2021 Final Report Summary Sheet

Grantee Information

Project Title: Nitrogen placement and application timing for best efficiency, growth, and yield of corn across Illinois.

Institution: University of Illinois

Primary Investigator: Fred Below

NREC Project # 2019-3-360267-438

[redacted]

Is your project on target from an IMPLEMENTATION standpoint? ☒ **Yes** ☐ **No**

If you answered "no" please explain:

Is your project on target from a BUDGET standpoint? ☒ **Yes** ☐ **No**

If you answered "no" please explain:

Based on what you know today, will you meet the objectives of your project on-time and on-budget? ☒ **Yes** ☐ **No**

If you answered "no" please explain:

Have you encountered any issues related to this project? ☒ **Yes** ☐ **No**

If you answered "yes" please explain:

Two field sites have experience severe weather conditions including a drought resulting in poor pollination and yield loss at Champaign in 2019 and a derecho resulting in severe wind damage at Yorkville in 2020.

Have you reached any conclusions related to this project that you would like to highlight? ☒ **Yes** ☐ **No**

If you answered "yes" please explain:

Data collected thus far supports the hypothesis that concentrating N fertilizer belowground near the crop row (i.e. banding) can increase grain yield and N removal, while limiting N loss to the environment.

Have you completed any outreach activities related this project? Or do you have any activities planned? ☒ **Yes** ☐ **No**

If you answered "yes" please explain and provide details for any upcoming outreach:

During the 2021 growing season, the Crop Physiology Laboratory hosted several companies including Illini FS and Mosaic for field days, including plot tours of this project. The data has been presented by both Fred Below and Eric Winans (the PhD student responsible for coordinating the research) at numerous meetings, including with representatives from Liqui-Grow, Syngenta, The Mosaic Company, CHS Inc, Montag Manufacturing, and John Deere. Eric has also made the data available to Stewart Farms, the land-owner at the Yorkville site, Talon Becker, the manager at the Ewing Demonstration Center, and Bartling Farms, the land-owner at the Nashville site.

The results of this study were presented by Eric at a round-table hosted by Nutrien at the Top Producer Summit in Chicago, IL on January 30, 2019, which was attended by over 20 growers from Illinois and surrounding states.

Fred Below presented this data to attendees at the Fertilizer Outlook and Technology Conference in Savannah, Georgia on November 19, 2019 and to a select group farmers at the DEKALB/Asgrow NextGen Select Grower Meeting at Bloomington, IL on January 13, 2020. A portion of this data was also presented to farmers, and agricultural specialists at two DEKALB/Asgrow Yield Chaser events in Mt Vernon, IL and Effingham, IL on February 5 and 6, 2020, which had hundreds of attendees.

Fred Below presented results from this study at the Fluid Fertilizer Forum and Annual Meeting on February 17th, 2020 in Phoenix, Arizona, and both Fred Below and Eric Winans attended and presented a poster at the NREC Research Review event at the I-Hotel in Champaign, IL on February 13, 2020.

Subsequent meeting presentations were limited due to the the COVID-19 restrictions, but this data was presented in virtual poster presentations at the American Society of Agronomy and North Central Extension-Industry Soil Fertility Conferences in 2020, and in a virtual presentation by Fred Below at the Bi-State Extension Crop Production conference on December 3, 2020.

Dr. Below and Eric Winans participated in an educational video on the benefits of banded fertilizer for Nutrien-eKonomics which has been shared on their website and social media platforms at https://www.youtube.com/watch?v=EECUth6Ff70

The results of this project will be summarized in a chapter of Eric Winan's PhD dissertation and could potentially be published in a peer-reviewed journal.

NITROGEN PLACEMENT AND APPLICATION TIMING FOR BEST EFFICIENCY, GROWTH, AND YIELD OF CORN ACROSS ILLINOIS

Cooperators and locations

Dr. Frederick E. Below is a Professor of Crop Physiology in the Department of Crop Sciences at the University of Illinois. His research is focused on sustainably and efficiently producing high corn and soybean yields. fbelow@illinois.edu, 217-333-9745

Eric T. Winans is a fith-year Graduate Research Assistant in the Department of Crop Sciences, University of Illinois. He earned his M.S. degree in 2019 and is now working towards the completion of his Ph.D. with a focus on hybrid evaluation and nitrogen fertilizer management. winans2@illinois.edu, 217-414-9504

Project Locations: Crop Sciences Research and Education Center, University of Illinois, Champaign, IL; Stewart Farms, Yorkville, IL; Bartling Farms, Nashville, IL; and the U. of I. Ewing Demonstration Center, Ewing, IL

Synopsis

It is a common understanding that delaying a portion of applied nitrogen (N), as opposed to a single pre-plant application, could increase N availability to the growing corn crop and improve fertilizer N recovery and grain yield. However, research shows that the yield response to split applications of N is entirely dependent on the environment and is often uneconomical. What is typically more important for increasing yield potential and nutrient use is assuring adequate N availability at the start of the growing season. It is hypothesized that concentrating N in a band near the crop row at planting, as opposed to broadcasting across the entire soil surface, will allow for adequate N availability to set the crop's growth trajectory and yield potential and thereby allow for split applications of N without the risk of decreasing yield. Thus, the objectives of this study were to assess the effect of N placement on N use efficiency and grain yield and determine if placement changes the optimal N rate at planting. Across three sites in Illinois, UAN was broadcast incorporated or banded next to the crop row (2" x 2") at 45, 90, 135, and 180 lbs N acre^{-1} near the time of planting. All treatments were balanced for 180 lbs N acre^{-1} with sidedress applications at the V6 growth stage. Across N rates and locations, banding N near the crop row increased grain yield, seasonal N uptake, N use efficiency (bu lb N^{-1}), and N recovery efficieny (%). The optimal N rate at planting was more dependent on the environment, rather than placement. However, yield, N uptake, and use efficiency at 45 lbs N acre^{-1} banded was always the same or better than any of the broadcasted rates.

Objective

The principal objective of this experiment was to investigate the possible improvement in nitrogen use efficiency and corn yield by increasing the concentration of nitrogen (N) near the plant through banding at the time of planting, allowing a greater proportion of total N to be applied later in the season. The trial has successfully been established through three years and will complete its anticipated objectives on budget and on time.

Site characteristics and cultural practices

All experiments were conducted under conventional tillage in a corn-soybean rotation. The trial was planted using a precision plot planter with variable rate capability (SeedPro 360, ALMACO, Nevada, IA) at Yorkville, IL (41°36'53.01"N, 88°23'10.21"W; 9 June 2019, 5 June 2020, 7 May 2021), Champaign, IL (40° 3'8.85"N, 88°14'2.46"W; 1 June 2019, 1 June 2020, 27 April 2021), Ewing, IL (38° 5'56.84"N, 88°50'50.49"W; 5 June 2019), and Nashville, IL (38°19'04"N, 88°20'10"W; 8 June 2020, 23 April 2021). Corn hybrid DKC64-34RIB was planted at all locations to target a final stand of 36,000 plants acre^{-1}. Preplant applications of Acuron (3 qt acre^{-1}) were used for weed control. Soil cores (0-12" deep) were collected from plot areas prior to planting and assessed for pH, organic matter, and fertility levels and are reported in in the appendix (Table 1A). Monthly precipitation totals and temperature averages were compared to the 30-year average and are also presented in the appendix (Tables 2A-4A). In 2019, excessive rainfall was observed at all locations in the month of May, delaying planting to June. Drought conditions during pollination and grain fill (July-August) led to poor pollination and low yields at Champaign in 2019. The 2020 growing season experienced another wet spring and late planting, a dry August, and a derecho at the Yorkville site resulting in plot damage due to green snap and stalk lodging. Overall, weather conditions in 2021 allowed for timely trial establishment and were conducive of high corn yields. However, wind events in 2021 lead to some early green-snap and late stalk lodging at Champaign and Yorkville, respectively.

Nitrogen applications

Urea ammonium nitrate (UAN) was applied at five rates (0, 45, 90, 135, and 180 lbs N acre^{-1}) at the time of planting. Each initial rate was applied using two different applications methods: surface broadcast with light incorporation (1-3" deep) or banded two inches below and two inches away from the seed (2 x 2 band). All treatments were balanced to total 180 lbs N acre^{-1} with a Y-drop sidedress application of UAN at the V6 plant growth stage. All treatments were compared to an unfertilized check and are outlined in Table 1.

Experimental design and analysis

Experimental units were plots four rows wide and 37.5 feet in length with 30-inch row spacing. Treatments were arranged in a randomized complete block design with six replications. Statistical analysis was performed using a linear mixed model approach with PROC MIXED in SAS (version 9.4; SAS Institute, Cary, NC) and means were separated using Fisher's protected LSD test at the 0.10 level of significance. The normality of residuals was assessed using PROC UNIVARIATE and the assumption of homoscedasticity was tested using the Brown-Forsythe modification of the Levene Test in PROC GLM. Each location was analyzed separately with N treatment included in the model as a fixed effect and replication as a random effect. Because of the pollination issues, yield and nutrient uptake data collected at the 2019 Champaign site was dropped from analysis and is not reported. Additionally, data collected from the Yorkville location in 2020 was removed from the analysis because of severe wind damage to the plots.

Placement and rate statistical analysis focused on eight treatments (45:135 Band, 90:90 Band, 135:45 Band, 180:0 Band, 45:135 Broad, 90:90 Broad, 135:45 Broad, and 180:0 Broad) to compare the respective placements (banded and broadcast) across rates and to compare the different rate ratios (45:135, 90:90, 135:45, and 180:0) across both placements.

Table 1. Placement and rate of N applied at-planting (AP), N rate applied at V6 with Y-drop, and the total N rate applied for each treatment. Nitrogen was applied as UAN for all applications.

		Nitrogen Rate		
Treatment ID	AP Placement	AP	V6	Total
		lbs N acre^{-1}		
UTC	-	0	0	0
0:180	-	0	180	180
45:135 Band	Band	45	135	180
90:90 Band	Band	90	90	180
135:45 Band	Band	135	45	180
180:0 Band	Band	180	0	180
45:135 Broad	Broadcast	45	135	180
90:90 Broad	Broadcast	90	90	180
135:45 Broad	Broadcast	135	45	180
180:0 Broad	Broadcast	180	0	180

Nitrogen accumulation: Methods and results

Total above-ground plant biomass sampling was conducted at tasseling (VT) and physiological maturity (R6) by sampling three representative plants from each of the center two rows of each plot and then drying to 0% moisture. The plants sampled at R6 were partitioned into grain and stover. Dried stover samples were ground to pass through a 2 mm mesh screen and a representative 50 mg subsample was evaluated for N concentration using a combustion-based analyzer. Nutrient accumulation in the stover was determined using total stover biomass and stover N concentrations. Nitrogen concentrations in the grain was calculated by converting protein concentration in the grain, obtained using near-infrared transmittance spectroscopy (Infratec 1241Grain Analyzer; FOSS, Eden Prairie, MN). Total N in the grain was determined using total grain weight and grain N concentration. Total N uptake is the sum of total N in the grain and stover. Due to wind damage at the Yorkville site in 2020, plots were not sampled at the R6 growth stage.

Averaged across rates, placing N in a 2x2 band near the crop row increased seasonal N uptake compared to broadcast application at six of the seven environments (Table 2). Additionally, total N uptake at physiological maturity was maximized with banded N at most locations. Positive responses to banded N were most consistently observed at the Southern Illinois locations, Ewing and Nashville. Typically, total N uptake was maximized when higher rates (135 and 180 lbs N acre^{-1}) were banded at planting. When broadcasting N, however, delaying half or more of the applied N until V6 led to greater N uptake. This data shows that N broadcast-applied at planting was less available to the plant than when banded or sidedressed at V6. Like observations in Southern Illinois, total plant N uptake at the Yorkville site was maximized when the majority of N was banded at planting. At Champaign, total N uptake was maximized when half of N was banded at planting in 2020 and no differences were observed among the fertilized plots in 2021.

Table 2. Corn nitrogen uptake at R6 as affected by fertilizer nitrogen treatment in Illinois from 2019-2021. Lowercase letters indicate a treatment mean significant difference within location at $P < 0.10$.

	Yorkville		Champaign		Ewing	Nashville	
Treatment	2019	2021	2020	2021	2019	2020	2021
	lbs N acre^{-1}						
UTC	120 **e**	155 **d**	102 **e**	84 **b**	53 **f**	75 **e**	113 **e**
0:180	210 **bc**	224 **abc**	170 **bcd**	185 **a**	110 **ab**	170 **c**	210 **cd**
45:135 Band	219 **ab**	228 **abc**	177 **abcd**	198 **a**	110 **abc**	190 **a**	221 **b**
90:90 Band	217 **ab**	223 **bc**	185 **a**	191 **a**	111 **ab**	190 **a**	222 **b**
135:45 Band	222 **ab**	231 **abc**	179 **abc**	195 **a**	118 **a**	189 **a**	241 **a**
180:0 Band	227 **a**	232 **ab**	175 **abcd**	189 **a**	113 **ab**	183 **abc**	238 **a**
45:135 Broad	193 **d**	222 **bc**	166 **d**	182 **a**	106 **bc**	185 **ab**	217 **bc**
90:90 Broad	200 **cd**	234 **a**	173 **abcd**	197 **a**	103 **c**	173 **bc**	204 **d**
135:45 Broad	196 **cd**	225 **abc**	167 **cd**	195 **a**	93 **d**	152 **d**	207 **cd**
180:0 Broad	191 **d**	218 **c**	170 **bcd**	186 **a**	81 **e**	155 **d**	201 **d**
	†Level of Significance $P > F$						
Placement	***(Band)	*(Band)	*(Band)	ns	***(Band)	***(Band)	***(Band)
Rate	ns	ns	ns	ns	*(45:135)	**(45:135)	ns
Placement x Rate	ns	**	ns	ns	**	*	**

† Placement (45 Band + 90 Band + 135 Band + 180 Band) vs. (45 Broad + 90 Broad + 135 Broad + 180 Broad) and rate (45 Band + 45 Broad) vs. (90 Band + 90 Broad) vs. (135 Band + 135 Broad) vs. (180 Band + 180 Broad).

* Significant at $P < 0.10$; **Significant at $P < 0.01$; ***Significant at $P < 0.001$; ns, non-significant at $P = 0.10$.

Grain yield: Methods and results

The center two rows of each plot were mechanically harvested for determination of plot grain weight and harvest moisture, and yield was subsequently standardized to bushels per acre at 15.5% moisture. Subsamples of the harvested grain were evaluated for individual kernel weight and kernel number. Kernel weight is presented at 0% moisture.

When broadcasting N, the optimal preplant rate was 90 lbs N/acre, on average, delaying half of N to be sidedressed at V6 (Figure 1). Applying more or less than half of N broadcasted at planting reduced yield. Conversely, yield was maximized when anywhere from 25-75% of N was banded at planting. Additionally, the highest average yield was achieved when only 25% of N was banded at planting and the majority of N was delayed to V6.

At the Ewing site in 2019, when averaged across fertilizer rates, banding N at planting increased grain yield by 10 bu acre^{-1} (Table 3). When broadcasting N prior to planting, the crop responded better when a portion applied N was delayed to V6, demonstrated by a decrease in yield with the 180:0 broadcast treatment. On average, banding N at Yorkville in 2019 increased grain yield by 13 bu acre^{-1} and the highest yield was achieved when 180 lbs N acre^{-1} was banded at planting.

The highest yield at Champaign in 2020 was produced when banding 45 lbs N acre^{-1} at planting (Table 3). Banding low rates of N at planting was sufficient, while rates above 90 lbs N acre^{-1} were needed when broadcasted to maximize yield. However, banding the high rate of N (180 lbs N/acre) reduced yield. Delaying a portion of the N to V6 was beneficial at the Nashville site in 2020, as the 45:135 and 90:90 rate ratios resulted in the highest yields across both placement methods (Table 3).

In 2021, banding N increased yield at Nashville regardless of rate (Table 3). The highest yield, 269 bu/acre, was achieved when banding 135 lbs N/acre at planting, which was a 12 bu/acre increase over the standard practice of broadcasting the full rate of N at planting. Yield was maximized when banding only 45 lbs N/acre at the Champaign site in 2021, while no differences in yield were observed among the fertilized plots at Yorkville.

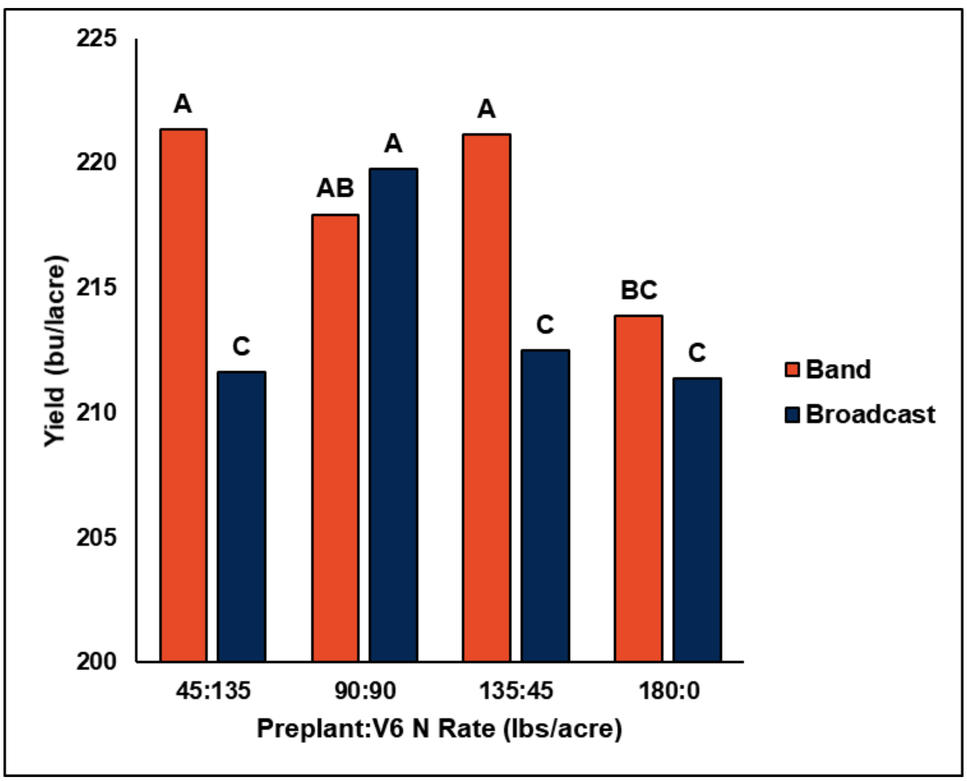

Figure 1. Corn grain yield as influenced by nitrogen placement and rate averaged over seven environments in Illinois from 2019-2021. Uppercase letters that differ indicate treatment mean significant differences at $P < 0.10$.

Table 3. Grain yield of corn as affected by fertilizer nitrogen treatment in Illinois from 2019-2021. Grain yield is reported at 15.5% moisture. Lowercase letters indicate a treatment mean significant difference within location at $P < 0.10$.

Treatment	Yorkville		Champaign		Ewing	Nashville	
	2019	2021	2020	2021	2019	2020	2021
	bu acre^{-1}						
UTC	144 **e**	210 **b**	130 **d**	138 **e**	64 **c**	81 **d**	176 **e**
0:180	202 **d**	258 **a**	201 **bc**	245 **bcd**	122 **a**	194 **abc**	263 **bcd**
45:135 Band	217 **bc**	265 **a**	213 **a**	261 **a**	123 **a**	206 **a**	265 **abc**
90:90 Band	220 **ab**	264 **a**	206 **abc**	250 **abd**	120 **a**	200 **a**	266 **ab**
135:45 Band	224 **ab**	265 **a**	211 **ab**	256 **ab**	126 **a**	198 **ab**	269 **a**
180:0 Band	231 **a**	265 **a**	203 **abc**	235 **d**	119 **a**	184 **c**	262 **bcd**
45:135 Broad	204 **d**	260 **a**	200 **c**	239 **cd**	114 **ab**	203 **a**	261 **bcd**
90:90 Broad	217 **b**	268 **a**	208 **abc**	259 **ab**	120 **a**	205 **a**	263 **bcd**
135:45 Broad	207 **cd**	267 **a**	204 **abc**	248 **acd**	117 **a**	186 **bc**	259 **cd**
180:0 Broad	217 **bc**	258 **a**	209 **abc**	252 **abc**	102 **b**	185 **c**	257 **d**
	†Level of Significance $P > F$						
Placement	***(Band)	ns	ns	ns	**(Band)	ns	**(Band)
Rate	*(180)	ns	ns	ns	ns	***(45:135)	ns
Placement x Rate	ns	ns	*	*	ns	ns	ns

† Placement (45 Band + 90 Band + 135 Band + 180 Band) vs. (45 Broad + 90 Broad + 135 Broad + 180 Broad) and rate (45 Band + 45 Broad) vs. (90 Band + 90 Broad) vs. (135 Band + 135 Broad) vs. (180 Band + 180 Broad).

* Significant at $P < 0.10$; **Significant at $P < 0.01$; ***Significant at $P < 0.001$; ns, non-significant at $P = 0.10$.

Nutrient use efficiency: Methods and results

Nutrient use efficiencies were calculated for each treatment from the amount of fertilizer applied, total N uptake, and corn grain yield compared to the unfertilized check plots. Nitrogen recovery efficiency (NRE) was calculated by subtracting the total N uptake of the check plot plants from the total N uptake resulting from each fertilized treatment and dividing by the corresponding total N rate applied (i.e. 180 lbs N acre^{-1}). Nitrogen used efficiency (NUE) was calculated by subtracting the check plot yield from the yield resulting from each fertilized treatment and dividing by the total fertilizer N rate applied (i.e. 180 lbs N acre^{-1}).

Nitrogen recovery efficiency was increased when banded across all rates (Figure 2a). When broadcasting N at planting, NRE was increased by delaying a portion of applied N to V6. Regardless of rate, banding N assured more applied N was recovered by the crop. As all fertilized plots received the same total rate of N, NUE followed a similar trend as grain yield. Across locations, NUE can be optimized when banding reduced rates of N at planting (i.e. 45-135 lbs/acre) (Figure 2b). Overall, NUE was similar across rates when banded while the 90:90 split was optimal when broadcasting N.

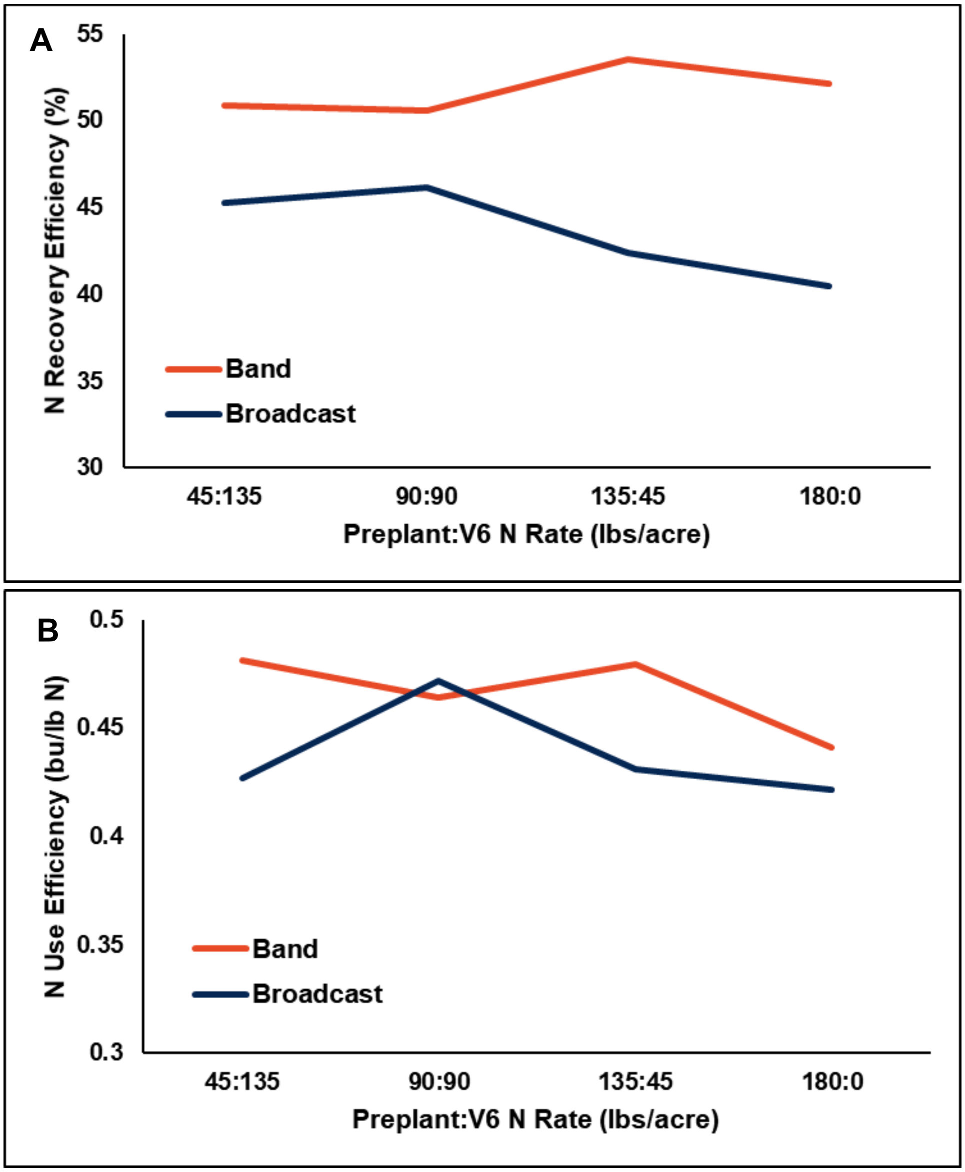

Figure 2. Corn N recovery efficiency (a.) and N use efficiency (b.) as influenced by nitrogen placement and rate across seven environments in Illinois from 2019-2021.

Discussion of results

Averaged across preplant N rates and environments, banding nitrogen at planting increased grain yield by 5 bu acre^{-1} compared to broadcast applications. Moreover, banding just 45 lbs N/acre at planting and delaying the remainder to sidedress increased yield by 10 bu/acre compared to the standard practice of broadcasting the full rate of N at planting. While optimal preplant rates were heavily influenced by the environment, there is good indication that splitting N can lead to increased yield and N recovery. This is especially true when preplant N is broadcasted. However, the additional application cost of sidedressing N should be considered. It is expected, though, that 2x2 placement of N with the planter, as opposed to broadcast application, could reduce application costs and time in the spring. Regardless of preplant rate, banding N led to greater season-end total plant nitrogen accumulation. Additionally, NUE and NRE were increased when N was banded at planting. Collectively, these data show that concentrating N near the crop row (i.e. banding) can increase grain yield and N removal, while limiting N losses to the environment.

Next steps

A more complete analysis and summary of data will be completed and included in the dissertation of Eric Winans. This will include multivariate analysis of yield components, grain yield, and N use parameters. Additionally, regression analysis will be performed on at-planting nitrogen fertilizer rate response for each placement, with the consideration of environmental and economic variables. Upon the completion of full data analysis and assessment of results, a decision on publication of these findings will be made.

APPENDIX

Table 1A. Preplant soil properties and Mehlich 3-extraction-based mineral test results for the research areas.

Location	OM	CEC	pH	NO_3	NH_4	P	K	Ca	Mg	S	Zn
	%	meq/100g		———	———	———	ppm	———	———	———	———
Yorkville, 2019	4.8	30.5	6.4	11.2	9.6	43	149	3872	863	14	2.4
Yorkville, 2020	4.6	20.2	6.3	9.7	3.0	145	125	2453	621	11	6.9
Yorkville, 2021	5.1	21.8	6.8	13.9	2.6	61	151	2991	715	7	13.3
Champaign, 2019	3.5	21.5	6.1	6.0	4.8	44	131	2747	457	10	1.3
Champaign, 2020	4.3	24.3	6.7	4.2	4.8	15	96	3361	728	8	1.0
Champaign, 2021	3.0	21.8	6.5	14.1	14.2	17	93	2074	462	6	1.0
Ewing, 2019	1.6	9.7	7.5	2.7	5.7	33	54	1797	69	11	1.2
Nashville, 2020	1.9	9.1	7.1	8.1	3.6	20	75	1634	85	9	1.4
Nashville, 2021	1.9	9.0	6.2	7.2	4.5	14	61	1334	114	5	0.9

Table 2A. Precipitation and temperature during the production season at Ewing, Champaign, and Yorkville, IL in 2019 compared to the 30-year average (normal). Values obtained from the Illinois State Water Survey.

	Precipitation (inches)		**Temperature (°F)**	
Month	**2019**	**Normal**	**2019**	**Normal**
		Ewing, IL		
May	7.0	4.7	67.4	66.5
June	3.5	4.0	72.8	75.0
July	2.1	3.6	78.5	77.7
August	2.2	3.1	76.0	75.9
September	0.3	3.5	75.1	68.7
		Champaign, IL		
May	5.2	4.7	63.7	63.4
June	3.7	4.4	71.7	72.5
July	2.3	4.2	77.3	75.1
August	2.1	3.4	73.5	73.5
September	3.3	3.1	71.7	66.7
		Yorkville, IL		
May	8.4	3.6	57.5	60.6
June	2.6	3.8	68.6	69.8
July	2.8	3.2	75.3	71.9
August	4.4	3.4	68.9	69.7
September	12.0	2.7	66.9	62.6

Table 3A. Precipitation and temperature during the production season at Nashville, Champaign, and Yorkville, IL in 2020 compared to the 30-year average (normal). Values obtained from the Illinois State Water Survey.

	Precipitation (inches)		Temperature (°F)	
Month	2019	Normal	2019	Normal
		Nashville, IL		
May	4.3	4.9	64	66
June	4.0	3.9	77	74
July	9.1	3.3	80	77
August	7.5	3.3	75	75
September	0.6	2.9	68	67
		Champaign, IL		
May	5.3	3.7	50	53
June	4.7	4.7	61	63
July	5.8	4.4	74	72
August	4.6	4.1	77	75
September	1.3	3.4	73	74
		Yorkville, IL		
May	3.6	3.0	46	49
June	6.1	3.8	58	60
July	3.3	3.8	61	70
August	4.4	3.2	74	72
September	0.9	3.4	58	70

Table 3A. Precipitation and temperature during the production season at Nashville, Champaign, and Yorkville, IL in 2021 compared to the 30-year average (normal). Values obtained from the Illinois State Water Survey.

	Precipitation (inches)		Temperature (°F)	
Month	**2019**	**Normal**	**2019**	**Normal**
		Nashville, IL		
April	4.5	4.4	57	56
May	4.1	4.9	64	66
June	2.8	3.9	77	74
July	9.8	3.3	77	77
August	3.1	3.3	78	75
		Champaign, IL		
April	2.1	3.7	53	53
May	3.4	4.7	61	63
June	7.6	4.4	75	72
July	4.2	4.1	74	75
August	4.1	3.4	76	74
		Yorkville, IL		
April	1.9	3.0	50	49
May	3.4	3.8	59	60
June	6.6	3.8	73	70
July	2.7	3.2	71	72
August	1.1	3.4	72	70