-N model distributed N applications site-specifically based on historic yield, soil texture, and elevation (Figure 1).
- Yield and profit were very similar between the grower's traditional management and the Adapt-N model on a whole-field basis.
- Nitrogen use efficiency was good for both approaches, below the traditional 1.2 lb of N per bushel of grain assumed for yield-based N recommendations. The Adapt-N model N management had better nitrogen use efficiency than grower's typical N management on a whole-field basis.

This research was supported in part by an award from the USDA-NRCS Conservation Innovation Grants, On-Farm Conservation Innovation Trials, award number NR203A750013G014.