2016 Nutrient Management Initiative (NMI) Results

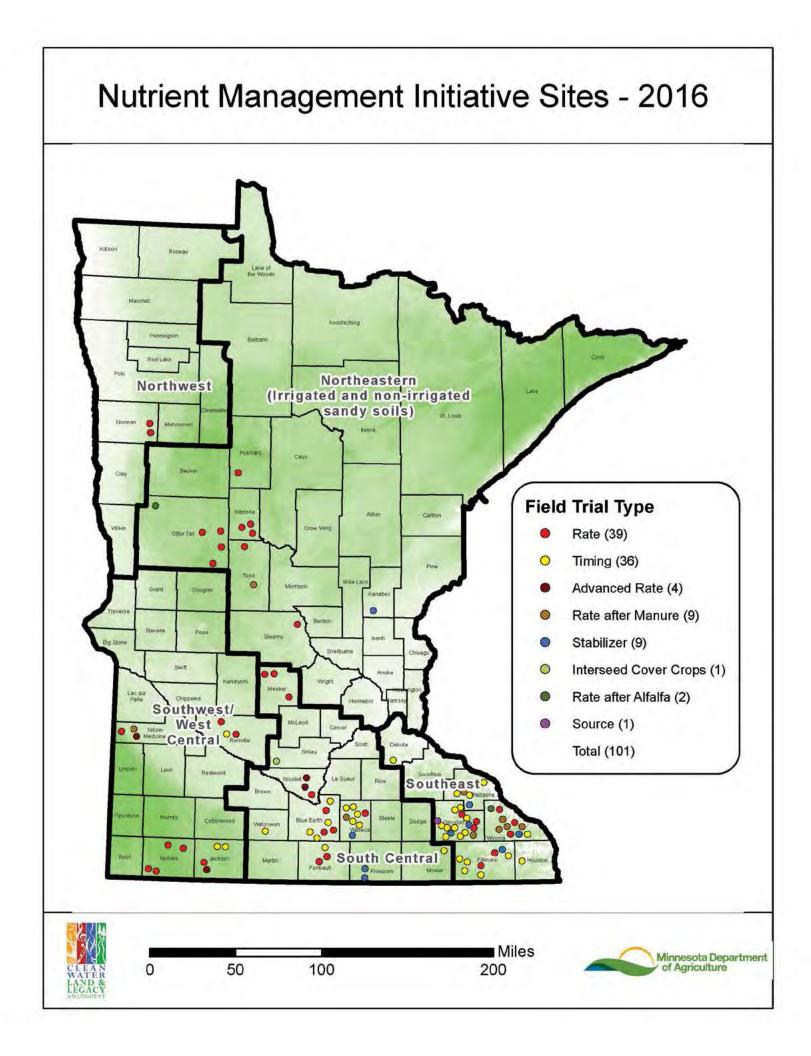






Table of Contents

2016 NMI participation map
2016 Nutrient Management Initiative Introduction
Average results of 2016 NMI trials5
Nitrogen Use Efficiency (NUE) 6
Southeast region
South Central region
Southwest/West Central region
Northwest region
Northeastern (Irrigated and non-irrigated sandy soils)

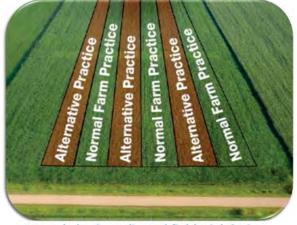


2016 Nutrient Management Initiative (NMI)

The Nutrient Management Initiative is a simple tool to help evaluate the efficiency of nitrogen fertilizer inputs through the use of on-farm side-by-side trials. The NMI was reintroduced in 2015 with direct funding from the Minnesota Department of Agriculture (MDA) and includes field trial options that consider nitrogen rate, timing, stabilizer, and source evaluations. In 2016, 100 farmers worked with 29 crop advisers statewide to establish 101 on-farm trials geared towards improving nitrogen efficiencies on their own farms. Since 2015, there has been a total 269 NMI trials in Minnesota.

NMI Design

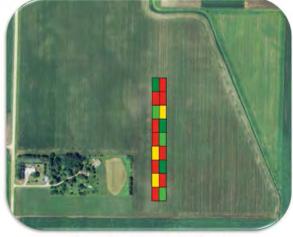
Farmers worked with a crop adviser to set up field trials and verify crop management and harvest information. Advances in technology make NMI trials easier to install pre-determined nitrogen treatments and extract and review harvest information directly from yield maps. Participants received an individual and regional analysis of the results at the end of the season.



Example basic replicated field trial design.

Many crop advisers utilized the NMI in order to promote and evaluate industry advancements, new technology, or application equipment that can help improve efficiency and boost yields. Some crop advisers, MDA, soil and water conservation district, and University of Minnesota (U of M) Extension personnel also held winter farmer meetings to review field trial results. New ideas for field trials from farmers included evaluating inter-seeding cover crops while side dressing nitrogen, as well as a nitrogen rate comparison trial on corn grown for silage in southeast Minnesota.

2016 brought the addition of advanced nitrogen rate trials with guidance from U of M Extension research specialists. Advanced trials will provide a more in-depth design to help validate nitrogen rate recommendations for corn/corn and corn/soybean rotations. Farmers and crop advisers worked directly with staff to set up six replicated nitrogen rates across their fields. Four advanced trials were completed this year; two in the Southwest/West Central region, and two in the South Central. The U of M sent out the nitrogen prescriptions directly to the participants, as well as determined the final results after receiving yield information directly from the monitor after harvest.



Example advanced nitrogen

Average results of 2016 NMI trials

CORN FOLLOWING CORN											
	All trials combined				Rate	trials	Timing trials	Stabilizer trials			
Nitrogen BMP Region	Total N (ac)	Yield (bu/ac)	NUE (lbs of N per bushel)	Price (per pound of N)	Additional N (Ibs/ac)	Yield from additional N (bu)	Split App Advantage (bu)	Stabilizer Advantage (bu)	Stabilizer Cost (ac)		
Southeast	177.84	218.42	0.81	\$0.38	39.69	3.53	2.89	0.29	\$12.50		
South Central	150.56	208.42	0.72	\$0.49	31.00	0.00	30.3*				
Southwest/West Central	177.00	239.00	0.74	na	30.00	0.00					
Northwest											
Northeast	182.83	198.12	0.93	\$0.40	32.50	6.40		0.30			
Averages	172.06	215.99	0.80	\$0.42	33.30	2.48	2.89	0.30	12.50		
	*Only	on one tria	al. Preplan	t 32% UAI	V1app vsas	split 2 app. No	t included in averag	ges.			

• Not including the four U of M advanced nitrogen rate trials

The average cost for a pound of nitrogen was **\$0.42**. When considering an average of all nitrogen rate trials following corn, an additional **33.30** pounds of nitrogen cost **\$13.99** per acre, but only offered an average yield increase of **2.48** bushels per acre.

CORN FOLLOWING SOYBEANS											
	All trials combined				Rate trials		Timing trials	Stabiliz	Stabilizer trials		
Nitrogen BMP Region	Total N (ac)	Yield (bu/ac)	NUE (lbs of N per bushel)	Price (per pound of N)	Additional N (lbs/ac)	Yield from additional N (bu)	Split App Advantage (bu)	Stabilizer Advantage (bu)	Stabilizer Cost (ac)		
Southeast	152.04	217.59	0.70	0.41	35.70	3.72	0.32	1.43			
South Central	151.59	213.20	0.71	0.51	36.75	5.00	5.49				
Southwest/West Central	159.53	216.02	0.73	0.42	31.76	3.97	1.62				
Northwest											
Northeast	192.84	184.17	1.05	0.43	40.33 0.66			0.30	na		
Averages	164.00	207.75	0.80	0.44	36.14	3.34	2.48	0.87			

The average cost for a pound of nitrogen was **\$0.44**. When considering an average of all nitrogen rate trials following soybeans, an additional **36.14** pounds of nitrogen cost **\$15.90** per acre, but only offered an average yield increase **3.34** bushels per acre.

Only two NMI trials were not harvested correctly last fall in southeast Minnesota and are not included in this report. Of the remaining trials not listed above, one trial in southeast Minnesota was corn grown for corn silage, while the other nine trials had different previous crops consisting of potatoes, barley, wheat, dry beans, and alfalfa. Most of these trials were located in central Minnesota in the Northeast irrigated and non-irrigated sandy soils region.

Statistical Analysis

Statistical analysis was completed on sixty of the ninety-seven (62%) basic NMI field trials which had a minimum of three replications of each nitrogen practice. This is standard practice within the research community. Replications of practices with statistical analysis are crucial to determine if the yield difference is actually a true treatment effect of the different nitrogen practices, and not an effect of other factors from in-field variability. Consistently similar yield results of each specific nitrogen treatment strip help to indicate this as well. While comparisons were made on trials with only one or two replications, results were not confirmed with statistical analysis.

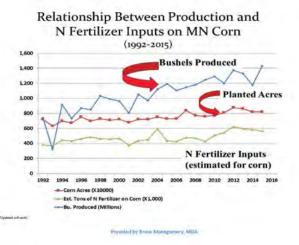
After analysis of those sixty trials, only seven showed a statistically significant difference in yield due to the actual nitrogen treatment. This means that most of the participants did not see any yield difference between their normal and alternative practices. In other words, the lower nitrogen rate, split application, or stabilizer use which was considered an alternative practice, may be adequate to cover the crop nitrogen needs and not affect yields.

Before drawing a conclusion, it is important to note that the 2016 growing season generally was favorable for release of nitrogen from the breakdown of soil organic matter, or mineralization. In-field variability can considerably alter results of each individual field trial strip and needs to be considered before formulating results. The generally above-average nitrogen release may have helped make up for some of the difference between the normal and alternative practices.

Nitrogen Use Efficiency (NUE)

Minnesota corn production is becoming much more efficient by producing a bushel of corn with less nitrogen. In addition to nitrogen management, technology, field history, genetics, equipment, weather, product timing and placement are some of the contributors to the ability of corn to utilize applied nitrogen.

Using on-farm field trials serve as a critical component to evaluating the efficiencies of management practices on any field. NUE values can be represented several ways; however, any NUE value can be a very simple comparison tool and serve as an indicator for tracking and reducing nitrogen losses over time.



Many farmers often question how nitrogen practices on their own farms compare to their neighbors or other farmers in the same area. Similar to 2015, each NMI farmer participant was given a unique field trial identifier with NUE values by taking the total nitrogen rate divided by yield, which determines the amount of nitrogen required to produce one bushel of corn. Nitrogen practices in each trial were given a unique ID for the normal or alternative practices. The NUE values were then sorted by similar crop rotations in the same region and used as a simple method to help showcase farmers that are minimizing their nitrogen inputs and still maintaining great yields.

The last two NMI seasons have shown the benefit and nitrogen producing potential of soil organic matter. For estimates on soil mineralization and plant nitrogen uptake potential, refer to the summary reports from the advanced scientific trials located at the beginning of the Southeast Minnesota section of this report titled **"Effects of Nitrogen Rate and Application Timing on 2016 Corn Yield"**. These advanced trials measured the amount of nitrogen supplied by soil organic matter alone, as well as the nitrogen Fertilizer Recovery Efficiency of the actual applied nitrogen, which generally only averaged around 50-60% in 2016. Results of almost all of the individual NMI field trials reflect similar results with no response to additional nitrogen for another above-average growing season with record yields experienced by many Minnesota farmers.

NUE values are a simple method to help highlight advanced nitrogen management practices and yields from within the same region. NMI participants can review the results of all the other trials and evaluate the factors they feel contributed to the outcomes. The top three NUE practices are listed on the initial summary page of each region. Below is a table highlighting some of the statewide farmers that had field practices which used the least amount of nitrogen to produce a bushel of corn. The asterisk (*) marks a field trial on peat soil, with an organic matter level of 38.7%, which again confirms the soils ability to provide nitrogen during the growing season.

	2016 NMI Top Nitrogen Use Efficient (NUE) farmers Total Nitrogen Rate / Yield = pounds of nitrogen per bushel											
NUE (N rate/ yield)	Field Trial ID	Region	County	Previous Crop	Total N Rate (lbs/ac)	Yield (bu/ac)	Variety	Trial type	Page #			
.33	*DPSCR*	South Central	Blue Earth	Corn	66	201.3	DKC 46-20	Rate	80			
.42	SFNWR2	Northwest	Norman	Dry Beans	88.5	211.4	Dekalb 43-10	Rate	129			
.43	JBSES	Southeast	Fillmore	Soybeans	100	232.2	Dekalb 50-84	Stabilizer	70			
.48	SFNWR1	Northwest	Norman	Dry Beans	101	210.4	Dekalb 38-03	Rate	128			
.50	GKSWR	Southwest	Nobles	Soybeans	120	237.7	Dekalb 54-38	Rate	115			
.50	RNSET	Southeast	Olmsted	Corn	103	208.0	na	Timing	35			
.52	GLSER	Southeast	Wabasha	Soybeans	136	262.5	DKC54-40VT2P	Rate	49			
* peat so	il											

Environmental Considerations

Today's farmers are very mindful of not only the economic challenges associated with nutrient management decisions, but also of the fate of excessive nutrient losses to the environment. Water quality issues are becoming much more well-known and often the target of news stories and releases. University of Minnesota research has continually shown that applying nitrogen rates at or near the Economic Optimum Nitrogen Rates (EONR) and following nitrogen best management practice (BMP) guidance can ensure maximum profits while minimizing the risk of nitrate losses to surface and ground water sources. Overall results of the 2015-2016 NMI rate trials across Minnesota indicated that rate reductions of a minimum of thirty pounds of nitrogen per acre did not have any negative effect on yield, but rather provided an avenue to reduce inputs to improve economic return.

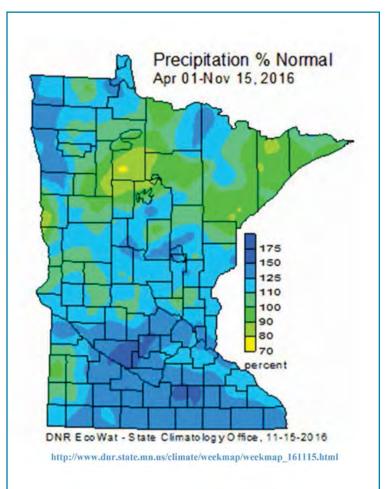
With increased scrutiny of our water resource quality, responsible nutrient management decisions will become even more important in the future. NMI is by no means the silver bullet to solve water quality issues, but participation can certainly help to relay the interest of farmers and ag-industry in working together to protect our water quality. NMI also opens the door to allow participants to share, evaluate, and develop new strategies to enhance nitrogen management practices to protect economic and environmental performance.

2016 year in review

With the exception of a few areas, favorable temperatures and rainfall were maintained throughout the growing season. Many areas received above average and timely rains throughout the season. For most parts of the state, the past two growing seasons have been above average. NMI trial results need to be considered based to these conditions which may not reflect average growing seasons.

Record Yields

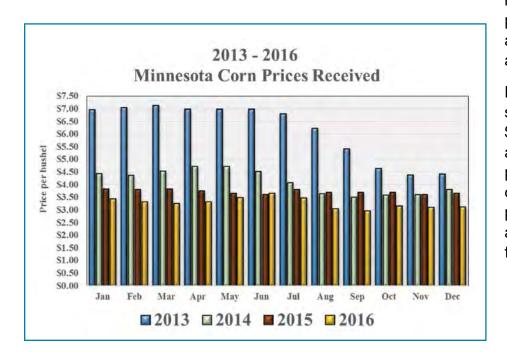
The 2016 crop year was another exceptional year across the state for both corn and soybeans. For the second year in a row, Minnesota farmers set records for corn and soybeans yields. Corn yields averaged 193 bushels per acre, 5 bushels per acre above the previous record set in 2015. Soybean yields averaged 52.5 bushels per acre, 2.5 bushels per acre above the previous record, also set in 2015.



High yields were needed again this year to offset the low prices of both corn and soybeans. Even in the central sand plains of Minnesota, dry land corn acres often averaged over 160 bushels per acre in areas where less than 100 bushels per acre would be normal.

Corn prices did not average over \$4.00 per bushel at any time in 2016, according to the latest data from the USDA National Agricultural Statistics Service (NASS). However, soybean prices rebounded from 2015 topping out over \$10.00 in the summer of 2016, before falling below \$9.00 for most of the fall.

Cropland cash rents in Minnesota remained relatively high in 2016, averaging \$170 per acre, slightly below the all-time high of \$186 in 2014 and \$11 less than in 2015. Cropland values also remained



relatively high, averaging \$4,700 per acre, down slightly from the all-time high of \$4,870 in 2014 and \$50 less than in 2015.

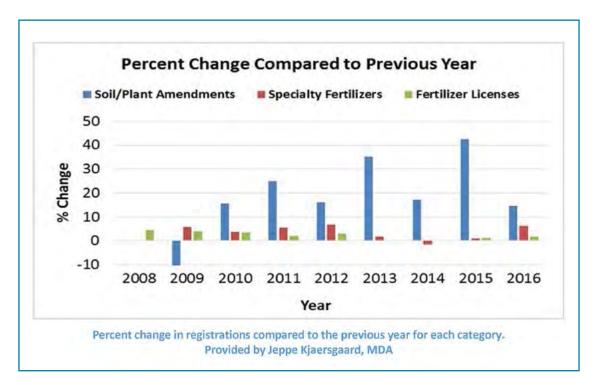
Nitrogen inputs were also down slightly in 2016 ranging from \$0.27 per pound of nitrogen for anhydrous ammonia and \$0.37 per pound for urea in December of 2016, down from \$0.33 per pound of nitrogen for anhydrous ammonia and \$0.38 per pound for urea in December of 2015.

Increase in fertilizer licenses, specialty fertilizers, and soil and plant amendment registrations at MDA

The number of fertilizer licenses, specialty fertilizer and soil & plant amendment consumer products continues to increase, according the MDA's license and registration database. During 2016, the MDA issued 1939 fertilizer licenses which is 2% more than in 2015. A fertilizer license must be obtained by anyone who sells or distributes fertilizer, custom applies fertilizer or manufactures, blends or otherwise manipulates fertilizer. The number of fertilizer licenses has increased by 21% since 2007.

A combination of 372 companies registered a total of 4384 specialty fertilizers, representing an increase of over 6% compared to 2015. The number of specialty fertilizer registrations has increased by 34% since 2008.

Soil and plant amendment registrations increased to 557 in 2016, which is 15% more than in 2015. Soil & plant amendments are materials intended to improve plants, seed or soil to improve certain desirable characteristics. Soil and plant amendment product registrations have increased by 284% since 2008.



Summary

Organizing and evaluating the results from the NMI is difficult and is by no means a substitute for the reliable, research based results that are delivered by the University of Minnesota. Each site is unique with different farming practices, field variability, and weather patterns that can influence results. The purpose of NMI trials is simply to provide farmers an opportunity to compare different nitrogen practices on their own farms and evaluate other trials from the same region. The NMI can go a long way to help relay the positive efforts farmers are already making on their farms, as well as serve another great tool to help open discussion on ideas that can help benefit water quality in Minnesota.

Thank you to all everyone who participated and assisted with the NMI in 2016. Several new ideas were generated from participants, which should result in an expansion of field trial options in the future. Our goal is to continue to improve and expand the NMI program to become a more valuable tool for Minnesota farmers and crop advisers to not only use, but also to showcase their commitment to advancements that benefit water quality. 2017 NMI enrollment will offer increased enrollment throughout Minnesota and will have a more regional focus that provides additional information to participants on a local level.

For more information about the Nutrient Management Initiative go to:

www.mda.state.mn.us/nmi

Ryan Lemickson, Minnesota Department of Agriculture

Southeast

2016 Nutrient Management Initiative (NMI)

Dawn Bernau Minnesota Department of Agriculture 3555 9th Street NW, Suite 350 Rochester, Mn 55901 507-206-2881 Dawn.Bernau@state.mn.us \bigcirc \bigcirc 0000 **Field Trial Type** \bigcirc \bigcirc • Rate (9) • Timing (21) Rate after Manure (6) \bigcirc • Stabilizer (5) \bigcirc \bigcirc • Rate after Alfalfa (1) • Source (1) \bigcirc

Southeast Table of Contents

Southeast BMP region summary tables	
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Corn following Corn

fect of Nitrogen Rate and Application Timing on 2016 Corn Yield	
Harmony site	14
Greenleafton site	16
Nitrogen Use Efficiency summary	18
Nitrogen Rate trials	19
Nitrogen Rate after manure trials	21
Nitrogen Timing trials	27
Nitrogen Stabilizer trials	37

Corn following Soybeans

	Effect of N Rate and Timing on 2016 Corn Yield	
	Grandmeadow South	8
	Grandmeadow North	1
	Nitrogen Rate on 2016 Corn Yield	
	Fountain site	2
	Elgin site	4
Nit	trogen Use Efficiency summary	6
•	Nitrogen Rate trials	7
•	Nitrogen Timing trials	3
	Effect of Nitrification Inhibitor on 2016 Corn Yield-Dover site	3
	Effect of Urease Inhibitor on 2016 Corn Yield – Arendahl site 6	5
•	Nitrogen Stabilizer trials 6	7
	Nitrogen rate after alfalfa7	1

Southeast BMP Region S U M M A R Y

Averages											
	All trial practices combined				Rate trials		Timing trials	Stabilizer trials			
Previous Crop	Total N (ac)	Yield (bu/ acre)	NUE (rate/ yield)	Price per pound of N	Additional N (Ibs)	Yield from additional N (bu)	Split App Advantage (bu)	Stabilizer Advantage (bu)	Stabilizer Cost (ac)		
Corn	177.84	218.11	0.84	\$0.38	39.69	3.53	2.89	0.29	\$12.50		
Soybeans	152.04	217.59	0.70	\$0.41	35.71	3.72	0.32	1.43	na		
Alfalfa	139.00	235.33	0.59	\$0.41	50.00 0.00						
Averages	156.29	223.68	0.71	0.40	41.80	2.42	1.61	0.86	12.50		

The average cost for a pound of nitrogen was **\$0.40**. When considering an average of all nitrogen rate trials, an additional 41.80 lbs N/ acre cost **\$16.72** per acre, resulting in an average yield difference of only **2.42** bushels/acre in 2016.

	CORN AFTER CORN: Top Nitrogen Use Efficiencies (NUE)										
Total N Rate/Yield - Ibs of N Per Bushel											
Page NUE County Trial Practice ID Total N Rate (lbs/ac) Yield (bu/ac) Variety Type of Trial											
35	0.5	Olmsted	RNSETalt	103	208	na	Timing				
35	0.52	Olmsted	RNSETnorm	103	199.6	na	Timing				
23	0.55	Winona	BGSERMalt	108	195	Dekalb 5284	Rate after Manure				

	CORN AFTER CORN: Top Yields											
	bu/acre											
Page Yield (bu/ ac) County Trial Practice ID NUE Total N Rate (lbs/ac) Variety Type of												
32	250.3	Olmsted	JLSETnorm	0.74	186	DKC 49-72 SS	Timing					
37	248.1	Wabasha	TBSETalt	0.73	180	DKC 53-56 SS	Timing					
32	247	Olmsted	JLSETalt	0.75	186	DKC 49-72 SS	Timing					

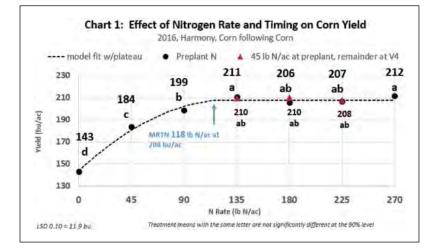
	CORN AFTER SOYBEANS: Top Nitrogen Use Efficiencies (NUE)										
Total N Rate/Yield - Ibs of N per bushel											
Page	Page NUE County Trial Practice ID Total N Rate (lbs/ac) Yield (bu/ac) Variety Type of Trial										
70	0.43	Fillmore	JBSESnorm	100	232.2	Dekalb 50-84	Stabilizer				
70	0.45	Fillmore	JBSESalt	100	223.1	Dekalb 50-84	Stabilizer				
49	0.52 Wabasha GLSERnorm 136 262.5 DKC54-40 VT2P Rate										

	CORN AFTER SOYBEANS: Top Yields										
bu/acre											
Page Yield (bu/ac) County Trial Practice ID NUE Total N Rate (lbs/ac) Variety Type of Tr											
49	262.5	Wabasha	GLSERnorm	0.52	136	DKC54-40 VT2P	Rate				
49	259.1	Wabasha	GLSERalt	0.72	186	DKC54-40 VT2P	Rate				
56	249.3	Olmsted	DTSETalt	0.6	150	DKC 50-84 VT2P	Timing				

Effect of Nitrogen Rate and Application Timing on 2016 Corn Yield Harmony Site, Fillmore County, Minnesota

Parameter	Plot Details
Test:	Nitrogen rate and timing
Previous Crop:	Corn
Hybrid:	Dyna-Gro D39SS17 RIB
Tillage System:	Conventional tillage
N Applic. / Plant Date:	April 15, 2016 / April 25, 2016
N Source:	Urea-bdcst with DCD/NBPT (Agrotain Plus)
Sidedress Date/Form:	June 2, 2016, Urea-bdcst
Population:	35,000 planted/33,500 actual
Plot Design:	Randomized block (CRBD), 4 reps.

Harmony Weather Station Measure	April-June	July-Sept
% of normal precipitation:	-9%	+113%
% of days with more than 1.0" rainfall:	1%	10%



Soil Fertility Measure	Plot Values	
Soil Type:	Tama Silt Loam	
O.M.%:	4.5% (high)	
pH:	5.9 (5.8-7.0 normal)	
CEC:	25.4 meq/100 g	
Bray P1:	42 ppm (very high)	HAN A
Potassium:	183 ppm (very high)	

Avg of treatments sampled at 0-6"depth on 4/13/16

Maximum **R**eturn **T**o **N**itrogen (MRTN) is the rate that optimizes net profit. Rates near the MRTN can also reduce risk of nitratenitrogen leaching to groundwater and surface water.

To determine the MRTN rate, spring 2016 market prices of **0.40/lb N** fertilizer and **\$3.50/bu** corn were entered into an on-line tool called the <u>Corn Nitrogen Rate Calculator</u>. The corn following corn recommendation at these prices is to apply between **142-164 lb N/ac** with a likely best rate of **153 lb N/ac**. The normal N application rate to this field is **211 lb N/ac**.

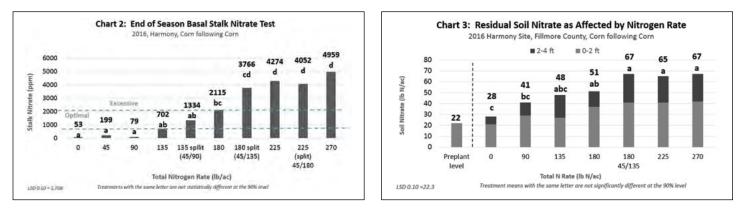
Chart 1 shows the corn yield and nitrogen rate relationship for this plot. Using this curve, the <u>calculated</u> MRTN was **118 lb N/ac** with a yield of **208 bu/ac**. Due to minimal early season leaching rains, split N applications did not increase yield. Net returns using <u>actual</u> 2016 prices can be seen in the economics table below.

	2016 Economics										
Total N Rate (Ib N/ac)	Timing	Average Yield (bu/ac) LSD = 8	Average Moisture (%) LSD = 0.4	Drying Cost (\$/ac)	N Cost (\$/ac)	Net Return (\$/ac)	Profit Rank				
0	Preplant	143 (d)	22.1 (a)	\$30	\$0	\$397	10				
45	Preplant	184 (c)	21.3 (bc)	\$35	\$18	\$499	7				
90	Preplant	199 (b)	21.4 (bc)	\$38	\$36	\$522	3				
135	Preplant	211 (a)	21.3 (b)	\$40	\$54	\$540	1				
135 (45/90)	Preplant + V4	210 (ab)	21.3 (b)	\$40	\$62	\$528	2				
180	Preplant	206 (ab)	21.7 (c)	\$41	\$72	\$505	5				
180 (45/135)	Preplant + V4	210 (ab)	21.6 (bc)	\$42	\$80	\$509	4				
225	Preplant	207 (ab)	21.7 (c)	\$42	\$90	\$489	6				
255 (45/180)	Preplant + V4	208 (ab)	21.5 (bc)	\$40	\$98	\$484	9				
270	Preplant	212 (a)	21.6 (ac)	\$42	\$108	\$485	8				

COLOR KEY = #1 Rank

Assumptions: Corn price \$3.00/bu. (avg. Oct. 2016 price), and .40/lb urea. A \$.03/bu. deduction was used for every moisture point over 15.0%. Extra application costs associated with the in-season split application had an assumed cost of \$8/ac. Treatment means with the same letter in the respective column are not significantly different at the 90% level. Least significant difference (LSD) is the amount needed to be considered statistically different from the treatment mean.

Effect of Nitrogen Rate and Application Timing on 2016 Corn Yield



- The optimal range for the end of season basal stalk nitrate test is 700-2,000 ppm. Stalk nitrate concentrations below 700 ppm may indicate nitrogen deficiencies while levels above 2,000 ppm may indicate excessive nitrogen. Tests indicated that rates above **180 lb N/ac** were considered excessive (chart 2).
- Preplant soil nitrate levels prior to spring N treatment application was 22 lb N/ac at 0-2' depth.
- Soil nitrate samples collected at the end of the season indicate how much nitrogen was left over (chart 3). Higher residual soil nitrate (RSN) levels could increase nitrate-nitrogen leaching risk to groundwater and surface water. The amount of RSN measured after harvest at 4' depth in the 135 lb N/ac treatment averaged 48 lb N/ac. The amount of RSN measured in the 225 lb N/ac treatment was 65 lb N/ac. Higher N rates resulted in 17 lb N/ac more RSN, but were not significantly different. Excessive rains late in the season, 113% above normal, likely leached away any potential differences.

N Rate Ibs N/ac	Average Yield bu/ac LSD = 11.9	Total Corn N Uptake Ibs N/ac	N Supplied by Soil %	N Fertilizer Recovery %	Bushels produced per unit of N bu/lb N
0 (check)*	143 (d)	106			
45	184 (c)	135	79%	63%	4.0
90	199 (b)	158	67%	58%	2.2
135	211 (a)	178	60%	53%	1.6
135 (45/90)	210 (ab)	178	60%	53%	1.6
180	206 (ab)	173	62%	37%	1.1
180 (45/135)	210 (ab)	181	59%	42%	1.2
225	207 (ab)	182	58%	34%	0.9
225 (45/180)	208 (ab)	179	59%	32%	0.9
270	212 (a)	192	55%	32%	0.8

Nitrogen Uptake and Use Efficiency

Treatment means with the same letter in the respective column are not significantly different at the 90% level. Least significant difference (LSD) is the amount needed to be considered statistically different from the treatment mean.

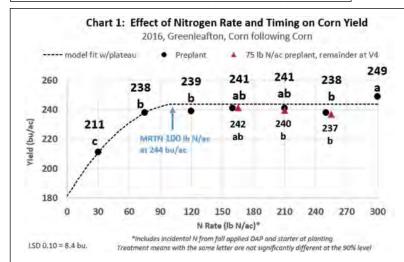
- The total N uptake in the grain and stover for the check rate was 106 lb N/ac. This is an indication of how much N was supplied by the soil. Across all treatments about 62% of the corn N uptake was from the soil.
- The amount of N fertilizer recovered by the 135 lb N/ac treatment was 53%. The amount of N fertilizer recovered by the 225 lb N/ac rate was 34% resulting in 19% percentage point lower nitrogen use efficiency (NUE).
- The 135 lbs N/ac treatment produced 0.7 bu/ac more corn per unit of N applied when compared to the 225 lb N/ac rate.

February 2017, Kevin Kuehner, Jeff Vetsch

Effect of Nitrogen Rate and Application Timing on 2016 Corn Yield Greenleafton Site, Fillmore County, Minnesota

Parameter	Plot Details
Test:	Nitrogen rate and timing
Previous Crop:	Corn
Hybrid:	Dekalb DKC 54-38
Tillage System:	Conventional tillage
N Applic. / Plant Date:	April 15, 2016 / April 22, 2016
N Source:	Urea-bdcst with DCD (Agrotain Ultra)
Sidedress Date/Form:	June 2, 2016, Urea-bdcst
Population:	35,000 planted/33,800 actual
Plot Design:	Randomized block (CRBD), 4 reps.

Harmony Weather Station Measure	April-June	July-Sept
% of normal precipitation:	-9%	+113%
% of days with more than 1.0" rainfall:	1%	10%



Soil Fertility Measure	Plot Values	
Soil Type:	Tama Silt Loam	
O.M.%:	4.5% (high)	
pH:	5.9 (5.8-7.0 normal)	
CEC:	25.4 meq/100 g	
Bray P1:	42 ppm (very high)	
Potassium:	183 ppm (very high)	

Avg of treatments sampled at 0-6"depth on 4/13/16

Maximum Return To Nitrogen (MRTN) is the rate that optimizes net profit. Rates near the MRTN can also reduce risk of nitratenitrogen leaching to groundwater and surface water.

To determine the MRTN rate, spring 2016 market prices of **0.40/Ib N** fertilizer and **\$3.50/bu** corn were entered into an on-line tool called the <u>Corn Nitrogen Rate Calculator</u>. The corn following corn recommendation at these prices is to apply between **142-164 Ib N/ac** with a likely best rate of **153 Ib N/ac**. The normal N application rate to this field is **203 Ib N/ac**.

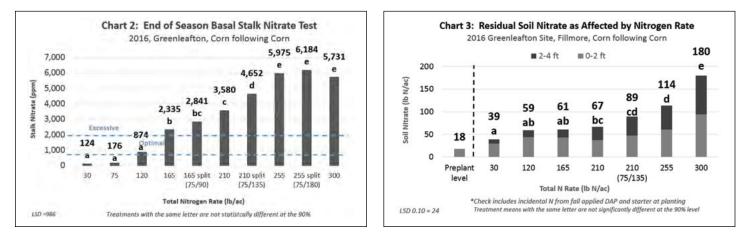
Chart 1 shows the corn yield and nitrogen rate relationship for this plot. Using this curve, the <u>calculated</u> MRTN was **100 lb N/ac** with a yield of **244 bu/ac**. Due to minimal early season leaching rains, split N applications did not increase yield. Net returns using <u>actual</u> 2016 prices are in the economics table below.

		2016	Economics				
Total N Rate (Ib N/ac)	Timing	Average Yield (bu/ac) LSD = 8	Average Moisture (%) LSD = 0.4	Drying Cost (\$/ac)	N Cost (\$/ac)	Net Return (\$/ac)	Profit Rank
30 (check)*	Preplant	211 (c)	20.1 (a)	\$32	\$12	\$589	8
75	Preplant	239 (b)	18.9 (b)	\$28	\$30	\$659	1
120	Preplant	239 (b)	19.6 (c)	\$33	\$48	\$636	2
165	Preplant	241 (ab)	19.8 (ac)	\$35	\$66	\$622	3
165 (75/90)	Preplant + V4	242 (ab)	19.6 (c)	\$33	\$74	\$619	4
210	Preplant	243 (ab)	19.7 (c)	\$34	\$84	\$611	5
210 (75/135)	Preplant + V4	240 (b)	19.7(c)	\$34	\$92	\$594	6
255	Preplant	238 (b)	19.6 (c)	\$33	\$102	\$579	9
255 (75/180)	Preplant + V4	237 (b)	19.7 (c)	\$33	\$110	\$568	10
300	Preplant	212 (a)	21.6 (ac)	\$42	\$108	\$485	8

COLOR KEY = #1 Rank

Assumptions: Corn price \$3.00/bu. (avg. Oct. 2016 price), and .40/lb urea. A \$.03/bu. deduction was used for every moisture point over 15.0%. Extra application costs associated with the in-season split application had an assumed cost of \$8/ac. Treatment means with the same letter in the respective column are not significantly different at the 90% level. Least significant difference (LSD) is the amount needed to be considered statistically different from the treatment mean. *The test plot including the check treatment received 30 lb N/ac of incidental N from fall applied liquid MAP and starter at planting.

Effect of Nitrogen Rate on 2016 Stalk Nitrate and Residual Soil Nitrogen Tests



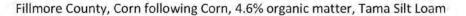
- The optimal range for the end of season basal stalk nitrate test is 700-2,000 ppm. Stalk nitrate concentrations below 700 ppm may indicate nitrogen deficiencies while levels above 2,000 ppm may indicate excessive nitrogen. Tests showed that rates above **120 lb N/ac** were considered excessive (chart 2).
- Preplant soil nitrate levels collected in early April prior to spring N treatment application (some N was applied with fall DAP) measured **18 lb N/ac** at 0-2' depth.
- Soil nitrate samples collected at the end of the season indicate how much nitrogen was left over (chart 3). Higher residual soil nitrate (RSN) levels could increase nitrate-nitrogen leaching risk to groundwater and surface water. The amount of RSN measured after harvest for the 120-165 lb N/ac treatments averaged 60 lb N/ac. The amount of RSN measured in treatments with more than 210 lb N/ac were significantly different and contained an average of 87 lb N/ac more RSN. Excessive rains late in the season, 113% above normal, likely leached away any potential significant differences between the other N rate treatments.

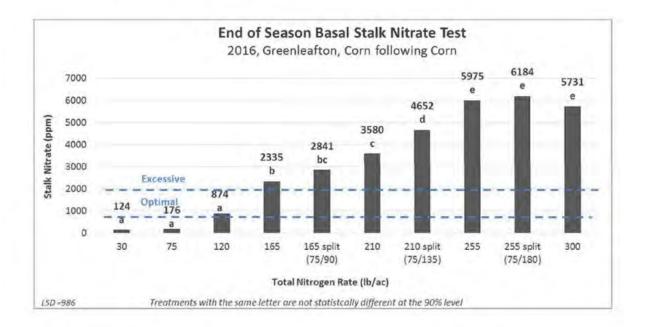
Nitrogen Uptake and Use Efficiency

N Rate Ibs N/ac	Average Yield bu/ac LSD = 8	Total Corn N Uptake Ibs N/ac	N Supplied by Soil %	N Fertilizer Recovery %	Bushels produced per unit of N bu/lb N			
30 (check)*	211 (c)							
75	239 (b)				3.2			
120	239 (b)				2.0			
165	241 (ab)	Du	Due to the significant amount of incidental					
165 (75/90)	242 (ab)	N source	es in the test plot and the	check (50 lb N/ac),	1.5			
210	243 (ab)	these	oarticular NUE indices wer	e not calculated.	1.2			
210 (75/135)	240 (b)				1.1			
255	238 (b)				0.9			
255 (75/180))	237 (b)				0.9			
300	249 (a)				0.8			

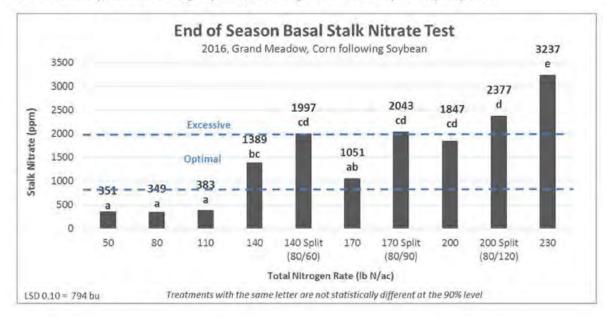
February 2017, Kevin Kuehner, Jeff Vetsch

GREENLEAFTON Site

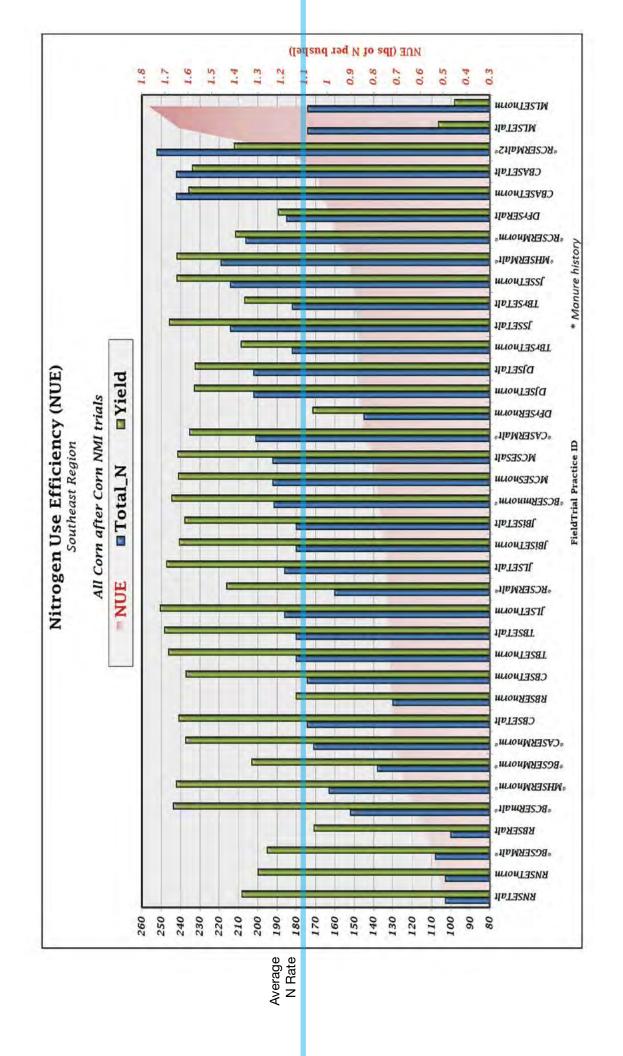




GRAND MEADOW Site



Mower County, Corn following Soybean, 4.6% organic matter, Tripoli Silty clay Loam



Field Trial ID		DFrSER Trial County						ate	N source Cost/tor 46% N		46-0-0 \$379 \$0.41
Previous Crop Corn			Soil Tes	Info	vv	hitewate		Field 1		\$0.41	
	2016	NMI		Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	11/7/14 2.1 6.8 33 105		Variety Popula Row W Plantin Harves Soil Te Tillage Manur Alfalfa Irrigato	tion /idth g Date t Date xture e Histe Histo	e ory	21920 II	0193AM2 32100 30 4/16/10 11/5/10 silt loan No-Til No No No
0 lbs N sided	1.2024.2						N	lorn	al Pra	ctice	
source	S ton	rate		application	1	N	P	K	S	stabil	izer
46-0-0 21-0-0-24 7-23-5	\$379 \$395 \$709	260 100 55	Spring Preplant Broadcast Spring Preplant Broadcast At Planting Band			120 21 4	13	4	24	Agrol Agrol	tain
Stabilizer Cost / ac	\$0			Totals		145	13	4	24		_
40 lbs N side	dress						Alt	terna	itive P	ractice	
source	\$ ton	rate	\$	application		N	Р	K	S	stabil	izer
46-0-0 21-0-0-24 7-23-5	\$379 \$395 \$709	260 100 55	Spring I At	Preplant Broadcas Preplant Broadcas Planting Band		120 21 4	13	4	24	Agrot Agrot	tain
46-0-0	\$370	87	Sid	edress Dribble		40				Agro	lain
Stabilizer cost / ac	SO			Totals		185	13	4	24		
195 190			Y	ields By Pra	ctice			189.3			
190 185 180 175 170 170 165 160 155			21.3	NITROGEN P	0.457165		40) lbs SD			

Practice	Total N Rate	ID	Yield	NUE	N cost per acre ²	N cost per bushel ²	Moisture	Test Weight	
0 lbs N sidedress	145	DFrSERnorm	171.3	0.85	\$49.43	\$0.29	23.9	na	
40 lbs N sidedress	185	DFrSERalt	189.3	0.98	\$65.91	\$0.35	24.0	na	

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)
 ² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

Field Trial ID Previous Crop		RBSE	CR	Trial County Township		1	rogen R Fillmore lot Mou		N sour Cost/to 28%		28-0-0 n n
	-		21.04	Soil Tes	t Info				Field	l Info	
Te		_		Date OM% pH Nitrogen	4/16/15 3.5 7.1		Variety Popula Row W Plantin	tion /idth		De	kalb 49-7 34 3 4/25/1
				P (bray) P (olsen)	8		Harves Soil Te	t Date xture			11/2/10
	2016	NM		Potassium Sulfur Zinc	102 10 1.2		Tillage Manur Alfalfa Irrigat	e Histo Histo	ory	all Chisel &	Spring FC No No No
120 lbs N pre		NML				_			al De	actice	1.
source	\$ ton	rate	41	pplication	- 1	N	P	K	S	stabi	lizor
28-0-0 18-46-0	5 101	40 25	Spring P At P	replant Broadcas lanting Band	t	120 4.5	11.5		3	Stau	uzer
0-0-60 21-0-0-24		50 25		lanting Band lanting Band		5.25		30	6		
Stabilizer Cost / ac	\$0			Totals		130	12	30	6		_
90 lbs N prep	lant						Al	terna	ative l	Practice	
source	\$ ton	rate	aj	pplication	-	N	Р	K	S	stabi	lizer
28-0-0 18-46-0 0-0-60		30 25 50	At P	replant Broadcas lanting Band lanting Band	t	90 4.5	11.5	30			
21-0-0-24		25		lanting Band		5.25		23	6		
Stabilizer cost / ac	\$0			Totals		100	12	30	6		_
210			Yi	elds By Pra	ctice						_
200	6.4				192.6				194.3		
VIELD (BU/ACRE) 180 170 160		169.8		165.4			177.8			166.8	6
160 150 140			149.8							_	-
120	lbs N	90 lbs N	90 lbs N	120 lbs N NITROGEN F	90 lbs N PRACTICE	1	20 lbs N	2	20 lbs N	0 Cheo	k

130

100

120 lbs N preplant

90 lbs N preplant

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)
 ² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

RBSERnorm

RBSERalt

179.9

170.7

0.72

0.58

na

na

14.0

14.1

na

na

56.3

56.3

Field Trial ID Previous Crop			SERM Corm	Trial County Township		1	rogen F Wabash Iainvie	a	N sour Cost/to 82%		82-0- \$56 \$0.3
A	IT T	100	A	Soil Tes	t Info				Field	Info	
		1		Date	4/8/15		Variet	у		DKC	44-13 S
1		117	A CONTRACTOR	OM%	3.1		Popula				3450
	111	1	1.0	рН	6.9		Row V				3
1		14	COM.	Nitrogen	70		Planti				4/23/1
40.00	111		1 48M	P (bray) P (olsen)	72		Harve: Soil Te				10/5/1 silt loar
			1.1	P (olsen) Potassium	244		Tillage			Cor	ventiona
			100	Sulfur	244		Manu		orv	co	Ye
And and A		_	- Y	Zinc			Manu			Be	ef (Cows
2	016 NI	MI					Liquid				Soli
	22001						Alfalfa				N
140 lbs N prepla	nt					-	1	Norn	nal Pra	actice	
source	S ton	rate	a	pplication		N	Р	K	S	stabil	lizer
Manure Credits Year 1	0.0	20 ton	Pre	vious Credits		30					
32-0-0	\$565	170		g Preplant Band	1	140					
8-46-0	\$465	60	At F	Planting Band		11	28				
)-0-60	\$365	140		Planting Band		1.1	1.1	84	1.00		
21-0-0-24	\$379	50	At F	Planting Band		10.5			12		
						_					
Stabilizer Cost / ac	\$0	_		Totals		192	28	84	12		_
100 lbs N prepla	ant	_					_	-	ative I	ractice	-
source	S ton	rate		pplication		N	Р	K	S	stabil	izer
Manure Credits Year 1	10.13	20 ton		vious Credits	1 C C C	30	100	1.1			
32-0-0	\$565	120		g Preplant Band	1	100	in the				
8-46-0	\$465	60		Planting Band		11	28	5.5			
)-0-60	\$365	140	100 C	Planting Band		10.00		84			
21-0-0-24	\$379	50	At F	Planting Band		10.5			12		
Stabilizer cost / ac	\$0			Totals		152	28	84	12		
255				lds By Pra	ctice						
250		2	49.6	244.5				244.0			
ju 245 239.	2			244.5	243.	3		244.0		243.6	
240	-	_		100							
2							-				
/ng) 235							-				
/ng) 013	-										
8) 230 225 225					-						
220											
	bs	14	10 lbs	140 lbs	100 lb	s N	1	00 lbs N	1	100 lbs N	
220 215 140 II		and the second se	-	NITROGEN	PRACTICE					-	Test
220 215		14 N Rate	IO Ibs			N cos	st per	N cr	ost per	100 lbs N Moisture	Test Weight
220 215 140 Jk	Total	and the second se	-	NITROGEN	PRACTICE	N cos	st per	N co bu		-	Test Weight 57.2

\$34.45

\$0.14

56.7

18.5

152

100 lbs N preplant

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)
 ² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

BCSERMalt

243.6

0.62

Field Trial ID Previous Crop			ERM om	Trial County Township		N Rate	after M Winona Utica		N source Cost/ton 82% N		82-0- \$49 \$0.3
(and the second	eit.	2		Soil Test	Info		27	. 1	Field In	nfo	16
				Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur	7/6/05 3.2 6.6 20 120		Variet Popula Row W Plantin Harves Soil Te Tillage Manun	ition Vidth ng Date st Date exture re Histo	ory	Conv	alb 528 3(4/19/1) ventiona Ye
20	016 NM	π		Zine			Manur Liquid			ltry (Hen	Solic
		-					Alfalfa	Histor	ry		No
80 lbs N sidedres	-								al Prac		_
source 82-0-0	\$ ton	rate 97		pplication edress Band		N	Р	K	S	stabil	izer
Manure Credits Year 2	\$490 \$50	60	10 P P P P P P P P P P P P P P P P P P P	vious Credits		80 38					
32-0-0	\$230	44.4		plant Dribble/Sp	ray	14					
12-0-0-26	\$250	44.4	Spring Pre	plant Dribble/Sp	ray	5.5			11.5		
Stabilizer Cost / ac	\$0			Totals	_	138	0	0	12		_
50 lbs N sidedres	is						Alt	erna	tive Pr	actice	
source	\$ ton	rate	aj	pplication	1	N	Р	K	S	stabil	izer
82-0-0	\$490	61		edress Band		50					
Manure Credits Year 2	\$50	60		vious Credits	_	38					
32-0-0	\$230	44.4		plant Dribble/Sp		14					
12-0-0-26	\$250	44,4	Spring Pre	plant Dribble/Sp	ray	5.5			11.5		
Stabilizer cost / ac	\$0			Totals		0 108	0	0	12		_
			Vie	lds By Prac	tice						
220			206.0				208.0				
210 200 196.0	19	95.0		194.0	196.0						
190 III											
180	_								176.0		
200 196.0 190 180 180 170 170			-					-		165.0	P
▶ 160			-					-			
150 80 lbs SD	50 1	bs SD	80 lbs SD	50 lbs SD NITROGEN PRA	50 lbs SD	80) lbs SD	c	heck, 9	Check,	1
Practice	10000	N Rate	ID	Vield	NUE	N cos	t per	N co	st per	Moisture	Test

Practice	Total N Rate	ID	Vield	NUE	N cost per acre ²	N cost per bushel ²	Moisture	Test Weight
80 lbs N sidedress	138	BGSERMnorm	203.0	0.68	\$24.00	\$0.12	na	na
50 lbs N sidedress	108	BGSERMalt	195.0	0.55	\$15.00	\$0.08	na	na

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)
 ² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

Field Trial ID Previous Crop			SERM Corn	Trial County Township			e after M Winona Utica		N sou Cost/t 46%		46-0- \$37 \$0.4
2	016 NR	AI		Soil Te Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	st Info 10/14/15 4.1 6.6 32.4 268.1		Variety Popula Row W Plantin Harves Soil Te Tillage Manur Manur Type	tion Vidth ng Date at Date exture re Histo re Type	ory	Con	P033 3600 2: 4/19/10 loam ventiona Ye Solia
120 IL N. 11. 1.							Alfalfa	_			N
138 lbs N sidedr	1					120	-	-	-	actice	
source 10-18-4 46-0-0 21-0-0-24 0-0-60 Manure Credits Year 1 Manure Credits Year 2	\$ ton \$775 \$375 \$360 \$372	state 5 300 50 50 50	At I Spring F Spring F Spring F	Pplication Planting Band Preplant Broadca Preplant Broadca Preplant Broadca Preplant Broadca	st st	N 5.3 138 10.5 17	P 9.5	к 2.1 30	S 12	stabi	lizer
Stabilizer Cost / ac	S 0			Totals		171	10	32	12		
168 lbs N sidedr	ess						Alt	erna	tive I	ractice	
source	S ton	rate	a	pplication		N	Р	K	S	stabi	lizer
10-18-4 46-0-0 21-0-0-24 0-0-60 Manure Credits Year 1	\$775 \$375 \$360 \$372	5 365 50 50	Spring F Spring F Spring F	Planting Band Preplant Broadca Preplant Broadca Preplant Broadca Preplant Broadca	st st	5.3 168 10.5	9.5	2.1 30	12		
Manure Credits Year 2			1 0			17					
Stabilizer cost / ac	S 0			Totals		201	10	32	12		
			Yie	elds By Pra	ctice						
250 245									244.3		
				235.					-		
Q 235	23	0.1									
(32) 240 235 230 230 225 225 220											
Q 225											
₩ 220 215											
210									_		
	138	lbs N		168 lb: NITROGEN PI					138 lbs	N	
						Num	st per	Non			Test
Practice	Total !	N Rate	ID	Yield	NUE			1.2.2.2.2	st per	Moisture	and the second second
Practice 138 lbs N sidedress	Total I		ID CASERMnon		NUE ¹ 0.72	ac	re ²	bu	st per shel ²	Moisture	Weigh

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

Field Trial ID Previous Crop		MHS Corn S		Trial County Township	1		e after M Olmstec Elmira		N sour Cost/to 46%		46-0-0 \$390 \$0.42
6		-		Soil Test I	nfo		_		Field 1	Info	
() Contraction of the	-	-		Date 1	1/3/14		Variet		G	old Country	
		-	X	OM%	3.4		Popula				3500
			- 11	pH	6.6		Row W				3
			311	Nitrogen	120			ng Date			4/22/10
				P (bray) P (olsen)	136		Harves Soil Te				silt loan
1 Second				Potassium	696		Tillage			Spring Tilla	
	1 - 1			Sulfur	070			re Histo		opring rine	Ye
500		-1-1-		Zinc	5.5			re Type		Dairy	(Cows
		-	/				Туре				Liqui
20	16 NM	u				_	Alfalfa	Histor	у		N
0 lbs N sidedress							N	lorma	al Pra	ctice	
source	S ton	rate	a	pplication		N	P	K	S	stabili	zer
46-0-0	\$390	195	Spring I	Preplant Broadcast		90	1			Hydra H	lume
Manure Credits Year 1	2.1	3000		eplant Broadcast		30.5	39	117	20		
0-0-62	\$399	100		Preplant Broadcast			1.0	62			
21-0-0-24	\$379	100		Preplant Broadcast		21			24		
10-34-0	\$510	35		lanting Dribble		3.5	12				
28-0-0 12-0-0-26	\$289 \$425	53 22		anting Dribble anting Dribble		15 2.5		14	6		
12-0-0-20	\$425	22	ALL	landing Dribble		2.5		14	0		
Stabilizer Cost / ac	\$10			Totals		163	51	193	50		
57 lbs N sidedres	5						Alt	ernat	ive P	ractice	
source	S ton	rate	a	pplication		N	Р	K	S	stabili	izer
46-0-0	\$390	195	Spring I	Preplant Broadcast		90	-				
Manure Credits Year 1	1.1	3000	Fall Pr	eplant Broadcast		30.5	39	117	20	Hydra I	lume
0-0-62	\$399	100		Preplant Broadcast				62			
21-0-0-24	\$379	100		Preplant Broadcast		21			24		
10-34-0	\$510	35		anting Dribble		3.5	12				
28-0-0 12-0-0-26	\$289 \$425	53 22		lanting Dribble		15 2.5	1.000	14	6		
46-0-0	\$390	123		Iress Broadcast		56.5	-	14	0	Conta	iN
Stabilizer cost / ac	\$13	120	() THE	Totals		219	51	193	50	Cont	
									20		
			Yie	lds By Practi	ice						
270				260.7	262.	5 2	261.3			262	.8
	257.2					r (258.2			
ACR 220		245.4	248.9	250.1					24	8.7	
/ng		245.4							Г		
250 250 250 250 250 240 240 230 240 230											
HH 230											
		10.									
220		and a second	the second se		1000				-		
57 lbs SD	Check	57 lbs SD	0 lbs	57 lbs SD 0 lbs	57 lbs	02	0 lbs	57 lbs S	D Olb	s SD 0 lb	ic i

Practice	Total N Rate	ID	Yield	NUE	N cost per acre ²	N cost per bushel ²	Moisture	Test Weight
0 lbs N sidedress	163	MHSERMnorm	241.9	0.67	\$0.00	\$0.00	19.8	na
57 lbs N sidedress	219	MHSERMalt	241.6	0.91	\$23.73	\$0,10	19.9	na

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)
 ² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

Field Trial ID Previous Crop			SERM Corn	Trial County Township			after M Winona , Charl	1	N source Cost/to 46%		46-0-0 \$395 \$0.43
and the second		-		Soil Tes	t Info		1.5		Field	Info	
20	2016 NIM	II		Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	11/6/14 2.8 6.8 49.5		Harve Soil To Tillage Manui Manui Liquid	ation Vidth ng Date st Date exture	ory id	si Coi	LG 5499 36500 30 4/23/16 andy loam rventiona Yes Finishing Solic No
104 lbs N Prepla	nt								al Pra	ctice	
source	S ton	rate	an	plication	1	N	P	K	S	stabi	lizer
46-0-0 44-0-0 Manure Credits Year 1 0-0-60 21-0-0-24 10-12-30-6-1	\$395 \$550 \$405 \$355 \$470	225 100 20 50 50 200	Spring Pro Spring Pro Spring Pro Spring Pro Spring Pro Spring Pro	eplant Broadc eplant Broadc eplant Broadc eplant Broadc eplant Broadc anting Band	ast ast ast	103.5 44 28 10.5 20	64 24	144 30 60	12 12	ES	
Stabilizer Cost / ac	\$ 0			Totals		206	88	234	24	-	
50 Iba M Duanlan	+						1,1000	- Andrews	1. 1997	ractice	_
58 Ibs N Preplan	1	0.000			-			1	1 1		
source 46-0-0	\$ ton \$395	rate 125		plication eplant Broade	oct	N 57.5	Р	K	S	stabi	uzer
44-0-0 Manure Credits Year 1 0-0-60 21-0-0-24 10-12-30-6-1	\$550 \$405 \$355 \$470	100 20 50 50 200	Spring Pro Spring Pro Spring Pro Spring Pro	eplant Broadc eplant Broadc eplant Broadc eplant Broadc anting Band	ast ast ast	44 28 10.5 20	64 24	144 30 60	12 12	ES	N
Stabilizer cost / ac	\$0	-		Totals	k.	0 160	88	234	24		
			¥/!~1	J. D. D.							
250			riel	ds By Pra		240.9					
240 230 220 210 200 190 180 104 lbs N	207.4		199.7 49 lbs N 58 lb	DIS N 149 lb	.7 	4 lbs N	200		208.3	192. 192.	1
	Also	appli	ed a higher ra	NITROGEN P	11.52	t at 14	9 Ibs	N/acr	е.		
Practice	Total I	N Rate	ID	Vield	NUE	N cos			st per shel ²	Moisture	Test Weight
104 lbs N Preplant	20)6	RCSERMnorm	n 211.4	0.97	\$44		-	0.21	55.6	21.5
58 lbs N Preplant		50	RCSERMalt	215.8	0.74	\$24		-	0.11	56.3	21.5

² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

Field Trial ID Previous Crop		SHSE		Trial County Township			e after M Winona Utica		N sour Cost/te 82%		82-0-0 \$490 \$0.30
6	State 1	1000		Soil Te	t Info				Field	Info	
2	016 NP	AI		Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	10/1/14 3.1 7 11 112		Variet Popula Row V Plantin Harves Soil Te Tillage Manun Manun Liquid Alfalfa	ation Vidth ng Date st Date exture re Histo re Histo re Typo l or Sol	ory e id		LG 2549 33000 30 4/22/16 silt loam nventional Yes rry (Cows) Liquid No
90 lbs N Sidedre	22							the second second		actice	INC
source	\$ ton	rate	9	pplication	1	N	P	K	S		ilizer
Manure Credits Year 1 Manure Credits Year 2 82-0-0 32-0-0	\$84 \$8 \$490 \$230	14000 g 110 88.8	Pre Sid	vious Credits vious Credits ledress Band plant Dribble/s	Spray	56 36 90 28	100	241			
Stabilizer Cost / ac	\$0			Totals		210	100	241	0		_
60 lbs N sidedre							_	-	-	ractice	
source	\$ ton	rate		pplication		N	Р	K	S	stab	ilizer
Manure Credits Year 1 Manure Credits Year 2 82-0-0 32-0-0	\$84 \$8 \$490 \$230	56 36 110 88.8	Pre Sic	vious Credits vious Credits ledress Band eplant Dribble/s	Spray	56 36 60 28	100	241			
Stabilizer cost / ac	S 0		ſ	Totals		180	100	241	0		-
			Yield	ds By Prac	tice						
19 17.1 17 15 15 13 11 9 7		16.6		13.5	16.1		ľ	14.4		15.9	
5 9 0 lbs	N	60 lbs	N	90 lbs N NITROGEN PF	60 lbs M ACTICE	N	60	lbs N		0 Check	
Practice	a second	N Rate	ID	Yield (tons)	NUE ¹	ac		te	ost per on ² 1.76	Moisture	Test Weight
90 lbs N Sidedress			SHSERMnorr	n 15.3	13.76		5.89				

180

60 lbs N sidedress

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per ton. (Total N rate/Yield)
 ² Nitrogen source(s) used in comparison only. Does not include other mutrient sources or application fees.

SHSERMalt

15.7

11.48

\$17.93

\$1.14

na

na

Field Trial ID Previous Crop	3	CBAS		Trial County Township		V	gen Tin Vinona Hart		N sour Cost/to 46%		46-0-0 na na
STORAGE STOR		-		Soil Tes	t Info				Fiel	d Info	
20	source \$ ton rate 330 Sp			Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc			Harve Soil T Tillag Manu	ation Width ng Dat est Dat exture e re His a Histo	te c tory	DKC 44	-13 SS/RIE 3500(30' 4/23/16 11/4/16 onventiona No No No
Split 152/69 lbs M	V							Norr	nal P	ractice	
		rate		application	_	N	Р	K	S	stabi	lizer
46-0-0 21-0-0-24 46-0-0 21-0-0-24			Sprin Sic	g Preplant Broad g Preplant Broad ledress Broadcas ledress Broadcas	cast t	151.8 10.5 69 10.5			12 12	Inst Agrotai	
Stabilizer Cost / ac	<u>\$0</u>			Totals	_	242	0	0	24		
Preplant 221 lbs	N						A	ltern	ative	Practice	
source	\$ ton	rate		application		N	Р	K	S	stabi	
46-0-0		480	Spring	g Preplant Broad	cast	220.8					
21-0-0-24		100	Sprin	g Preplant Broad	cast	21			24		
					_		0	0	24		
Stabilizer cost / ac	<u>\$0</u>			Totals		242	U	U	24		
245			3	Totals	ractice		U	U			
245 (a) 240 235 230 230 225 220	0	234.	6	234.3	2	233.6	U	233.	6	232.	
132 240 239. 132 235 1 132 230 230 133 225 1	0	234.	6	vields By P	2		U		6	232. Prepl:	

Practice	Total N Rate	ID	Yield	NUE	acre ²	bushel ²	% MT
Split 152/69 lbs N	242	CBASETnorm	235.6	1.03	na	na	18.5
Preplant 221 lbs N	242	CBASETalt	233.6	1.04	na	na	19.0

57.7 57.3

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

² Nitrogen source(s) used in comparison only. Does not include other mutrient sources or application fees.

Field Trial ID Previous Crop		CBoSE7	Trial County Township		(gen Tin Olmsted Salem		N sou Cost/t 46%		46-0- \$37 \$0.4
5	1 - 1	The Bar	Soil Te	st Info				Fie	ld Info	
2	016 NMI		Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	5/25/12 2.9 6.4 29 204		Variet Popula Row V Plantin Harve Soil To Tillago Manun Alfalfa Irrigat	ation Vidth ng Da st Dat exture e re Hist a Hist	te 1 story	I Fall Chisel &	4212 3400 3 DKC 53-5 10/20/1 loan Spring F(N N N
Preplant 124 lbs	s N					I	Nori	nal P	ractice	
source 46-0-0	\$ ton \$370	rate 270	application Preplant Broadcas		N 124.2	Р	K	S	stabi	lizer
21-0-0-24 18-46-0 46-0-0	\$379 \$465 \$370	50 65 65	Preplant Broadcas At Planting Band At Planting Band	ł	10 11 29	29		12		
Stabilizer Cost / ac	\$0		Totals	-	174	29	0	12		
Split 85/40 lbs N	T					Al	tern	ative	Practice	
source	\$ ton	rate	application		N	Р	K	S	stabi	lizer
46-0-0	\$370	184	Preplant Broadcas	the second s	84.6					
21-0-0-24	\$379	50	Preplant Broadcas		10	20		12		
18-46-0 46-0-0	\$465 \$370	65 65	At Planting Band At Planting Band		11 29	29				
46-0-0	\$370	86	Sidedress Broadca		39.6					
Stabilizer cost / ac	\$0		Totals		174	29	0	12		
	30		Yields By P	ractice	1/4	23	Ū	12		
255			247.0		247.5					
(12250 245 240 235 230 230 230 225						1				
240									234.2	
8) 235 C1 230	226.6									
230										
220									and the second s	
215	Preplant		Split		Preplar				Split	

Practice	Total N Rate	ID	Yield	NUE ¹	N cost per acre ²	N cost per bushel ²	% MT	Test Weight
Preplant 124 lbs N	174	CBoSETnorm	237.0	0.73	\$49.68	\$0.21	17.2	56.7
Split 85/40 lbs N	174	CBoSETalt	240.6	0.72	\$49.68	\$0.21	17.9	56.4

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)
 ² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

Previous Crop		DJSI		Trial County Township		T	ogen Tir Vabasha Jakwood	1			82-0- \$56 \$0.3 \$0.4
6	State of the local division of the local div	-	-	Soil Te	st Info				_	d Info	
		A		Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	11/13/13 2 6 19 115		Variety Popula Row W Plantin Harves Soil Te Tillage Manur Alfalfa	tion /idth ng Data nt Date xture re Hist	ory	and have and a	CC49-728 3650 3 5/20/1 10/10/1 silt loat No-Ti N No-Ti N
	2016	NMI					Irrigat	ed			N
135 lbs N Pr	eplant						I	Norn	mal Practice		
source	S ton	rate	ap	plication		N	Р	K	S	stab	ilizer
82-0-0	\$565	165		Preplant Band		135	1.2.1	1		No	one
7-23-5	\$702	55		anting Band		4	13	3	1.11	1.0.1	one
21-0-0-24	\$379	100		eplant Broadca		21			24		one
8-46-0	\$465	125		eplant Broade	ast	18	46		1.1		one
28-0-0	\$275	85	At Plar	nting Dribble		24				No	one
Stabilizer Cost / a	c SO	1		Totals		202	59	3	24		
75/60 lbs N	Split						_		ative	Practice	
source	S ton	rate		plication		N	P	K	S	Contraction of the second	ilizer
82-0-0	\$565	92		Preplant Band		75			1	2,63	one
7-23-5	\$702	55		anting Band	-	4	13	3			one
21-0-0-24	\$379	100		eplant Broade		21	12		24		one
8-46-0	\$465	125		eplant Broadca	ast	18	46				one
28-0-0	\$275	85	At Plai	nting Dribble		24				INC	one
28-0-0	\$275		Sided	ress Dribble		60				No	one
Stabilizer cost / ac	s SO		Sida dua	Totals ss dribble with	Vield260 V	202	59	3	24		
				elds By P		Diops					
-				cius by i	actice			232.3			
234		23	32.7				-	-	-		
		25	32.7								
		2:	32.7								
		2:	32.7								
		2:	32.7								
232 230 228 226 226 224		2:	32.7								
(232 230 228 226 224 222 222 222		2:	32.7								
(322 230 228 228 226 226 224			32.7 ant 135	NITROGE	N PRACTICE		Sp	lit 75/6	0		

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

202

202

² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

DJSETnorm

DJSETalt

232.7

232.3

0.87

0.87

\$45.90

\$54.96

\$0.20

\$0.24

na

na

na

na

135 lbs N Preplant

75/60 lbs N Split

Field Trial ID Previous Crop		JBiSET Com	Trial County Township	W	gen Tir /abasha Elgin		N source Cost/ton 46% N	
	1		Soil Test Info				Field]	Info
2	016 NMI		Date 11/13/13 OM% pH 6.2 Nitrogen P (bray) 66 P (olsen) Potassium 125 Sulfur Zinc		Variet Popula Row V Plantin Harve Soil To Tillage Manu Alfalfa Irrigat	ation Vidth ng Da st Dat exture e re Hist a Hist	te tory	DKC 53-56 5 361 4/15/ 11/1/ Conventior 1 1 1
Preplant 160 lbs	N				ľ	Vorn	nal Pra	ctice
source	\$ ton	rate	application	N	Р	K	S	stabilizer
46-0-0 21-0-0-24 10-34-0	\$360 \$379 \$550		Spring Preplant Broadcast Spring Preplant Broadcast At Planting Band	160 16 4	14		18	Instinct Instinct
Stabilizer Cost / ac	\$0		Totals	180	14	0	18	
Split 110 prepla	nt/50 lbs 1	N			Al	tern	ative P	
source	\$ ton	rate	application	N	Р	K	S	stabilizer
46-0-0 21-0-0-24 10-34-0	\$360 \$379 \$550	75 40	Spring Preplant Broadcast Spring Preplant Broadcast At Planting Band	110 16 4	14		18	
46-0-0	\$360	109	Sidedress Broadcast	50				Agrotain
Stabilizer cost / ac	\$0	_	Totals	180	14	0	18	
			Yields By Practice					
250			246.1					
(132) 245 240 00 235 232 230		243.0					-	242.7
V/08 240	-		232			237.4		
B 235 232	.2		232					
225			1 X	1				
720								

Practice	Total N Rate	ID	Yield	NUE ¹	N cost per acre ²	N cost per bushel ²	% MT	Test Weight
Preplant 160 lbs N	180	JBiSETnorm	240.4	0.75	\$62.40	\$0.26	17.2	na
Split 110 preplant/50 lbs N	180	JBiSETalt	237.5	0.76	\$62.40	\$0.26	16.7	na

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

Field Trial ID Previous Crop		JLSET Corn	Trial County Township		rogen Ti Olmstee Farmingte	ł		n \$599 N cost/lb \$0.3
AL ST	-	-	Soil Test Info					N cost/lb \$0.4 I Info
Image: Source Source \$ ton rate			Date5/21/13OM%3.8pH6.4NitrogenP (bray)25P (olsen)Potassium210SulfurZinc		Variety Population Row Widtl Planting D Harvest Da Soil Textur Tillage Manure H Alfalfa His Irrigated		nte te e story	DKC49-72S 3750 3 4/19/1 10/14/1 silt loar Conventiona N N N
Preplant 180 lbs N	1					Nor	mal Pr	actice
		A STOCK AND A	application	N	Р	K	S	stabilizer
82-0-0 10-34-0	\$599 \$550	220 55	Spring Preplant Band At Planting Band	180 6	19			None
Stabilizer Cost / ac	\$0		Totals	180	5 19	0	0	
Split 90/90 lbs N		-			A	lterr	native I	Practice
source	\$ ton	rate	application	N	Р	K	S	stabilizer
32-0-0	\$599	110	Spring Preplant Band	90		1		
10-34-0	\$550	55	At Planting Band	6	19			
28-0-0	\$275	320	Sidedress Dribble	90				None
Stabilizer cost / ac	\$0		Totals	180	5 19	0	0	
			Yields By Practic	e				
260 255 250 245 245 245 235 235 230		243.8	255.3			250).6	253.2

Practice	Total N Rate	ID	Yield	NUE ¹	N cost per acre ²	N cost per bushel ²	% MT	Test Weight
Preplant 180 lbs N	186	JLSETnorm	250.3	0.74	\$66.60	\$0.27	17.4	56.7
Split 90/90 lbs N	186	JLSETalt	247.0	0.75	\$77.50	\$0.31	17.5	56.7

3

Split 90/90

Split 90/90

Split 90/90

.

Preplant 180

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

4

Preplant 180

220

Preplant 180

Field Trial ID Previous Crop		JSSET	Trial County Township	F	gen Tin illmore ountian	ning	N sour Cost/tr 82%		82-0-0 \$500 \$0.30
	2 3.56							N cost/lb	\$0.59
	and a los		Soil Test Info	_		-		d Info	0 41 077
		5	Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc		Variety Popula Row W Plantir Harves Soil Te Tillage Manur Alfalfa	tion /idth ng Da st Dat xture re His	te e tory	Pioneer P992 Con	9 AMX 34500 30 4/24/10 ventiona No No
20	016 NMI				Irrigat				No
Preplant 195 lbs	N				N	lorn	nal P	ractice	
source	\$ ton	rate	application	N	Р	K	S	stabili	zer
18-46-0 0-0-60 Sulfur	\$540 \$400 \$760	150 150 25	Fall Preplant Broadcast Fall Preplant Broadcast Fall Preplant Broadcast	13.5	69	90	25		
82-0-0	\$500	238	Spring Preplant Band	195					
10-34-0	\$545	5	At Planting Band	5.9	19.8				
Stabilizer Cost / ac	SO		Totals	214	89	90	25		
	1.1				Alt	ern	ative	Practice	
Split 160 / 35 lbs	N					_	_		7.00
Split 160 / 35 lbs source	\$ N	rate	application	N	Р	K	S	stabili	ZCI
source 18-46-0 0-0-60 Sulfur	\$ ton \$540 \$400 \$760	150 150 25	Fall Preplant Broadcast Fall Preplant Broadcast Fall Preplant Broadcast	13.5	_	К 90	S 25	stabili	ZCI
source 18-46-0 0-0-60 Sulfur 82-0-0	\$ ton \$540 \$400 \$760 \$500	150 150 25 195	Fall Preplant Broadcast Fall Preplant Broadcast Fall Preplant Broadcast Spring Preplant Band	13.5 160	Р			stabili	ZCI
source 18-46-0 0-0-60 Sulfur 82-0-0 46-0-0	\$ ton \$540 \$400 \$760	150 150 25	Fall Preplant Broadcast Fall Preplant Broadcast Fall Preplant Broadcast	13.5	Р			stabili	
source 18-46-0 0-0-60	\$ ton \$540 \$400 \$760 \$500 \$545	150 150 25 195 76	Fall Preplant Broadcast Fall Preplant Broadcast Fall Preplant Broadcast Spring Preplant Band Sidedress Broadcast	13.5 160 34.96	P 69			stabili	



Practice	Total N Rate	ID	Yield	NUE ¹	N cost per acre ²	N cost per bushel ²	% MT	Test Weight
Preplant 195 lbs N	214	JSSETnorm	241.7	0.89	\$58.50	\$0.24	18.0	57.0
Split 160 / 35 lbs N	214	JSSETalt	245.6	0.87	\$68.71	\$0.28	18.0	57.0

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)
 ² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

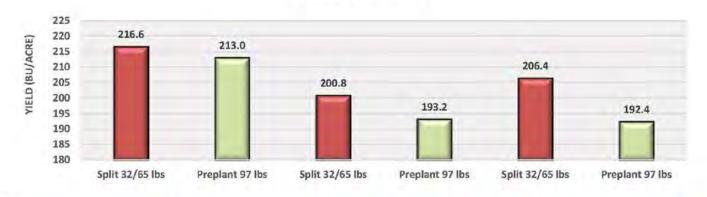
Field Trial ID Previous Crop		MLSET Com	Trial County Township		W	gen Tim Vabasha reenfield			on N cost/lb	82-0-0 \$56: \$0.3-
1		2	Soil Test Info						N cost/lb d Info	\$0.4
2	016 NMI		Date 10/10 OM% pH Nitrogen P (bray) P (olsen)	0/12 6.4 24 129		Variety Popula Row W Plantin Harves Soil Te Tillage Manur Alfalfa Irrigat	tion /idth g Dat t Dat xture e His Histo	te e tory	DKC	46-36 S 2950 3 4/23/1 9/29/1 ndy loar ventiona N N N
Preplant 150 lbs	N				1	N	lorn	nal Pi	ractice	
source	\$ ton	rate	application		N	Р	K	S	stabili	zer
82-0-0	\$565	180	Spring Preplant Band		150				N-Ser	ve
18-46-0	\$465	75	At Planting Band		13.5	34.5	1			
0-0-60	\$365	75	At Planting Band				45			
21-0-0-24	\$379	50	At Planting Band		10.5			12		
Stabilizer Cost / ac	50		Totals	_	174	35	45	12		
Split 70/80 lbs N	l					Alt	ern	ative	Practice	
source	\$ ton	rate	application		N	Р	K	S	stabili	zer
82-0-0	\$565	85	Spring Preplant Band		70					
18-46-0	\$465	75	At Planting Band		13.5	34.5	100			
0-0-60	\$365	75	At Planting Band		1.	100	45	1.1		
21-0-0-24	\$379	50	At Planting Band		10.5		-	12		
46-0-0	\$370	175	Sidedress Broadcast		80				Agrot	ain
Stabilizer cost / ac	S 0		Totals		174	35	45	12		
			Yields By Practic	ce						
120 115 110 105 102.7						111.4				

100		99.3		98.5			100.8	
95	_		92.1					_
90					_		_	
85								
80		-	-		the second second		1000	and a second
	Preplant	Preplant	Preplant	Preplant	Split	Split	Split	Split

Practice	Total N Rate	ID	Yield	NUE ¹	N cost per acre ²	N cost per bushel ²	% MT	Test Weight
Preplant 150 lbs N	174	MLSETnorm	98.1	1.77	\$51.00	\$0.52	15.3	55,0
Split 70/80 lbs N	174	MLSETalt	106.3	1.64	\$55.97	\$0.53	15.3	56.6

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)
 ² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

Field Trial ID Previous Crop		RNSET Com	Trial County Township			gen Tin Olmsted Orion	ing	N sou Cost/1 46%	ton N cost/lb	28-0- n n
Sandanarot	210	ALC: NO	Soil Test	Info				28%	N cost/lb ld Info	n
			Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	5/15/13 1.8 6.5 10		Variety Popula Row W Plantin Harves Soil Te Tillage Manun Alfalfa	tion /idth ig Da it Dat xture re His	te te tory	Novemb	3600 3 5/1/1 er 9 201 loan No-Ti N
2016 NM	AI.				_	Irrigat	ed			N
Preplant 97 Ibs N							-		ractice	
source 28-0-0	\$ ton	rate	application At Planting Band		N 97	P	K	S	stabil	IZET
10-34-0		349 58	At Planting Band		6	20				
Stabilizer Cost / ac	\$0		Totals		103	20	0	0		_
Split 32/65 lbs N						Alt	erna	ative	Practice	-
source	\$ ton	rate	application		N	Р	Κ	S	stabil	izer
28-0-0		116	At Planting Band		32					
46-0-0		141	Sidedress Broadcas	ti i	65	20				
10-34-0		58	At Planting Band		6					
Stabilizer cost / ac	S 0		Totals		103	20	0	0		



Practice	Total N Rate	ID	Yield	NUE ¹	N cost per acre ²	N cost per bushel ²	% MT	Test Weight
Preplant 97 lbs N	103	RNSETnorm	199.6	0.52	na	na	19.0	na
Split 32/65 Ibs N	103	RNSETalt	208.0	0.50	na	na	19.1	na

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

Field Trial ID	TBrSET		County		Nitrogen Timing Dakota		N source ² Cost/ton		46-0-0 \$375	
Previous Crop		Com	Township		Waterford			Urea N cost/lb \$0.4 Field Info		
	8 8	11	Soil Test Info Date 4/15/15	5	Variet	v	Field	2 C 2 - C C 18	Kalb 4929	
Atternative Practice Normal Farm Practice	Alternative Practice Normal Farm Practice	Alternative Fractio	OM% 4.2 pH u index 6.5 Nitrogen P (bray) 15 P (olsen) Potassium 101 Sulfur Zinc		Popula Row V Plantin Harves Soil Te Tillage Manun Alfalfa	ation Vidth ng Dato st Date exture e re Histo a Histo	Fa		32000 30 5/2/16 11/2/16 n/silt loam	
					Irrigat		10		INC	
Preplant Urea 1					-	1	1	actice	Protect	
source 46-0-0	\$ ton \$375	rate 321	application Spring Preplant Broadcast	N	Р	K	S	stabi	240 PM	
48-0-0 18-46-0	\$500	112	Spring Preplant Broadcast	148 20	50			Insti	net	
0-0-60	\$347	167	Spring Preplant Broadcast	20	50	100				
21-0-0-24	\$394	65	Spring Preplant Broadcast	13.6			15			
	12500.0	RE								
Stabilizer Cost / ac S0		Totals	182	50	100	15	1			
Split Urea 68 / 8	0 lbs N				AI	terns	tive	Practice		
source	\$ ton	rate	application	N	P	K	S	stabi	izer	
46-0-0	\$375	152	Spring Preplant Broadcast	68			-	Insti		
18-46-0	\$500	112	Spring Preplant Broadcast	20	50				and a	
0-0-60	\$347	167	Spring Preplant Broadcast			100	1.2			
21-0-0-24	\$394 65 Spring Preplant Broadcast			13.6		1.00	15	Instinct		
46-0-0 \$375		174	Sidedress Broadcast	80						
Stabilizer cost / ac	SO		Totals	182	50	100	15			
			Yields By Practice							
220					215.4					
215 210 205 205 200 200 200 200 200 200 200 20			209.0 20	09.9	9.9			208.4		
VA 205 200	0.8	201.7						-		
200										
1 105							-			
글 195									-	
150	1									
185	-									
150	: 148 lbs	split 68/80 lb	s Preplant 148 lbs split 6	8/80 lbs	Pre	eplant 1	48 lbs	split 68/8	0 lbs	
185	: 148 lbs	split 68/80 lb	s Preplant 148 lbs split 6		Pro st per		48 lbs	split 68/8	0 lbs	

Practice	Total N Rate	ID	Yield	NUE	N cost per acre ²	N cost per bushel ²	% MT	Test Weight	
Preplant Urea 148 lbs N	182	TBrSETnorm	208.4	0.87	\$60.68	\$0.29	18.1	56.7	
Sphi Urea 68 / 80 lbs N	182	TBrSETalt	206.7	0.88	\$60.68	\$0.29	17.9	57.0	

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

Field Trial ID Previous Crop	TBSETTrial CountyCornTownship		County	W	Nitrogen Timing Wabasha Elgin		N source Cost/ton 46% N	1	46-0-0 \$360 \$0.39
	5. (1 - 1 M		Soil Test Info				Field	Info	
2	016 NMI		Date11/13/13OM%6.3pH6.3Nitrogen6.4P (bray)6.6P (bray)6.6P (bray)6.6P (bray)6.6P (bray)6.6Sulfur123Sulfur123Zinc	2	Variet Popula Row W Plantin Harves Soil Te Tillage Manur Alfalfa Irrigat	ition Vidth ng Da st Dat exture re Hist	tory		53-56 SS 36100 30 4/15/15 11/1/16 ventiona No No
Preplant 160 lbs	N			1	N	orn	al Pra	ctice	
source	\$ ton	rate	application	N	Р	K	S	stabili	zer
46-0-0 21-0-0-24 10-34-0	\$360 \$379 \$550	348 75 40	Spring Preplant Broadcast Spring Preplant Broadcast At Planting Band	160 16 4	14		18	Instir Instir	
Stabilizer Cost / ac	<u>\$0</u>		Totals	180	14	0	18		
Split 110 prepla	nt/50 lbs N	1			Alt	erna	ative P	ractice	
source	\$ ton	rate	application	N	Р	K	S	stabili	zer
46-0-0 21-0-0-24 10-34-0	\$360 \$379 \$550	239 75 40	Spring Preplant Broadcast Spring Preplant Broadcast At Planting Band	110 16 4	14		18		
46-0-0	\$360	109	Sidedress Broadcast	50				Agrot	ain
Stabilizer cost / ac	<u>\$0</u>	4	Totals	180	14	0	18		_
			Yields By Practice						
260			250.0			251.5			
255 250 245 241 245 241 235 230 225	9	246.2	24	5.6				247.3	

Practice	Total N Rate	ID	Yield	NUE ¹	N cost per acre ²	N cost per bushel ²	% MT	Test Weight
Preplant 160 lbs N	180	TBSETnorm	246.1	0.73	\$62.40	\$0.25	0.0	0.0
Split 110 preplant/50 lbs N	180	TBSETalt	248.1	0.73	\$62.40	\$0.25	0.0	0.0

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

² Nitrogen source(s) used in comparison only. Does not include other mutrient sources or application fees.

Field Trial ID Previous Crop	MCSES Corn		County Township		V	gen Stal Vabasha lainviev	a	N sou Cost/t 82%		82-0-0 \$565 \$0.34
A CONTRACT	-	No.	Soil Test In	fo				Field	Info	
	2016 N	M	Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	4/8/15 3.1 6.9 72 244		Variety Popula Row W Plantir Harves Soil Te Tillage Manur Alfalfa Irrigat	ition Vidth ng Date st Date exture re Histor Histor	ory	DKC	44-13 SS 34500 30 4/23/10 silt loan wentiona Ye No No
	2222						-			1.
No N-Serve with	AA p	replant				N	orm	al Pr	actice	
source	cost	rate	application		N	Р	K	S	stabil	izer
Manure Credits Year 1	1. T. T.	20 ton	Previous Credits		30					-
82-0-0	\$565	170	Spring Preplant Band		140				Nor	ne
18-46-0	\$465	60	At Planting Band		11	28				
0-0-60	\$365	140	At Planting Band				84			
21-0-0-24	\$379	50	At Planting Band		10.5			12		
Stabilizer Cost / ac	\$0		Totals		192	28	84	12		
N-Serve with AA	prep	lant				Alt	ernat	tive F	ractice	
source	cost	rate	application		N	Р	K	S	stabil	izer
Manure Credits Year 1		20 ton	Previous Credits		30					
82-0-0	\$565	170	Spring Preplant Band		140			1	N-Se	rve
18-46-0	\$465	60	At Planting Band		11	28				
0-0-60	\$365	140	At Planting Band				84			
21-0-0-24	\$379	50	At Planting Band		10.5			12		
Stabilizer cost / ac	\$12.50		Totals		192	28	84	12		
255			Yields By Prac	tice						
350		240.0	245.4			24	4.2		243.4	
240 237.4	4	240.0		235.9		-				
235 245 240 237,4 0 8 235 230 230 235 230 230 237										
215										
None	9	None	None	N-Serve		N-S	erve		N-Serve	

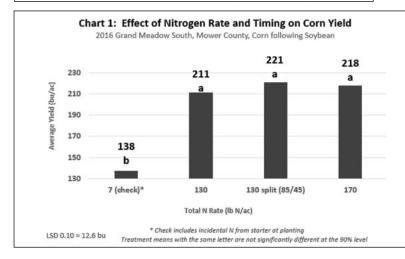
Practice	Stabilizer	ID	Yield	NUE	Stabilizer cost per acre ²	% MT	Test Weight
No N-Serve with AA preplant	None	MCSESnorm	240.9	0.79	\$0.00	18.3	56.3
N-Serve with AA preplant	N-Serve	MCSESalt	241.2	0.79	\$12.50	18.2	56.7

Effect of Nitrogen Rate and Application Timing on 2016 Corn Yield

Grand Meadow So	uth Site, Mower	County, Minnesota
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Parameter	Plot Details
Test:	Nitrogen rate and timing
Previous Crop:	Soybeans
Hybrid:	Pioneer PO157
Tillage System:	Conventional tillage
N Applic. / Plant Date:	April 15, 2016 / April 16, 2016
N Source:	Urea-broadcast-incorporate
Sidedress Date/Form:	June 13, 2016, UAN 28% row
Population:	34,000 planted/33,0 00 actual
Plot Design:	Randomized (CRD), 4 reps.

Grand Meadow Weather Station Measure	April-June	July-Sept
2% of normal precipitation:	-6%	62%
% of days with more than 1.0" rainfall:	3%	9%



Soil Fertility Measure Soil Type: D.M.%: DH: DEC:	Plot ValuesTripoli Silty Clay Loam5.8% (high)6.8 (5.8-7.0 normal)25.4 meq/100 g	
	,	
Potassium:	129 ppm (high)	

Avg of treatments, grid sampled at 0-6"depth in 2015

Maximum Return To Nitrogen (MRTN) is the nitrogen rate that optimizes net profit. Rates near the MRTN can also reduce risk of nitrate-nitrogen leaching to groundwater and surface water.

To determine the MRTN rate, spring 2016 market prices of **0.40/lb N** fertilizer and **\$3.50/bu** corn were entered into an on-line tool called the <u>Corn Nitrogen Rate Calculator</u>. The corn following soybean recommendation at these prices is to apply between **102-129 lb N/ac** with a likely best rate of **115 lb N/ac**. Normal N application rates on this farm is **170 lb N/ac** at preplant.

This study evaluated whether 40 lb N/ac less nitrogen at preplant or when split applied is more efficient and profitable. Results indicated that the 130 lb N/ac split rate had the highest yield, net profit and nitrogen use efficiency. There were no statistically significant yield differences between the lower and higher rate treatments. This was likely the result of optimal early season precipitation conditions.

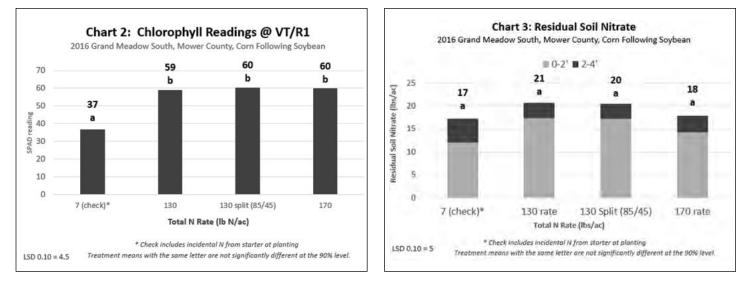
	2016 Economics							
Total N Rate (Ib N/ac)	Timing	Average Yield (bu/ac) LSD = 12.6	Average Moisture (%) LSD = 0.3	Drying Cost (\$/ac)	N Cost (\$/ac)	Net Return (\$/ac)	Profit Rank	
7 (check)*		138 (b)	19.1 (a)	\$17	\$4	\$394		
130	Preplant	211 (a)	19.4 (a)	\$28	\$55	\$551	2	
130 (85/45)	Preplant +V5	221 (a)	20.0 (b)	\$33	\$58	\$562	1	
170	Preplant	218 (a)	19.8 (b)	\$31	\$71	\$551	3	

ASSUMPTIONS: Corn price \$3.00/bu. (avg. Oct. 2016 price), 0.42/lb urea, 0.49/lb for UAN 28% at V4. A \$0.03/bu. deduction was used for every moisture point over 15.0%. Extra application costs associated with the in-season split application had an assumed cost of \$10/ac. Treatment means with the same letter in the respective column are not significantly different at a 90% confidence level. Least significant difference (LSD) is the amount needed for one treatment mean to be considered statistically different from another treatment mean. *The check treatment received 7 lb N/ac of incidental N from 10-34-0 starter at planting.

A collaborative project between the Minnesota Department of Agriculture and CHS of Ostrander/Grand Meadow

December 2016, Kevin Kuehner

Effect of Nitrogen Rate on 2016 Chlorophyll and Residual Soil Nitrogen Tests



Chlorophyll readings collected at VT/R1 showed there was no significant differences detected between the three nitrate rate treatments. (chart 2).

- Preplant soil nitrate levels (PPNT) collected in early April before any fertilizer was applied to the plot measured 33 lb N/ac at 0-1 foot depth.
 Presidedress nitrate tests (PSNT) collected at the same depth at V2 growth stage within the split rate treatments averaged 21 ppm (84 lb N/ac).
 Assuming a critical value of 25 ppm nitrate, the N recommendation was 32 additional lb N/ac.
- Soil nitrogen samples collected at the end of the season indicate how much nitrogen was left over (chart 3). Higher residual soil nitrate (RSN) levels could increase nitrate-nitrogen leaching risk to groundwater and surface water. The amount of RSN measured after harvest was very low and ranged from **18-21 lb N/ac**. The RSN concentrations did not relate well to the different N rate and timing treatments. This was unexpected as one may expect higher RSN with higher nitrogen rates. A possible explanation for this can be explained by the above normal rainfall totals in August and September. Excessive rainfall during this time period could have leached most of the residual nitrate from the profile, resulting in undetectable differences between treatments.

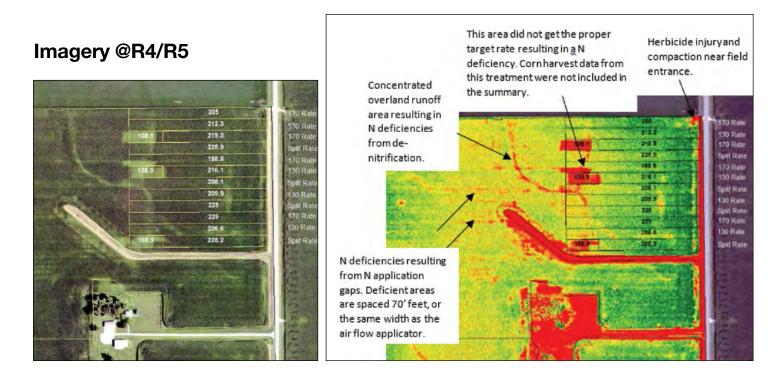
Nitrogen Uptake and Use Efficiency

Total N Rate Ibs N/ac	Yield bu/ac	Check yield as % of treatment yield bu/lb N	N Supplied by Soil %	Total N uptake in grain and stover bu/lb N	FRE1 %	PFP2 bu/lb N	PFPP23 lb N/bu	AE4 bu/lb N
7 (control)	138 (b)			66*				
130	211 (a)	65%	49%	135	53 (a)	1.6	0.6	1.1
130 split (85/45)	221 (a)	62%	45%	146	62 (a)	1.7	0.6	1.2
170	218 (a)	63%	44%	150	50(a)	1.3	0.8	0.9

1(FRE) Fertilizer Recovery Efficiency= Uptake(rate)-Uptake(control)/N rate. Assumes fertilizer only gets credit for the increase in N uptake. Assumes N content in roots and cob are negligible. 2(PFP) Partial Factor Productivity = Yield(rate)/ N rate, 3(PFP2)= Uptake(rate)/Yield(rate) 4 (AE) Agronomic Efficiency= Yield(rate)-Yield(control)/ N rate Column titles in bold were tested for significance. Values with the same letters are not statistically significant at the 90% level. *Excludes incidental N that may be in the control.

- The total corn N uptake in the grain and stover for the zero rate check was 66 lb N/ac. This is an indication of how much N was supplied by the soil.
 Across all treatments about 50% of the corn N uptake was from the soil.
- The amount of N fertilizer recovered (FRE) ranged from 50-62% with the highest recovery from the 130 split rate treatment.
- The 130 lbs N/ac preplant and split treatment produced 1.6-1.7 bu/lb of N applied while the 170 rate produced 1.3 bu/lb of N applied.

December 2016, Kevin Kuehner



High resolution imagery (0.5 meter true color, color infrared and passive NDVI) were collected on August 6th, 2016 using a fixed wing aircraft. This information was used to verify N application locations, general health of the corn crop and identify other potential variables that could have impacted yield results. For instance, the imagery was very helpful in identifying N deficiency in one of the 170 lb N/ac rate treatments due to an applicator issue. This treatment was excluded from the study due to abnormally low yields (29 bushels below the means of the other three replications).

In-Season Nitrogen Prediction Model combined with Soil Nitrogen Testing

N Rate (Ibs/ac)	April 13 2016	June 1 2016	July 22 2016	August 8 2016	October 6 2016	October 19 2016
130 Pre-Plant	33 lbs/ac PPNT*	+17 lbs/ac exess (Range of +5 to +30)	+20 lbs/ac excess (Range of +10 to +30)	+20 lbs/ac excess (Range of +10 to +30)	+18 lbs/ac excess (Range of +10 to +30)	21 lbs/ac RSN*
130 Split (85/45)	33 lbs/ac PPNT*	PSNT=21 ppm resulting in N rec of 32 additional lbs N/ac at sidedress. -17lbs/ac deficit (Range of 0 to -35)	+23 lbs/ac excess (Range of +10 to +35) June 13, 2016 45 lbs/ac of N applied.	+23 lbs/ac excess (Range of +10 to +35)	+22 lbs/ac excess (Range of +15 to +30)	20 lbs/ac RSN*
170 Pre-Plant (normal practice)	33 lbs/ac PPNT*	+33 lbs/ac excess (Range of +20 to +50)	+34 lbs/ac excess (Range of +20 to +50)	+37 lbs/ac excess (Range of +25 to +45)	+37 lbs/ac excess (Range of +25 to +45)	18 lbs/ac RSN*

In season N prediction model inputs- 103 day corn, 35,000 population, silty clay loam soil, 210 bu/ac yield goal, reduced tillage/ *Reflects actual soil nitrate test results collected from the field and not results predicted from the model.

Generally, the model appeared to predict the optimal amount of in-season N to apply for the 130 lb N/ac split treatment. One management approach that may work well for producers in Mower County is to apply MRTN rates at preplant or at planting and use soil nitrate testing combined with other in-season N prediction tools to determine how much, if any, additional in-season N may be needed.

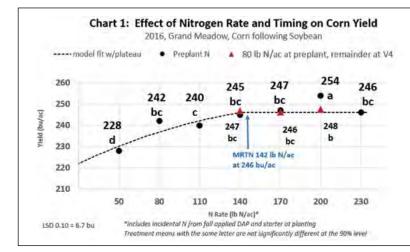
December 2016, Kevin Kuehner

Effect of Nitrogen Rate and Application Timing on 2016 Corn Yield

Grand Meadow North	Site, Mower	County, Minnesota
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Parameter	Plot Details
Test:	Nitrogen rate and timing
Previous Crop:	Soybean
Hybrid:	Dekalb DKC 53-56 RIB
Tillage System:	Conventional tillage
N Applic. / Plant Date:	April 15, 2016 / April 18, 2016
N Source:	Urea-bdcst with NBPT (Agrotain Ultra)
Sidedress Date/Form:	June 2, 2016, Urea-broadcast
Population:	35,300 planted/33,600 actual
Plot Design:	Randomized block (CRBD), 4 reps.

Grand Meadow Weather Station Measure	April-June	July-Sept
% of normal precipitation:	-6%	62%
% of days with more than 1.0" rainfall:	3%	9%



Soil Fertility Measure	Plot Values	
Soil Type:	Tripoli Silty Clay Loam	
O.M.%:	8.4% (very high)	│ <mark>┟╧</mark> ╫┟┠╼
pH:	6.5 (5.8-7.0 normal)	
CEC:	37.6 meq/100 g	
Bray P1:	29 ppm (very high)	
Potassium:	172 ppm (very high)	
1		

Avg of treatments sampled at 0-6"depth on 4/13/16

Maximum **R**eturn **T**o **N**itrogen (MRTN) is the rate that optimizes net profit. Rates near the MRTN can also reduce risk of nitratenitrogen leaching to groundwater and surface water.

To determine the MRTN rate, spring 2016 market prices of **0.40/Ib N** fertilizer and **\$3.50/bu** corn were entered into an on-line tool called the <u>Corn Nitrogen Rate Calculator</u>. The corn following soybean recommendation at these prices is to apply between **102-129 Ib N/ac** with a likely best rate of **115 Ib N/ac**. The normal N application rate to this field is **170-190 Ib N/ac**.

Chart 1 shows the corn yield and nitrogen rate relationship for this plot. Using this curve, the <u>calculated</u> MRTN was **142 lb N/ac** with a yield of **246 bu/ac**. Due to minimal early season leaching rains, split N applications did not increase yield. Net returns using <u>actual</u> 2016 prices can be seen in the economics table below.

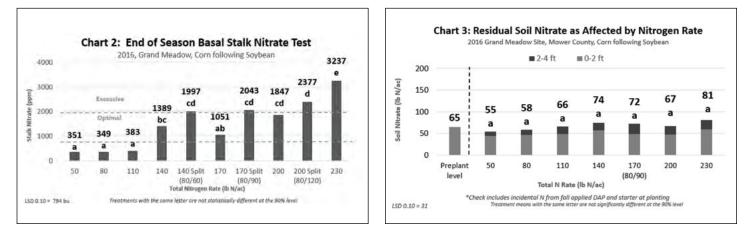
2016 Economics							
Total N Rate (Ib N/ac)	Timing	Average Yield (bu/ac) LSD = 6.7	Average Moisture (%) LSD = 0.4	Drying Cost (\$/ac)	N Cost (\$/ac)	Net Return (\$/ac)	Profit Rank
50 (check)*	Preplant	228 (d)	21.0 (de)	\$41	\$20	\$622	7
80	Preplant	242 (bc)	20.1 (a)	\$37	\$32	\$658	1
110	Preplant	237 (c)	20.2 (ab)	\$37	\$44	\$630	6
140	Preplant	245 (bc)	20.5 (bc)	\$40	\$56	\$638	3
140 (80/60)	Preplant + V4	247 (bc)	20.5 (bc)	\$41	\$64	\$636	4
170	Preplant	247(bc)	20.2 (ab)	\$39	\$68	\$634	5
170 (80/90)	Preplant + V4	246 (bc)	21.2 (e)	\$45	\$76	\$617	8
200	Preplant	254 (a)	20.7(cde)	\$44	\$80	\$639	2
200 (80/120)	Preplant + V4	247 (b)	20.6(bcd)	\$41	\$88	\$613	9
230	Preplant	246 (bc)	20.5 (bc)	\$41	\$92	\$607	10

COLOR KEY = #1 Rank

Assumptions: Corn price \$3.00/bu. (avg. Oct. 2016 price), and .40/lb urea. A \$.03/bu. deduction was used for every moisture point over 15.0%. Extra application costs associated with the in-season split application had an assumed cost of \$8/ac. Treatment means with the same letter in the respective column are not significantly different at the 90% level. Least significant difference (LSD) is the amount needed to be considered statistically different from the treatment mean.

February 2017, Kevin Kuehner, Jeff Vetsch

Effect of Nitrogen Rate on 2016 Stalk Nitrate and Residual Soil Nitrogen Tests



- The optimal range for the end of season basal stalk nitrate test is 700-2,000 ppm. Stalk nitrate concentrations below 700 ppm may indicate nitrogen deficiencies while levels above 2,000 ppm may indicate excessive nitrogen. Tests were highly variable, but generally showed that rates between **140-170 lb N/ac** were optimal, while rates above **200 lb N/ac** were significantly different and considered excessive (chart 2).
- Preplant soil nitrate levels collected in early April prior to spring N treatment application (some N was applied with fall DAP) measured 65 lb N/ac.
- Soil nitrate samples collected at the end of the season indicate how much nitrogen was left over (chart 3). Higher residual soil nitrate (RSN) levels could increase nitrate-nitrogen leaching risk to groundwater and surface water. The amount of RSN measured after harvest at 4' depth were similar across all treatments and averaged 68 lb N/ac. Excessive rains late in the season, 62% above normal, likely leached away any potential differences.

Nitrogen Uptake and Use Efficiency

N Rate Ibs N/ac	Average Yield bu/ac LSD = 8	Total Corn N Uptake Ibs N/ac	N Supplied by Soil %	N Fertilizer Recovery %	Bushels produced per unit of N bu/lb N
50 (check)*	228 (d)				
80	242 (bc)				4.4 (f)
110	237 (c)				2.3 (e)
140	245 (bc)				1.6 (d)
140 (80/60)	247 (bc)	Due to the	ne significant amount of in	cidental N sources	1.5 (d)
170	247(bc)		he test plot and the check		1.1 (c)
170 (80/90)	246 (bc)	these p	particular NUE indices wer	e not calculated.	1.1 (c)
200	254 (a)				0.9 (b)
200 (80/120)	247 (b)				0.9 (b)
230	246 (bc)				0.8 (a)

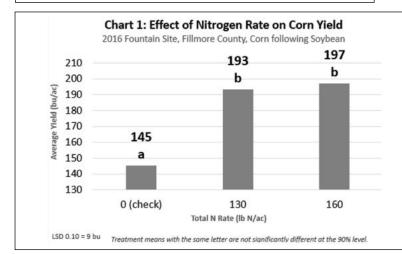
February 2017, Kevin Kuehner, Jeff Vetsch

Effect of Nitrification Inhibitor on 2016 Corn Yield

Fountain Site, Fillmore County, Minnesota

Plot Details
Nitrogen rate
Soybeans
Titan Pro 40-03 (conventional)
No Till
June 2, 2016
April 25, 2016
Anhydrous ammonia at V4
36,000 planted/33,000 actual
Randomized (CRD) 3 reps.

Grand Meadow Weather Station Measure	April-June	July-Sept
Avg. % of normal precipitation:	+2%	+97%
% of days with more than 1.0" rainfall:	3%	10%



		5
Soil Fertility Measure	Plot Values	
Soil Type:	Fayette Silt Loam	
O.M.%:	3.1 % (medium)	
pH:	7.0 (5.8-7.0 normal)	
Bray P1:	38 ppm (very high)	
Potassium:	186 ppm (very high)	

Sampled at 0-6" depth on 10/25/15

Maximum Return To Nitrogen (MRTN) is the nitrogen rate that optimizes net profit. Rates near the MRTN can also reduce risk of nitrate-nitrogen leaching to groundwater and surface water.

To determine the MRTN rate, spring 2016 market prices of **0.40/lb N** fertilizer and **\$3.50/bu** corn were entered into an on-line tool called the Corn Nitrogen Rate Calculator. The recommendation at these prices is to apply between **102-129 lb N/ac** with a likely best rate of **115 lb N/ac**. Normal N application rates on this farm are **130 lb N/ac** at preplant.

This study evaluated whether an additional **30 lb N/ac** of in-season N had a yield advantage over the producers normal rate.

2016 results showed there was no significant difference between the higher and lower N rate.

2016 Economics						
Total N Rate (Ib N/ac)	Timing	Average Yield (bu/ac) LSD = 9	Average Moisture (%) LSD = 0.5	Drying Cost (\$/ac)	N Cost (\$/ac)	Net Return (\$/ac)
0 (check)*		145 (a)	20.7 (a)	\$1	\$25	\$410
130	@V4	193 (b)	20.8 (a)	\$2	\$34	\$503
160	@V4	197 (b)	20.9 (a)	\$1	\$35	\$503

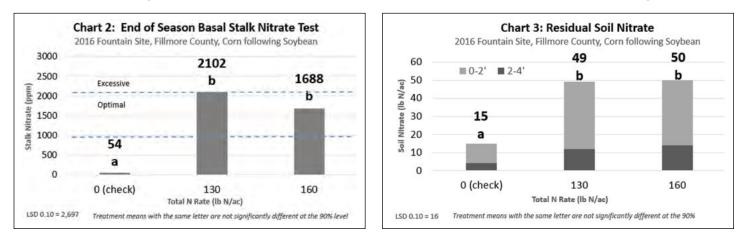
ASSUMPTIONS: Corn price assumes \$3.00/bu. (avg. Oct. 2016 price) and 0.33/lb anhydrous ammonia (avg. April price). A \$0.03/bu. deduction was used for every moisture point over 15.0%. Treatment means with the same letter in the respective column are not significantly different at a 90% confidence level. Least significant difference (LSD) is the amount needed for one treatment mean to be considered statistically different from another treatment mean.

NMI is a collaborative project between farmers of southeast Minnesota, Minnesota Department of Agriculture and University of Minnesota Extension

December 2016

Nutrient Management Initiative

Effect of Nitrogen Inhibitor on 2016 Stalk Nitrate and Residual Soil Nitrogen Tests



- The optimal range for the end of season basal stalk nitrate test is 700-2,000 ppm. Stalk nitrate concentrations below 700 ppm may indicate nitrogen deficiencies while levels above 2,000 ppm may indicate excessive nitrogen. Tests showed that both treatments were near the optimal category and there was no significant difference between the treatments (chart 2).
- Preplant soil nitrate levels collected in early April prior to spring N treatment application measured 41 lb N/ac at 0-2 foot depth. Pre sidedress soil nitrate test (PSNT) levels at V4 crop growth, before anhydrous N was applied, averaged 39 lb N/ac (9.8 ppm) at 0-1 foot depth across both treatments.
- Soil nitrogen samples collected at the end of season indicate how much nitrogen was left over (chart 3). Higher residual soil nitrate (RSN) levels could increase nitrate-nitrogen leaching risk to groundwater and surface water. The amount of RSN at a depth of four feet measured after harvest ranged from 49-50 lb N/ac in the treatments and 15 lb N/ac in the check. Most of the RSN was detected in the upper two feet. There was no significant difference between treatments. Any potential differences between the different N rates was likely removed by the excessive rains late in the season (97% above normal).

Average N Fertilizer **Bushels produced** N Rate Yield **Total Corn N Uptake** N Supplied by Soil per unit of N Recovery lbs N/ac lbs N/ac bu/ac % % bu/lb N LSD = 90 (check)* 146 (a) 69 130 193 (b) 111 62% 32% 1.5 160 197 (b) 117 59% 59% 1.5

Nitrogen Uptake and Use Efficiency

Least significant difference (LSD) is the amount needed to be considered statistically different from the treatment mean. Treatment means with the same letter in the respective column are not significantly different at the 90% level.

- The total corn N uptake in the grain and stover for the zero rate check was 69 lbs N/ac. This is an indication of how much N was supplied by the soil. Across both treatments 59-61% of the corn N uptake was from the soil.
- The amount of N fertilizer recovered by both treatments was similar and ranged from 30-32%.
- Both treatments produced 1.5 bu. per lb of N applied.

NMI is a collaborative project between farmers of southeast Minnesota, Minnesota Department of Agriculture and University of Minnesota Extension December 2016

Effect of Nitrification Inhibitor on 2016 Corn Yield

Elgin Site, Olmstead County, Minnesota

Parameter	Plot Details	
Test:	Nitrogen rate	
Previous Crop:	Soybeans	
Hybrid:	Dekalb 5358	
Tillage System:	Conventional	
N Applic. Date:	April 14, 2016	
Plant Date:	April 16, 2016	
N source:	Anhydrous ammonia	
Population:	34,000 planted/32,917 actual	
Plot Design:	Randomized (CRD), three reps.	

Grand Meadow Weather Station Measure

21 (check)*

Avg. % of normal precipitation:

Soil Fertility Measure	Plot Values
Soil Type: O.M.%:	Port Byron Silt Loam
O.M.%:	3.5 % (high)
pH:	6.7 (5.8-7.0 normal)
Bray P1:	28 ppm (very high)
Potassium:	163 ppm (very high)

Avg. of treatments, grid sampled 0-6"depth

Maximum Return To Nitrogen (MRTN) is the nitrogen rate that optimizes net profit. Rates near the MRTN can also reduce risk of nitrate-nitrogen leaching to groundwater and surface water.

To determine the MRTN rate, spring 2016 market prices of **0.40/lb N** fertilizer and **\$3.50/bu** corn were entered into an on-line tool called the Corn Nitrogen Rate Calculator. The recommendation at these prices is to apply between **102-129 lb N/ac** with a likely best rate of **115 lb N/ac**. Normal N application rates on this farm is **170 lb N/ac** at preplant.

This study evaluated if there were any yield differences with **30 lb N/ac** less nitrogen when compared to the normal rate at this farm.

2016 results indicated there was no significant difference in yield between the lower and higher N rate.

	art 1: Effect of Ni 016 Elgin Site, Olmsted		
250		232	230
250 — 5 230 —	205	a	а
210 -	b		
190 —	_		
170 —			
230 210 190 170 150		_	
a 130 —			

April-June

-8%

July-Sept

+40%

Total N Rate (lb N/ac)

141

* Check includes incidental N from starter at planting

 $LSD \ 0.10 = 9 \ bu$ Treatment means with the same letter are not significantly different at the 90% level.

			2016 Econo	mics			
Total N Rate (Ib N/ac)	Timing	Average Yield (bu/ac) LSD = 9	Average Moisture (%) LSD = 1.3	Drying Cost (\$/ac)	N Cost (\$/ac)	Net Return (\$/ac)	Profit Rank
21 (check)*		204 (a)	19.2 (a)	\$26	\$7	\$579	
141	Preplant	231 (b)	19.8 (a)	\$33	\$47	\$613	1
171	Preplant	229 (b)	19.5 (a)	\$31	\$56	\$600	2

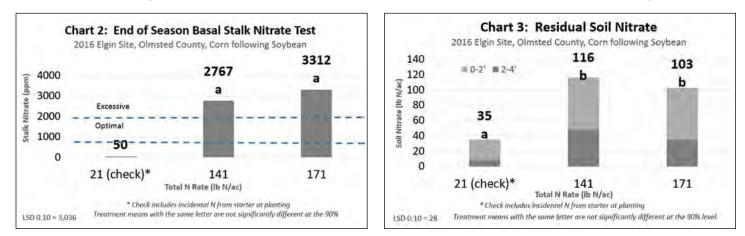
171

ASSUMPTIONS: Corn price \$3.00/bu. (avg. Oct. 2016 price) and 0.33/lb anhydrous ammonia (avg. April price). A \$0.03/bu. deduction was used for every moisture point over 15.0%. Treatment means with the same letter in the respective column are not significantly different at a 90% confidence level. Least significant difference (LSD) is the amount needed for one treatment mean to be considered statistically different from another treatment mean.*The check treatment received 21 lb N/ac of incidental N from 28-0-0 and 10-34-0 starter at planting.

NMI is a collaborative project between farmers of southeast Minnesota, Minnesota Department of Agriculture and University of Minnesota Extension

December 2016

Effect of Nitrogen Inhibitor on 2016 Stalk Nitrate and Residual Soil Nitrogen Tests



- The optimal range for the end of season basal stalk nitrate test is 700-2,000 ppm. Stalk nitrate concentrations below 700 ppm may indicate nitrogen deficiencies while levels above 2,000 ppm may indicate excessive nitrogen. Tests showed that both the 141 and 171 lb N/ac rates were in the excessive test category. There were no significant differences detected between the 141 and 171 lb N/ac treatments (chart 2).
- Preplant soil nitrate (PPNT) levels collected in early April prior to spring N treatment application measured **42 lb N/ac** at 0-2 foot depth. Presidedress nitrate test (PSNT) samples collected at V4 to a depth of 0-1 foot averaged **109 and 141 lb N/ac** (27.3 and 35.3 ppm) respectively for the 141 and 171 lb N/ac treatments.
- Soil nitrogen samples collected at the end of the season indicate how much nitrogen was left over (chart 3). Higher residual soil nitrate (RSN) levels could increase nitrate-nitrogen leaching risk to groundwater and surface water. The amount of RSN measured after harvest down to four feet, was very high and ranged from 103-116 lb N/ac in the treatments. For comparison, typical RSN levels after harvest when using MRTN rates is about 75 lb N/ac or less in a corn/soybean rotation at a depth of five feet under normal rainfall conditions.
- There were no statistically significant RSN differences detected between the 141 and 171 lb N/ac treatments. Any potential differences between N treatment rates could have been removed due to excessive rains late in the season (+40%).

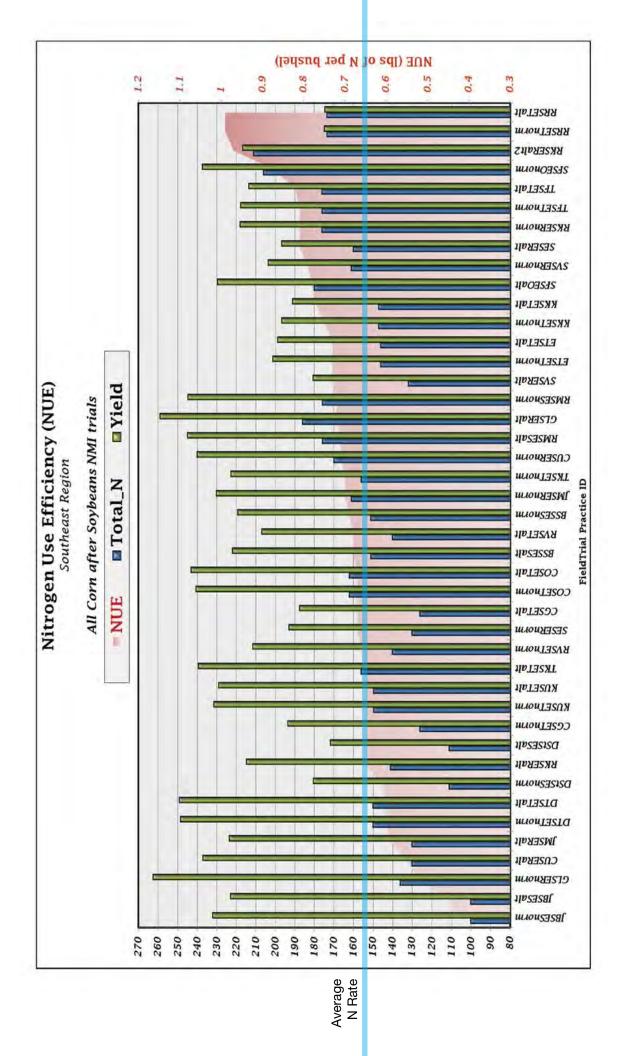
Average N Fertilizer **Bushels produced** Total Corn N Uptake Yield N Supplied by Soil N Rate Recovery per unit of N lbs N/ac lbs N/ac bu/ac % % bu/lb N LSD = 921 (check)* 204 (a) 71** 141 68% 231 (b) 135 45% 1.6 171 229 (b) 134 69% 37% 1.3

2016 Nitrogen Uptake and Use Efficiency

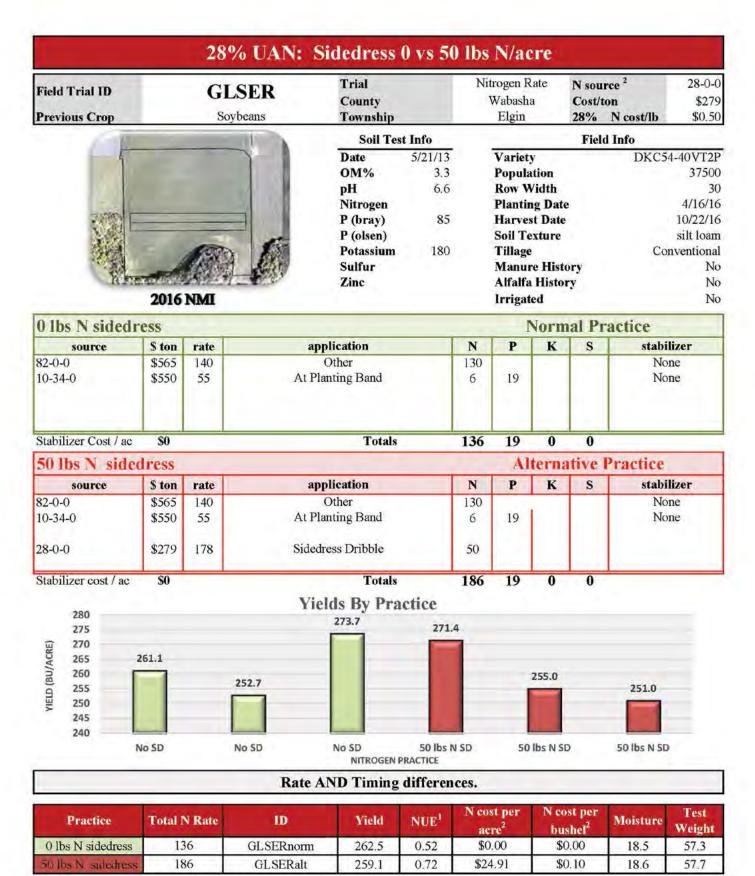
Least significant difference (LSD) is the amount needed to be considered statistically different from the treatment mean. Treatment means with the same letter in the respective column are not significantly different at the 90% level. *The check treatment received 21 lb N/ac of incidental N from 28-0-0 and 10-34-0 starter at planting. **Excludes incidental commercial N that may be in the control. Note that incidental N rates above 10 lb N/ac in the control may increase uncertainty in how much N is provided by the soil.

- The total corn N uptake in the grain and stover for the zero rate check was 71 lb N/ac. This is an indication of how much N was supplied by the soil. Across all treatments an estimated 68% of the corn N uptake was supplied from the soil.
- The amount of N fertilizer recovered by the 141 lb N/ac treatment was 45%. The amount of N fertilizer reovered by the higher 171 lb N/ac rate averaged 37% or 8 percentage point lower nitrogen use efficiency.
- The 141 lb N/ac treatment produced 0.3 bu/ac more corn per unit of N when compared to the higher N rate.

NMI is a collaborative project between farmers of southeast Minnesota, Minnesota Department of Agriculture and University of Minnesota Extension December 2016



Field Trial ID		CUSEF	Tri Co	ial unty			rogen R Olmstec		N sour Cost/to		82-0-0 \$580
Previous Crop		Soybeans		wnship			Viola		82%	N cost/lb	\$0.3
Autor				Soil Tes				_	Field	Info	
	2016	NMI	pH Nit P () P () Pot	1% rogen bray) olsen) tassium lfur	10/20/12 3.2 6.7 29 142		Variet, Popula Row V Plantin Harves Soil Te Tillage Manun Alfalfa Irrigat	ntion Vidth ng Date st Date exture exture re Histor Histor	ory		-37 VT2 3400 3 4/24/1 11/15/1 silt loan aventiona N N N
		NMI							1.0		INC
150 lbs N pro	7						-	-	1	actice	
source	S ton	rate	applicatio			N	Р	K	S	stabi	lizer
82-0-0 18-46-0 0-0-60	\$580 \$480 \$380	150 50 100	Spring Preplan At Planting I At Planting I	Band		150 9	23	60			
21-0-0-24	\$379	50	At Planting	Band		10.5			12		
Stabilizer Cost / ac	\$0			Totals	_	170	23	60	12		_
110 lbs N pre	plant						Al	terna	tive I	Practice	_
source	S ton	rate	application	on	_	N	Р	K	S	stabi	lizer
82-0-0	\$580	110	Spring Preplan	nt Band		110			- 1		
18-46-0	\$480	50	At Planting			9	23		11.11		
0-0-60	\$380	100	At Planting					60	1.2		
21-0-0-24	\$379	50	At Planting	Band		10.5			12		
Stabilizer cost / ac	\$0			Totals		130	23	60	12		
250			Yields E	By Pra	ctice						
245			243.0	0						244.4	
	227.2	240.2		1						_	
240 IV	237.2							235.0			
178 235					231.	7		_			
A A A A A A A A A A					1						
230 (EP						-					
₩ 225								110 lbs		110 lbs	
220	150 lbs	150 lbs	150 lb N	DS ITROGEN F	110 lt PRACTICE	05		110 105		110 105	
220	150 lbs Total I		N			N cos	st per	N co	st per shel ²	Moisture	Test Weight
220	Total I	N Rate	ID N	ITROGEN F	PRACTICE	N cos ac	st per	N co bus			



¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

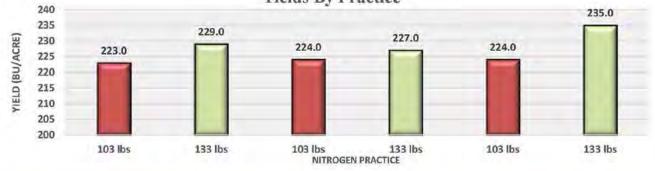
² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

	Preplant U	Jrea: 133 vs	\$ 103	lbs N/acre			
Field Trial ID Previous Crop	JMSER Soybeans	Trial County Township		Nitrogen Rate Olmsted Dover	N sourc Cost/to 46%		46-0-0 \$375 \$0.41
(1990) - B	Con Children Const	Soil Test	Info		Field	Info	
	a state of the	Date		Variety			DK 44-13
Martin Contraction		OM%	3.7	Population			36400
A KING O		pH	6.3	Row Width			20
21		Nitrogen		Planting Dat	te		4/13/16
		P (bray)	45	Harvest Dat	e		10/15/16
11 =		P (olsen)		Soil Texture	ê.		silt loam
*		Potassium	241	Tillage		Spring '	Fillage Only
		Sulfur		Manure Hist	tory		No
		Zinc	2.5	Alfalfa Histo	ory		No
2	016 NMI			Irrigated	1.5		No

133 lbs N p	replant				Normal Practice					
source	\$ ton	rate	application	N	Р	K	S	stabilizer		
46-0-0	\$375	290	Spring Preplant Broadcast	133.4	0	0				
21-0-0-24	\$372	100	Spring Preplant Broadcast	21	0	0	24			
Hydra-Hume	\$2,300	10	Spring Preplant Broadcast		100	101				
10-34-0	\$577	70	At Planting Band	7	24	0				
0.111 0			77.4.1							
Stabilizer Cost /	ac S0		Totals	161	24	0	24			

103 lbs N p	replant		Alternative Practice					
source	\$ ton	rate	application	N	Р	K	S	stabilizer
46-0-0	\$375	225	Spring Preplant Broadcast	103.4	0	0		
21-0-0-24	\$372	100	Spring Preplant Broadcast	21	0	0	24	
Hydra-Hume	\$2,300	10	Spring Preplant Broadcast		1.			
10-34-0	\$577	70	At Planting Band	7	24	0		
_								
Stabilizer cost / a	ac SO		Totals	131	24	0	24	

Yields By Practice



Practice	Total N Rate	ID	Yield	NUE	N cost per acre ²	N cost per bushel ²	Moisture	Test Weight
133 lbs N preplant	161	JMSERnorm	230.3	0.70	\$54.69	\$0.24	18.0	na
103 lbs N preplant	131	JMSERalt	223.6	0.59	\$42.39	\$0.19	18.0	na

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

Field Trial ID Previous Crop		RKS Soybe		Trial County Township			rogen R Winona Utica		N sour Cost/to 46%		46-0-(\$38(\$0.4
	-	11 A		Soil Tes	t Info				Field	Info	
		1		Date	10/4/13		Variety				LG 5470
		1	- 11.	OM%	2.4		Popula				3380
				pН	6.7		Row W				3
			192	Nitrogen			Plantin	~			4/17/1
				P (bray)	28		Harves				loan
				P (olsen) Potassium	167		Soil Te Tillage			Co	nventiona
the second se	-			Sulfur	107		Manur		OFV	cu	N
	_	_		Zinc			Alfalfa				N
	2016	NMI					Irrigat		•		N
154 lbs N prep	olant						r	Norm	al Pra	actice	
source	S ton	rate	ap	plication		N	P	K	S	stabi	lizer
10-34-0	\$585	5	At Pla	anting Band		6	20				
46-0-0	\$380	335		eplant Broadcast		154			-		
21-0-0-24	\$355	50		eplant Broadcast		10.5	36.65		12		
18-46-0	\$495	30		eplant Broadcast		5.4	13.8	200			
)-0-60	\$380	100	Spring Pre	eplant Broadcast				60			
						(
Stabilizer Cost / ac	\$0			Totals		176	34	60	12		
119 lbs N prep	olant						Al	terna	tive F	Practice	
source	\$ ton	rate		plication		N	P	K	S	stabi	lizer
10-34-0	\$585	5		anting Band		6	20		1000		
46-0-0	\$380	411		eplant Broadcast		118.7					
21-0-0-24	\$355	50		eplant Broadcast		10.5	120		12		
18-46-0	\$495	30		eplant Broadcast		5.4	13.8	0			
)-0-60	\$380	100	Spring Pre	eplant Broadcast				60			
Stabilizer cost / ac	\$0			Totals		141	34	60	12		
			Vie	lds By Pra	ctice	141	34	00	14		
225 219	.5		218.4				218.4				
220 Giu	1	213.0		217.1	216.5				216.5	216.1	
ACR 512		215.0		100	-				-		
AIELD (BU/ACRE) 212 210 205 205 205 205 205 205 205 205 205 20		-									
9 205			_	_							
₹ 200	_		_		-						
195	-		-	1					-		
154 lb	s N	119 lbs	154 lbs N	189 lbs N NITROGEN P	119 lbs N	1	54 lbs N	1	89 lbs N	154 lbs	N
	_	1	Also applied	a high rate	10-11-0 (AL-	os N/a	cre.				
-								_			
Denvelo	Tatal			3/2414	Arrival	N cos	t per	N co	st per	Madada	Test
Practice	Total I	N Rate	ID	Yield	NUE	N cos aci			st per shel ²	Moisture	Test Weight
Practice 154 lbs N preplant		N Rate		Yield 218.1	NUE ¹ 0.81		re ²	bu		Moisture 17.7	

 189 lbs N preplant
 211
 RKSERalt2
 216.8
 0.97
 \$78.07

 ¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)
 ²
 ² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

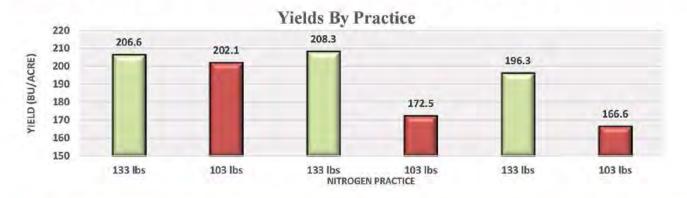
Field Trial ID Previous Crop		100.000	ESER bybeans		Trial County Township		1	rogen Fillmo Founta	re	N source Cost/ton 82% N	
Aller	-	-			Soil Tes	st Info				Field I	Info
					Date OM% pH Nitrogen P (bray) P (olsen)	10/21/15 3.1 6.98 38		Plant Harv			36
	/				Potassium Sulfur Zinc	186			ge 1re Histo fa Histor		No-
	2016	NMI						Irriga		•	
130 lbs N side	edress								Norm	al Pra	ctice
source 82-0-0	S ton	rate 158			ication ess Band		N 130	P 0	K	S	stabilizer
	\$500						10,0				
Stabilizer Cost / ac	\$0				Totals	-	130	0	0	0	
160 lbs N side	edress							A	lterna	tive P	ractice
source	S ton	rate			ication		N	Р	K	S	stabilizer
82-0-0	\$500	195		Sidedr	ess Band		160	0	0		
Stabilizer cost / ac	\$0				Totals	-	160	0	0	0	
240 230	22	28.0		Yield	ls By Pra	ctice				-	
220			195.5	201.3	199.4	195.8	188.	7	189.9		195.0
08) 180 9 170 9 160 150 135. 140	,									154.5	
130 120 0 Che	ck 180	lbs N	130 lbs	160 lbs	160 lbs	130 lbs	130	bs	160 lbs	O Chec	ck 180 lbs N

Practice	Total N Rate	ID	Yield	NUE ¹	N cost per acre ²	N cost per bushel ²	Moisture	Test Weight
130 lbs N sidedress	130	SESERnorm	193.3	0.67	\$39.63	\$0.21	20.8	53.0
160 lbs N sidedress	160	SESERalt	196.9	0.81	\$48.78	\$0.25	20.7	52.7
80 lbs N sidedress	180		211.5	0.85	\$54.88	\$0.26	20.5	53.0

Field Trial ID	SVSER	Trial County		Nitrogen Rate Olmsted	N sou Cost/t	on	46-0-0 \$375
Previous Crop	Soybeans	Township		Dover	46%	N cost/lb	\$0.41
-		Soil Test	Info		Fie	ld Info	
	- all	Date		Variety			DK 46-37
		OM%	1.7	Population			35500
		pH	6.9	Row Width			20
		Nitrogen		Planting Da	te		4/13/16
		P (bray)	11	Harvest Dat	e		11/3/16
		P (olsen)		Soil Texture		silt	y clay loam
81 11		Potassium	101	Tillage		Spring 7	illage Only
Allen a		Sulfur		Manure His	tory		No
the second	and the second s	Zinc	0.62	Alfalfa Histo			No
2	016 NMI	100		Irrigated			No

133 lbs N p	replant				Normal Practice					
source	S ton	rate	application	N	Р	K	S	stabilizer		
46-0-0	\$375	290	Spring Preplant Broadcast	133.4	0	0				
21-0-0-24	\$372	100	Spring Preplant Broadcast	21	0	0	24			
Hydra-Hume	\$2,300	10	Spring Preplant Broadcast		100	101				
10-34-0	\$577	70	At Planting Band	7	24	0				
Stabilizer Cost /	ac S0		Totals	161	24	0	24			

104 lbs N p	replant				A	terna	ative P	ractice
source	\$ ton	rate	application	N	Р	K	S	stabilizer
46-0-0	\$375	225	Spring Preplant Broadcast	103.5	0	0	1	
21-0-0-24	\$372	100	Spring Preplant Broadcast	21	0	0	24	
Hydra-Hume	\$2,300	10	Spring Preplant Broadcast					
10-34-0	\$577	70	At Planting Band	7	24	0		
Stabilizer cost / a	ic SO	_	Totals	132	24		24	



Practice	Total N Rate	1D	Yield	NUE	N cost per acre ²	N cost per bushel ²	Moisture	Test Weight
133 lbs N preplant	161	SVSERnorm	203.7	0.79	\$54.69	\$0.27	19.2	na
104 lbs N preplant	132	SVSERalt	180.4	0.73	\$42.44	\$0.24	19.4	na

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

Field Trial ID Previous Crop		SEI ,	Trial County Fownship		F	gen Tin illmore Sumner				28-0-0 na na
ACCREDING THE R.	ATTEN DE		Soil Te	st Info				_	I Info	na
2016 NR	A		Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	4/24/12 3 6.3 20 100		Variet Popula Row V Plantin Harve Soil To Tillage Manu Alfalfa Irrigat	ation Vidth ng Dat st Dat exture e re Histon histon	te e tory	D Apr	KC 49-72 35500 30 il 24 2010 ber 3 2010 loam No-Til No No No
At Planting 122 lbs N	-							al Dr	actice	
	\$ ton rate	T	application		N	P	K	S	stabi	izar
source 28-0-0 12-0-0-26	\$ ton rate 437 33	At I	Planting Bar Planting Bar		122 4	Ľ	R	8.5	Stabi	
Stabilizer Cost / ac	\$0		Totals		126	0	0	9		
Split 78/46 lbs N							1	1.1.1.1.1.1.1.1	Practice	
A CALE OF A CALE	\$ ton rate	-	application		N	Р	K	S	stabi	lizer
28-0-0 12-0-0-26 46-0-0	279 19.8 100	At I	Planting Bar Planting Bar Iress Broade	nd	78 2.3 46			5		
Stabilizer cost / ac	<u>\$0</u>	1	Totals		126	0	0	5		_
		Yield	ds By Pr	actice						
210 205 200.4 200 195 195 195 195 180 180 180 175 170 165 160	198.5	197.7	199.5	196.8		184.6		180.0	16	3.1
At Planting	Split	At Planting	Split	At Plantin		Split		At Planti	ng Sp	
Practice	Total N Rat	2 ID	Yield	NUE ¹	N cos aci	-		ost per shel ²	% MT	Test Weight
At Planting 122 lbs N	126	CGSETnorm	193.7	0.65	n		1.1	na	19.0	na

Field Trial ID Previous Crop		COSE Soybeans	Cour	nty	Н	gen Tin Iouston 'ucatan		N source Cost/to 46%		46-0-0 \$385 \$0.42
aller a the of	-	1	5	Soil Test Info				Field	l Info	
			Date OM9 pH Nitro P (br P (ols	% gen ay) sen) ssium		Variet Popula Row V Plantin Harve Soil To Tillage Manun Alfalfa	ation Vidth ng Dav st Dat exture e re Histo a Histo	te e tory	Т	DKC 53-53 34000 30 4/22/10 11/4/10 niventiona No No
2016	NMI				1	Irrigat				No
Preplant 138 lbs N							-	1 1	actice	
source	\$ ton	rate	applic		N	Р	K	S	stabil	
46-0-0 21-0-0-24	\$385 \$365	300 100	Spring Preplat Spring Preplat		138 21				Insti Insti	
0-0-60	\$390	100	Spring Prepla		-21		60		msu	not
7-23-5	\$727	44	Sidedress		3	10	2.2			
Stabilizer Cost / ac	\$0			Fotals	162	10	62	0		
Split 69/69 lbs N						AI	tern	ative	Practice	
source	\$ ton	rate	applic	ation	N	Р	K	S	stabil	izer
46-0-0	\$385	150	Spring Prepla	nt Broadcast	69				Insti	nct
21-0-0-24	\$365	100	Spring Prepla		21				Insti	nct
0-0-60	\$390	50	Spring Preplan	nt Broadcast			30			
7-23-5	\$727	44	Sidedress		3	10	2.2			
46-0-0 0-0-60	\$385 \$390	150 50	Sidedress I Sidedress I	the state of the second s	69		30		Agrotai	1 Ultra
Stabilizer cost / ac	S 0			Fotals	162	10	62	0		
			Yields	By Practice						
260 gg 255			248.						249.2	
255 250 244.8 245 245 240 235 235 230		245.0	240.							1

Practice	Total N Rate	ID	Yield	NUE ¹	N cost per acre ²	N cost per bushel ²	% MT	Test Weight
Preplant 138 lbs N	162	COSETnorm	240.7	0.67	\$57.96	\$0.24	16.5	52.3
Split 69/69 lbs N	162	COSETalt	243.1	0.67	\$57.96	\$0.24	16.7	51.8

Preplant

Split

Preplant

Split

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

Preplant

² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

225 220

Split

eld Trial ID DTSET revious Crop Soybeans			T Trial			gen Tin Imsted		N source Cost/ton	6	46-0-0 \$370	
Previous Crop		Soybean	County Township	,		Viola			cost/lb	\$0.40	
	15.5	-	Soil 7	lest Info				Field	Info		
2016 1	MI		Date OM% pH Nitrogen P (bray) P (olsen) Potassiun Sulfur Zinc	11/29/13 3.5 7.3 17 n 126		Variet Popula Row W Plantin Harves Soil To Tillage Manun Alfalfa Irrigat	ation Vidth ng Dat st Data exture exture re Histo a Histo	e tory		-84 VT2F 34000 30 5/4/16 10/21/16 silt loam nventiona No No	
Preplant 104 lbs N						1	Norn	nal Pra	Practice		
source	\$ ton	rate	application	L)	N	Р	K	S	stabili	zer	
46-0-0 18-46-0 21-0-0-24 0-0-60 18-46-0 0-0-60	\$370 \$475 \$379 \$335 \$475 \$335	225 150 50 75 50 50	Spring Preplant Br Spring Preplant Br Spring Preplant Br Spring Preplant Br At Planting B At Planting B	roadcast roadcast roadcast and	103.5 27 10.5 9	69 23	45 30	12			
Stabilizer Cost / ac	\$0		Tota	ls	150	92	75	12			
Split 53/51 lbs N						AI	tern	ative P	ractice		
source	\$ ton	rate	application	í l	N	Р	K	S	stabili	zer	
46-0-0 18-46-0 21-0-0-24 0-0-60 18-46-0 0-0-60 46-0-0	\$370 \$475 \$379 \$335 \$475 \$335 \$370	115 150 50 75 50 50 110	Spring Preplant Br Spring Preplant Br Spring Preplant Br Spring Preplant Br At Planting B At Planting B Sidedress Broa	roadcast roadcast roadcast and and	53 27 10.5 9 50.5	69 23	45 30	12	Agrot	ain	
Stabilizer cost / ac	S 0		Tota	ls	150	92	75	12			
260 (255 250 250 245 245 240 235 230		249.1	Yields By 246.1		15.5		252.	3	249.9		
F 230 225											

Practice	Total N Rate	ID	Yield	NUE	N cost per acre ²	N cost per bushel ²	% MT	Test Weight
Preplant 104 lbs N	150	DTSETnorm	248.5	0.60	\$41.40	\$0.17	17.1	57.3
Split 53/51 Ibs N	150	DTSETalt	249.3	0.60	\$41.40	\$0.17	17.0	57.9

Field Trial ID Previous Crop		ETSE Soybean	1	Frial County Fownship		C	gen Tim Dimsted ock Dell		N sour Cost/t 46%		28-0-0 n n	
100 2	- B-	-	ń	and as a						N cost/lb	n	
21	FUT	See and	h -	Soil Test	Info 5/25/16		Variat		Fie	d Info		
W SPECIAL PORT				Date OM%	2.3		Variety Popula				3400	
C 1. 1				pH	6.3		Row W				3	
N. M.	-			Nitrogen			Plantin	ng Da	te		5/5/1	
	- Book			P (bray)	11		Harves				11/5/1	
	and the second			P (olsen) Potassium	108		Soil Te		9	C	loan	
- 18.00				Sulfur	108		Tillage Manur		tory	C	N	
				Zinc			Alfalfa				N	
201	16 NMI						Irrigat				N	
Deaplant 130 lbs	NI				T		N	Jan	nalD	al Practice		
Preplant 139 lbs	1	rate	an	plication		N	P	K	s s	stabi	lizer	
28-0-0		496		lant Dribble/S	prav	139	-					
10-34-0		69.6		anting Band		7	23.6					
	5					-					_	
Stabilizer Cost / ac	\$0			Totals		146	24	0	0			
Split 92/47 lbs N							Alt	tern	ative	Practice		
source	\$ ton	rate		plication		Ν	Р	K	S	stabi	lizer	
28-0-0		328		lant Dribble/S	pray	92	1					
46-0-0		104	and the second se	ess Broadcast		47	23.6					
10-34-0	0	69.6	At Pl	anting Band	-	7						
									1.			
Stabilizer cost / ac	\$0			Totals		146	24	0	0			
			Viel	ds By Pra	otica							
-			1 ICI	us by Fra	cute							
215 1 210			208.3	P								
205	203.1					199.6						
V/n 200					Г		1					
^B 195 190 190										189.2		
185							-					
180				-			-					
175	anlant		C. P.		L	Dunglass				Calls		
PI	replant		Split			Preplant				Split		
		_				N cos	4	21	ost per		Test	

Practice	Total N Rate	ID	Yield	NUE ¹	N cost per acre ²	N cost per bushel ²	% MT	Test Weight
Preplant 139 lbs N	146	ETSETnorm	201.4	0.73	na	na	0.0	0.0
Split 92/47 lbs N	146	ETSETalt	198.8	0.73	na	na	0.0	0.0

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

Field Trial ID		KUSET	County	(ogen Tin Olmsted		N source Cost/ton	\$58
Previous Crop	-	Soybeans	Township		Dover			so.3
(-	. Jol	Soil Test Info			1.8		V cost/lb \$0.4
1 internet	1	A State	Date 11/15/1	5	Variet	v	Fien	DKC 46-37 VT2
			OM% 3.		Popula			3400
			pH 6.	4	Row V			3
			Nitrogen	0	Plantin	-		4/27/1
			P (bray) 1 P (olsen)	Q	Harve: Soil Te			10/25/1 silty clay loa
	1 1 24		Potassium 14	5	Tillage			No-Ti
A STATE	and a	hr at	Sulfur		Manu		tory	Ν
ALC: NO.			Zinc		Alfalfa		ory	N
	2016 N	MI			Irrigat	ted		N
Preplant 130 I	bs N					Nori	mal Pr	actice
source	\$ ton	rate	application	N	P	K	S	stabilizer
82-0-0	\$580	160	Spring Preplant Band	130			1.1	
18-46-0 0-0-60	\$480 \$380	50 100	At Planting Band At Planting Band	9	23	60		
21-0-0-24	\$379	50	At Planting Band	10.5		00	12	
	1.000			1000				
Stabilizer Cost / ac	<u>\$0</u>		Totals	150	23	60	12	
Split 90/40 lbs	N			T	A	ltern	ative	Practice
source	\$ ton	rate	application	N	Р	K	S	stabilizer
82-0-0	\$580	160	Spring Preplant Band	90			1.1.1.1	
18-46-0	\$480	50	At Planting Band	9	23			
0-0-60	\$380	100	At Planting Band	See.		60		
21-0-0-24	\$379	50	At Planting Band	10.5			12	
46-0-0	\$370	85	Sidedress Broadcast	40				Agrotain
Stabilizer cost / ac	SO		Totals	150	23	60	12	
	50				20	00	12	
240			Yields By Practi	ce				
	32.3	231.7						233.1
235 23 230 (BU/ACRE) 230 225 225 220 220		231.7	230.6			22	8.4	
/ng) 225				225.9			-	
9 220								100
E 220								100
215								

Practice	Total N Rate	ID	Yield	NUE ¹	N cost per acre ²	N cost per bushel ²	% MT	Test Weight
Preplant 130 lbs N	150	KUSETnorm	231.5	0.65	\$45.50	\$0.20	15.3	na
Split 90/40 lbs N	150	KUSETalt	229.1	0.65	\$47.59	\$0.21	15.6	na

Field Trial ID		KKSET Soybeans	Trial County Township		ogen Tir Mower Racine	ning	N sou Cost/1		82-0- n
Previous Crop		Soydeans	Township		Racine	-	82%	N cost/lb	n
	. cin.	1750	Soil Test Info					ld Info	
	2016 NMI		pH 6. Nitrogen	3 5 2	Variet Popula Row V Planti Harve Soil To Tillag Manu Alfalfa Irriga	ation Width ng Da st Dat exture e re Hist a Hist	te te story	Octobe	3400 3 1 25 201 r 25 201 loan wention N N N
Preplant 140 lt				1		_	nalP	ractice	
source	\$ ton	rate	application	N	P	K	S	stabili	zer
10-34-0	\$ 101	69	Spring Preplant Band	6.9	23	K	2	Statin	
32-0-0		170	Spring Preplant Band	140					
Stabilizer Cost / ac	\$0		Totals	147	23	0	0		_
Split 84/56 lbs					-	-	-	Practice	
source	\$ ton	rate	application	N	P	K	S	stabili	zer
0-34-0 32-0-0		69 102	Spring Preplant Band Spring Preplant Band	6.9 84	23				
46-0-0		122	Sidedress Broadcast	56.1					
Stabilizer cost / ac	50		Totals	147	23	0	0		
			Yields By Practice						
				198.9				200.4	
205	1222								
200	194.9								
200	194.9								
200	194.9		181.7						
200 195 190 190	194.9		181.7						
200 195 190 185 180	194.9		181.7						

Practice	Total N Rate	ID	Yield	NUE ¹	N cost per acre ²	N cost per bushel ²	% MT	Test Weight
Preplant 140 lbs N	147	KKSETnorm	196.9	0.75	na	na	14.6	na
Split 84/56 lbs N	147	KKSETalt	191.1	0.77	na	na	15.0	na

Field Trial ID Previous Crop		RRSE T	ſ	Trial County Township	F	gen Tin illmore ford Vil		N source Cost/to 46%		46-0-0 \$376 \$0.41
(····				Soil Test Info				Field	Info	
2	016 NMI			Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc		Variet Popula Row V Plantin Harve: Soil To Tillage Manun Alfalfa Irrigat	ation Vidth ng Da st Dat exture e re Histo a Histo	e tory		30000 36 pril 27th ventional No No
Preplant 120 lbs	N				1	N	lorn	al Pra	actice	
source	\$ ton	rate	6	application	N	Р	K	S	stabili	zer
46-0-0	\$376	260	Spring Preplant Broadcast						Non	e
21-0-0-24	\$365	100	Spring Preplant Broadcast			- 24		24		
18-46-0	\$463	100		Preplant Broadcast	18	46	-34-1			
0-0-60 10-9-10	\$343 \$407	100 150		Preplant Broadcast ng Preplant Band	15	13.5	60 15			
Stabilizer Cost / ac	\$0			Totals	174	60	75	24		
Split 69/51 lbs N	ĥ	-				Alt	erna	ative P	ractice	
source	\$ ton	rate	1	application	N	Р	K	S	stabili	zer
46-0-0	\$376	150	Spring	Preplant Broadcast	69				-	
21-0-0-24	\$365	100	Spring	Preplant Broadcast	21	1.0		24		
18-46-0	\$463	100		Preplant Broadcast	18	46				
0-0-60	\$343	100		Preplant Broadcast	1.5	in the	60			
10-9-10	\$407	150		ng Preplant Band	15	13.5	15	_	A	T 71.
46-0-0	\$376	110	Side	dress Broadcast	50.6				Agrotain	Ultra
Stabilizer cost / ac	\$0			Totals	174	60	75	24		
			Yie	lds By Practice						
	79.4			175.5					174.6	
180 170 160 150 140						169.9				
A/D 160										
D 150										
140		136.	.1							
130										
120						ALC: NO.				

Practice	Total N Rate	ID	Yield	NUE ¹	N cost per acre ²	N cost per bushel ²	% MT	Test Weight
Preplant 120 lbs N	174	RRSETnorm	175.0	0.99	\$49.04	\$0.28	14.8	56.0
Split 69/51 lbs N	174	RRSETalt	174.7	0.99	\$49.04	\$0.28	15.0	56.0

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

² Nitrogen source(s) used in comparison only. Does not include other mutrient sources or application fees.

Field Trial ID Previous Crop		RVSET Soybeans	Trial County Township	1	ogen Tii Fillmore Sumner	3	N source Cost/to 82%		82-0-(na na
			Soil Test Info				Fiel	d Info	
	2016 NM	I	pH 6. Nitrogen	3 .5	Variet Popul Row V Planti Harve Soil T Tillag Manu Alfalf Irriga	ation Width ng Da est Dat exture e re His a Histe	tory	Cor	33000 30 4/25/10 10/30/10 10am nventiona No No No
Preplant 140 lb	s N				-	Nor	mal P	ractice	
source 32-0-0	\$ ton	rate 170	application Spring Preplant Band	N 140	Р	K	S	stabiliz	zer
Stabilizer Cost / ac Split 84/56 lbs source 82-0-0 46-0-0	\$0 N \$ ton	rate 102 121	Totals application Spring Preplant Band Sidedress Broadcast	140 140 N 84 56	0 A P	0 Iterr K	0 native S	Practice stabiliz	zer
Stabilizer cost / ac	\$0	121	Totals Yields By Practic	140	0	0	0		
230 220				217.	3			219.9	
AIELD (BU/ACRE)	206.0								
<u>e</u> 2 200			194.0						

Practice	Total N Rate	ID	Yield	NUE ¹	N cost per acre ²	N cost per bushel ²	% MT	Test Weight
Preplant 140 lbs N	140	RVSETnorm	211.6	0.66	na	na	25.5	54.5
Split 84/56 lbs N	140	RVSETalt	207.0	0.68	na	na	25.3	55.3

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

² Nitrogen source(s) used in comparison only. Does not include other mutrient sources or application fees.

Field Trial ID Previous Crop		TKSET Soybeans	Trial County Township	0	gen Tir Olmsted ock Del		N source Cost/ton 46% N		46-0- n n
/ I MA	100		Soil Test Info				Field	Info	
	R.	We	Nitrogen		Variet Popula Row V Planti Harve	ation Vidth ng Dat			3400 3 4/25/1
20	16 NM	A I	P (olsen) Potassium 15 Sulfur Zinc		Soil To Tillage Manu Alfalfa Irriga	exture e re His a Histo	tory	Cor	loan iventiona N N N
Preplant 111 lbs	N			1	ľ	Vorn	nal Pra	actice	
source	\$ ton	rate	application	N	P	K	S	stabil	izer
21-0-0-24	of ton	75	Spring Preplant Broadcast	15	-		18		
6-0-0	1000	242	Spring Preplant Broadcast	111			2.2		
8-46-0		135	Spring Preplant Broadcast	24	62				
-0-60		72	Spring Preplant Broadcast	1.1	200	43			
0-34-0		58	At Planting Band	6	20				
Stabilizer Cost / ac	\$0		Totals	156	82	43	18	_	
Split 51/60 lbs N					Al	tern	ative P	ractice	
source	\$ ton	rate	application	N	Р	K	S	stabil	izer
21-0-0-24		75	Spring Preplant Broadcast	15			18		
6-0-0	-	110	Spring Preplant Broadcast	51					
8-46-0		135	Spring Preplant Broadcast	24	62				
-0-60		72	Spring Preplant Broadcast	1.00	1000	43			
16-0-0	Contract,	130	Sidedress Broadcast	60					
10-34-0		58	At Planting Band	6	20				
Stabilizer cost / ac	\$ 0		Totals	156	82	43	0		

51/60 lbs Wens

51/60 lbs Dek 51/60 lbs Wens

ens 111 lbs Wens

111 lbs Dek

111 lbs Dek

2 diffe	erent varieties.	Wensman an	nd Dekalb.	Yield av	erages using	Wensman	only.	
Practice	Total N Rate	ID	Yield (Wensman Only)	NUE ¹	N cost per acre ²	N cost per bushel ²	% MT	Test Weight
Preplant 111 lbs N	156	TKSETnorm	222.9	0.70	na	na	na	na
Split 51/60 lbs N	156	TKSETalt	239.4	0.65	na	na	na	na

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

Field Trial ID Previous Crop		TFSET Soybeans	Trial County Township		C	gen Tim Imsted gh Fores		N sour Cost/te 46%		46-0-0 na na
20	016 NMI		Soil Test Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	Info 10/21/13 3 6.8 20 130		Variety Popula Row W Plantin Harves Soil Te Tillage Manur Alfalfa Irrigato	tion /idth g Dat t Dato xture e Hist Histo	e e tory		36000 3(5/1/10 ber 21 2010 Loan onventiona No No
Preplant 149 lbs	N					ľ	Vorn	nal P	ractice	
source 21-0-0-24 46-0-0 10-34-0	\$ ton	rate 100 324 58	application Spring Preplant Broadcast Spring Preplant Broadcast At Planting Band		N 21 149 6	P 20	K	S	stabi	HLVI
Stabilizer Cost / ac	\$0		Totals		176	20	0	0		
Split 79/70 lbs N					-	Alt	tern	ative	Practice	8
source	\$ ton	rate	application		N	Р	K	S	stabi	ilizer
21-0-0-24 46-0-0 46-0-0 10-34-0		100 171 152 58	Spring Preplant Broade Spring Preplant Broade Sidedress Broadcast At Planting Band	cast	21 79 70 6	20 20				
Stabilizer cost / ac	\$0		Totals	-	176	40	0	0		
225			Yields By Pr	actice						
Z20 215 210 (BU/ACRE) 205 200 195 190	217.4		213.4 Split		218.1 Preplat				213.9	

16.6

16.6

na

na

na

na

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

176

176

² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

TFSETnorm

TFSETalt

217.7

213.6

0.81

0.82

na

na

Preplant 149 lbs N

Split 79/70 lbs N

Effect of Nitrification Inhibitor on 2016 Corn Yield

Dover Site, Olmstead County, Minnesota

Parameter	Plot Details
Test:	Nitrogen rate
Previous Crop:	Soybeans
Hybrid:	Dekalb DJC52-85
Tillage System:	Strip Till
N Applic. Date:	April 26, 2016 with planter (4 x 2)
Plant Date:	April 26, 2016
N source:	UAN 28% at planting
Population:	34,000 planted/30,000 actual
Plot Design:	Side by side, avg. of 3 reps.

April-June

-8%

1%

219

b

151

Treatment means with the same letter are not significantly different at the 90% level

Total N Rate (lb N/ac)
*Check includes incidental N from fall applied DAP and starter at planting

Chart 1: Effect of Nitrification Inhibitor on Corn Yield

2016 Dover Site, Olmsted County, Corn following Soybean

July-Sept

222

b

151 with nitrification

inhibitor

+40%

7%

Grand Meadow Weather Station Measure

139

а

35 (check)*

Avg. % of normal precipitation: % of days with more than 1.0" rainfall:

230

210

190

170

150 130

ISD 0 10 = 9 hu

Average Yleld (bu/ac)

Soil Fertility Measure	Plot Values
Soil Type:	Mt. Carroll Silt Loam
O.M.%:	2.0 % (low)
pH:	6.7 (5.8-7.0 normal)
Bray P1:	16 ppm (high)
Potassium:	140 ppm (high)

Sampled at 0-6" depth on 5/31/13

The nitrification inhibitor used at this plot was Instinct®. The active ingredient for this product is nitrapyrin. Instinct is a nitrification inhibitor for UAN and Urea and delays the conversion of ammonium-nitrogen to nitrate-nitrogen. Instinct is a trademark of Dow AgroSciences.

2016 results showed there was no significant yield difference between the tested treatments (chart 1).

Factors that may have contributed to no differences detected include: N application method and timing, ideal early season growing conditions and soil mineralization, below normal early season precipitation totals and minimal leaching rains.

			2016 Economics	6			
Total N Rate (lb N/ac)	Timing	Average Yield (bu/ac) LSD = 9	Average Moisture (%) LSD = 0.5	Drying Cost (\$/ac)	N Cost (\$/ac)	Net Return (\$/ac)	Profit Rank
35 (check)*		139 (a)	20.7 (a)	\$1	\$25	\$410	
151	@planting	193 (b)	20.8 (a)	\$2	\$34	\$503	1
151 w/N inhibitor	@planting	197 (b)	20.9 (a)	\$1	\$35	\$503	2

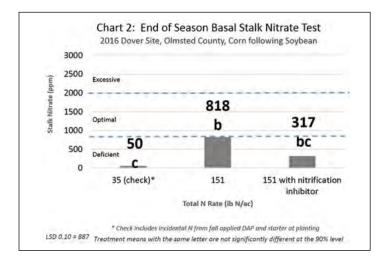
ASSUMPTIONS: Corn price assumes \$3.00/bu. (avg. Oct. 2016 price) and 0.33/lb anhydrous ammonia (avg. April price). A \$0.03/bu. deduction was used for every moisture point over 15.0%. Treatment means with the same letter in the respective column are not significantly different at a 90% confidence level. Least significant difference (LSD) is the amount needed for one treatment mean to be considered statistically different from another treatment mean.

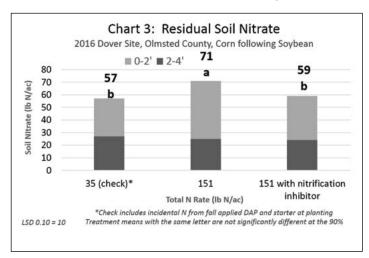
NMI is a collaborative project between farmers of southeast Minnesota, Minnesota Department of Agriculture and University of Minnesota Extension

December 2016

Nutrient Management Initiative

Effect of Nitrogen Inhibitor on 2016 Stalk Nitrate and Residual Soil Nitrogen Tests





- The optimal range for the end of season basal stalk nitrate test is 700-2,000 ppm. Stalk nitrate concentrations below 700 ppm may indicate nitrogen deficiencies while levels above 2,000 ppm may indicate excessive nitrogen. Tests showed that both treatments were near the **optimal to deficient** category and there was no significant differences observed between the treatments (chart 2).
- Preplant soil nitrate levels collected in early April prior to spring N treatment application (some N was applied with fall DAP) measured 41 lb N/ac at 0-2 foot depth. Soil nitrate levels at V4 crop growth stage (PSNT) at 0-1 foot depth averaged 142 lb N/ac (35.5 ppm) without the inhibitor and 93 lb N/ac (23.3 ppm) with the inhibitor.
- Soil nitrate samples collected at the end of the season indicate how much nitrogen was left over (chart 3). Higher residual soil nitrate (RSN) levels could increase nitrate-nitrogen leaching risk to groundwater and surface water. The amount of RSN at a depth of four feet measured after harvest ranged from 59-71 lb N/ac in the treatments and 57 lb N/ac in the check. There was 11 lb N/ac less RSN when using the N inhibitor. Most of the RSN was found from 0-2 feet.

Nitrogen Uptake and Use Efficiency

N Rate Ibs N/ac	Average Yield bu/ac LSD = 9	Total Corn N Uptake Ibs N/ac	N Supplied by Soil %	N Fertilizer Recovery %	Bushels produced per unit of N bu/lb N
35 (check)*	139 (a)	44**			
151	219 (b)	147	30%	68%	1.5
151 w/N inhibitor	222 (b)	136	32%	61%	1.2

Least significant difference (LSD) is the amount needed to be considered statistically different from the treatment mean. Treatment means with the same letter in the respective column are not significantly different at the 90% level.

*Check includes incidental N from fall applied DAP and starter at planting.

**Excludes incidental commercial N that may be in the control. Note that incidental N rates above 10 lb N/ac in the control may increase uncertainty in how much N is provided by the soil.

- The total corn N uptake in the grain and stover for the zero rate check was 44 lb N/ac. This is an estimate of how much N was supplied by the soil. Across both treatments 30-32% of the corn N uptake was from the soil.
- The amount of N fertilizer recovered by both treatments ranged from 61-68%.
- Both treatments produced between 1.2 to 1.5 bu. per lb of N applied.

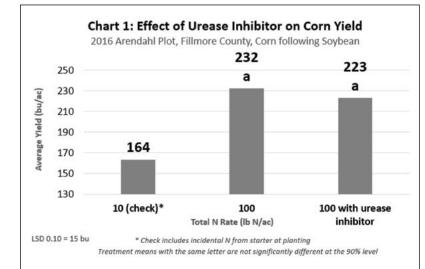
NMI is a collaborative project between farmers of southeast Minnesota, Minnesota Department of Agriculture and University of Minnesota Extension December 2016 Nutrient Management Initiative

Effect of Urease Inhibitor on 2016 Corn Yield

Arendahl Site, Fillmore County, Minnesota

Parameter	Plot Details
Test:	Urease inhibitor (NBPT)
Previous Crop:	Soybeans
Hybrid:	Dekalb 50-85
Tillage System:	Conventional
N Applic. Date:	April 26, 2016 and Nov. 8,2016
Plant Date:	May 3, 2016
N source:	UAN 28%, bdcst/pre-emg., no inc.
Population:	34,000 planted/33,125 actual
Plot Design:	Side by side, avg. of 3 reps.

Grand Meadow Weather Station Measure	April-June	July-Sept
Avg. % of normal precipitation:	+2%	+97%
% of days with more than 1.0" rainfall:	3%	10%



Soil Fertility Measure	Plot Values	
Soil Type:	Tama Silt Loam	
O.M.%:	4.2 % (high)	│ <mark><mark></mark> <u></u> </mark>
pH:	6.5 (5.8-7.0 normal)	
Bray P1:	6 ppm (low)	
Potassium:	104 ppm (medium)	

Sampled at 0-6" depth on April 16, 2015

The urease inhibitor used on this plot was Factor®. The active ingredient in this product is NBPT. Factor is a urease inhibitor for UAN and urea and reduces the risk of ammonia volatilization losses of urea by the urease enzyme found naturally in the soil. Factor is manufactured for Rosen's Inc. and is a registered trademark of Midtech R&D, Inc.

2016 results showed there was no significant yield difference between the treatments.

UAN 28% was broadcast applied on May 3, 2016 (preemerge) with no incorporation. At least 0.5" of rain was received within **seven days** after N application. Ideal early season temperatures and rainfall may have reduced ammonia volatilization risk at this plot.

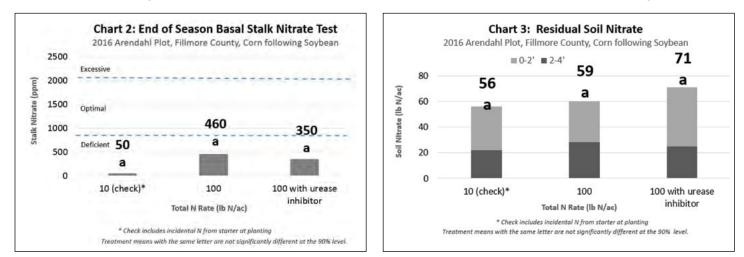
	2016 Economics												
Total N Rate (Ib N/ac)	Timing	Average Yield (bu/ac) LSD = 15	Average Moisture (%) LSD = 0.5	Drying Cost (\$/ac)	N Cost (\$/ac)	Net Return (\$/ac)	Profit Rank						
10 (check)*		164	14.9	\$0	\$5	\$488							
100	Pre-emerge	232 (a)	14.5 (a)	\$0	\$46	\$650	1						
100 w/ inhibitor	Pre-emerge	223 (a)	14.3 (a)	\$0	\$57	\$612	2						

ASSUMPTIONS: Corn price assumes \$3.00/bu. (avg. Oct. 2016 price), \$0.46/lb UAN (avg. March price) and \$11.00/ac for stabilizer. A \$0.03/bu. deduction was used for every moisture point over 15.0%. Treatment means with the same letter in the respective column are not significantly different at a 90% confidence level. Least significant difference (LSD) is the amount needed for one treatment mean to be considered statistically different from another treatment mean. *Check includes incidental N from starter at planting.

NMI is a collaborative project between farmers of southeast Minnesota, Minnesota Department of Agriculture and University of Minnesota Extension

December 2016

Effect of Nitrogen Inhibitor on 2016 Stalk Nitrate and Residual Soil Nitrogen Tests



- The optimal range for the end of season basal stalk nitrate test is 700-2,000 ppm. Stalk nitrate concentrations below 700 ppm may indicate nitrogen deficiencies while levels above 2,000 ppm may indicate excessive nitrogen. Tests showed that both treatments were in the **deficient category** and there was no significant difference between the treatments (chart 2).
- Preplant soil nitrate levels collected in early April prior to spring N treatment application measured 46 lb N/ac at 0-2 foot depth. Soil nitrate levels at V4 crop growth stage (PSNT) measured 105 lb N/ac (26.3 ppm) at 0-1 foot depth without inhibitor and 95 lb N/ac (23.8 ppm) with inhibitor.
- Soil nitrogen samples collected at the end of the season indicate how much nitrogen was left over (chart 3). Higher residual soil nitrate (RSN) levels could increase nitrate-nitrogen leaching risk to groundwater and surface water. The amount of RSN measured after harvest at 0-4 foot depth ranged from 59-71 lb N/ac in the treatments and 56 lb N/ac in the check. There were no significant differences between treatments and likely the result of above normal rainfall late in the season (97% above normal).

Average **Bushels produced** N Fertilizer N Rate Yield Total Corn N Uptake N Supplied by Soil per unit of N Recovery lbs N/ac lbs N/ac bu/ac % % bu/lb N LSD = 15 10 (check)* 164 71** 100 232 (a) 131 54% 60% 2.3 100 w/ inhibitor 126 56% 55% 2.2 223 (a)

Least significant difference (LSD) is the amount needed to be considered statistically different from the treatment mean. Treatment means with the same letter in the respective column are not significantly different at the 90% level. *Check includes incidental N from starter at planting. **Excludes incidental commercial N that may be in the control. Note that incidental N rates above 10 lbs N/ac in the control may increase uncertainty in how much N is provided by the soil.

- The total corn N uptake in the grain and stover for the zero rate check was **71 lbs N/ac**. This is an estimate of how much **N was supplied by the soil**. Across both treatments about **55%** of the corn N uptake was from the soil.
- The amount of N fertilizer recovered by both treatments ranged from 55-60%.
- Both treatments produced 2.2 to 2.3 bu. per lb of N applied.

Nitrogen Uptake and Use Efficiency

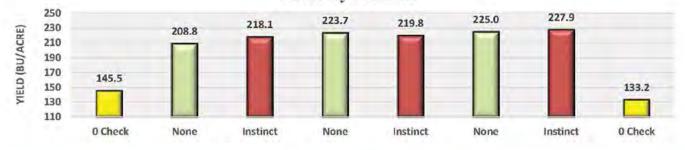
NMI is a collaborative project between farmers of southeast Minnesota, Minnesota Department of Agriculture and University of Minnesota Extension December 2016

Field Trial ID Previous Crop	BSSES Soybeans	Trial County Township		Nitrogen Stabilizer Olmsted Dover	N source ² Cost/ton 28% N cost/lb	28-0-0 \$275 \$0.49
And Designed	at the second second	Soil Tes	t Info		Field Info	
		Date	5/31/13	Variety	1	DJC52-85
100		OM%	2	Population		34000
1.15		pH	6.7	Row Width		30
A CONTRACT		Nitrogen		Planting Date	e	4/26/16
and the second se		P (bray)	16	Harvest Date	0	
A 1900		P (olsen)		Soil Texture		silt loam
in the second	the second second	Potassium	140	Tillage		Strip Till
13		Sulfur		Manure Hist	ory	No
		Zinc		Alfalfa Histo	ry	No
	2016 NMI			Irrigated		No

28% / ATS w	ith no s	tabilizer			N	orma	l Prac	tice
source	cost	rate	application	N	Р	K	S	stabilizer
28-0-0	\$275	416	At Planting Band	116.5	-		1	None
12-0-0-26	\$641	72	At Planting Band	8.64	1		18.7	None
10-34-0	\$580	35	At Planting Band	3.5	11.9			
18-46-0	\$465	125	Fall Preplant Broadcast	22.5	57.5			
0-0-60	\$365	125	Fall Preplant Broadcast			75		
Stabilizer Cost / ac	50		Totals	151	69	75	19	

28% / ATS wi	ith Inst	inct			Alte	ernat	ive Pr	actice
source	cost	rate	application	N	Р	K	S	stabilizer
28-0-0	\$275	416	At Planting Band	116.5				Instinct
12-0-0-26	\$641	72	At Planting Band	8.64	1.0		18.7	Instinct
10-34-0	\$580	35	At Planting Band	3.5	11.9			
18-46-0	\$465	125	Fall Preplant Broadcast	22.5	57.5			
0-0-60	\$365	125	Fall Preplant Broadcast			75		
Stabilizer cost / ac	S11		Totals	151	69	75	19	

Yields By Practice



Practice	Stabilizer	ID	Yield	NUE ¹	Stabilizer cost per acre ²	% MT	Test Weight
28% / ATS with no stabilizer	None	BSSESnorm	219.2	0.69	\$0.00	15.3	56.9
28% / ATS with Instinct	Instinct	BSSESalt	221.9	0.68	\$11.00	15.1	56.9

Field Trial ID	DStSES	Trial County		Nitrogen Stabilizer Olmsted	N source ² Cost/ton	46-0-0 na
Previous Crop	Soybeans	Township		High Forest	46% N cost/lb	na
1000	- That we have been a state	Soil Te	st Info		Field Info	
	20	Date	11/10/15	Variety	DK	C 53-7855
	10 M	OM%	3	Population		32000
	18.	pH	5.8	Row Width		30
		Nitrogen		Planting Date	e	4/25/16
		P (bray)	12	Harvest Date		10/24/16
Comments of the second		P (olsen)		Soil Texture		silt loam
1	1	Potassium	142	Tillage		No-Till
4		Sulfur		Manure Hist	ory	No
		Zinc		Alfalfa Histo	ry	No
	2016 NMI			Irrigated	<i>V</i> .	No

No Instinct					N	lorm	al Pra	ctice
source	cost	rate	application	N	Р	K	S	stabilizer
46-0-0		217	At Planting Band	100				None
21-0-0-24		50	At Planting Band	11			12	None
18-46-0		65	At Planting Band		30			None
0-0-60		50	At Planting Band			30		None
Stabilizer Cost / a	c \$0		Totals	111	30	30	12	

Stabilizer Cost / ac

Instinct				Alternative Practice					
source	cost	rate	application	N	Р	K	S	stabilizer	
46-0-0		217	At Planting Band	100	-			Instinct	
21-0-0-24		50	At Planting Band	11			12	Instinct	
18-46-0		65	At Planting Band	2.	30		122	Instinct	
0-0-60		50	At Planting Band			30		Instinct	
Gu L'IV			m I		20	20			
Stabilizer cost / ac	na		Totals	111	30	30	12		

All fertilizer put on dry at planting with planter 3" to side of row and 4" deep. 18 rows with instinct, 18 rows without instinct.

Yields By Practice



Practice	Stabilizer	ID.	Yield	NUE ¹	Stabilizer cost per acre ²	% MT	Test Weight
No Instinct	None	DStSESnorm	180.5	0.61	\$0.00	16.4	56.3
Instinct	Instinct	DStSESalt	171.9	0.65	na	16.7	56.3

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

Field Trial ID Previous Crop		JBSES Soybeans	b c	rial ounty ownship			gen Stab Fillmore Arendah		N sou Cost/f 28%		28-0-0 na na
6	-		-	Soil Test I	nfo				Field	Info	
			O pl Ni P P P	ate M% H itrogen (bray) (olsen) otassium	4/16/15 4.2 6.5 6 104		Variety Popula Row W Plantin Harves Soil Te Tillage	tion /idth ig Date t Date xture		area a	-
		5 NMI		ılfur inc	9 0.9		Manur Alfalfa Irrigat	Histor ed	y		No No
28% UAN wi	-			olication	1	N	P	orma K	I Pra	actice stabil	
source 28-0-0 18-46-0 0-0-60 21-0-0-24	cost	rate 30 gal 25 50 25	Spring Pre At Pla At Pla	plant Broadcast nting Band nting Band nting Band	1	N 90 4.5 5.25	<u>Р</u> 11.5	30	6	Nor	CALL PORT
Stabilizer Cost / ac	\$0			Totals		100	12	30	6		-
28% UAN wi	cost	rate		olication		N	P	K	s s	ractice stabil	zer
28-0-0 18-46-0 0-0-60 21-0-0-24	COSL	30 gal 25 50 25	Spring Pre At Pla At Pla	plant Broadcast nting Band nting Band nting Band		90 4.5 5.25	11.5	30	6	Factor (A	
Stabilizer cost / ac	\$0			Totals		100	12	30	6	<u></u>	-
	40.7			ds By Prac	tice						
230 220 210 200 190 180 170 160		223.5	226.8	232.4		229.1		213.	5	163.5	
150 N	lone	Factor	None	Factor		None		Facto	Nr.	0 Check	

Practice	Stabilizer	ID	Yield	NUE	Stabilizer cost per acre ²	Moisture	Test Weight	
28% UAN with no stabilizer	None	JBSESnorm	232.2	0.43	na	14.5	58.0	
28% UAN with Factor (Agrotain)	Factor(Agrotain)	JBSESalt	223.1	0.45	na	14.3	58.3	

	ant Nitro	Nitrogen Stabilizer			N source ² 44-0-					
Field Trial ID		RMSES	County				Cost/ton		\$55	
Previous Crop		Soybeans	Township		Warren		ESN N cost/lb		\$0.6	
	10	112/0	Soil Test Info					N cost/lb Info	\$0.4	
0.00	No.	A	Date 11/6/	14	Variet	v	TICK	Pioneer 01:	57 AM	
1000	1	()		2.8	Popula				3550	
10.04	1		•	5.6	Row W				3	
1000			Nitrogen		Plantin	0			4/16/1	
1.00		The last	P (bray) 10 P (olsen)	5.2	Harves Soil Te		ę.	C	lay loan	
1.000	1		Potassium 130	0.5	Tillage				vention	
Viet 1	F	4 .	Sulfur		Manur		ory		N	
No. of Concession, Name			Zinc		Alfalfa		ry		N	
	2016	NMI			Irrigat	ed			N	
ESN 110/ Ure	a 16 lb	s N Preplan	t		Normal Practice					
source	cost	rate	application	N	P	K	S	stabil	izer	
17-15-19-4-1	\$465	200	At Planting Band	34	30	38	8			
46-0-0	\$380	35	Spring Preplant Broadcast	16		-		EC	NT	
44-0-0 21-0-0-24	\$550 \$365	250 75	Spring Preplant Broadcast Spring Preplant Broadcast	110 15.75			18	ESI	N	
Elemental Sulfur	\$1,100	10	Spring Preplant Broadcast				9			
			101							
Stabilizer Cost / ac	na		Totals	176	30	38	35			
125 lbs N Ure	a Prep	ant		1	Alte	ernat	tive I	ractice		
source	cost	rate	application		Р	K	S	stabil	izer	
17-15-19-4-1	\$465	200	At Planting Band		30	38	8	1		
46-0-0	\$380	275	Spring Preplant Broadcast			1000	1			
	00.00			15.75			10			
21-0-0-24 Elemental Sulfur	\$365 \$1,100	75 10	Spring Preplant Broadcast Spring Preplant Broadcast				18 9			
Semental Sultur	\$1,100	10	Spring Preprant Broadcast				2			
							-	2		
Stabilizer cost / ac	S 0		Totals	175	30	38	35			
			Yields By Practice							
260	250.7							250.5		
250 245			239.6 240.9		243.0					
A 245		2	239.6 240.9							
ā 235										
Q 230										
0 230 225										
(3X) 250 245 240 235 230 235 230 225 215 210										

Practice	Stabilizer	ID	Yield	NUE'	N cost per acre ²	% MT	Test Weight	
ESN 110/ Urea 16 lbs N Preplant	ESN	RMSESnorm	244.9	0.72	\$75.36	18.9	57.8	
125 lbs N Urea Preplant	None	RMSESalt	245.0	0.71	\$51.63	18.4	58.2	

		Urea:	50 lb	s N/acre	e after	Alfa	lfa				
Field Trial ID	11.73	DShSERA		Trial				Alfalfa	N sou		46-0-
			5 1	County			Winon		Cost/t		\$37
Previous Crop		Alfalfa (SE MN)		Township		W	hitewa	ter	46%	N cost/lb	\$0.4
	ANT-	COLER D		Soil Tes	t Info					l Info	
		Re-		Date	4/29/15		Variet	-	oducer'	s Hybrids 5.	
		R. and St.		OM%	2.5		Popula				3250
1 to and the		A MARCENT		pH	7.1		Row V		2.4		4/25/1
	27 1	1.000		Nitrogen P (bray)	33.0			ng Date st Date			11/2/1
A CONTRACTOR				P (olsen)	55.0		Soil To				silty cla
1 4 - C				Potassium	126.0		Tillage				No-Ti
- 22	1	-	- 13	Sulfur			Manu	re Histe	ory		N
and the second s	1	-	1.1	Zinc				a Histor	ry		Y
2	016 NM	I					Irriga	ted			N
No Urea preplan	nt	a sere					1	Norm	al Pr	actice	
source	\$ ton	rate		plication		N	Р	K	S	stabi	lizer
Alfalfa Credits Year 1	I Share	Gen 1		ious Credits	_	100	A.m.				
8-46-0	\$475	50		anting Band		9	23				
0-0-60 21-0-0-24	\$335 \$379	50 25		anting Band anting Band		5	1	30	6		
.1-0-0-24	Φ372	25	7.011	anning Dana		5			Q		
Stabilizer Cost / ac	50		_	Totals		114	23	30	6		
50 lbs N preplan	t						Al	terna	tive I	Practice	
source	S ton	rate	ap	plication		N	Р	K	S	stabi	lizer
Alfalfa Credits Year 1	1.5	1.5.1		ious Credits		100	24	1	11.1		
8-46-0	\$475	50		anting Band	· · · · ·	9	23	1.1			
)-0-60	\$335 \$379	50 25		anting Band anting Band				30	1		
21-0-0-24 6-0-0	\$375	the second se		eplant Broade	east	5 50			6		
-0-0	\$313	110 0	pingii	cpiant Dioad	Can	50					
Stabilizer cost / ac	\$0			Totals		164	23	30	6	-	_
240			Yiel	ds By Pra	actice						
240 236.0	0	235.9		235.7	235.9	9				234.6	
l 235	1		- 1		-			234.0		234.0	
A/L											
230											
235 ALEED (BU/ACRE)						_					
220 No Un	ea	No Urea	N	lo Urea Nitrogen Prad	50 lbs U	Irea	50	Ibs Urea	3	50 lbs Ure	а
	1			1		New	st per	Nee	st per		Test
Practice	Total	N Rate II)	Yield	NUE	ac			shel ²	Moisture	Weigh
No Urea preplant	1	14 DShSER	Anorm	235.9	0.48		.00	-	0.00	15.9	58.0
no orea prepiant	14			233.9	0.40		50	_	00	10.9	57.0

164

50 lbs N preplant

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)
 ² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

DShSERAalt

234.8

0.70

\$20.50

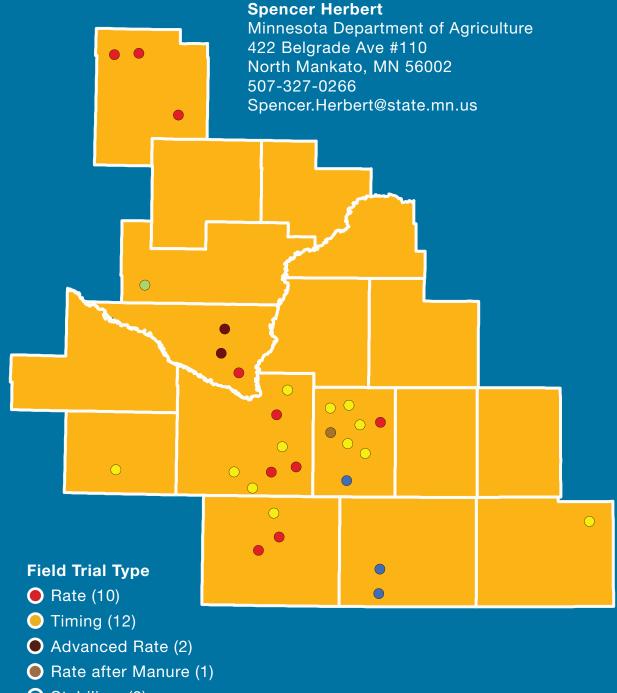
\$0.09

16.0

57.6

South Central

2016 Nutrient Management Initiative (NMI)



- O Stabilizer (3)
- Interseed Cover Crop (1)

South Central Table of Contents

Advanced Nitrogen Rate Evaluations	 76
South Central BMP Region summary	 78

Corn following corn trials

•	Nitrogen rate trials	79
•	Nitrogen timing trials	82
	Nitrogen Use Efficiency summary	83

Corn following soybeans trials

•	Nitrogen Rate trials
	Nitrogen Rate after manure trials
•	Nitrogen timing trials
	Nitrogen timing after manure
	Nitrogen stabilizer trials
	Interseeding cover crops at V7
	Nitrogen Use Efficiency summary 106

Advanced Nitrogen Rate Evaluations

Site Details	
County:	Nicollet
Soil series:	Klossner muck + Harps clay loam
Previous crop:	Soybean
Strips:	2 (1170' x 70' each)
Plot Design:	Randomized complete block
Tillage System:	Conventional DMI ripper in fall, field cultivator in spring.
Corn hybrid:	Channel 197-150 (97 days)
Planting date:	May 5, 2016
Population:	33,000
Starter fertilizer:	150 lb/ac in DAP + 75 lb/ac AMS
Base nitrogen (N):	43 lb/ac in DAP + AMS
Additional N:	Applied as unrea, May 5, 2016
Additional N rates:	6 (0, 32, 57, 107, 157, and 207 lb/ac)
Harvest date:	10/17/2016

Soil-test results	
Organic matter (%)	6.8
pH	7.5
Phosphorus (Olsen) (ppm)	4.0
Potassium (ppm)	163
Zinc (ppm)	2.0

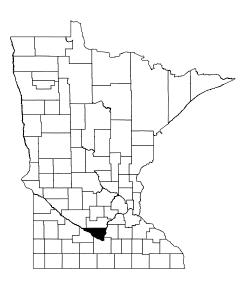
Total monthly precipitation (inch) and departure from normal (DN)					
Percipitation	Мау	June	July	August	
Observed	5.26	3.84	6.25	6.75	
Normal	3.34	4.75	3.91	4.22	
DN	+1.92	-0.91	+2.34	+2.53	

N Rate 2016 corn grain yield (bu/ac)					
lb/ac	Rep1	Rep 2	Rep 3	Average	
43	218	234	231	228	
75	207	232	234	225	
100	n/a*	234	232	233	
150	230	226	236	231	
200	234	236	233	234	
250	232	233	232	232	

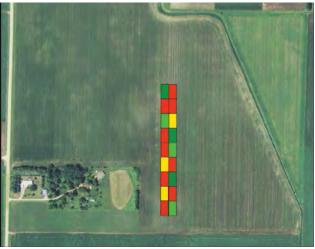
* Data not available

A collaborative project between the Minnesota Department of Agriculture and the University of Minnesota.

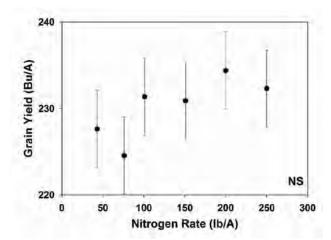
January 2017, Apurba k. Sutradhar



Trial Layout



Corn response to N rates



Treatments were not significant at this site. Numerically, maximum grain yield was obtained when 200 lb N/ac was applied. The increase in yield produced by the 200 lb reate was not economical.

Advanced Nitrogen Rate Evaluations

Site Details	
County:	Nicollet
Soil series:	Cordova clay loam + Nicollet clay loam
Previous crop:	Soybean
Strips:	2 (945' x 70' each)
Plot Design:	Randomized complete block
Tillage System:	Conventional, DMI ripper in fall, cultivator in spring
Corn hybrid:	199-29 (99 days)
Planting date:	May 5, 2016
Population:	33,000
Starter fertilizer:	100 lb/ac in DAP + 50 lb/ac AMS
Base nitrogen (N):	29 lb/ac in DAP + AMS
Additional N:	Applied as unrea, May 5, 2016
Additional N rates:	6 (0, 22, 72, 122, 172, and 222 lb/ac)
Harvest date:	10/17/2016

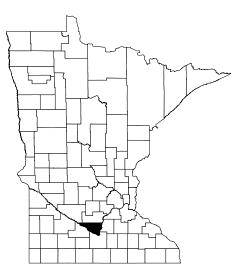
Soil-test results	
Organic matter (%)	5.9
рН	6.9
Phosphorus (Olsen) (ppm)	8.0
Potassium (ppm)	164
Zinc (ppm)	1.4

Total monthly precipitation (inch) and departure from normal (DN)					
Percipitation	Мау	June	July	August	
Observed	5.26	3.84	6.25	6.75	
Normal	3.34	4.75	3.91	4.22	
DN	+1.92	-0.91	+2.34	+2.53	

N Rate 2016 corn grain yield (bu/ac)					
lb/ac	Rep1	Rep 2	Rep 3	Average	
29	204	220	210	211	
50	201	249	232	227	
100	246	208	243	232	
150	252	260	240	251	
200	276	249	249	258	
250	254	261	250	255	

A collaborative project between the Minnesota Department of Agriculture and the University of Minnesota.

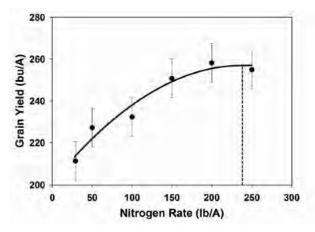
January 2017, Apurba k. Sutradhar



Trial Layout



Corn response to N rates



- Average highest grain yield = 257 bu/ac
- N rate needed = 238 lb N/ac
- Grain yield = 201 + 0.47 (N rate) 0.0009 (N rate)²
- R² = 0.60, P < 0.01

Price ratio	EONR (lb N/ac)
0.05	214
0.10	188
0.15	162

Economic Optimum Nitrogen Rates (EONR) at three price ratios were less than the N rate needed for average highest yield. To ensure maximum profit, EONR rates should be used.

South Central BMP Region S U M M A R Y

	Averages												
	All tr	ial practic	al practices combined Rate tria			trials	Timing trials	Stabilizer trials					
Previous Crop	Total N (ac)	Yield (bu/ acre)	NUE (rate/ yield)	Price per pound of N	Additional N (lbs) Vield from additional N (bu)		Split App Advantage (bu)	Stabilizer Advantage (bu)	Stabilizer Cost (ac)				
Corn	150.56	208.42	0.70	\$0.49	31.00	0.20	32.3*						
Soybeans	151.59	213.20	0.71	\$0.51	36.75 5.13		5.49	na	7.6				
Averages	151.08	210.81	0.71	0.50	33.88 2.67		5.49		7.60				

* One trial preplant 32% UAN vs Split (2 app)

The average cost for a pound of nitrogen was **\$0.50**. When considering an average of all nitrogen rate trials, an additional **33.88** lbs N/ acre cost **\$16.94** per acre, resulting in an average yield difference of only **2.67** bushels/acre in 2016.

			CORN AFTER CORN:	Top Nitrogen Use I	Efficiencies (NUE	:)							
	Total N Rate/Yield - Ibs of N Per Bushel												
Page	PageNUECountyTrial Practice IDTotal N Rate (lbs/ac)Yield (bu/ac)VarietyType of Trial												
80	0.33	Blue Earth	DPSCRnorm*	66	201.3	DKC 46-20	Rate						
80	0.48	Blue Earth	DPSCRalt*	96	200.00	DKC 46-20	Rate						
79	0.54	Meeker	CRFSCRalt	107	196.3	Legend 9697VIP	Rate						

* Peat soil with 38.7% Organic Matter

			CORN	AFTER CORN:	Top Yields							
	bu/acre											
PageYield (bu/ac)CountyTrial Practice IDNUETotal N Rate (lbs/ ac)VarietyType of T Type of T												
81	232.6	Watonwan	GRSCTalt	0.93	217	na	Timing					
81	229.7	Watonwan	GRSCTalt2	0.94	217	na	Timing					
78	209.8	Waseca	BKSCRnorm	0.74	155	Pioneer PO533AM1	Rate					

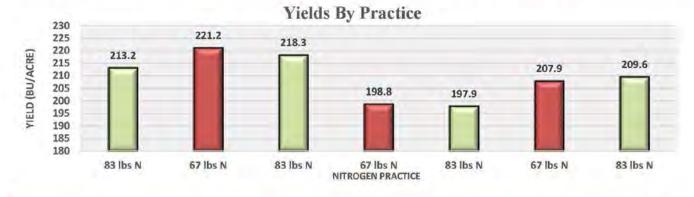
		COR	N AFTER SOYBEA	NS: Top Nitroger	n Use Efficie	ncies (NUE)						
	Total N Rate/Yield - Ibs of N per bushel											
Page	PageNUECountyTrial Practice IDTotal N Rate (lbs/ac)Yield (bu/ac)VarietyType of Trial											
87	0.54	Faribault	LFSCRalt	107	198	Golden Harvest E01P5	Rate					
85	0.55	Blue Earth	DLSCRalt	115 209.2		DKC 54-38	Rate					
83	0.58	Meeker	ACSCRnorm	105	180.6	Legend 40J592VT2	Rate					

			CORN AF	TER SOYBEANS:	Top Yields							
	bu/acre											
Page	Yield (bu/ac)	County	Trial Practice ID	NUE	Total N Rate (Ibs/ ac)	Variety	Type of Trial					
101	249.6	Freeborn	DHSCSalt	0.77	193	Producers 6100	Stabilizer					
86	247.8	Faribault	GPSCRalt	0.77	190	G02W74-3000GT	Rate					
95	240.2	Blue Earth	HGSCTalt	0.68	164	Producers 6108	Timing					

Field Trial ID Previous Crop	BKSCR	Trial County Township		Nitrogen Rate Waseca 108	N source ² Cost/ton Urea N cost/lb	46-0-0 \$380 \$0.41
r revious crop	Com	Soil Tes	t Info	100	Field Info	U 1
	3 3 4	Date	10/1/14	Variety	pioneer PC	533AM1
	chies the	OM%	4	Population		34500
1 8 2	Pres a	pH	6.4	Row Width		30
<u> </u>	AEAE	Nitrogen		Planting Dat	te	na
1 2 2	Alfernative P Normal Farm Alternative Pr Normal Farm	P (bray)	31	Harvest Date	e	na
	Alternativ Normal Fi Alternativ Kormal Fi	P (olsen)		Soil Texture		elay loam
lor le	Ite for	Potassium	197.3	Tillage		Strip Till
		Sulfur	-	Manure Hist	tory	
Station of Street, or other		Zinc		Alfalfa Histo	ory	
20	016 NMI			Irrigated		

83 Ibs N sided	Iress				N	orma	al Prac	tice
source	S ton	rate	application	N	Р	K	S	stabilizer
44-0-0ESN	\$582	121	Fall Preplant Band	53.1				ESN
10-50-0	\$597	150	Fall Preplant Band	15	75			
0-0-60	\$470	107	Fall Preplant Band	1		64		
Sulfer 90%	\$900	16	Fall Preplant Band				14.4	
46-0-0	\$380	145	Sidedress Band	66.7				
21-0-0-24	1.1.1	79	Sidedress Band	16.6			19	
10-50-0		31	Sidedress Band	3.1	15.5			
Stabilizer Cost / ac	\$0		Totals	155	91	107	33	

67 lbs N sided	ress				Alt	ernat	tive Pr	actice
source	S ton	rate	application	N	Р	K	S	stabilizer
44-0-0ESN	\$582	121	Fall Preplant Band	53.1	- 24			ESN
10-50-0	\$597	150	Fall Preplant Band	15	75			
0-0-60	\$470	107	Fall Preplant Band			64		
Sulfer 90%	\$900	16	Fall Preplant Band				14.4	
46-0-0	\$380	116	Sidedress Band	53.4				
21-0-0-24		63	Sidedress Band	13.3			15	
10-50-0	-	25	Sidedress Band	2.5	12.5			
Stabilizer cost / ac	\$0		Totals	137	88	64	29	



Practice	Total N Rate	ID	Yield	NUE ¹	N cost per acre ²	N cost per bushel ²	Moisture	Test Weight
83 lbs N sidedress	155	BKSCRnorm	209.8	0.74	\$27.35	\$0.13	21.3	na
.67 lbs N sidedress	137	BKSCRalt	209.3	0.66	\$21.89	\$0.10	21,5	na

Field Trial ID Previous Crop		CRFS		Trial County Township			trogen F Meeker Darwin		N sour Cost/to 28%		28-0-0 \$290 \$0.52
61	113	1111		Soil Tes	t Info					l Info	
	Normal Farm Practico Alternative Practice Alternative Practice	Normal Farm Practice Atternative Practice	Normal	Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	11/1/14 2.5 7.1 5 31 23 98 8 1.7		Variet Popula Row V Plantin Harves Soil To Tillage Manun Alfalfa	ation Vidth ng Date st Date exture e re Histo	ory	a viria p	d 9697 VII 3500(30 5/6/10 11/7/10 sand No-Til No-Til No
	2016	NMI					Irrigat	ted			Ye
75 lbs N side	dress						I	Norm	al Pr	actice	
source 3-15-19-3 28-0-0 28-0-0	\$ ton \$2,715 \$290 \$290	rate 5 gal	At Pla Sidedr	plication anting Band ess Band V3 ress Band V8		N 1.7 75 75	P 8.3	<u>к</u> 10.5	S 1.7		llizer rdian
Stabilizer Cost / ac	s \$11			Totals		152	8	11	2		
30 lbs N side	dress						Al	terna	tive l	Practice	
source	\$ ton	rate		plication		N	P	K	S	stabi	ilizer
3-15-19-3 28-0-0 28-0-0	\$2,715 \$290 \$290	5 gal	Sidedr	anting Band ress Band V3 ress Band V8		1.7 30 75	8.3	10.5	1.7	Guar	rdian
Stabilizer cost / ac	\$11			Totals		107	8	11	2		
205			Yi	elds By Pra	actice						
200 195 190 190 185 180 175	195.0		94.8	197.9	19			190.8]	194.8	
Practice	75 lbs SD	30 N Rate	lbs SD	75 lbs SD NITROGEN Yield	30 lb I PRACTICE		st per	75 lbs 9	st per	30 lbs : Moisture	SD

Practice	Total N Rate	ID	Yield	NUE ¹	acre ²	bushel ²	Moisture	Weight
75 lbs N sidedress	152	CRFSCRnorm	194.5	0.78	\$38.84	\$0.20	13.7	55.1
30 lbs N sidedress	107	CRFSCRalt	196.3	0.54	\$15.54	\$0.08	13.7	56.4

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)
 ² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

Field Trial ID Previous Crop		DPSC Com	R	Trial County Township			trogen R Blue Ear LeRay		N sour Cost/to 28%		28-0-(\$28(\$0.5(
()	111	1111		Soil Test	t Info				Field	l Info	
An	Normal Farm Practice Atternative Practice	Normal Farm Practice Alternative Practice Normal Farm Practice		Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	6/1/15 38.7 6.2 29 115 5		Variet Popula Row W Plantin Harves Soil Te Tillage Manun Alfalfa	ition Vidth ng Date st Date exture re Histo	ory		NC 46-2 3450 3 10/6/10 clay loan Ridge-Til N N
	2016	NMI					Irrigat	ed	•		N
30 lbs N side	edress				-		I	Norm	al Pr	actice	
source	S ton	rate	ap	lication		N	P	K	S	stabi	lizer
28-0-0 11-52-0 0-0-62 28-0-0	\$280 \$530 \$376 \$280	107 50 100 107	At Plar Spring Pre Spring Pre	nting Dribble plant Broadcast plant Broadcast ress Dribble		30 6 0 30	26 0	31	2.5 2.5		
Stabilizer Cost / ac				Totals		66	26 Al	31 terna	5 Itive l	Practice	
source	\$ ton	rate		olication		N	P	K	S	stabi	lizer
28-0-0 11-52-0 0-0-62 28-0-0	\$280 \$530 \$376 \$280	107 50 100 214	Spring Pre Spring Pre	nting Dribble plant Broadcast plant Broadcast ress Dribble		30 6 0 60	26 0	31	2.5 5		
Stabilizer cost / ac	\$0		Vie	Totals lds By Pra	otice	96	26	31	8	-	
210 205 200 195 180	200.3	201.7		197.5	196.3			202.2		205.9	
	50 lbs SD	30 lbs S	D	60 lbs SD NITROGEN P	30 lbs 5 RACTICE	SD	6	0 lbs SD		30 lbs SD	
	_										
Practice	Total I	N Rate	D	Yield	NUE		st per		st per	Moisture	Test Weight
Practice 30 lbs N sidedres			1D SCRnorm	Yield 201.3	NUE ¹ 0.33	ac	st per re ² 5.00	bus	st per shel ²).07	Moisture 19.1	Test Weigl na

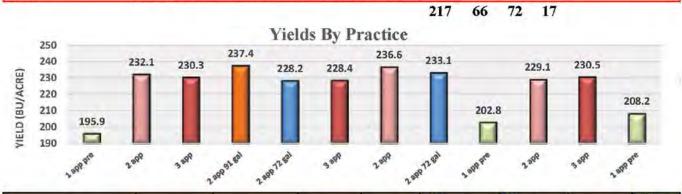
96 DPSCRalt 60 lbs N sidedress 200.0 \$30.00 0.48 ¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)
 ² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

na

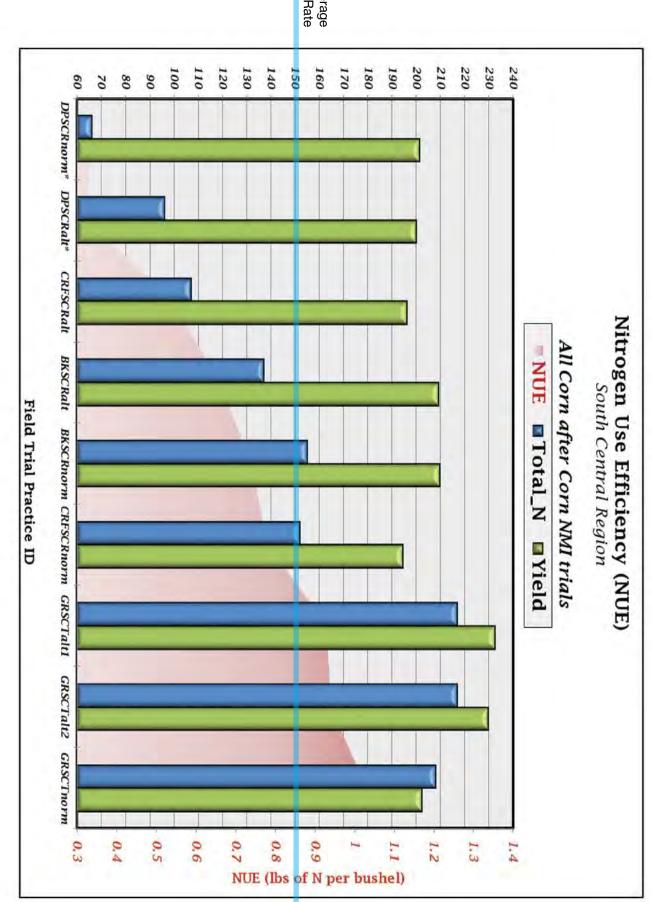
18.6

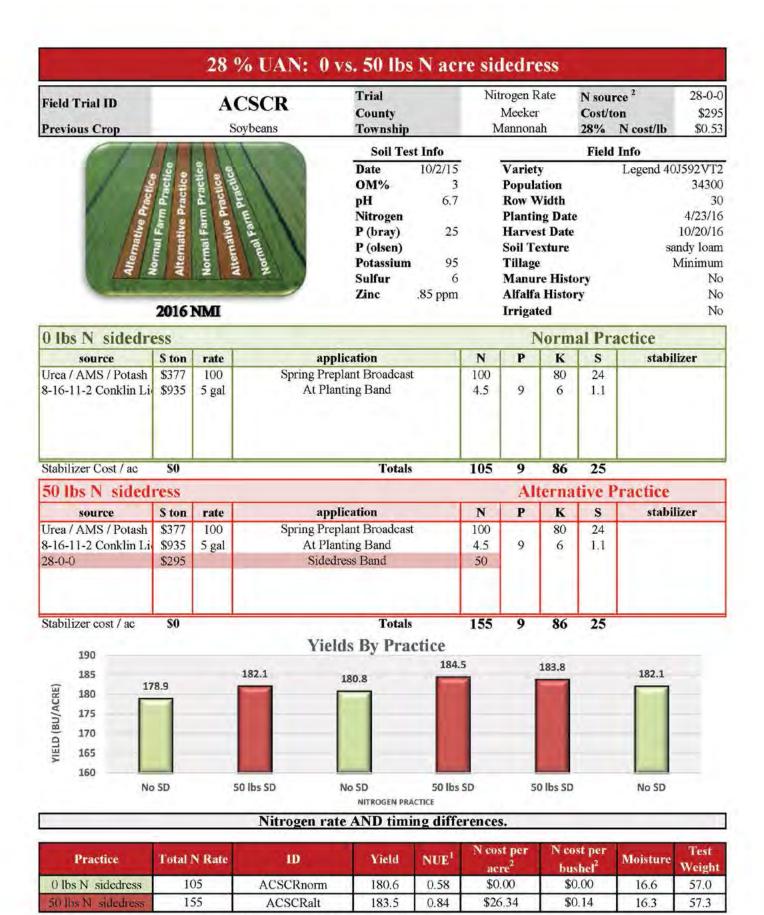
\$0.15

Field Trial ID Previous Crop		GRS		Trial County Township		W	gen Tin atonwa ong Lak	n	N sou Cost/t 32%		32-0-0 \$330 \$0.52
		1		Soil Tes	t Info				Fiel	d Info	
				Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	8/12/14 5.1 6.3 25 26 147 4.6 1.7		Variet Popula Row V Plantin Harve Soil To Tillago Manun Alfalfa Irrigat	ation Vidth ng Da st Dat exture e re Hist	te story		30 clay loan ventiona No No No
	016 NM	α			-			-	1.0		140
1 app preplant	1.	1	and tracks						-	ractice	
source	\$ ton	rate	application Spring Preplant Broadcast		N	P	K	S	stabili	zer	
Other Credits 32-0-0	\$330	51 gal		g Preplant Broade		27 181	66	72	17	Insti	nct
Stabilizer Cost / ac	\$0			Totals	-	208	66	72	17	1	
2 app split (V5)							Alte	rna	tive I	Practice 1	
source	\$ ton	rate		application		N	Р	K	S	stabili	zer
Other Credits 32-0-0 32-0-0		10 gal 44 gal	Sprin	g Preplant Broado g Preplant Broado dress Dribble at V	cast	27 35.5 154	66	72	17	Instin	nct
Stabilizer cost / ac	\$0			Totals		217	66	72	17		
3 app split (Y dr	on)R1	6				-	Alte	rna	tive I	Practice 2	
source	\$ ton	rate		application		'N	P	K	S	stabili	
Other Credits 32-0-0 32-0-0		10 gal 22 gal	Sprin Side	g Preplant Broadd g Preplant Broadd dress Dribble at V	cast V5	27 35.5 77	66	72	17	Insti	
32-0-0	\$330	22 gal	Sidedress	Dribble at R1 ()	(drops)	77					



Practice	Total N Rate	ID	Yield	NUE ¹	N cost per acre ²	N cost per bushel ²	% MT	Test Weight
l app preplant	208	GRSCTnorm	202.3	1.03	\$94.12	\$0.47	16.7	na
2 app split (V5)	217	GRSCTalt	232.6	0.93	\$98.54	\$0.42	17.1	na
3 app split (Y drop)R1	217	GRSCTalt2	229.7	0.94	\$98.54	\$0.43	17.1	na





Field Trial ID Previous Crop		CLFS		Trial County Township			trogen R Meeker nion Gro		N sour Cost/t 28%		28-0-0 \$295 \$0.53
r revious crop	141	boybe	ans	Soil Tes	t Info	0	non oro	NC		d Info	φ0.J.
Atternative Pract	Normal Farm Practice Alternative Practice		Normal	Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	10/8/15 3 6.5 45 38 212 15 2.1		Variety Popula Row W Plantim Harves Soil Te Tillage Manur Alfalfa Irrigate	tion /idth ng Date at Date exture re Histo Histo	ory		9495VT2 34300 30 4/16/10 10/21/10 clay loan Minimum No No No
0 lbs N sidedr	ess						I	Norm	al Pr	actice	
source	S ton	rate	a	pplication		N	P	K	S	stabi	lizer
11-52-0 Urea / AMS/ Potash Conklin 8-16-11-2	\$534 \$444 \$935	357 276 5 gal	Spring P	eplant Broadcast replant Broadcas lanting Band	t	4.3 100 4.5	211.3 9	34.5 24 6	1.1		
Stabilizer Cost / ac	\$0			Totals		109	220	65	1		
50 Ibs N sided		1000				N	P	-	s	Practice stabi	Marrie
source 11-52-0 Urea / AMS/ Potash Conklin 8-16-11-2 28-0-0	\$ ton \$534 \$444 \$935 \$295	rate 357 276 5 gal	Fall Pro Spring P At F	pplication eplant Broadcast replant Broadcas lanting Band edress Band	t	N 4.3 100 4.5 50	9	K 34.5 24 6	1.1	SLADI	ШХЕГ
Stabilizer cost / ac	\$ 0		Vi	Totals elds By Pra	ctice	159	220	65	1		
180 175 170 165 160 155 150	80.9	17 50 lb	9.5	178.8	181.			177.7		181.4	
Practice		N Rate	ĺD	NITROGEN I Yield		N co	st per re ²	N co	st per	Moisture	Test Weight

109

159

0 lbs N sidedress

50 lbs N sidedress

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)
 ² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

CLFSCRnorm

CLFSCRalt

179.2

180.7

0.61

0.88

\$0.00

\$26.34

\$0.00

\$0.15

17.3

17.1

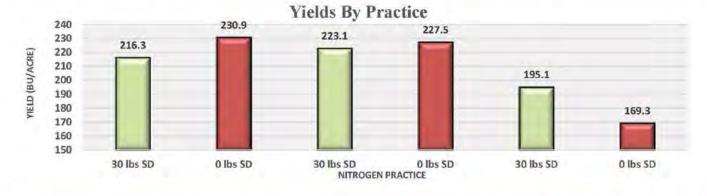
58.8

58.8

Field Trial ID Previous Crop	DLSCR Soybeans	Trial County Township		Nitrogen Rate Blue Earth McPherson	N source ² Cost/ton 28% N cost	28-0-0 na // lb na			
	1111	Soil Te	st Info		Field Info				
		Date	Fall 2014	Variety		DKC 54-38			
<u>i</u>	Carlos at the	OM%	5.4	Population		36000			
	De la se la	pH	6.7	Row Width		30			
S 8 8	Alternative Pr Normal Farm Alternative Pr Normal Farm	Nitrogen		Planting Date	e	4/22/16			
12 2	Alternative Normal Farr Alternative Normal Farr	P (bray)	37.4	Harvest Date	é				
	Alternativ Normal Fa Alternativ Normal Fa	P (olsen)		Soil Texture		clay loam			
1	Inter Ion	Potassium	195	Tillage		Conventional			
A A	a z a z	Sulfur		Manure Hist	ory	No			
No. of Lot of Lo		Zinc		Alfalfa Histo	ry	No			
20	016 NMI			Irrigated		No			

30 lbs N side	dress				N	lorma	l Prac	ctice
source	S ton	rate	application	N	Р	K	S	stabilizer
82-0-0		140	Spring Preplant Band	115				
0-0-62		100	Fall Preplant Broadcast	0	0	62		
28-0-0		107	Sidedress Dribble	30				
		1						
Stabilizer Cost / ac	: SO		Totals	145	0	62	0	

0 lbs N sideo	Alternative Practice							
source	S ton	rate	application	N	P	K	S	stabilizer
82-0-0		140	Spring Preplant Band	115			1	
0-0-62		100	Fall Preplant Broadcast	0	0	62		
28-0-0		0	Sidedress Dribble	0				
				0				
Stabilizer cost / ac	\$0		Totals	115	0	62	0	



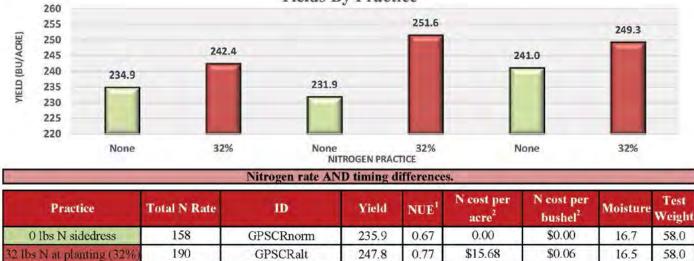
Practice	Total N Rate	ID	Yield	NUE ¹	N cost per acre ²	N cost per bushel ²	Moisture	Test Weight
30 lbs N sidedress	145	DLSCRnorm	211.5	0.69	na	na	15.6	na
0 lbs N sidedress	115	DLSCRalt	209.2	0.55	na	na	15,4	na

Field Trial ID Previous Crop	GPSCR Soybeans	Trial County Township		Nitrogen Rate Faribault Barber	N source ² Cost/ton 32% N cost/lb	32-0-0 \$315 \$0.49
6111	1111	Soil Test	t Info		Field Info	
	8 8	Date	6/1/10	Variety	G02W74-	3000GT
		OM%	3.2	Population		33000
18 E	2 2 2	pH	5.8	Row Width		30
S E S	Normal Farm Alternative Pr Normal Farm	Nitrogen		Planting Dat	e	
	Es III	P (bray)		Harvest Date	8	11/5/16
Altornativ Normal F.	Normal Far Alternative Normal Far	P (olsen)	22	Soil Texture	c	lay loam
	tor	Potassium	190	Tillage	Conv	rentional
A A		Sulfur		Manure Hist	tory	No
No. of Lot of Lo		Zinc		Alfalfa Histo	ry	No
2016	5 NMI			Irrigated		No

0 lbs N sidedres	s				N	ormal	Prac	tice
source	S ton	rate	application	N	Р	K	S	stabilizer
11-52-0	\$560	128	Fall Preplant Broadcast	14	66			
0-0-60	\$440	173	Fall Preplant Broadcast			103		
9-18-9	\$740	40	At Planting Dribble	4	7	4		
82-0-0	\$645	171	Fall Preplant Band	140				None
Stabilizer Cost / ac	50		Totals	158	73	107	0	

source	S ton	rate	application	N	Р	K	S	stabilizer
11-52-0	\$560	128	Fall Preplant Broadcast	14	66			
0-0-60	\$440	173	Fall Preplant Broadcast	100		103		
9-18-9	\$740	40	At Planting Dribble	4	7	4		
82-0-0	\$645	171	Fall Preplant Band	140				None
32-0-0	\$315	100	At Planting Broadcast	32				
Stabilizer cost / ac	\$0		Totals	190	73	107	0	

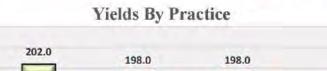


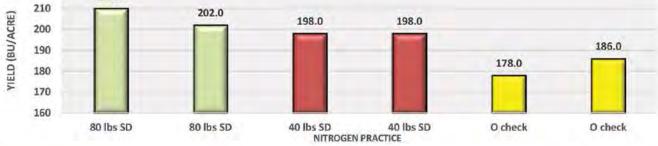


Field Trial ID Previous Crop	LFSCR Soybeans	County		Nitrogen Rate Faribault Barber	N source ² Cost/ton 32% N cost/lb	32-0-0 \$275 \$0.43
611		Soil Tes	t Info		Field Info	
	8 8 9	Date	9/25/15	Variety	Golden Harve	st E01P5
	5 5 5 5	OM%	5	Population		35500
	S S S S	pH	6.9	Row Width		30
<u> </u>	Alternative Pr Normal Farm Atternative Pr Normal Farm	Nitrogen	10 ppm	Planting Date		4/22/16
1 2 2	Alternative Normal Farr Atternative Normal Fart	P (bray)	61	Harvest Date		
	Alternativ Normal Fa Alternativ Normal Fa	P (olsen)	XXX	Soil Texture	c	lay loam
2 5	Iter Intel	Potassium	257	Tillage		Other
4 2	A Z A Z	Sulfur	7	Manure Histo	ory	No
-		Zinc	4.1	Alfalfa Histor	y	No
20	DIG NMI			Irrigated	3	No

80 lbs N sid	edress		Normal Practice					
source	S ton	rate	application	N	Р	K	S	stabilizer
32-0-0	\$275	18 gal	Carrier (Weed and Feed)	63				Guardian
12-0-0-26	\$390	2 gal	Carrier (Weed and Feed)	2.6			5.7	
3-18-18	\$1,260	4 gal	At Planting Band	1.3	8	8		
32-0-0		22 gal	Sidedress Band	80		P		
Stabilizer Cost /	ac S0		Totals	147	8	8	6	

40 lbs N sid	ledress			Alternative Practice						
source	S ton	rate	application	N	Р	K	S	stabilizer		
32-0-0	\$275	18 gal	Carrier (Weed and Feed)	63				Guardian		
12-0-0-26	\$390	2 gal	Carrier (Weed and Feed)	2.6			5.7			
3-18-18	\$1,260		At Planting Band	1.3	8	8				
32-0-0	1000	11 gal	Sidedress Band	40						
Stabilizer cost / a	ic SO		Totals	107	8	8	6			





Practice	Total N Rate	ID	Yield	NUE	N cost per acre ²	N cost per bushel ²	Moisture	Test Weight
80 lbs N sidedress	147	LFSCRnorm	206.0	0.71	\$34.40	\$0.17	na	na
40 lbs N sidedress	107	LFSCRalt	198.0	0.54	\$17.20	\$0.09	na	na

² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

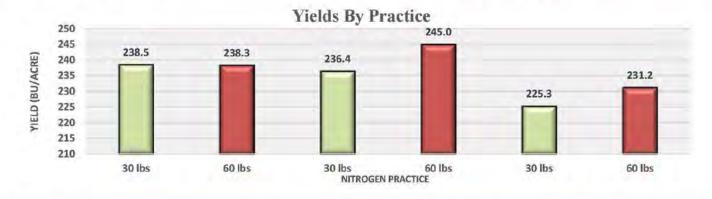
220

210.0

and the second sec		Total		Nitrogen Rate	NT	2	28-0-0
Field Trial ID	MLSCR	Trial		Blue Earth	N sour		
Previous Crop	Soybeans	County Township	-	McPherson	Cost/to 28%	on N cost/lb	na na
	1111	Soil Test Info Field Info					
	8 8 8	Date	Fall 2014	Variety		DK	C 57-75
	CE IC IC	OM%	6.7	Population			36000
8 6	Di a Di a	pH	6.7	Row Width			30
<u></u>	A E A E	Nitrogen		Planting Dat	te		
	Ta tive	P (bray)	30	Harvest Date	e		11/8/16
	an lan lan	P (olsen)		Soil Texture		с	lay loam
Uterna Iornai	Alternative P Normal Farm Alternative Pr Normal Farm	Potassium	147	Tillage		Conv	entional
A S	AZAZ	Sulfur		Manure Hist	tory		No
No. of Concession, Name		Zinc	1.9	Alfalfa Histo	ory		No
20	016 NMI			Irrigated			No

30 lbs N side	dress			Normal Practice					
source	S ton	rate	application	N	Р	K	S	stabilizer	
82-0-0		146	Spring Preplant Band	120				None	
11-52-0		82	Fall Preplant Broadcast	9	43	100			
0-0-62		263	Fall Preplant Broadcast	0	0	163			
28-0-0		107	Sidedress Dribble	30					
Stabilizer Cost / ac	s S0		Totals	159	43	163	0		

60 lbs N side	edress			Alternative Practice						
source	S ton	rate	application	N	Р	K	S	stabilizer		
82-0-0		146	Spring Preplant Band	120				None		
11-52-0		82	Fall Preplant Broadcast	9	43					
0-0-62		263	Fall Preplant Broadcast	0	0	163				
28-0-0		214	Sidedress Dribble	60						
				0						
Stabilizer cost / ac	\$0		Totals	189	43	163	0			



Practice	Total N Rate	ID	Yield	NUE	N cost per acre ²	N cost per bushel ²	Moisture	Test Weight
30 lbs N sidedress	159	MLSCRnorm	233.4	0.68	na	na	15.6	na
60 lbs N sidedress	189	MLSCRalt	238.2	0.79	na	na	15.7	na

Field Trial ID Previous Crop		MVSCR Soybeans		Trial County Township			rogen R lue Eart Lime		N sour Cost/t 28%		28-0-0 \$445 \$0.79
	111	1111		Soil Tes	Info				Field	l Info	
	Normal Fam Practice Alternative Practice	Normal Farm Practice Atternative Practice Normal Farm Practice	5	Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	7/23/14 4.5 6.6 n/a 30 n/a 164 n/a 2		Variety Popula Row W Plantin Harves Soil Te Tillage Manur Alfalfa Irrigato	tion /idth og Date at Date xture e Histo Histo	ory	Γ	DKC 52-84 34800 3(5/5/10 clay loan Strip Til No No No
34 lbs N sid	edress	146.12					N	Jorm	al Pr	actice	
source	S ton	rate	annli	cation	1	N	P	K	S		lizer
10-34-0 18-46-0 46-0-0 0-0-60 28-0-0	\$695 \$544 \$384 \$440 \$445	4 125 125 75 11.3 g	At Plant Fall Prep Fall Prep Fall Prep	ing Band lant Band lant Band lant Band lass Band		4.56 22.5 57.5 33.7	15.5 57.5	45	2	N-S	
Stabilizer Cost / a	0 (00)			Totals		118	73	45	0		
67 lbs N sid	_	and the second s							-	Practice	
source	\$ ton	rate		cation		N	P	K	S	and the second se	erve
10-34-0 18-46-0 46-0-0 0-0-60 28-0-0	\$695 \$544 \$384 \$440 \$445	4 125 125 75 22.6 g	Fall Prep Fall Prep Fall Prep	ing Band lant Band lant Band lant Band ess Band		4.56 22.5 57.5 67.4	15.5 57.5	45		19-5	
Stabilizer cost / ac			Yield	Totals Is By Pra	ctice	152	73	45	0		
205 200 195 190	199.1	183.6	186.3	187.	3	100					
AIETD (BU/ACKE) 185 185 180 175 160 155 150						180.7		170	0.2	175.7	
	57 lbs N	34 lbs N	O check	34 lbs NITROGEN P		67 lbs	N	34 1	os N	O check	¢
									st per		

56.7

56.0

21.1

20.6

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen ver bushel. (Total N rate/Yield)

118

152

² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

MVSCRnorm

MVSCRalt

180.3

189.9

0.66

0.80

\$26.78

\$53.56

\$0.15

\$0.28

34 lbs N sidedress

67 lbs N sidedress

Field Trial ID Previous Crop		ADSCR Soybeans	M Trial County Township	N Ra	te after N Waseca Alton	i.	N source ² Cost/acre 28%/ATS	28%/ATS Mit \$1: N cost/lb \$0.5
(Part	200		Soil Test Info				Field In	nfo
	016 N	MI	Date 6/15. OM% 4 pH 6 Nitrogen P (bray) 4 P (olsen) Potassium 10 Sulfur	413 4.5 5.3 20 61	Harve Soil Te Tillag Manu Manu Liquic	ation Vidth ng Date st Date exture exture re Histo re Type l or Soli	F: ry d	DKC 53-68RI 3550 3 April 17t clay loan all Disc & Spring FC Ye Swine (Finishing Liquid
M C I'					Applic	ation N		Injection (Sweep
Manure Credits	_		11 - 41	N			nal Prac	
source\$ tonrateManure Credits Year 1\$1253200 gal			Fall Preplant Band	application N P K Fall Preplant Band 151 67 112				stabilizer None
Stabilizer Cost / ac	SO		Totals	151	67	112	19	
Manure Credits	-				-	-	ative Pr	
source Manure Credits Year 1	\$ ton \$125	rate 3200 gal	application Fall Preplant Band	N 151	P 67	K 112	S 19	stabilizer None
28%/ATS Mix	\$125	10 gal	Sidedress Band	28	0	0	2	None
	60		Totals	179	67	112	21	
Stabilizer cost / ac	S0		X71 1 1 10 10	ice				
	50		Yields By Pract	ave				
214	20	211.4	Yields By Pract	ice	_	212	.1	
214	20	211.4	Yields By Pract		Г	212	.1	
214	20	211.4	Yields By Pract			212	.1	
214	20	211.4	Yields By Pract		[212	.1	
214 212 210 210	20	211.4	Yields By Pract			212	.1	

Practice	Total N Rate	ID	Yield	NUE	N cost per acre ²	N cost per bushel ²	Moisture	Test Weight
Manure Credits	151	ADSCRMnorm	212.4	0.71	\$0.00	\$0.00	18.0	58.0
Mamure Credits - 28%/ATS	179	ADSCRMmalt	211.4	0.85	\$15.00	\$0.07	18,0	58.0

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)
 ² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

Field Trial ID		ALSCT	County	F	gen Tin aribault		N sour Cost/t	on	32-0-0 \$273
Previous Crop		Soybeans	Township		Barber	-		N cost/lb	\$0.43
		11	Soil Test Info				Fie	ld Info	. FOID
8	2 3 8 8		Date 9/25/15 OM% 55		Variet Popula	•		Golden Harve	st E01P: 35500
	Pra acti acti	21	pH 6.9		Row V				30500
	EAEA	Ē	Nitrogen 10 ppm		Planti		te		4/22/10
	Fa		P (bray) 61		Harve				
Alternative Pr Normal Co	Alternative Practi Normal Farm Practi	Alternal Farm Prar Normal Farm Pra	P (olsen) XXX		Soil To			•	lay loan
Nor	Nor	Nor	Potassium 257		Tillage				Othe
			Sulfur 7		Manu				N
All addresses	001630.0		Zinc 4.1		Alfalfa		ory		N
	2016 NMI				Irrigat	ted	-		N
80 lbs N at V6	(Ydrop)				1	Nori	nal P	ractice	
source	\$ ton	rate	application	N	Р	K	S	stabiliz	LOG N.
32-0-0	\$275	18	Carrier (Weed and Feed)	63				Guardi	an
12-0-0-26	\$390	2	Carrier (Weed and Feed)	2.6			5.7		
3-18-18	\$1,260	4	At Planting Band	1.3	8	8			
32-0-0 at V6		22	Top Dress Dribble	77					
Stabilizer Cost / ac	\$0		Totals	144	8	8	6		
80 lbs N at VT	(Ydrop)				AI	tern	ative	Practice	
source	\$ ton	rate	application	N	Р	K	S	stabiliz	zer
32-0-0	\$275	18	Carrier (Weed and Feed)	63					
12-0-0-26	\$390	2	Carrier (Weed and Feed)	2.6	1.1		5.7		
3-18-18	\$1,260	4	At Planting Band	1.3	8	8	1.000		
2-0-0 at VT		22	Top Dress Dribble	77					
Stabilizer cost / ac	\$0		Totals	144	8	8	6		
			Yields By Practice						
210		204.0							
W 205 1	98.0								
¥ 195			188.0 18	88.0					
/n 190 185						186	.0	0.00	
								178.0	
9 180									

Y drop at V6 Y drop at VT Y drop at VT O Check O Check

Practice	Total N Rate	ID	Yield	NUE ¹	N cost per acre ²	N cost per bushel ²	% MT	Test Weight
80 lbs N at V6 (Ydrop)	144	ALSCTnorm	201.0	0.72	\$33.11	\$0.16	na	na
80 lbs N at VT (Ydrop)	144	ALSCTalt	188.0	0.77	\$33.11	\$0.18	na	na

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

Field Trial ID Previous Crop		AGS		Trial County Township		1	gen Tii Vaseca nesvill		N sour Cost/to 26%		26.4-0-0-2.0 \$290 \$0.55	
	ALLY	11	1	Soil Te	st Info		1 A A		Fi	Field Info		
Alternativa Practica Normal Farm D.	Alternative Practice Normal Farm Practice	Alternative Fractice		Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	10/28/13 3.3 6.5 0 30.6 1.1 192.7 0.1 2.1		Variet Popul Row V Planti Harve Soil T Tillag Manu Alfalf Irriga	ation Width ng Da est Dat exture e re His a Histe	tory	Pi	roducers 6108 34000 4/28/16 11/4/16 clay loam Conventiona No No	
Preplant 99 lbs	N							Nor	mall	Practice		
source	\$ ton	rate	1	application	-	N	Р	K	S		oilizer	
11-52-0 0-0-62 26.4-0-0-2.6	\$530 \$376 \$290	125 125 374	Fall Pr Fall Pr	replant Broad replant Broad Preplant Bro	lcast	14 99	65	78	10			
28.4-0-0-2.8 28-0-0	\$290	574 107		(Weed and		30			10			
12-0-0-26	\$428	55		Carrier (Weed and Feed)					14			
Stabilizer Cost / ac	\$0			Totals	1	150	65	78	24	1		
Split 71/28 lbs l	N acre	_					A	Iter	nativ	e Practic	e	
source	\$ ton	rate		application		N	Р	K	S	stal	oilizer	
28-0-0	\$280	125		replant Broad		14	65					
0-0-62	\$376	125		replant Broad				78	-			
26.4-0-0-2.6 28-0-0	\$290 \$280	268 107		Preplant Bro (Weed and]		71 30			7			
12-0-0-26	\$428	55		(Weed and)		7			14			
26.4-0-0-2.6	\$290	107	the second se	edress Dribb		28			3			
Stabilizer cost / ac	\$0			Totals			65	78	24			
230 225 220 215 210 205 200	9.8		17.1	224.6	2	22.9	5	211 5plit 71	3.9 /28 lbs	214 Preplan		
Practice	Total I		ID	Yield	NUE ¹	N cos	it per	Nc	ost per shel ²	% MT	Test Weight	
Preplant 99 lbs N	15	50	AGSCTnorm	221.5	0.68		.45	-	0.25	17.1	56.2	
Treplant 99 105 N	1.		AOSC HIOM	GSCTnorm 221.5 0.68				D D	0.25	17.1	30.2	

\$54.45

\$0.24

17.0

17.0

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

150

Split 71/28 lbs N acre

² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

AGSCTalt

222.8

0.67

Field Trial ID Previous Crop		CGSC Soybear	Co	al unty wnship		B	gen Tii lue Earl Le Ray		N sour Cost/to 26%		26.4-0-0-2.6 \$290 \$0.55		
611	FILLY	110	-	Soil Test	Info				Field Info				
Atternative Practice	Alternative Practice Normal Farm Practice	Alternative Practice Alternative Practice Normal Farm Practice	Dat OM pH Nit P (i P (i Pot Sul Zin	te 1% rogen bray) blsen) tassium fur	11/9/15 5.7 6.3 0 27.5 0.8 144.1 0.2 2.3		Harve Soil To Tillago Manu	ation Vidth ng Date st Date exture e re Histe a Histo	e ory		Producers 6108 34000 30 4/18/16 clay loan Conventiona No No		
Preplant 96 lb	s N							Nor	mal H	ractice	-		
source	\$ ton	rate	appli	cation		N	Р	K	S	sta	bilizer		
11-52-0 0-0-62 26.4-0-0-2.6 28-0-0 12-0-0-26	\$530 \$376 \$290 \$280 \$428	149 279 364 107 55	Fall Preplant Broadcast Fall Preplant Broadcast Spring Preplant Broadcast Carrier (Weed and Feed) Carrier (Weed and Feed)			16 96 30 7	77	173	9 14				
Stabilizer Cost / ac	S0		Totals		149	77	173	23					
Split 68/28 lbs	N						A	Iterr	ativo	Practic	e		
source	\$ ton	rate	appli	cation	-	Ν	Р	K	S	sta	bilizer		
11-52-0 0-0-62 26.4-0-0-2.6 28-0-0 12-0-0-26 26.4-0-0-2.6	\$530 \$376 \$290 \$280 \$428 \$290	149 279 257 107 55 107	Fall Preplant Broadcast Fall Preplant Broadcast Spring Preplant Broadcast Carrier (Weed and Feed) Carrier (Weed and Feed) Sidedress Dribble		ast cast ed)	16 68 30 7 28	77	173	6 14 3				
Stabilizer cost / ac	\$0		Totals Yields By Practice		ractice	149	77	173	23				
240				236.0									
V 230 (ПВ) 225 220 215 210	29.7	229		68/28 lbs N		29.2		232	2.1		9.5		

l	Tractice	I Otal I V Rate		Tielu	NUL	acre ²	bushel ²	70 141 1	1
	Preplant 96 lbs N	149	CGSCTnorm	229.5	0.65	\$52.80	\$0.23	16.4	Τ
	Split 68/28 lbs N	149	CGSCTalt	232.6	0.64	\$52.80	\$0.23	16.7	

56.0 56.0

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)
 ² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

Field Trial ID Previous Crop	(GWS Soybea	County			ogen Ti Waseca anesvill	1	N sour Cost/to 26%		26.4-0-0-2.0 \$290 \$0.55		
CII	(A	11	Soil Te	est Info				Fie	ield Info			
Allemative Practice	Alternative Practice Normal Farm Practice	Alternative Practice	Date OM%	10/28/13 8.4 7.1 0 14.4 7 209.1 0.2 1.5		Harves Soil To Tillage Manu	ation Vidth ng Date st Date exture e re Histo a Histor	ry		DKC 53-50 34000 30 4/22/10 11/5/10 clay loan Conventiona No No No		
Preplant 96 lb	s N						Normal Pra					
source	\$ ton	rate	application	7	N	Р	K	S		bilizer		
11-52-0 0-0-62 26.4-0-0-2.6 28-0-0 12-0-0-26	\$530 \$376 \$290 \$280 \$428	186 178 364 107 55	Fall Preplant Broa Fall Preplant Broa Spring Preplant Bro Carrier (Weed and	Fall Preplant Broadcast Fall Preplant Broadcast Spring Preplant Broadcast Carrier (Weed and Feed) Carrier (Weed and Feed)			110	9 14				
Stabilizer Cost / ac	\$0	_	Totals		153	97	110	23				
Split 68 / 28lbs	s N					A	ltern	ative	Practice	e		
source	\$ ton	rate	application		Ν	Р	K	S	sta	bilizer		
11-52-0 0-0-62 26.4-0-0-2.6 28-0-0 12-0-0-26 26.4-0-0-2.6	\$530 \$376 \$290 \$280 \$428 \$290	186 178 257 107 55 107	Fall Preplant Broa Fall Preplant Broa Spring Preplant Bro Carrier (Weed and Carrier (Weed and Sidedress Drib	adcast badcast Feed) Feed)	20 68 30 7 28	97	110	6 14 3				
Stabilizer cost / ac	\$0		Totals	153	97	110	23					
240 235 230 225 220 215 215 210 205 200	30.7	22	Yields B 7.4 226.8	y Practic	e 206.4		210	5.9	22	9.7		

Practice	Total N Rate	ID	Yield	NUE ¹	acre ²	bushel ²	% MT	Weight
Preplant 96 lbs N	153	GWSCTnorn	221.2	0.69	\$52.80	\$0.24	17.1	55.3
Split 68 / 28lbs N	153	GWSCTalt	224.8	0.68	\$52.80	\$0.23	17.0	55.8

Field Trial ID Previous Crop		HGS	CI	Trial County Township		E	ogen Ti Blue Ear AcPhers	th	N sour Cost/to 26%		26.4-0-0-2.6 \$290 \$0.55
	/H A	111		Soil Te	st Info				Fie	ld Info	
Alternative Precision	Normal Farm Practice Alternative Practice Normal Farm Practice	The state	N	Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	10/15/11 5.9 6.1 0 13.2 1.3 163.3 0.2 1.5		Harve Soil T Tillag Manu Alfalfa	ation Width ng Date st Date exture e re Histo a Histor	ry	Ρ	roducers 6108 35000 5/5/16 10/21/16 clay loam Conventiona No
D 1 1107	2016 N	MI				_	Irriga		1.0	(1	No
Preplant 127				lutiontes.		N	D	-	1 1	ractice	Lilling.
source 11-52-0 0-0-62	\$ ton \$530 \$376	rate 284 207	Fall Pre	pplication plant Broad plant Broad		N 31	P 148	K 128	S	Sta	bilizer
26.4-0-0-2.6 10-34-0	\$290 \$550	481 58	Spring Preplant Broadcast At Planting Band				20		12		
Stabilizer Cost / ac	\$0		Totals			164	168	128	12		
Split 99/28 lbs	s N						ł	Altern	ative	Practic	e
source	\$ ton	rate	aj	oplication		N	Р	K	S	sta	bilizer
11-52-0 0-0-62	\$530 \$376	284 207	Fall Pre	plant Broad plant Broad		31	148	128			
26.4-0-0-2.6 10-34-0	\$290 \$550	374 58		replant Broa lanting Banc		99 6	20		9		
26.4-0-0-2.6	\$290	107	Sideo	Sidedress Dribble		28			3		
Stabilizer cost / ac	\$0		Totals			164	168	128	12		
240 (18) 235 230 225 220	239.8		32.9	239.6		e 235.3 ant 127	lbs	24: Split 99		23 23 23 23 23 23 23 24 23 24 24 24 24 24 24 24 24 24 24 24 24 24	
Practice	Total 1	N Rate	ID	Yield	NUE ¹		st per re ²		st per hel ²	% MT	Test Weigh
Preplant 127 lbs N			IGSCTnorm	235.1	0.70	\$69	9.85	\$0	.30	17.3	56.0
C.L. ANOCH - N	1.	CA	HOCOT-1	240.2	0.70	Dec	1 05	1 00	20	17 1	500

\$0.29

17.1

56.0

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

164

Split 99/28 lbs N

² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

HGSCTalt

240.2

0.68

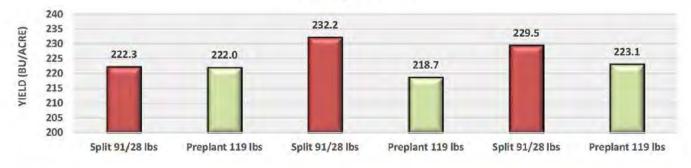
\$69.85

Field Trial ID	KGSCT	Trial County		Waseca	Cost/ton	26.4-0-0-2.6 \$290
Previous Crop	Soybeans	Township		Iosco	26% N cost/II	\$0.55
		Soil Te	st Info		Field Info	
	2 3	Date	10/12/11	Variety		DKC 54-38
	OM%	4.8	Population		34000	
	P1 20	pH	6.5	Row Width		30
S E -	Normel Farm Alternative Pr Normal Farm	Nitrogen	0	Planting Date		4/16/16
	E9 IN	P (bray)	5.2	Harvest Date		10/16/16
	len len	P (olsen)	3.5	Soil Texture		clay loam
Alternatiy Normal F.	Normel Fan Alternative Normal Far	Potassium	160.1	Tillage	(Conventional
4 2 4	2 4 2	Sulfur	0.2	Manure Histo	ry	No
		Zinc	2.1	Alfalfa Histor	y	No
201	2016 NMI			Irrigated		No

Preplant 119 lbs	s N			Normal Practice						
source	\$ ton	rate	application	N	Р	K	S	stabilizer		
11-52-0	\$530	216	Fall Preplant Broadcast	24	112					
0-0-62	\$376	213	Fall Preplant Broadcast			132				
26.4-0-0-2.6	\$290	449	Spring Preplant Broadcast	119		660	9			
10-34-0	\$550	58	At Planting Band	6	20					
Stabilizer Cost / ac	\$0		Totals	149	132	132	9			

Split 91 / 28 lbs	N			Alternative Practice						
source	\$ ton	rate	application	N	Р	K	S	stabilizer		
11-52-0 0-0-62	\$530 \$376	216 213	Fall Preplant Broadcast Fall Preplant Broadcast	24	112	132				
26.4-0-0-2.6	\$290	342	Spring Preplant Broadcast	91	- 1	0.00	6			
10-34-0	\$550	58	At Planting Band	6	20					
26.4-0-0-2.6	\$290	107	Sidedress Dribble	28			3			
Stabilizer cost / ac	\$0		Totals	149	132	132	9			

Yields By Practice



Practice	Total N Rate	ID	Yield	NUE ¹	N cost per acre ²	N cost per bushel ²	% MT	Test Weight
Preplant 119 lbs N	149	KGSCTnorm	221.3	0.67	\$65.45	\$0.30	18.2	56.5
Split 91 / 28 lbs N	149	KGSCTalt	228.0	0.65	\$65.45	\$0.29	17.8	56.4

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

Field Trial ID Previous Crop		KTS Soybe	U ,	Trial County Township		1	ogen Tir Waseca Alton	-	N sour Cost/to 26%		26.4-0-0-2.6 \$290 \$0.55
	19 31	11		Soil Te	est Info		1.1		Fi	eld Info	
Alternative Practice Normal Farm Practice Alternative Practice Alternative Practice Alternative Practice Alternative Practice		Sulfur 0.2 Zinc 2.2		Population Row Width Planting Date Harvest Date Soil Texture Tillage Manure History				Gold Country 9904 34000 30 4/23/16 11/2/16 clay loam Conventional No No			
	5000 C.05	-							Ilom	ractice	
Preplant 96 lbs				- Destina		AL	D		and the second second	and the second second	bilizer
source 11-52-0 0-0-62	\$ ton \$530 \$376	rate 100 150	Fall Pre	pplication plant Broad plant Broad		N 11	P 52	К 93	S	sta	IDINZET
26.4-0-0-2.6	\$290	364		replant Broa		96		-	9		
28-0-0	\$280	107	Carrier (Weed and I	Feed)	30					
12-0-0-26	\$428	55		Weed and I	1 1 C 1 C 1 C 1 C 1 C 1 C 1 C 1 C 1 C 1	7	1.0		14		
10-34-0	\$550	58	At P	6	20						
Stabilizer Cost / ac	\$0			Totals		150	72	93	23		
Split 68/28 lbs	Ň						A	lter	nativo	Practic	ce
source	\$ ton	rate	aj	pplication		Ν	Р	K	S	sta	bilizer
11-52-0	\$530	100	Fall Pre	plant Broad	lcast	11	52		1		
0-0-62	\$376	150		plant Broad		_		93	1		
26.4-0-0-2.6	\$290	257		replant Broa		68			6		
28-0-0	\$280	107		Weed and		30					
12-0-0-26	\$428 \$290	55 107		Weed and I dress Dribb		7 28			14 3		
26.4-0-0-2.6 10-34-0	\$290	And a state of the		lanting Ban	Add and a second s	6	20		3		
Stabilizer cost / ac	\$0	50	7.01	Totals		150	72	93	23		
/n 8) 195 190 190 185 180 175 170	98.8	201	8.5	elds By 200.0		11.2 58/28 lb			6.1		1.3
Practice		N Rate	ID ID	Yield	NUE ¹	N co:	st per	No	ost per	% MT	Test Weigh
							re ²	-	shel ²		
Preplant 96 lbs N		50 H	KTSCTnorm	189.1	0.79	\$52	2.80	\$	0.28	16.6	56.7
			DECOT 1		0.70		00		0.00		54.7

56.7

\$0.26

16.6

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

150

² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

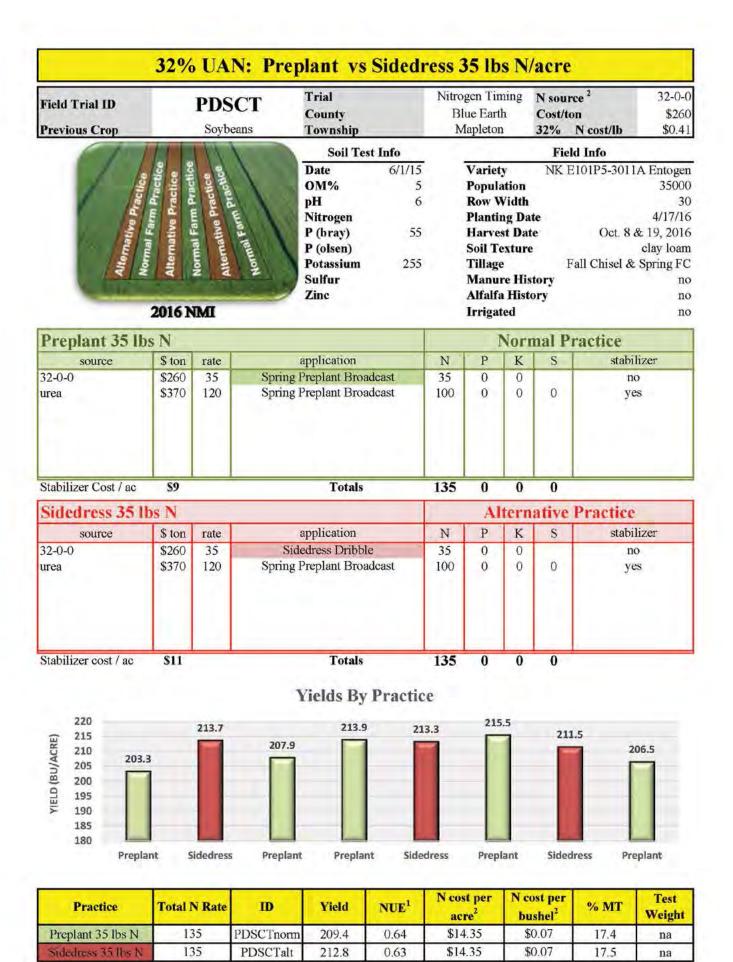
KTSCTalt

204.3

0.73

\$52.80

Split 68/28 lbs N



¹ NUE (Nitrogen Use Efficiency).	Pounds of nitrogen per bushel. (Total N rate/Yield)
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Field Trial ID Previous Crop		SMSC Soybean		Trial County Township		Nitr	ogen Ti Waseca St Mary		N sour Cost/to 26%		26.4-0-0-2.0 \$290 \$0.55
r revious crop	the state of state of state	boybean	,	Soil Test Info			Stiviary		ld Info	Φ0.5.	
		111		Date	9/21/11		Variet	v	rie		DKC 53-68
Altomative Practice	Normal Farm Practi Alternative Practice Normal Farm Practi	Alternative Practice Alternative Practice Normal Farm	1	OM% pH Nitrogen P (bray) P (olsen) Potassium	4.7 6 0 19.6 1.3 157		Popula Row V Plantin	ntion Vidth ng Date st Date exture			3400 3 4/17/1 10/19/1 clay loan Conventiona
		4 4 4	10	Sulfur	0.2			re Histe			N
	2016 N	MT		Zinc	1.8		Alfalfa	Histor	ry		N
							minga				10
Preplant 96 ll						_		1.00	1	ractice	
source 11-52-0	\$ ton	rate		application		N	P 102	K	S	sta	bilizer
0-0-62	\$530 \$376	198 278		replant Broadc replant Broadc		22	103	172			
26.4-0-0-2.6	\$290	320		Preplant Broad		96		172	9		
28-0-0	\$280	107		(Weed and Fe		30			1		
12-0-0-26	\$428	55		(Weed and Fe		7			14		
10.21.0	\$550	58		Diantin a Dan d		6	20		1.5		
10-34-0 Stabilizer Cost / ac	\$550 \$0	38	At	Planting Band Totals		161	20 123	172	23		
Split 68/28 lbs				1 Official		101				Practic	0
			_		_	NT.		-			
source	\$ ton \$530	rate 198		application replant Broade	1.4	N 22	P 103	K	S	Sta	bilizer
0-0-62	\$376	278		replant Broade		22	105	172			
26.4-0-0-2.6	\$290	214		Preplant Broad		68		1/2	6		
28-0-0	\$280	107		(Weed and Fe		30	1				
12-0-0-26	\$428	55	Carrier	(Weed and Fe	eed)	7			14		
26.4-0-0-2.6	\$290	107	Sid	edress Dribble		28			3		
10-34-0	\$550	58	At	Planting Band		6	20				
Stabilizer cost / ac	\$0			Totals		161	123	172	23		
230 1 225	222.1			Yields By	Practic	e					
225 220 215 210 205 205 200	-										
215				209.6				210	0.2	20	9.6
210 205		203	1			204.0		-	-	F	
205 200		F	1								
195											
190 Solit	68/28 lbs	Preplant	96 lbc	Split 68/28 lb	e Pron	lant 96	lbc	Split 6	8/28%	Proplan	t 96 lbs
Spirt	00/20 105	Freplant	SOLD2	3hur 09/ 59 10	в мер	ant 90	ius	shur of	0/20%	Prepian	1, 30 105
						Neo	st per	Neo	st per		
Practice	Total I	N Rate	ID	Yield	NUE ¹		ere ²		shel ²	% MT	Test Weigh
Develope OC II - N	17	c1 (m)	COT	205.6	0.70		2.90			17.6	59.9

Flacuce	Total IN Nate	ID ID	Tielu	NUE	acre ²	bushel ²	70 1911	105
Preplant 96 lbs N	161	SMSCTnorm	205.6	0.78	\$52.80	\$0.26	17.6	
Split 68/28 lbs N	161	SMSCTalt	214.0	0.75	\$52.80	\$0.25	17.4	
		Preplant 96 lbs N 161	Preplant 96 lbs N 161 SMSCTnorm	Preplant 96 lbs N 161 SMSCTnorm 205.6	Preplant 96 lbs N 161 SMSCTnorm 205.6 0.78	Preplant 96 lbs N 161 SMSCTnorm 205.6 0.78 \$52.80	Preplant 96 lbs N 161 SMSCTnorm 205.6 0.78 \$52.80 \$0.26	Preplant 96 lbs N 161 SMSCTnorm 205.6 0.78 \$52.80 \$0.26 17.6

57.7 57.7

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)
 ² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees,

Field Trial ID		DGSC		Trial County			gen Tin ue Eart	h	N sou Cost/f	ton	32-0-0 \$260
Previous Crop	THE R.	Soybe	ans	Township			Lyra	-		N cost/lb	\$0.4
	LAN.	11		Soil Test			W		Fie	eld Info	D 200
		8	1	Date OM%	6/1/13 5		Variet Popula			1 itar	n Pro 3090 35000
		1 16		pH	6		Row V				3500
	E E	1a		Nitrogen			Planti		e		4/16/1
	EP	E	1	P (bray)	22		Harve				9/27/1
Alternative Pract Normal Farm Pract	Normal Farm Practi	Alternative Normal Farm Prac		P (olsen)			Soil Te	exture			clay loar
	IE	len len		Potassium	200		Tillage			Fall Chisel &	
Ite of the	10	In lie		Sulfur			Manu				Ye
A Z A	<u>1</u> 2 1	4 2	1	Zinc			Manu			Swine	Finishing
and the second second		100					Liquid			Broadcast inc	Liqui
201	6 NMI						Applic	ation		Broadcast me	<12 nour
Spring Preplant	35 Ibs	N					I	Norn	nal F	Practice	
source	\$ ton	rate	application				Р	K	S	stabil	izer
32-0-0	\$260	35	Spring Preplant Broadcast			35				no)
urea	\$370	60	Spring Preplant Broadcast			50		1.1		no	
Manure Credits Year 1		2500	Fall Preplant Broadcast		t	60	37	85		ye	s
		1.1					1				
Stabilizer Cost / ac	S 8			Totals		145	37	85	0		
Sidedress 35 lbs N	1						Al	tern	ative	Practice	
source	\$ ton	rate		application		N	Р	K	S	stabil	izer
32-0-0	\$260	35	Sic	ledress Dribble	-	35				1.1	
urea	\$370	60		Preplant Broadca		50				no)
Manure Credits Year 1	1.0	2500	Fall F	Preplant Broadcas	t	60	37	85		ye	s
						-					
Stabilizer cost / ac	\$11			Totals		145	37	85	0		
			Y	ields By Pra	ctice						
220											
220 213.8 215	21	0.8									
210				207.0			205.4				8.3
1/10 205		-	202.9		202.6				201	.7	-
ATELD (BU/ACRE) 212 202 202 202 202 202 202 202 202 202											-
III 195											
190											
103											

Practice	Total N Rate	ID	Yield	NUE	N cost per acre ²	N cost per bushel ²	% MT	Test Weight
Spring Preplant 35 lbs N	145	DGSCTMnorm	205.3	0.71	\$14.35	\$0.07	20.5	na
Sidedress 35 lbs N	145	DGSCTMalt	207.9	0.70	\$14.35	\$0.07	20.5	na

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)
 ² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

Field Trial ID Previous Crop		DHS Soyber		Trial County Township			gen Stab Freeborr Nunda		N sour Cost/to 28%		28-0-0 na na
	111	1111	-	Soil Tes	Info				Field	Info	
	Normal Farm Practice	MUS Normal Farm Practice Atternative Practice	Normal Fail	Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	10/15/16 4.05 6 29 98 2.46		Variety Popula Row W Plantin Harves Soil Te Tillage Manur Alfalfa Irrigat	tion /idth ng Date nt Date xture re Histo Histor	ory		cers 6100 34000 30 10/22/16 clay loam ventional No No
No sidedro	ess						N	orma	l Pra	ctice	
source	cost	rate	_	application		N	P	K	S	stabil	izer
28-0-0 12-0-0-26 18-46-0 0-0-60 10-34-0		428.57 77.7 153 217 59	Spring Spring Spring	Preplant Broadc Preplant Broadc Preplant Broadc Preplant Broadc Preplant Broadc Planting Band	ast ast	120 9.3 27.5 5.9	70.38 20.06	130.2	20.2	Insti	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Stabilizer Cost	/ \$6			Totals		163	90	130	20		
Sidedress	28% v	vith Insti	inct		1		Alto	ernat	ive P	ractice	
source	cost	rate		application		N	Р	K	S	stabil	izer
28-0-0 12-0-0-26 18-46-0 0-0-60 28-0-0		428.57 77.7 153 217 107.14	Spring Spring Spring	Preplant Broadc Preplant Broadc Preplant Broadc Preplant Broadc idedress Band	ast ast	120 9.3 27.5 30	70.38	130.2	20.2	Insti Insti	
10-34-0		59		t Planting Band	-	5.9	20.1			msu	not
Stabilizer cost	/ \$11			Totals		193	90	130	20	_	
				Yields By P	ractice						
260				250.7						40.4	
250 245		236.4	1			243.3			-	48.4	
(335 250 245 240 235 230 225 230 225 220 220	Ē	230.4									
₹ 220	N	ormal	F	Alternative	P	Normal			Alte	rnative	
		yield diffe	rence or pot	with a stabilize ential water qu actice is not re	ality benef	it. Ap	plying	additio		-	
Pr	actice		Stabilizer	ID	Yield	NUE		oilizer c er acre	A CONTRACTOR	% MT	Test Weight
the second s			None	DHSCSnorm	239.8	0.68		\$6.00		16.4	58.7
No sidedress			INOIIC	Dirisconomi	239.0	0.00		\$0.00		10.4	20.7

\$11.00

15.6

60.1

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

Sidedress 28% with Instinct

² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

DHSCSalt

249.6

0.77

Instinct

Field Trial ID Previous Crop		MBSC Soybeans	County	County Township		gen Stab Freeborn Nunda		N sour Cost/t 28%		28-0-0 n:
1	111	1111	Soil Test Info					Field	Info	
Automatic	Normal Farm Practice	Normal Farm Practice Atternative Practice	OM%	1/15 7.9 6.7 60 277 6.3 1.9		Variety Populat Row W Plantin Harvest Soil Tes Tillage Manuro Alfalfa Irrigate	tion idth g Date t Date xture e Histo Histor	ory	cl	VT RIE 34000 30 10/16/10 ay loan rentiona No No No
No sidedre	22			1	-	N	orms	al Pra	ctice	_
source	cost	rate	application	-	N	P	K	S	stabili	zer
28-0-0 0-0-60 11-52-0 10-34-0		430 125 150 69	Spring Preplant Broadcast Spring Preplant Broadcast Spring Preplant Broadcast At Planting Band		120.4 16.5 5.9	78 20.06	75		Non	e
Stabilizer Cost /	\$6		Totals	-	143	98	75	0		
Sidedress 2	8% v	vith Instin	ct			Alte	rnat	ive P	ractice	
source	cost	rate	application		N	Р	K	S	stabili	zer
28-0-0 0-0-60 11-52-0 10-34-0		430 125 150 69	Spring Preplant Broadcast Spring Preplant Broadcast Spring Preplant Broadcast At Planting Band		120.4 16.5 5.9	78 20.06	75		Non	e
28-0-0		107.14	Sidedress Band		30				Instin	ict
Stabilizer cost /	\$6		Totals		173	98	75	0		_
230 225 220 215 210 210 205 200		223.0	Yields By Practic		220.8			2	24.3	
200	N	ormal	Alternative	N	Iormal	-		Alte	rnative	

above normal farm practice is not recommended for the NMI.

Practice	Stabilizer	-1D	Yield	NUE	Stabilizer cost per acre ²	% МТ	Test Weight
No sidedress	None	MBSCSnorm	221.9	0.64	\$6.00	17.2	58.3
Sidedress 28% with Instinct	Instinct	MBSCSalt	224.5	0.77	\$6.09	16.9	58.5

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)
 ² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

Field Telet ID		OHO	CE	Trial		Nitro	gen Stat	oilizer	N sou	rce ²	46-0-(
Field Trial ID		SHS	S	County			Waseca		Cost/t		\$283	
Previous Crop		Soyb	eans	Township		1	Freedom	1	46% N cost/lb \$0.3			
1	111	13 KK		Soil Test	t Info				Field	Info		
	3 .	8 . 8	1	Date	10/1/13		Variety			TP-4003 &		
		Child act	Normal Farm Pra	OM%	6		Popula				34500	
1	4 5	Normal Farm Practic Atternative Practic		pH	6.3		Row W				30	
5	ES	EG	E	Nitrogen	20		Plantin Harves				4/14/16	
1	E S	E I	1 23	P (bray) P (olsen)	20		Soil Te				clay loan	
Ë	E E	Em Smi	e	Potassium	216		Tillage			Co	nventiona	
Alternative	Normal Farm Alternative Pi	to to	102	Sulfur	210		Manur		orv	CO	Ne	
				Zinc	1.3		Alfalfa				No	
ALC: NOT THE OWNER.							Irrigat				No	
Cuning Duanla	2016	24 X X X			T			lower	al D.	actice	_	
Spring Prepla		1 1		and David and		N					line and	
source 46-0-0	cost \$283	rate 250	Spring	application g Preplant Broadca	ast	N 115	Р	K	S	stabil	644. C	
28-0-0	\$263	12		idedress Dribble	451	36				140.	lie	
6-24-6	\$707	5		t Planting Band		3.33	13.32	3.33				
11-52-0	\$481	150		Preplant Broadcas	st	16.5	78					
0-0-60	\$333	150		Preplant Broadcas				90				
Gypsum 17.5S 22Ca	\$189	100	Spring	g Preplant Broadca	ast				17.5			
01111 0 11							01	02	10		_	
Stabilizer Cost / ac	\$0			Totals		171	91	93	18			
Spring Prepla	_		h Instinct				-			Practice		
source	cost	rate		application		N	Р	K	S	stabil	and the second	
46-0-0	\$283	250		g Preplant Broadca	ast	115	1000			Insti	nct	
28-0-0 6-24-6	\$263 \$707	12 5		idedress Dribble t Planting Band		36	12.22	3.33				
11-52-0	\$481	150		Preplant Broadcas	÷	3.33 16.5	13.32 78	3.33				
0-0-60	\$333	150		Preplant Broadcas		10.5	10	90				
Gypsum 17.5S 22Ca		100		g Preplant Broadca				20	17.5			
Stabilizer cost / ac	\$9			Totals		171	91	93	18	-	_	
Stabilizer cost / ac		stinct was	sprayed on in	n strips before th	e pre-emerg							
				1								
225				Yields By Pr	actice						_	
₩ 220 ₩ 215				211.5	213.0	0	2	16.7		216.2		
¥ 210	03.2		203.4		_			-				
R 205 200						-						
G 200 E 195												
200				and a								
	None		Instinct	None	Instine	t	P	lone		Instinct		
185							Stab	ilizer o	teor	and the second second	Test	
,	ie.		Stabilizer	ID	Vield	NUE				% MT		
Practio			Stabilizer	ID	Yield	NUE ¹		er acre		% MT	Weight	
1	i i		Stabilizer None Instinct	ID SHSCSnorm SHSCSalt	Yield 210.4 210.9	NUE ¹ 0.81 0.81	p			% MT 16.8 17.0		

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)
 ² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

Field Trial ID Previous Crop			HSCC Soybeans	Trial County Township			ding Cov Sibley Severand		Cost/t		28-0-0 \$275 \$0.49		
	111	111	1	Soil Tes	t Info				Field	Info			
ative P.	Atternative Practice Normal Farm Practice Atternative Practice Normal Farm Practice Atternative Practice Atternative Practice Normal Farm		ative Practice I Farm Practice ative Practice ative Practice		al Farm Practic	OM% pH Nitrogen P (bray) P (olsen)	10/10/13 5.4 6.9 15.8		Harves Soil Te	ition /idth ng Date at Date exture		c	P 3011A 35000 30 5/8/16 lay loam
Alter	Norm	Norm	Norm	Potassium Sulfur Zinc	121 5 1.3			e Histor History		Conv	ventional No No No		
	2016 N	IMI						75					
No Cover Cro							-	lorma			_		
source	S ton	rate		lication		N	P	K	S	stabili	izer		
18-46-0 0-0-60 Sulfer 46-0-0 28-0-0	\$510 \$366 \$620 \$371 \$275	184 133 11 92 298	Spring Prep Spring Prep Spring Prep	plant Broadcast plant Broadcast plant Broadcast plant Broadcast ress Band		33 42 84	85	80	10				
Stabilizer Cost / ac	S0			Totals		159	85	80	10				
Interseed Cov	ver Cro	ps at	V7				Alt	ternat	ive P	ractice			
source	\$ ton	rate		lication		N	Р	K	S	stabili	izer		
18-46-0	\$510	184	Spring Prep	lant Broadcast	1	33	85		1				
0-0-60	\$366	133		lant Broadcast				80					
Sulfer	\$620	11		lant Broadcast					10				
46-0-0 28-0-0	\$371 \$275	92 298	Sided Seeded 101b mix of A Turnip, Crimson Clov	er and Rapeseed	Radish,	42 84							
Stabilizer cost / ac	\$0	-	corn re	ows @ V7 Totals		159	85	80	10				
			Yiel	ds By Pra	ctice								
212 210			207.8		207.	9							
원 208 206				205.9		1		205.4					
208 206 204 202 202 200 200 198 196 194 192	204.0									202.4			
	er Crop Mix		None Cov	er Crop Mix	Non	e	Cove	er Crop M	lix	None			
	1 August and				1		st per	No.	t per		Test		

159

159

No Cover Crops

Interseed Cover Crops at V7

² Nitrogen source(s) used in comparison only. Does not include other mutrient sources or application fees.

KHSCCnorm

KHSCCalt

206.0

205.1

0.77

0.78

\$41.16

\$41.16

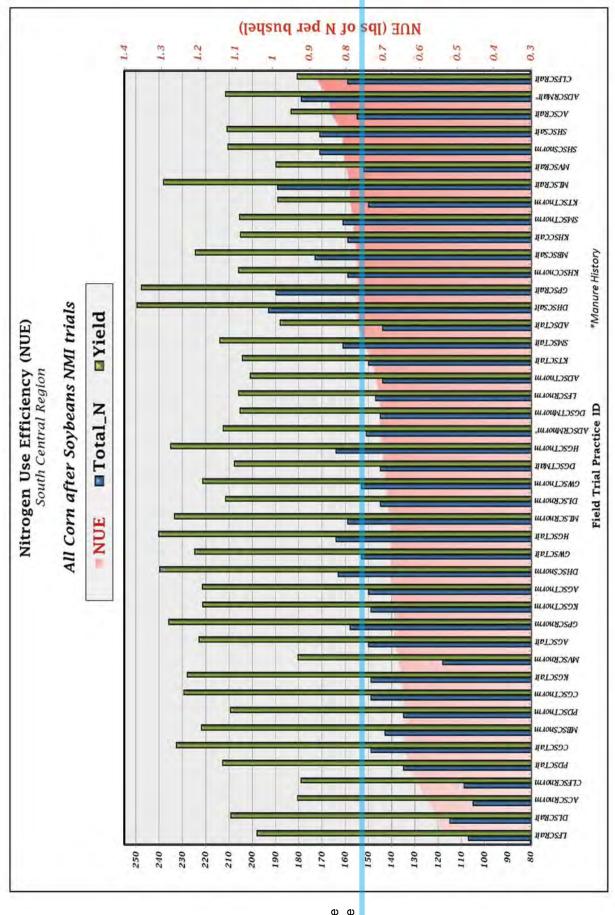
\$0.20

\$0.20

19.0

19.0

58.3 59.0



Average N Rate

Southwest / West Central

2016 Nutrient Management Initiative (NMI)



Southwest / West Central Table of Contents

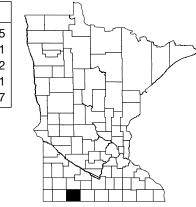
Advanced Nitrogen Rate Evaluations 109
Southwest/West Central BMP region summary 111
Corn following corn trial
Nitrogen rate trials
Corn following soybeans trials
Nitrogen rate trials
Nitrogen rate after manure 114
 Nitrogen timing trials
Corn following dry beans
Nitrogen rate trials
 Nitrogen timing trials
Nitrogen Use Efficiency summaries 124

Advanced Nitrogen Rate Evaluations

Site Details

County:JacksonSoil series:Crippin loam + Spicer-Lura complexPrevious crop:SoybeanStrips:2 (30' x 990' each)Plot Design:Randomized complete blockTillage System:ConventionalCorn hybrid:Dekalb 52-84	0.00 2 0 00.00	
Previous crop:SoybeanStrips:2 (30' x 990' each)Plot Design:Randomized complete blockTillage System:Conventional	County:	Jackson
Strips:2 (30' x 990' each)Plot Design:Randomized complete blockTillage System:Conventional	Soil series:	Crippin loam + Spicer-Lura complex
Plot Design:Randomized complete blockTillage System:Conventional	Previous crop:	Soybean
Tillage System: Conventional	Strips:	2 (30' x 990' each)
	Plot Design:	Randomized complete block
Corn hybrid: Dekalb 52-84	Tillage System:	Conventional
	Corn hybrid:	Dekalb 52-84
Planting date: May 8, 2016	Planting date:	May 8, 2016
Population: 36,000	Population:	36,000
Starter fertilizer: 5 gal/ac 10-34-0 + 1 qt/ac 10% zinc, applied in furrow	Starter fertilizer:	5 gal/ac 10-34-0 + 1 qt/ac 10% zinc, applied in furrow
Base nitrogen (N): 6 lb/ac, applied as starter fertilizer	Base nitrogen (N):	6 lb/ac, applied as starter fertilizer
Additional N: UAN, applied as sidedress	Additional N:	UAN, applied as sidedress
Additional N rates: 6 (0, 44, 94, 144, 194, and 244 lb/ac)	Additional N rates:	6 (0, 44, 94, 144, 194, and 244 lb/ac)
Harvest date: 11/10/2016	Harvest date:	11/10/2016

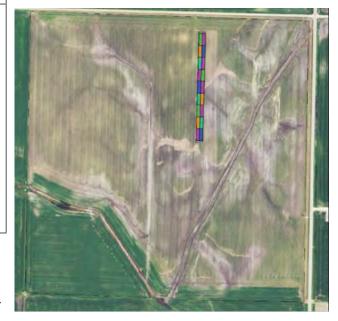
Soil-test results	
Organic matter (%)	4.5
рН	7.1
Phosphorus (Olsen) (ppm)	12
Potassium (ppm)	181
Zinc (ppm)	0.7



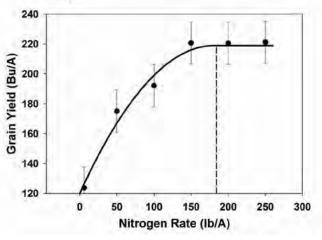
Total monthly precipitation (inch) and departure from normal (DN)							
Percipitation May June July Au							
Observed	6.1	5.0	4.7	2.3			
Normal	3.6	4.6	3.7	4.0			
DN	+2.5	+0.4	+1.0	-1.7			

N Rate 2016 corn grain yield (bu/ac)									
lb/ac	Rep1	Rep 2	Rep 3	Average					
6	154	121	96.2	124					
50	210	178	137	175					
100	187	196	193	192					
150	234	227	201	221					
200	235	236	191	221					
250	241	221	201	221					

Trial Layout



Corn response to N rates



- Average highest grain yield = 221 bu/ac
- N rate needed = 185 lb N/ac
- Grain yield = 120 + 1.09 (N rate) 0.0030 (N rate)²
- R² = 0.74, P < 0.01

Price ratio	EONR (lb N/ac)
0.05	173
0.10	165
0.15	156

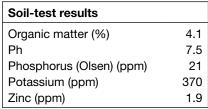
Economic Optimum Nitrogen Rates (EONR) at three price ratios were less than the N rate needed for average highest yield. To ensure maximum profit, EONR rates should be used.

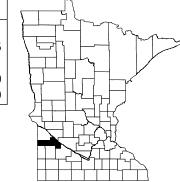
A collaborative project between the Minnesota Department of Agriculture and the University of Minnesota. January 2017, Apurba k. Sutradhar

Advanced Nitrogen Rate Evaluations

Site Details

One Detaile	
County:	Yellow Medicine
Soil series:	Canisteo clay loam + Amiret loam +
	Amiret-Swanlake loam
Previous crop:	Soybean
Strips:	1 (70' x 2340' each)
Plot Design:	Randomized complete block
Tillage System:	Fall 2015 chisel, spring 2016 cultivator
Corn hybrid:	Dekalb DKC44-14 GENSSX RIB
Planting date:	April 23, 2016
Population:	35,000
Starter fertilizer:	77.4 lb/ac DAP + 83.2 lb/ac K + 55.1 lb/ac AMS
Base nitrogen (N):	26 lb/ac, applied as starter fertilizer
Additional N:	Applied as Urea, on April 15, 2016
Additional N rates:	6 (26, 76, 126, 176, 226, and 276 lb/ac)
Harvest date:	11/09/2016





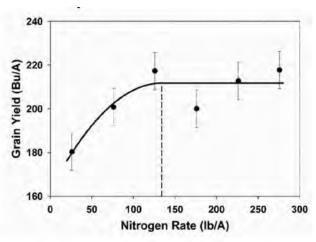
Total monthly precipitation (inch) and departure from normal (DN)								
Percipitation May June July August								
Observed	1.6	2.9	4.7	5.8				
Normal	2.9	4.1	3.4	3.3				
DN	-1.3	-1.2	+1.3	+2.5				

N Rate 2016 corn grain yield (bu/ac)									
lb/ac	lb/ac Rep1 Rep 2 Rep 3								
26	186	166	188	180					
76	188	215	200	201					
126	215	221	216	217					
176	219	186	196	200					
226	218	204	216	213					
276	236	189	228	208					

Trial Layout



Corn response to N rates



- Average highest grain yield = 212 bu/ac
- N rate needed = 134 lb N/ac
- Grain yield = 163 + 0.73 (N rate) 0.0027 (N rate)²
- R² = 0.43, P < 0.01

Price ratio	EONR (lb N/ac)
0.05	126
0.10	117
0.15	107

Economic Optimum Nitrogen Rates (EONR) at three price ratios were less than the N rate needed for average highest yield. To ensure maximum profit, EONR rates should be used.

A collaborative project between the Minnesota Department of Agriculture and the University of Minnesota. January 2017, Apurba k. Sutradhar

Southwest / West Central BMP Region S U M M A R Y

Averages										
	4	All Trials C	ombined	b	Rate Trials		Rate Trials Timing Trials		Stabilizer Trials	
Previous Crop	Total N	Yield	NUE	Price / Ib	Additional N (lbs)	Yield from additional N (bu)	Split App Advantage (bu)	Stabilizer Advantage (bu)	Stabilizer Cost (ac)	
Soybeans	159.53	216.02	0.73	\$0.42	31.76	3.97	5.60			
Dry Beans	167.50	207.49	0.81	\$0.49	30.00	1.63	2.52			
Corn (1)	177.00	239.00	0.74	-	30.00	0.00				
Averages	168.01	220.84	0.76	0.46	30.59	1.87	4.06			

The average cost for a pound of nitrogen was **\$0.46**. When considering an average of all nitrogen rate trials, an additional **30.59** lbs N/ acre cost **\$14.07** per acre, resulting in an average yield difference of only **1.87** bushels/acre in 2016.

	Top Nitrogen Use Efficiency (NUE)									
Total N Rate/Yield — Lbs of N Per Bushel										
PageNUECountyPrevious CropTrial Practice IDTotal N Rate (lbs/ac)Yield (bu/ac)VarietyType of Tri								Type of Trial		
115	0.5	Nobles	Soybeans	GKSWRalt	120	237.7	Dekalb 54-38	Rate		
117	0.51	Jackson	Soybeans	PHSWRalt	93	181.6	Gold Country 99044	Rate		
120	0.54	Jackson	Soybeans	PSSWTalt1	110	204.7	DK 54-38	Timing		

	Top Yields										
	bu/acre										
PageYield (bu/ac)CountyPrevious CropTrial Practice IDNUETotal N Rate (lbs/ac)VarietyType								Type of Trial			
111	242.00	Nobles	Corn	JKSWRalt	0.67	162	Dekalb 54-38	Rate			
115	237.70	Nobles	Soybeans	GKSWRalt	0.5	120	Dekalb 54-38	Rate			
112	237.60	RENVILLE	Soybeans	BLSWRnorm	0.78	186	9701VT2 Legend Seed	Rate			

Field Trial ID Previous Crop		JKS		Trial County Township			rogen R Nobles ittle Roo		N source Cost/ton 32% N		32-0-(na
Frevious Crop	111	COL		Soil Test	Info	L	tule Ko	<u> </u>	Field 1		na
1	1.	8 (2)			1/19/13	1.19	Variet	v	r leiu i		lb 54-38
1	ice le	Normal Farm Practic Atternative Practice Sarm Practice		OM%	3.5		Popula			Dena	34843
1	Pract	Pra	A	pH	6.2		Row W				30
	5 5 5	ELE		Nitrogen	N/A		Plantin	ng Date	3		5/6/10
Allen	Normal Farm Practi Alternative Practi	Normal Farm Practi Alternative Practice sarm practic		P (bray)	27		Harves			1000	
		E E	e	P (olsen)	200		Soil Te				lay loan
A N	Alt	All Ro	ON	Potassium Sulfur	200 N/A		Tillage Manur			Chisel & Sj	pring FC No
1. 6.7	1000	and the second		Zinc	N/A N/A		Alfalfa				No
	2016	NMI		Zanc	1.071		Irrigat		.,		No
100 11 17 1		12000					~		1.0		
129 lbs N sid									al Pra	Contraction of the	-
source	S ton	rate		pplication		N	P	K	S	stabiliz None	COR. AL
11-52-0 0-0-60		181 195		replant Broadcast replant Broadcast		19 1	94 0	117	0	None	
9-18-9		55		Planting Band		4.9	9.8	4.9	0	None	
32-0-0		99		anting Dribble		31	9.0	4.2		None	
12-0-0-26		11		anting Dribble	- 1	1.32			2.8	None	-
32-0-0		402.6		ledress Band		128.8			2.0	None	
12-0-0-26		48.4		ledress Band		5.8			12.5	None	
Stabilizer Cost / ac	so so			Totals		192	104	122	15		
99 Ibs N side	edress						Al	terna	tive P	ractice	
source	S ton	rate		pplication		N	P	K	S	stabiliz	
11-52-0		181		replant Broadcast		19	94	0	0	None	
0-0-60		195		replant Broadcast		1	0	117	0	None	
9-18-9		55 99		Planting Band		4.9	9.8	4.9		None	
32-0-0 12-0-0-26				anting Dribble anting Dribble		31 1.32			2.8	None	
32-0-0		11 308.9		ledress Band	_	98.8			2,0	None	
12-0-0-26		48.4		ledress Band		5.8			12.5	None	
12-0-0-20		10.1	- Sic	buress Dund	-	5.0			12.5	Tion	
Stabilizer cost / ac	S0			Totals		162	104	122	15		
			Vi	elds By Prac	tice						
255				crus by true	nee					250.6	
250 a 245							243.5		241.7		
245 240 235 2 230 220 225		238.2		238.5	239.3		-				
235 2	30.5	-	232.4								
g 230					-						
					-						
220											
215											

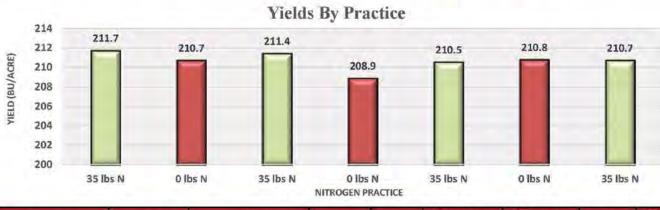
Practice	Total N Rate	ĺD	Yield	NUE	N cost per acre ²	N cost per bushel ²	Moisture	Test Weight
129 lbs N sidedress	192	JKSWRnorm	236.0	0.81	na	na	20.0	60.0
99 lbs N sidedress	162	JKSWRalt	242.7	0.67	na	na	20.2	60.0

on \$3 N cost/lb \$0.
l Info
9701VT2 Legend Se
340
4/17/ 10/27/
clay loa
Ridge-T
1
1
1
actice
stabilizer
Practice
stabilizer
235.8
235.8
235.8
235.8
235.8
235.8
120 lbs
120 lbs
120 lbs

Field Trial ID Previous Crop	EGSWR Soybeans	Trial County Township		Nitrogen Rate Nobles Bloom	N source ² Cost/ton 32% N cost/lb	32-0-0 \$305 \$0.48
611	1 MINT	Soil Tes	st Info		Field Info	
	8 8 4	Date	8/1/13	Variety	Wensman 8268	SVT2Rib
	3 5 5 5	OM%	4.5	Population		35400
8 8	2 2 2 2	pH	7.38	Row Width		30
4 E	AEAE	Nitrogen	16 (0-6")	Planting Dat	e	5/19/16
1	Far	P (bray)	7.6	Harvest Date		11/1/16
Uternat lormat	Alternative P Normal Farm Alternative P Normal Farm	P (olsen)		Soil Texture	c	lay loam
Uterna lormal	orth ter	Potassium	188	Tillage	Con	ventional
₹ ž	A Z A Z	Sulfur	13	Manure Hist	ory	No
A SHE		Zine	1.47	Alfalfa Histo	ry	No
2	016 NMI			Irrigated		No

35 lbs N sided	ress				N	Normal Practice			
source	\$ ton	rate	application	N	P	K	S	stabilizer	
10-50-0	\$570	120	Fall Preplant Broadcast	15	60			None	
0-0-60	\$420	150	Fall Preplant Broadcast			90			
46-0-0	\$365	184	Spring Preplant Broadcast	85		1.00		None	
8-20-5-5S5Zn	\$600	55	At Planting Band	4.4	11	2.75	2.75	None	
8-0-0-10Zn		2.4	At Planting Band				100	None	
32-0-0	\$305	121	At Planting Broadcast	38.7					
32-0-0	\$305	110	Sidedress Band	35	1				
Stabilizer Cost / ac	S0		Totals	178	71	93	3		

0 lbs N sided	lress				Ali	ternat	ive Pr	actice
source	S ton	rate	application	N	Р	K	S	stabilizer
10-50-0	\$570	120	Fall Preplant Broadcast	15	60		1	None
0-0-60	\$420	150	Fall Preplant Broadcast			90		
46-0-0	\$365	184	Spring Preplant Broadcast	85		10.		None
8-20-5-5S5Zn	\$600	55	At Planting Band	4.4	11	2.75	2.75	None
8-0-0-10Zn	100	2.4	At Planting Band			1.000		None
32-0-0	\$305	121	At Planting Broadcast	38.7				
	-	1944 - 19		n				
Stabilizer cost / ac	S0		Totals	143	71	93	3	



Practice	Total N Rate	ID	Yield	NUE ¹	N cost per acre ²	N cost per bushel ²	% MT	Test Weight
35 lbs N sidedress	178	EGSWRnorm	211.1	0.84	\$16.80	\$0.08	17.4	57.0
0 lbs N sidedress	143	EGSWRalt	210.4	0.68	\$0.00	\$0.00	17.4	57.0

Field Trial ID Previous Crop			SWRM	Trial County Township		Yell	trogen l ow Me oshkos	dicine	N sou Cost/ 82%		82-0-0 \$546 \$0.33
Product: NH3			-	Soil Test	Info	1			Fi	eld Info	
Applied Area: 29.70 ac		1	~	Date			Variety	y		wien	smen W91073
Rate (b); 245 - 2 245 - 205 245 - 105 245 - 105 0 - 145 DolfFictures #134 m				OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur			Popula Row W Plantir Harves Soil Te Tillage Manur	/idth ng Date nt Date xture re Histo	ory	Sprin	33000 30 4/14/16 10/26/16 g Tillage Only Yes
	2016 N	мт		Zinc			Manur Liquid				Beef (Cows Solid
	2010 14									Broadcast	Inc >96 hours
100 lbs N sided	Iress							Nor	mal	Practice	
source	\$ ton	rate		olication		N	Р	K	S	sta	bilizer
82-0-0	\$546	122		lress Band		100		1		19	ione
0-0-60	\$381	100		plant Broadcast				60			Jone
46-0-0	\$365	35	Spring Preplant Broadcast Spring Preplant Broadcast			15 23					lone
18-46-0	\$517	130		Spring Preplant Broadcast			60				Jone
21-0-0-24	\$370	50	Spring Preplant Broadcast			11	1.0		12		Jone
8-24-4	\$1,345	33	At Planting Dribble			2.6	7.9	1.3			lone
Soybean Credit			Previous Credits			45				I I	Jone
Manure Credits Year			Fall Prep	lant Broadcast	-	10	_				
Stabilizer Cost / ac \$0			Totals		207	68	61	12			
130 lbs N sided	lress						I	Iter	nativ	e Practi	ce
source	\$ ton	rate	app	olication		N	Р	K	S	sta	bilizer
82-0-0	\$546	158		lress Band		130		-		I	ione
0-0-60	\$381	100		plant Broadcast				60		ľ	Jone
46-0-0	\$365	35		plant Broadcast		15	1.1			ľ	Jone
18-46-0	\$517	130		plant Broadcast		23	60			N	Jone
21-0-0-24	\$370	50	Spring Pre	plant Broadcast		11			12	N	Jone
8-24-4	\$1,345	33		ting Dribble		2.6	7.9	1.3	100	Ν	lone
Soybean Credit			Previo	ous Credits		45				N	Jone
Manure Credits Year			Fall Prep	lant Broadcast	_	10					
Stabilizer cost / ac	S0	1.1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Totals		237	68	61	12		
			Yie	elds By Pra	ctice						
250				241.5							
245				241.5	2	36.8		23	8.7	24	40.3
240			234.8		2	50.0		-	-		
¥ 235 2:	30.2										
7											
/ng) 230											
/ng) 230											
AIELD (BU/											
215											
215 210	lbs SD	1	30 lbs SD	100 lbs SD	130	lbs SD		100 1	bs SD	130	lbs SD
215 210	lbs SD	1	30 lbs SD	100 lbs SD NITROGEN PR						130	lbs SD
215 210	lbs SD Total N	501	L30 lbs SD			N co	st per	N cos	t per	130 Moisture	lbs SD Test Weight
215 210 100	1	Rate		NITROGEN PR	ACTICE	N co ac	st per re ² 3.00	N cos bus	t per	Sector Sector	

Previous Crop			SWR beans	Trial County Township			rogen R Nobles and Prai		N sour Cost/to 32%		32-0-0 n: n:
	181	11/1		Soil Te	st Info				Field	Info	
Alleman	Normal Farm Practice Alternative Practice		Normal Farm	Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	11/13/13 0.035 6 N/A 21 187 N/A N/A		Variety Popula Row W Plantin Harves Soil Te Tillage Manur Alfalfa Irrigat	tion /idth og Date ot Date xture e Histo Histor	ory	De	kalb 54-38 35784 30 4/23/16 clay loan Strip Til No No No
		NMI							1.0		INC
87 lbs N side						_			-	actice	
source	S ton	rate		plication		N	P	K	S	stabi	di liberte
11-52-0 0-0-60 9-18-9 32-0-0 12-0-0-26 32-0-0 12-0-0-26		181 195 55 99 11 271.8 48.4	Spring Pr At Pl At Pla At Pla Side	eplant Broadcas eplant Broadcas anting Band nting Dribble nting Dribble xdress Band xdress Band		19 1 4.9 31 1.32 87 5.8	94 0 9.8	0 117 4.9	0 0 2.8 12.5	No No No No No No	ne ne ne ne
Stabilizer Cost / ac 57 lbs N side				Totals	-	150	104	122	15	Practice	_
	-	and a				N		_	-	stabi	Nacion
source 11-52-0	\$ ton	rate		plication eplant Broadcas		N 19	P 94	K	S	stabi No	
0-0-60 9-18-9 32-0-0 12-0-0-26 32-0-0 12-0-0-26		181 195 55 99 11 178.1 48.4	Spring Pr At Pl At Pla At Pla Side	eplant Broadcas anting Band nting Dribble nting Dribble xdress Band xdress Band		19 1 4.9 31 1.32 57 5.8	0 9.8	117 4.9	0 2.8 12.5	No No No No No	ne ne ne ne
A 1 11	S 0			Totals		120	104	122	15	-	
Stabilizer cost / ac		240.8		elds By Pra	ictice						
		240.8	239.9	241.1							
245							235.3				
245 240 235 230 230 225 220	34.3				235.9				231.9	233.7	
245 240 235 230 230 225 220 215	34.3	57 lbs SD	87 lbs SD	57 lbs SD SIDEDRESS N P	87 lbs SD	5	7 lbs SD		231.9	57 lbs 5	
245 240 235 230 225 220 215 87 I	bs SD	57 lbs SD		SIDEDRESS N P	87 lbs SD RACTICE	N cos	7 lbs SD	8 N co	7 lbs SD	57 lbs 5	5D Test
245 240 235 230 230 225 220 215	bs SD Total I	57 lbs SD	87 lbs SD		87 lbs SD	N cos ac	7 lbs SD	87 N co bus	7 lbs SD		5D

18.8

na

na

120

57 lbs N sidedress

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)
 ² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

GKSWRalt

237.7

0.50

na

Field Trial ID		JGSWI	County			rogen R ow Med		N sour Cost/te		82-0-0 \$540
Previous Crop		Soybeans	Township			Florida	i all'an		N cost/lb	\$0.33
C Aller		South Story of	Soil Tes	and the second s			_	Field	Info	
	5		Date OM% pH Nitrogen P (bray) P (olsen) Potassium	10/14/15 3.8 5.8 20 174		Variety Popula Row W Plantin Harves Soil Te Tillage	ition /idth ng Date st Date exture			5-65 RIE 34000 3(5/2/16 10/27/16 clay loan Othe
			Sulfur Zinc	9 1.6		Manur Alfalfa				No No
-	2016	NMI				Irrigat	ed			No
110 lbs N sid	edress	8		-		1	Norm	al Pr	actice	
source	S ton	rate	application		N	P	K	S	stabil	
82-0-0 0-0-60 46-0-0 18-46-0 21-0-0-24 8-24-4 Soybean Credit	\$546 \$471 \$439 \$570 \$373 \$1,345	134.1 84 44 109 50 33	Sidedress Band Fall Preplant Band Fall Preplant Band Fall Preplant Band Fall Preplant Band At Planting Dribble Previous Credits		110 20.24 19.62 10.5 2.6 45	50.14 7,9	50.4 1.3	12	Nor Nor Nor Nor Nor Nor Nor	ne ne ne ne
Stabilizer Cost / ac	<u>\$0</u>		Totals	-	208	58	52	12		_
70 lbs N side		Trans I				-	-	-	Practice	1000
source 82-0-0	\$ ton \$546	rate 85.4	application Sidedress Band	_	N 70	Р	K	S	stabil Nor	
0-0-60 46-0-0	\$471 \$439	84 44 109	Fall Preplant Band Fall Preplant Band Fall Preplant Band		20.24 19.62	50.14	50.4	12	Nor Nor Nor Nor	ne ne ne
18-46-0 21-0-0-24 8-24-4	\$570 \$373 \$1,345	50 33	Fall Preplant Band At Planting Dribble Previous Credits		10.5 2.6 45	7.9	1.3	12	Nor Nor	ie
18-46-0 21-0-0-24 8-24-4 Soybean Credit	\$373	50	At Planting Dribble		2.6	7.9 58	1.3 52	12	Nor	ie
18-46-0 21-0-0-24 8-24-4 Soybean Credit Stabilizer cost / ac	\$373 \$1,345	50	At Planting Dribble Previous Credits		2.6 45				Nor	ie
18-46-0 21-0-0-24 8-24-4 Soybean Credit Stabilizer cost / ac 240	\$373 \$1,345 \$0	50	At Planting Dribble Previous Credits Totals Yields By Pra		2.6 45	58			Nor	ie
18-46-0 21-0-0-24 8-24-4 Soybean Credit Stabilizer cost / ac 240 235 230 230 230 225 230 225 230 225 230 225 215	\$373 \$1,345	50	At Planting Dribble Previous Credits Totals		2.6 45 168	58	52		Nor	ie
18-46-0 21-0-0-24 8-24-4 Soybean Credit Stabilizer cost / ac 240 235 230 230 230 225 215 210	\$373 \$1,345 \$0	50 33	At Planting Dribble Previous Credits Totals Yields By Pra	229.	2.6 45 168	58	52		Nor Nor	ie
18-46-0 21-0-0-24 8-24-4 Soybean Credit Stabilizer cost / ac 240 235 230 230 235 230 215 210	\$373 \$1,345 \$0 232.6	50 33 229.3 229.3 70 lbs	At Planting Dribble Previous Credits Totals Yields By Pra 230.8 230.8 110 lbs	229.	2.6 45 168 7 os N cos	58	52 235.8		Nor Nor 230.0	ie

0.73

229.7

\$23.30

\$0.10

17.1

na

168

70 lbs N sidedress

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)
 ² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

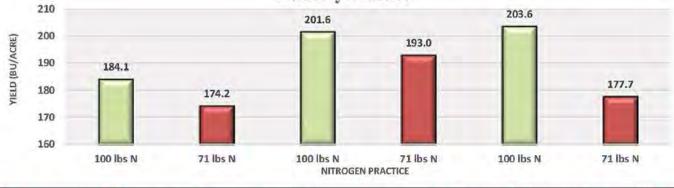
JGSWRalt

Field Trial ID	PHSWR	Trial County		Nitrogen Rate Jackson	N sou Cost/i		32-0-0 \$305
Previous Crop	Soybean	Township	-	Ewington	32%	N cost/lb	\$0.48
Contraction		Soil Te	st Info		Field	Info	
		Date	10/13/15	Variety		Gold Count	ry 99044
		OM%	5.1	Population			33834
		pH	7.9	Row Width			30
		Nitrogen	11 lbs	Planting Date	e		5/18/16
		P (bray)	9 to 33	Harvest Date			11/8/16
		P (olsen)		Soil Texture		c	lay loan
		Potassium	173	Tillage		Conv	entional
		Sulfur	12	Manure Histo	ory		No
		Zinc	0.2	Alfalfa Histor	ry		No
201	6 NMI			Irrigated			No

100 lbs N pro	eplant				N	orma	l Prac	tice
source	S ton	rate	application	N	P	K	S	stabilizer
11-52-0	\$508	360	Fall Preplant Broadcast	20.1	100.6	95.6		
Riser	\$1,878	26.6	At Planting Band	1.9	4.5	0.8		
32-0-0	\$305	312	At Planting Broadcast	99.8				None
Stabilizer Cost / ac	: \$0		Totals	122	105	96	0	

71 lbs N pre	plant			Alternative Practice						
source	S ton	rate	application	N	P	K	S	stabilizer		
11-52-0	\$508	360	Fall Preplant Broadcast	20.1	100.6	95.6	-			
Riser	\$1,878	26.6	At Planting Band	1.9	4.5	0.8				
32-0-0	\$305	220	At Planting Broadcast	70.5				None		
Stabilizer cost / ac	S0		Totals	93	105	96	0			





Practice	Total N Rate	1D	Yield	NUE	N cost per acre ²	N cost per bushel ²	Moisture	Test Weight
100 lbs N preplant	122	PHSWRnorm	196.4	0.62	\$47.90	\$0,24	15.5	60.7
71 lbs N preplant	93	PHSWRalt	181,6	0.51	\$33.84	\$0.19	15.2	61.3

Field Trial ID Previous Crop			SWR beans	Trial County Township	2		rogen R Nobles Iham La		N sour Cost/to 32%		32-0-0 \$300 \$0.47
	2016	NMI		Soil Tes Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	60		Variet, Popula Row W Plantir Harves Soil Te Tillage Manur Alfalfa Irrigat	tion /idth ng Date at Date exture re Histo Histor	ory	D	KC46-36 37500 30 5/9/16 ventional No No
70 lbs N sided	ess	1					N	orm	al Pra	ctice	
source	S ton	rate	apr	lication	-	N	P	K	S	stabi	lizer
10-50-0 0-0-60 21-0-0-24 32-0-0 8-20-5-5S5Zn 8-0-0-10ZN 32-0-0	\$560 \$420 \$425 \$300 \$590 \$4/ac \$300	180 150 62.5 70 55 2.4 70	Fall Prep Fall Prep Fall Prep At Pla At Pla At Pla	lant Broadcast lant Broadcast lant Broadcast inting Band inting Band inting Band lress Band		18 12 70 4.4 70	90 11	90 2.8	2.8	No Agro No	tain
Stabilizer Cost / ac	\$300	10	Sidet	Totals		174	101	93	3		
2.00 C C C C C C C C C C C C C C C C C C	- 200			Total		1/4		1911 E.			-
40 lbs N sidedi	-								-	ractice	_
source	S ton	rate		lication		N	P	K	S	stabi	0.000 C
10-50-0 0-0-60 21-0-0-24 32-0-0 8-0-0-10Zn 32-0-0	\$560 \$420 \$425 \$300 \$4/ac \$300	180 150 62.5 70 55 40	Fall Prep Fall Prep At Pla At Pla	lant Broadcast lant Broadcast lant Broadcast inting Band inting Band dress Band		18 12 70 4.4 40	90 11	90 2.8	2.8	No Agro No	tain
Stabilizer cost / ac	\$0			Totals		144	101	93	3		
210 205			Yie	lds By Pra			101			204.0	
200 195 190 185 180 175 170	194.0		195	.0		197.0					
	check (0	40 lb:	S SD SIDEDRESS NITROG		70 lbs SD			100	lbs SD	
			Also applied +	-30 lbs UAN (1	00 lbs si	dedress)				
Practice	Total I	N Rate	ID	Yield	NUE	N cos	t per		st per	% MT	Test
70 lbs N sidedress	17	74	SCSWRnorm	197.0	0.89	ac \$32	re .90		shel ²).17	17.9	Weight na
		4	SCSWRiofin	197.0	0.89		90 3.80	-	0.10	17.9	na
40 lbs N sidedress	1		NUN Pair	105.0	1 11/1						

Field Trial ID Previous Crop		GSS Soybe	a manage	Trial County Township			ogen Ti Jackson Weime	1		n N cost/lb	46-0-0 \$376 \$0.41
	M	1		Soil 7	est Info				52-0-0 Field	N cost/lb Info	\$0.55
	201	16 NMI		Date OM% pH Nitrogen P (bray) P (olsen) Potassiun Sulfur Zinc	10/24/13 6 Avg 7 Avg 13 Avg 203 Avg 2 Avg		Harve Soil To Tillage Manu	ation Width ng Date st Date exture e re Histo a Histor	ory	1	DK 54-3 3447 3 5/4/1 ventiona N N
Preplant 10	8 Ibs N	N					1	Norm	al Pra	actice	
source	S ton	rate	311.18	application		N	P	K	S	stabil	izer
46-0-0 18-46-0 0-0-60	\$376 \$520 \$426	304 176 Avg 50.3 Avg	Fall F	Preplant Broadc Preplant Broadc Preplant Broadc	ast	108.1 31.7	81	30.2		Nor	ne
Stabilizer Cost /	SO			Total	8	140	81	30	0		
Split 78 / 30	lbs						A	terna	tive I	ractice	
source	\$ ton	rate		application		N	р	K	S	stabil	100 C 10
46-0-0 18-46-0 0-0-60 32-0-0	\$376 \$520 \$426 \$350	239 176 avg 50.3 Avg 9 gals	Fall F Fall F	Preplant Broade Preplant Broade Preplant Broade idedress Band	ast	78.3 31.7 30	81	30.2		Noi	10
Stabilizer cost /	SO			Total	5	140	81	30	0		_
			1	Yields By]	Practice						
230 225		216.6			220.3						-
215 210 205	215.2		214.6	214.9			203,8				
200 195 190 185 180									191.4	192.	B
	#/30# SD	110#/30# S	D 110# NO 5	D 110# NO S	D 110#/30#	SD 1	10#/30#	SD 1	10# NO S	D 140#	1
							_		-	G	
Practice	Tota	I N Rate	ID	Yield	NUE ¹		st per re ²		ost per shel ²	% MT	Test Weigh
Practice Preplant 108 lbs N	1	I N Rate 140	ID GSSWTnorr		NUE¹ 0.68	ас \$4		bu \$		% MT 19.4	

\$48.51

\$0.23

19.5

na

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

140

² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

GSSWTalt

214.0

0.65

Split 78 / 30 lbs

Field Trial ID Previous Crop		PSSW Soybean	ĸ	Frial County Fownship		Nitrog	en Rate/ Jackson Weimer		Cost/t 46-0-0		46-0-0 \$370 \$0.4 \$0.4
	100			Soil T	est Info					d Info	ΦU.4
	- milel			Date	10/29/14		Variet	v	Tier	u mio	DK 54-3
				OM%	5.83 Avg		Popula				3512
				H	6.34 Avg		Row W	and the second se			3
				Nitrogen	10.10.1			g Date			5/5/1
				P (bray) P (olsen)	18.48 Avg 10.41 Avg		Harves Soil Te				10/17/1
	1			Potassium	183.56 Avg		Tillage			C	onvention
Concession of the local division of the loca				Sulfur	103.501115			e Histo	ry		N
		11110		Zinc	.92 Avg			Histor			N
	2016	NMI					Irrigat	ed			N
140 lbs N Pr	eplant						1	Norn	al Pi	ractice	
source	S ton	rate	8	pplication		N	P	K	S		ilizer
16-0-0	\$376	304 vr	Spring I	Preplant Bro		116.9				N	one
1-52-0	A CONTRACT OF	60 - 470 VR		eplant Broa		23.1	52				
-0-60	\$426	100	Fall Pr	eplant Broa	dcast			60			
tabilizer Cost / ac	\$0			Totals		140	52	60	0		
10 lbs N Pr	eplant	(no SD)	×			-	Al	terna	tive F	ractice	6
source	S ton	rate		pplication		N	Р	K	S		ilizer
6-0-0	\$376	239 vr		Preplant Bro		86.9		-		N	one
1-52-0		0 - 470 VR		eplant Broa		23.1	52				
)-0-60	\$426	100	Fall Pr	eplant Broa	dcast	110	50	60	0		
tabilizer Cost / ac	\$0			Totals	_	110	52	60	0		_
110/30 lbs N	Split						Al	terna	tive F	Practice 2	2
source	S ton	rate		pplication		N	Р	K	S	stab	ilizer
6-0-0	\$376	239 vr	1	Preplant Bro	A COLOR OF A DECISION	86.9				N	one
1-52-0		0 - 470 VR		eplant Broa	Contraction and the second sec	23.1	52				
)-0-60 2-0-0	\$426 \$305	100 9 gal		eplant Broa		30		60			
tabilizer cost / ac	\$0	9 gai	SIGCUL	Totals	0/10)	140	52	60	0		
220			١		y Practice						
215	200.0		210.5							212.9	-
Î 210	208.9										
205 Z	-	-			200.6		19	9.7		-	
8 200							F	-			
AIELD (BU/ACRE) 200 200 195 190											
185 180			1.00								
180	110# NO :	SD	110#/30# SD	NIT	110# NO SD ROGEN PRACTICI	E	140#	Spring		140# Spri	ng
Practice	Tota	IN Rate	ID	Yield	NUE1		st per		st per	Moisture	Test
						_	re ²		hel ²		Weight
140 lbs N Preplant		140	PSSWRnorm	206.3	0.68	\$47	7.93	\$0	.23	19.8	na
		110	DOCITID-141	2047	0.54	· 6. 6-	5.62	1	17	107	

110

140

110 lbs N Preplant (no SD)

110/S0 lbs 34 Sphit

² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

PSSWRalt1

PSSWRalt2

204.7

210.5

0.54

0.66

\$35.63

\$49.93

\$0.17

\$0.24

19.6

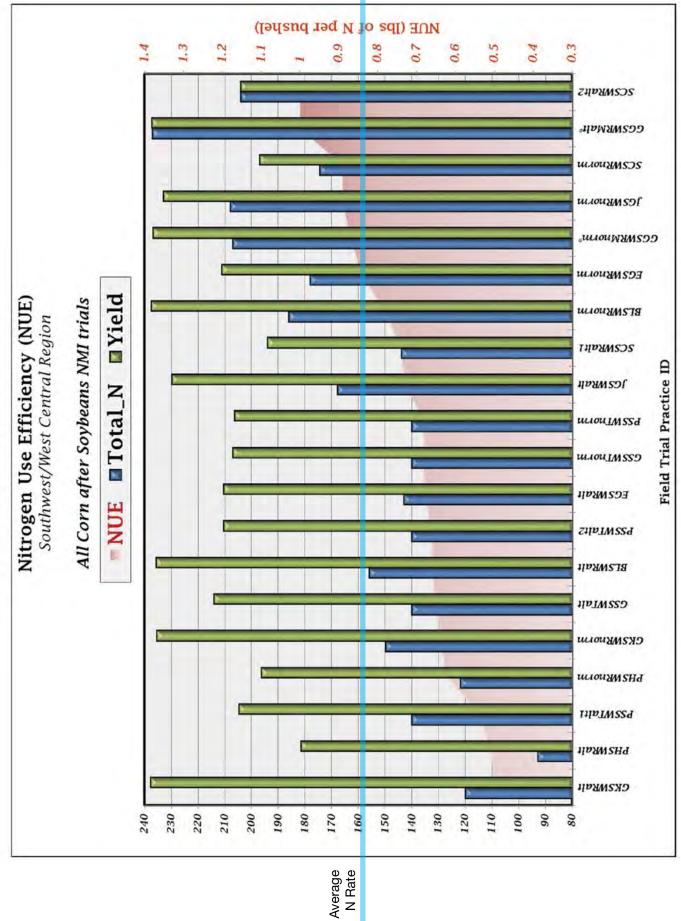
19.9

na

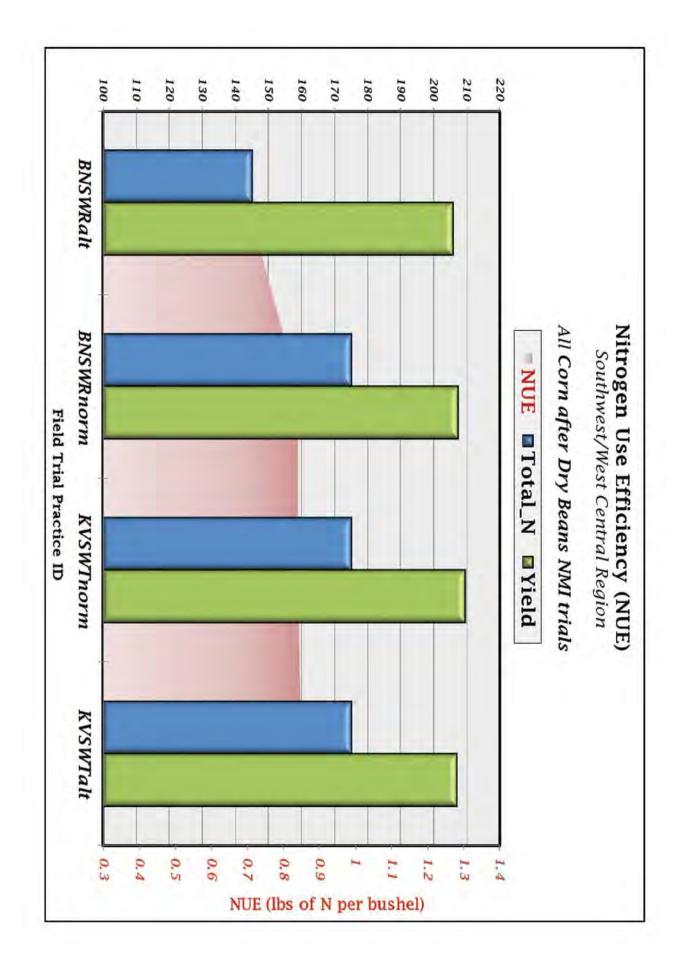
na

01		Dry bea	/ R ns	County Township	_	1	Renville Troy		Cost/ 28%	ton N cost/lb	\$275 \$0.49
	111	1771		Soil Tes	t Info				Field	Info	
Atternative Practice	Alternative Practice	Normal Farm Practice Alternative Practice	Non	Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	12/1/15 4.50% 7.7 N/A N/A 5 ppm 159 ppm 6 lbs 1.44 ppm		Variety Popula Row W Plantin Harves Soil Te Tillage Manur Alfalfa Irrigat	tion /idth g Date t Date xture e Histo Histor	ory	Pione	er 36V51 34000 30" 4/23/16 11/2/16 clay loam ventional No No
15 gals 28% sid	dedre	22					N	orma	l Pr	actice	
source	S ton	rate	an	plication	1	N	P	K	S	stabil	izer
Custom Blend 28-0-0 28-0-0	\$275	10 gal 15 gal	Spring Pro Carrier (eplant Broadca Weed and Feed dress Band		100 30 45	140	60	10		
Stabilizer Cost / ac	\$0			Totals		175	140	60	10		_
5 gals 28% side		1							-	ractice	
source Custom Blend 28-0-0 28-0-0	\$ ton \$275 \$275	rate 10 gal 5 gal	Spring Pro Carrier (plication eplant Broadca Weed and Feed dress Band		N 100 30 15	P 140	K 60	S 10	stabil	Izer
Stabilizer cost / ac	\$ 0			Totals		145	140	60	10	_	_
214			Yie	lds By Pra	actice					211.7	_
206 204 202 202 200 198 196	6.5	199.4	4	209.1	206.6		2	06.9			
194 1 5	gals	5 gal	s	15 gals SIDEDRESS NITRO	5 gals			5 gals		5 gals	
Practice	Total N	and the second	ID	Yield	NUE	N cos aci	re ²	bus	st per hel ²	Moisture	Test Weight
15 gals 28% sidedress	17	5 BI	NSWRnorm	207.5	0.84	\$22	05	\$0	11	18.9	55.6

Field Trial ID		KVSV	W I	Trial County			gen Tin Renville		N sour Cost/to	n	28-0-0 \$27:
Previous Crop		Dry be	ans	Township			Troy			N cost/lb	\$0.49
	Alternative Practice Normal Farm Practice	Normal Farm Practic		Soil Tes Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	t Info 12/1/15 4.5 7.7 N/A N/A 5 ppm 159 ppm 6 lbs 1.44 ppm		Variet Popula Row W Plantin Harves Soil Te Soil Te Manun Alfalfa Irrigat	ntion Width ng Dat st Dat exture e re Histon Histon	te e tory		neer 36V5 3400 30 4/23/1 11/2/1 clay loar onventiona N N N
20	16 NMI										
Sidedress 28%	15 gals]	Nori	mal P	ractice	
source	\$ ton	rate		plication		N	Р	K	S	stabi	lizer
Custom Blend 28-0-0 28-0-0	\$275 \$275	10 gal 15 gal	Carrier (eplant Broad Weed and Fe ress Dribble	ed)	100 30 45	140	60	10		
Stabilizer Cost / ac	S0	8		Totals		175	140	60	10	Practice	
At Planting 28% source	\$ ton	rate		plication		N	P	K	S		lizer
Custom Blend 28-0-0 28-0-0	\$275 \$275	10 gal 15 gal	Spring Pro Carrier (V	eplant Broad Weed and Fe ting Broadca	ed)	100 30 45	140	60	10	500	
Stabilizer cost / ac	SO			Totals		175	140	60	10		
			Yie	lds By P	ractice						
212					21	0.1				210	.3
210		208.1		206.4		1		206	.7		
208 206 206 204 202 200 At Pla	nting	Sidedre	ess A	t Planting	Side	dress		At Pla	nting	Sided	ress
202	nting	Sidedre		t Planting				At Plan		Sided	
202 200		Sidedre		· · · · · · · · · · · · · · · · · · ·		N cos	st per	N co	ost per	Sided	Test
202 200 At Pla	Total	N Rate	N	ITROGEN TIMIN	IG PRACTICE	N cos ac		N co bu			







Northwest

2016 Nutrient Management Initiative (NMI)



Northwest Table of Contents

Northwest BMP Region summary	28
Corn after dry beans trials	
Nitrogen rate trials1	29
Nitrogen use efficiency summary1	31

Northwest BMP Region S U M M A R Y

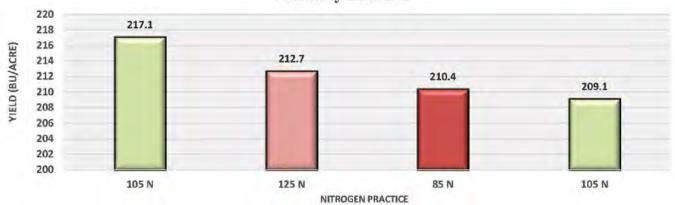
					Averages					
		All Trials C	ombine	b	Rate	Trials	Timing Trials	Stabilizer Trials		
Previous Crop	Total N	Yield	NUE	Price / Ib	Additional N (Ibs)	Yield from additional N (bu)	Split App Advantage (bu)	Stabilizer Advantage (bu)	Stabilizer Cost (ac)	
Dry Beans	114.92	213.93	0.54	\$0.45	20.00	2.73				
Averages	114.92	213.93	0.54	\$0.45	20.00	2.73				

The average cost for a pound of nitrogen was **\$0.45**. When considering an average of all nitrogen rate trials, an additional 20 lbs N/acre cost **\$9** per acre, resulting in an average yield difference of only **2.73** bushels/acre in 2016.

			Top Nitr	ogen Use Efficie	ncy (NUE)							
	Total N Rate/Yield											
Page	NUE	County	Previous Crop	Trial Practice ID	Total N Rate (lbs/ac)	Yield (bu/ac)	Variety	Type of Trial				
129	0.42	Norman	Dry Beans	SFNWR2alt2	88.5	211.4	DeKalb 43-10	Rate				
128	0.48	Norman	Dry Beans	SFNWR1alt2	101	210.4	DeKalb 38-03	Rate				
129	0.50	Norman	Dry Beans	SFNWR2norm	109	216.4	DeKalb 43-10	Rate				

				Top Yields				
				bu/acre				
Page	Yield (bu/ac)	County	Previous Crop	Trial Practice ID	NUE	Total N Rate (lbs/ac)	Variety	Type of Trial
129	219.6	Norman	Dry Beans	SFNWR2alt	0.59	129	DeKalb 43-10	Rate
129	216.4	Norman	Dry Beans	SFNWR2norm	0.5	109	DeKalb 43-10	Rate
128	213.1	Norman	Dry Beans	SFNWR1norm	0.57	121	DeKalb 38-03	Rate

Field Trial ID Previous Crop	13	SFNV Dry b	1.000	Trial County Township		1	rogen R Norman Fossum		N source Cost/ton 41% N		41-0-0-4.8s \$368 \$0.45	
1		1	1	Soil Test Inf				-	1	Field Info	La Cara	
	D16 N			Date 9/12 OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	3/15 3.2 8.2 26 3 90 118 0.7		Variety Popula Row W Plantin Harves Soil Te Tillage Manur Alfalfa Irrigat	tion /idth og Date t Date xture re Hist Histo	ory	DeKalb : 3 22" not Soil Test Ro 4 A Convent		
105 lbs N at p	122.0							-	al Pra	ctice	1	
source	S ton		a	plication	1	N	P	K	S	stabilize	er	
Other 10-34-0 41-0-0-4.8s	Other \$430 Fall 0-34-0 \$499 7.5 At H		Fall At F	Fall Preplant Band At Planting Band At Planting Broadcast			36 30	60 0	12.3	None		
Stabilizer Cost / ac	S0			Totals	1	121	66	60	12			
125 lbs N at p	lant	ing					Alt	erna	tive P	actice		
source	\$ ton	rate		plication		N	Р	K	S	stabilize	er	
Other 10-34-0 41-0-0-4.8s	0-34-0 \$499 7.5 At			Preplant Band lanting Band nting Broadcast		8 7.5 125 0	36 30	60 0	14.6	None		
Stabilizer cost / ac	S0			Totals		141	66	60	15			



Practice	Total N Rate	ID	Yield	NUE	N cost per acre ²	N cost per bushel ²	% MT	Test Weight	Residual soil N
105 lbs N at planting	121	SFNWR1norm	213.1	0.57	\$47.25	\$0.22	18.9	56.5	30 lbs/ac
125 lbs N at planting	141	SKNWR1alt	212.7	0.66	\$56.25	\$0.26	18.9	56.5	32 lbs/ac
85 lbs N at planting	101	SKNWR1alt2	210.4	0.48	\$38.25	\$0.18	18.9	56.5	19 lbs/ac

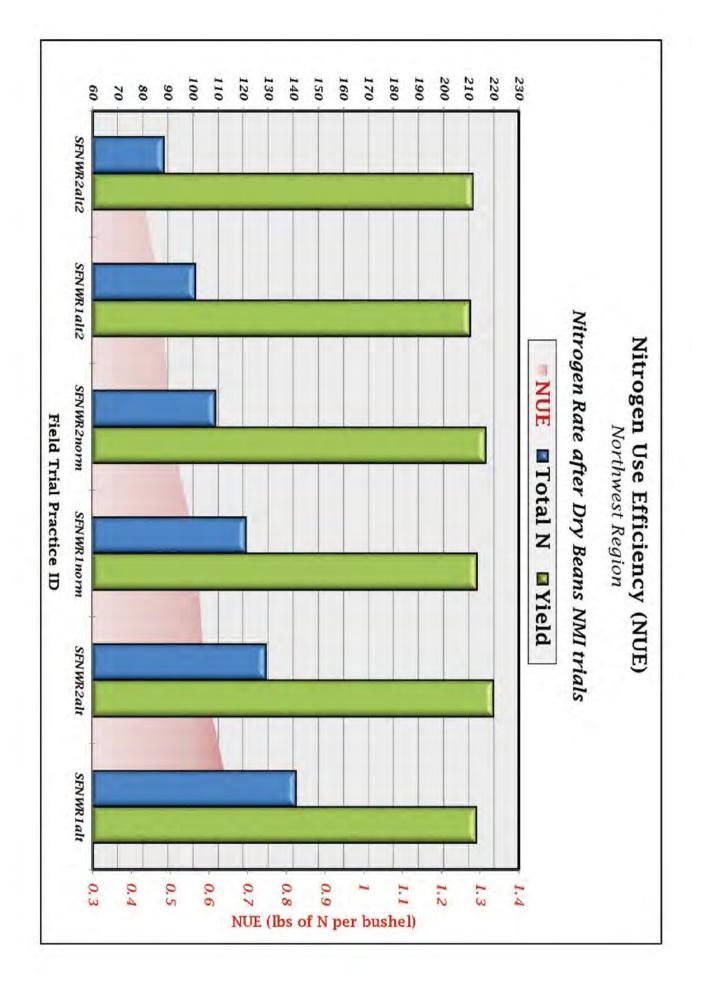
Field Trial ID Previous Crop		SFN Dry 1	WR2	Trial County Township		N	ogen R Norman ⁷ ossum	Č.	N source Cost/ton 41% N		41-0-0-4.88 \$368 \$0.45
	X	1 W BRIDE		Soil Test					Field 1	24.2112	
	2016			Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	9/2/15 3.4 8.2 49 13 132 20 1.6		Variet Popula Row W Plantir Harves Soil Te Tillage Manur Alfalfa Irrigat	ition Vidth ng Date st Date exture ce Hist Histo	0 ry		eKalb 43-10 36000 22" - tilea 4/23/10 10/28/10 clay loan Conventiona No No
04 lbs N at al		NIMI							nal Pra	otion	INC
94 Ibs N at pl			plication	- 1	N	P	K	s s	A 2 2 2 2	oilizer	
Other? (Type in) 10-34-0 41-0-0-4.8s	\$430 \$499 \$368	7.5 230	Fall F At P	replant Band anting Band ting Broadcast		7 7.5 94.3	34 30	60 0	11		one
Stabilizer Cost / ac	\$0			Totals		109	64	60	11		
115 lbs N at p	lanting	2					A	ltern	ative P	actice	5
source	\$ ton	rate	aj	plication		N	Р	K	S	stal	oilizer
Other? (Type in) 10-34-0 41-0-0-4.8s	\$430 \$499 \$368	7.5 280	At P	replant Band anting Band ting Broadcast		7 7.5 114.8 0	34 30	60 0	13.4	N	one
Stabilizer cost / ac	\$0			Totals		129	64	60	13		
230 226 (3222 218 214 210 210 206 202	219.1	80 #/A stri		.8s for a 74-0-0 /ields By Pra 216	actice	p (40 #	/A N s		top to bo	213.7	

190 94 N 115 N 115 N 74 N 94 N NITROGEN PRACTICE N cost per N cost per Test Practice **Total N Rate** ID Vield NUE Moisture acre² Weight bushel² 94 lbs N at planting 109 SKNWR2norm 216.4 0.50 \$42.44 \$0.20 19.1 56.7 129 115 lbs N at planting SFNWR2alt 219.6 0.59 \$51.66 \$0.24 19.1 56.7 88.5 SFNWR2alt2 211.4 0.42 \$33.30 \$0.16 19.1 56.7 74 lbs N at planting

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

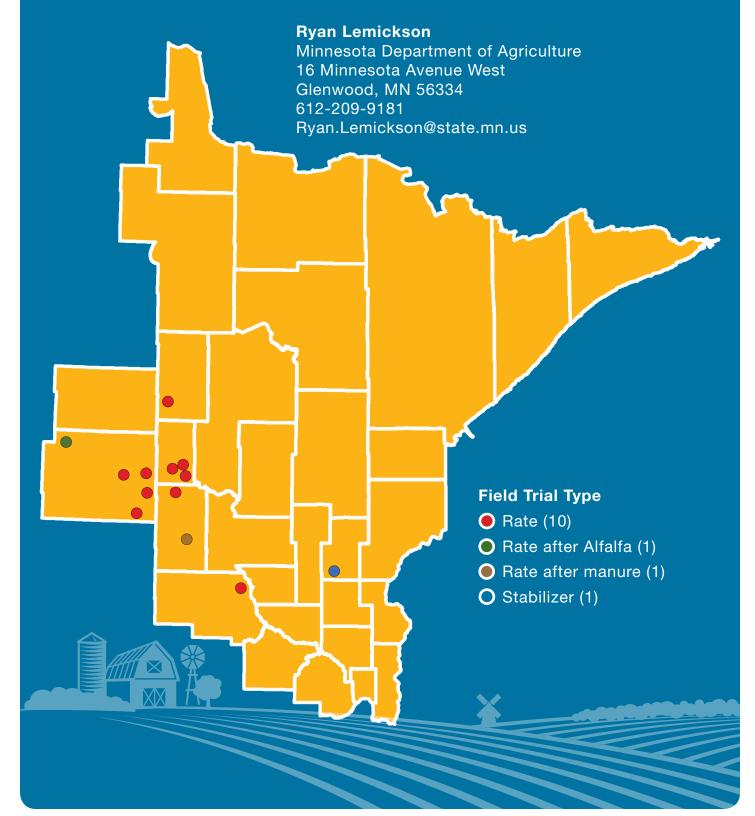
² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

194



Northeast

2016 Nutrient Management Initiative (NMI) Irrigated and Non-irrigated Sandy Soils BMP Region



Northeast Table of Contents

Northeast BMP Region summary	134
Irrigated trials (all previous crops)	
Non-irrigated trials (all previous crops)	

Northeast BMP Region S U M M A R Y

	Averages											
		All trials	combined		Rate	trials	Timing trials	Stabilize	er trials			
Farm Practice (all previous crops)	Total N (acre)	Yield (bu/ acre)	NUE (lbs of N per bushel)	Price per pound of N	Additional N (lbs)	Yield from Additional N (bu)	Split App Advantage (bu)	Stabilizer Advantage (bu)	Stabilizer Cost (ac)			
Irrigated	186.69	193.44	0.98	\$0.38	30.63	3.24						
Non-Irrigated	172.13	182.68	0.94	\$0.42	48.97	8.9*		0.30	NA			
Averages	179.41	188.06	0.96	\$0.40	39.80	3.24		0.30				

* only 1 out of 4 rate non-irrigated rate trials had a reponse to additional N (8.9 bu with additional 49 lbs of N)

The average cost for a pound of nitrogen was **\$0.40**. When considering an average of all nitrogen rate trials, an additional **39.80** lbs N/acre cost **\$15.92** per acre, resulting in an average yield difference of only **3.24** bushels/acre in 2016.

				Top Nitrogen	Use Efficiency	(NUE)							
	Total N Rate/Yield												
Page	NUE	Farm	County	Previous Crop	Trial Practice ID		Yield (bu/ac)	Variety	Type of Trial				
144	0.55	Non-irrigated	Todd	Wheat	NWNERalt	90	162.2	Dekalb 36-30	Rate				
137	0.82	Irrigated	Wadena	Barley	CLNERalt	171	208.1	Cropland 2845 VT2	Rate				
140	0.82	Irrigated	Stearns	Corn	RTNERnorm	176	214.9	Pioneer 9526	Rate				

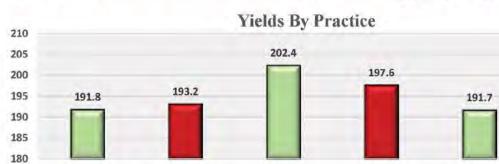
				Тор	Yields							
	bu/acre											
Page	Page Yield (bu/ac) Farm County Previous Crop ID NUE N Rate (lbs/ac) Total Type of Trial Practice ID NUE N Rate (lbs/ac)											
140	218.3	Irrigated	Stearns	Corn	RTNERalt	0.97	211	Pioneer 9526	Rate			
140	214.9	Irrigated	Stearns	Corn	RTNERnorm	0.82	176	Pioneer 9526	Rate			
141	211.2	Irrigated	Hubbard	Potatoes	TBNERnorm	0.95	200	NK 18Q	Rate			

Predictional DP ASNELR County WADENA Construction Previous Crop Potatees Township THOMASTOWN Construction Previous Crop Potatees Township THOMASTOWN Construction Source Source <th></th> <th></th> <th>Urea: 1</th> <th>135 vs 1</th> <th>105 lbs I</th> <th>N/acre</th> <th>Тор</th> <th>dress</th> <th>8</th> <th></th> <th></th> <th></th>			Urea: 1	135 vs 1	105 lbs I	N/acre	Тор	dress	8			
Sol Test Info Date D1/2/15 D1/2/15 PH Field Info OW% 0.012 Variety MYCOCEN 2G1 OW% 0.012 Photomatic 322 PH 5.6 Row Width 322 P(0ray) 47 Harvest Date 5/11 P(0ray) 47 Harvest Date Said Second Sulfur 121 lbs/oc Tillage Fall Chisel & Spring Sulfur 121 lbs/oc Manure History Atfalf History Atfalf All History Infining Band 2 8.2 2 713.3 10 At Planting Band 2 8.2 2 21-0-0-24 75 At Planting Band 21 0.3 5.74 22-0-0-24 75 Top Dress Broadcast 135 15 5 21-0-0-24 75 Top Dress Broadcast 15 15 20-0-26 22 At Planting Band 21 2.0.3 4 21-0-0-24 75 Top Dress Broadcast 15 5				L,	County		W	ADEN	A	Cost/to	o n	46-0-(n:
Date 10/12/15 ON% Variety MYCOGEN 2GI Population 00% 0.015 Nitrogen Planting Date 5/1. Nitrogen Planting Date 5/1. Nitrogen Planting Date 5/1. P(oken) Harvest Date Soil Texture sandy to 2016 NMI Soil Texture Soil Texture sandy to Nitrogen Titlage Fall Chisd & Spring Suffur 12 lbs/to Zine 2.16 ppm Affalfa History Nitrogen	r revious Crop		Fotatoes		1.1.1.1.1.1.1.1		mo	VIAST	JWIN			na
OM% 0.015 Population 325 pH 5.6 Rew Width 5/1. pH 5.6 Rew Width 5/1. pOray) 47 Harvest Date 5/1. P (bray) 47 Soil Texture sandy to P (bray) 47 Soil Texture sandy to Soil Texture Soil Texture sandy to Soil Texture sandy to 2016 NMI Texture All Alls History Manure History Manure History Atlafta History Aristo Manure History Atlafta History Manure History 20-0-026 22 At Planting Band 2 8.2 2 2 20-0-26 22 At Planting Band 21 2 5.74 4 20-0-26 22 At Planting Band 2.6 60 6 5 20-0-26 22 At Planting Band 2.7 5.74 5 5 20-0-26 22 At Planting Band 2 8.2 2 <td>100</td> <td>161</td> <td></td> <td></td> <td></td> <td></td> <td>4</td> <td>Variat</td> <td></td> <td>Field</td> <td></td> <td>N 2G16</td>	100	161					4	Variat		Field		N 2G16
Util SUMI Irrigated Isrigated ISS Ibs N topdress source Ston rate application N P K S Ston rate application N P K S Ston rate application N P K S Ston rate application N P KK S Ston rate application 135 I IS Ston rate application 30 IS S Ston rate application N P KK S Ston rate application N P												

Field Trial ID Previous Crop	ADNER Soybeans	Trial County Township	_	Nitrogen Rate East Otter Tail Compton	N source ² Cost/ton 28% N cost/lb	28-0-0 \$260 \$0.46
611		Soil Tes	t Info		Field Info	
	8 8 8	Date	10/9/15	Variety	Rer	k 299vt2p
2	Carlo and the set	OM%	2.3	Population		31000
		pH	6.8	Row Width		30
S I	EEE	Nitrogen	9.5	Planting Date	8	5/5/16
1 4	Fault Fa	P (bray)	41.8	Harvest Date		10/23/16
	Alternative Pr Normal Farm Alternative Pr Normal Farm	P (olsen)	13	Soil Texture	s	andy loam
lon lo	Itel Intel	Potassium	136	Tillage		Strip Till
d S	4 2 4 2	Sulfur	10.8	Manure Hist	ory	No
No. Martin		Zinc	2.4	Alfalfa Histor	ry	No
2	016 NMI			Irrigated		Yes

60 lbs N sid	edress				N	lorm	al Pra	ctice
source	S ton	rate	application	N	Р	K	S	stabilizer
18-46-0	\$510	130#	Spring Preplant Band	23.4	59.8			None
21-0-0-24	\$360	41#	Spring Preplant Band	8.4			9.8	None
0-0-60	\$365	95#	Spring Preplant Band			57		None
gypsoil	\$80	300#	Fall Preplant Broadcast				48	None
28-0-0	\$260	11	Sidedress Band	32.8				None
28-0-0	\$260	15	Sidedress Band	44.73				None
28-0-0	\$260	20	Sidedress Y drops	59.64	-	1.00		
Stabilizer Cost / a	ac SO		Totals	169	60	57	58	

90 lbs N sid	edress				Ali	terna	tive Pr	actice
source	S ton	rate	application	N	P	K	S	stabilizer
18-46-0	\$510	130#	Spring Preplant Band	23.4	59.8	1		None
21-0-0-24	\$360	41#	Spring Preplant Band	8.4	1.11.11.11		9.8	None
0-0-60	\$365	95#	Spring Preplant Band	1 - 42		57	1	None
gypsoil	\$80	300#	Fall Preplant Broadcast	1.2.1			48	None
28-0-0	\$260	11	Sidedress Band	32.8				None
28-0-0	\$260	15	Sidedress Band	44.73				None
28-0-0	\$260	30	Sidedress Y drops	89.64				1
Stabilizer cost / a	c \$0		Totals	199	60	57	58	



191.7

60 bs SD 90 lbs SD NITROGEN PRACTICE

60 bs SD

C	90 lbs SD

Practice	Total N Rate	D	Yield	NUE	N cost per acre ²	N cost per bushel ²	Moisture	Test Weight
60 lbs N sidedress	169	ADNERnorm	195.3	0.87	\$27.43	\$0.14	19.7	55.1
00 lbs N adultass	199	ADNERalt	197.0	1.01	\$41.23	\$0.21	19.6	55.6

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)

90 lbs SD

60 bs SD

² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.

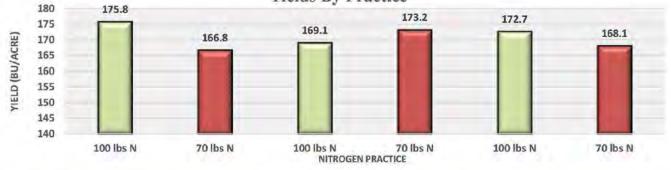
YIELD (BU/ACRE)

Field Trial ID	BJNER	Trial		Nitrogen Rate OTTERTAIL	N source ² Cost/ton	46-0-0
Previous Crop	Soybeans	County Township		PARKERS PRAIRIE		na na
(1)		Soil Te	st Info		Field Info	
		Date	10/29/15	Variety	DEKAI	B 34-82
<u></u>	en to the	OM%	0.025	Population		28000
		pH	6.1	Row Width		30
S 5	AEAE	Nitrogen		Planting Date		4/29/16
1312	Fa tive	P (bray)	6	Harvest Date		
<u> </u>	Alternative P Normal Farm Alternative Pr Normal Farm	P (olsen)		Soil Texture	sa	ndy loam
2 10	Ite lor	Potassium	60	Tillage	Fall Chisel & S	pring FC
 < 	A Z A A	Sulfur	- 1 . .	Manure Histo	ry	No
No. of Lot.		Zinc	1.03 PPM	Alfalfa Histor	y	No
2	016 NMI			Irrigated		Yes

100 lbs N to	op dress	5			N	lorma	I Prac	tice
source	S ton	rate	application	N	Р	K	S	stabilizer
0-0-60		183	Spring Preplant Broadcast			110		
11-52-0		106	Spring Preplant Broadcast	12	55			
21-0-0-24		42	Spring Preplant Broadcast	9			10	
46-0-0		41	Spring Preplant Broadcast	19			1.1	
46-0-0		92	Top Dress Broadcast	43				None
21-0-0-24		83	Top Dress Broadcast	17			20	
46-0-0		217	Top Dress Broadcast	100				None
Stabilizer Cost / a	ic \$0		Totals	200	55	110	30	

70 lbs N top	0 lbs N top dress						Alternative Practice						
source	\$ ton	rate	application	N	Р	K	S	stabilizer					
0-0-60		183	Spring Preplant Broadcast			110							
11-52-0		106	Spring Preplant Broadcast	12	55								
21-0-0-24		42	Spring Preplant Broadcast	9			10						
46-0-0		41	Spring Preplant Broadcast	19									
46-0-0		92	Top Dress Broadcast	43				None					
21-0-0-24		83	Top Dress Broadcast	17			20						
46-0-0	-	152	Top Dress Broadcast	70		-		None					
Stabilizer cost / ad	c SO		Totals	170	55	110	30						





Practice	Total N Rate	ĨD	Yield	NUE	N cost per acre ²	N cost per bushel ²	Moisture	Test Weight
100 lbs N top dress	200	BJNERnorm	172.5	1.16	na	na	16.7	57.2
70 lbs N top dress	170	BJNERalt	169.4	1.00	na	na	16.7	56.2

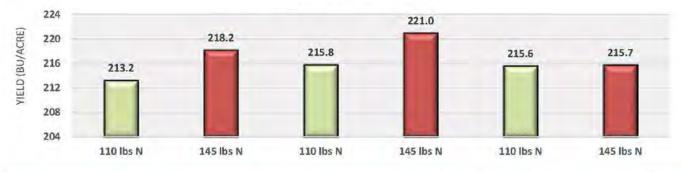
Previous Crop	rial ID CLNER s Crop Barley		Trial County Township			rogen F Wadena omasto	4	N sour Cost/to Urea		46-0- \$37 \$0.4
-	100	1 NO	Soil Tes	st Info				Field	Info	
2.	Jack Street		Date	Sp 2014		Variet	у		Croplan 2	845 VT
	1000		OM%	1.8		Popula	ation		· · · · · ·	3400
	500		pH	6.6		Row V	Vidth			1
	Final	1	Nitrogen				ng Date			4/22/1
	No.		P (bray)	23.8			st Date			10/24/
			P (olsen)	2.15		Soil To				ndy loa
		1	Potassium	147		Tillage			Con	vention
1000		1000	Sulfur	7			re Histo			N
-	20161	T	Zinc	5			a Histor	ry .		N
		NML				Irrigat				Y
75 lbs N topdr		and I	annliastian		N	P	-	al Pra	stabil	
source 46-0-0	\$ ton \$360	rate 55.74	application Spring Preplant Broadcast		N 25.6	P	K	S	stabil Nor	10 a 10 a
21-40-0-10s-1zn	\$525	25	Spring Preplant Broadcast		5.3	10.0		2.5	Nor	
21-0-0-24	\$350	31.25	Spring Preplant Broadcast		6.6	10.0		7.5	Nor	
0-0-60	\$360	58.33	Spring Preplant Broadcast		0.0		35.0	1.5	Nor	
46-0-0	\$378	58.5	Top Dress Broadcast	1000	26.9		35.0		Nor	
21-0-0-24	\$375	62.5	Top Dress Broadcast		13.1			15.0	Nor	
Boron	\$1,750	3.5	Top Dress Broadcast		4.5.1			15.0	Not	200
46-0-0	\$378	162	Top Dress Broadcast		75.0				Nor	22
28-0-0	\$320	85.6	Fertigation	-	24.0				Nor	
28-0-0	\$320	85.6	Fertigation		24.0	1.1			Nor	
Stabilizer Cost / ac	\$0		Totals		201	10	35	25		
45 lbs N topdr	ess					Alt	terna	tive P	ractice	
source	\$ ton	rate	application		N	Р	K	S	stabil	izer
46-0-0	\$360	55.74	Spring Preplant Broadcast	t	25.6			1	Nor	ne
21-40-0-10s-1zn	\$525	25	Spring Preplant Broadcast	E .	5.3	10.0		2.5	Nor	ne
21-0-0-24	\$350	31.25	Spring Preplant Broadcast	1	6.6			7.5	Nor	ne
)-0-60	\$360	58.33	Spring Preplant Broadcast	t i			35.0		Nor	
46-0-0	\$378	58.5	Top Dress Broadcast		26.9			1.00	Nor	
21-0-0-24	\$375	62.5	Top Dress Broadcast		13.1			15.0	Nor	
Boron	\$1,750	3.5	Top Dress Broadcast						Nor	
46-0-0	\$378	98	Top Dress Broadcast		45.1				Nor	
28-0-0	\$320	85.6	Fertigation		24.0				Nor	
28-0-0	\$320	85.6	Fertigation		24.0	10	25	25	Nor	ne
Stabilizer cost / ac	\$0				171	10	35	25		
			Yields By Prac	ctice						
215										
		207.7	207.7 206.6		2	208.6	2	.09.9	209.4	
210 200	5.0		206.6	202.8	1	-	Í		-	
205				202.0						
202										
08) 0 200										
013/1013/1013/1013/1013/1013/1013/1013/									- 11	
195 Z00										
190	as N	45 lbs N 74	ibs N 45 lbs N	75 lbs N	4	5 lbs N	79	ilbs N	45 lbc	J
	os N	45 lbs N 75	i lbs N 45 lbs N	75 lbs N	45	5 lbs N	75	ibs N	45 lbs 1	J

Practice	Total N Rate	ID	Yield	NUE ¹	N cost per acre ²	N cost per bushel ²	MT	Test Weight
75 lbs N topdress	201	CLNERnorm	206.6	0.97	\$30.75	\$0.15	16.9	55.8
45 lbs N topdress	171	CLNERalt	208.1	0.82	\$18.48	\$0.09	16.5	55.1

				ress 115			trogen R		N sout	ree ²	46-0-0
Field Trial ID		DSI	VER	County			VADEN		Cost/t		n
Previous Crop		Dry	beans	Township		WI	NG RIV	/ER	46%	N cost/lb	na
	111	EL IN	1	Soil Te	st Info			-	Field	Info	1.1
	/ S .	tice tice	1	Date	10/12/15		Variet			PIONEE	
1	8 8 8	Normal Farm Practice Atternative Practice	Normal Farm	OM%	1.0%		Popula				3600
6	Normalive Practi Normal Farm Prac Altornative Practi	d ad		pH	6.3		Row W				30
	3 5 3	1 2	E.	Nitrogen	61		Plantin	-			4/28/10
11 1	Normalive Pr Alternative Pr	al F	TIE	P (bray) P (olsen)	01		Harves Soil Te			lov	amy sand
		E S	E	Potassium	103		Tillage			Spring Till	
	Z A	žā	Ž	Sulfur	12 lbs/ac		Manu			opring m	N
				Zinc	1.83 ppm		Alfalfa		-		N
	2016	NMI		Lante	neo ppm		Irrigat		2		Ye
115 lbs N to								orma	1 Pra	ctice	
source	S ton	rate	a	pplication		N	P	K	S	stabi	lizer
0-0-60	o ton	100		eplant Broadcast		14		60	5	Stabl	
6-24-6		34		Planting Band		2	8.2	2			
7-13-3		10		lanting Band		1	2	0.3			
28-0-0		75		lanting Band		21	-	1.1			
12-0-0-26		22	At H	Planting Band		2.7			5.74		
46-0-0		250		Dress Broadcast		115					
21-0-0-24		75	Top I	Dress Broadcast		15			18		
28-0-0		110	ł	retigation		30			100		
12-0-0-26		22	H	retigation		2.6	-		6		
Stabilizer Cost / a	c \$0			Totals		189	10	62	30		
85 lbs N top	dress						Alt	ernat	ive P	ractice	
source	S ton	rate	a	pplication		N	Р	K	S	stabi	lizer
0-0-60		100	Fall Pr	eplant Broadcast		1000		60			
6-24-6		34		Planting Band		2	8.2	2			
7-13-3		10		Planting Band		1	2	0.3			
28-0-0		75		Planting Band		21					
12-0-0-26		22		Planting Band		2.7			5.74		
46-0-0		185		Dress Broadcast		85			1.0		
21-0-0-24		75		Dress Broadcast		15			18		
28-0-0		110		ertigation		30					
12-0-0-26	00	22	H	ertigation		2.6	10	(3	6	1	
Stabilizer cost / ac	s S 0			Totals		159	10	62	30		
165			Y	ields By Pra	ictice						
160	156.1										
155 150 145 140 135				151.9							
0¥ 150			142.5		143.5			41.8		144.4	
R 145						p	-	41.8		-	
0 140 135		-									
₹ 135 130											
125											
	115 lbs N	8	5 lbs N	115 lbs N NITROGEN	85 lbs N		115	bs N		85 lbs N	
	Gi	ower repo	rted anthracno	se killed corn m		gust b	efore bl	acklaye	er		
Practice	Total I	N Rate	LD	Yield	NUE		st per re ²	and the second second	st per hel ²	Moisture	Test Weight
115 lbs N top dre	ss 18	9	DSNERnorm	150.0	1.26		na	-	ner	18.0	56.7
i to tos ty top ule	1.0						141	-	2.0	18.0	56.4
85 lbs N top dres	s 15	0	DSNERalt	143.5	1.11		1a		1a		

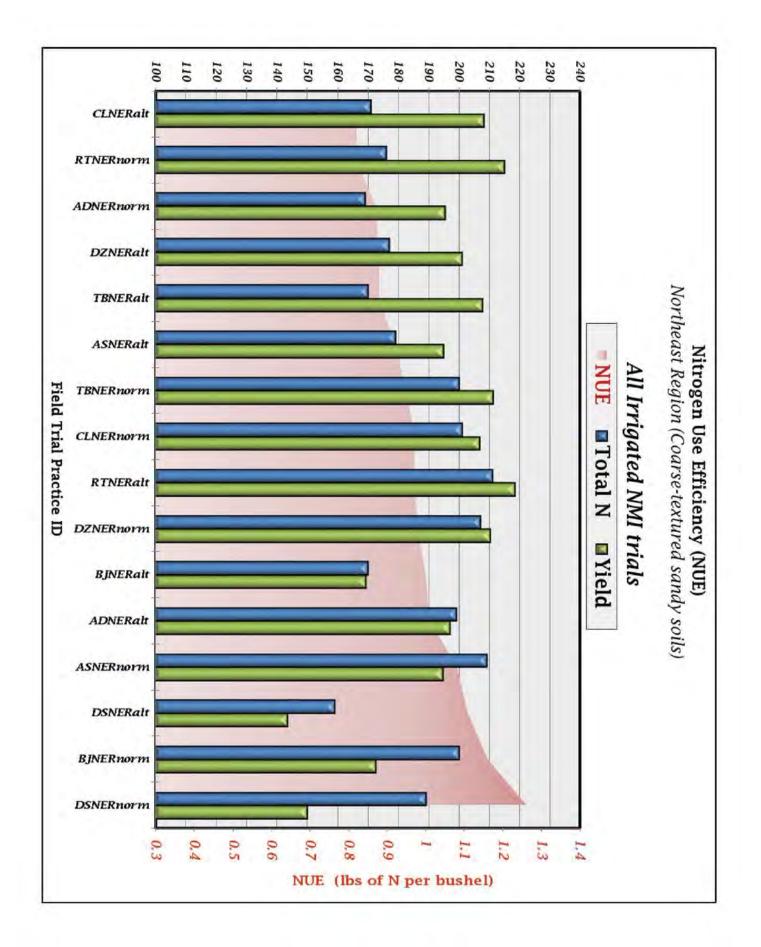
Field Trial ID		DZNER		Trial County		Eas	rogen R t Otter '	Fail	N source Cost/to		46-0-(n:
Previous Crop		Corn		Township		LE	AFLA	KE	46%	N cost/lb	n
	11.1	1111	-	Soil Test			11.		Field I		_
Atternative Press	Normal Farm Practice Alternative Practice	Normal Farm Practice Alternative Practice Normal Farm Practice		Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur	4/5/16 2.3 6.9 77 156		Variet Popula Row W Plantin Harves Soil Te Tillage Manun	tion /idth ng Date st Date sture	Fall		C 39-27 34000 3(4/23/10 ady loan pring FC
A STATE	2016	IMI	/	Zinc	3.37		Alfalfa Irrigat	Histor			Ye
92 lbs N top d	ress			2			N	orm	al Pra	ctice	
source	S ton	rate	applica	tion		N	Р	K	S	stabil	izer
25-0-0-5 8-20-5-5-0.5 46-0-0 21-0-0-24 46-0-0		54 110 100 50 200	At Plantin At Plantin Top Dress I Top Dress I Top Dress I	g Band Broadcast Broadcast Broadcast		15 9 46 10 92	23	6	3 6 12		
21-0-0-24	1 1	40	Top Dress I			10			12		
25-0-0-5		110	Fertiga	tion		25			5		
Stabilizer Cost / ac	\$0			Totals		207	23	6	38		_
62 lbs N top d	ress						Alt	erna	tive Pi	ractice	
source	S ton	rate	applica			N	Р	K	S	stabil	izer
25-0-0-5		54	At Plantin	g Band		15		1.11	3		
8-20-5-5-0.5 46-0-0 21-0-0-24 46-0-0 21-0-0-24 25-0-0-5		110 100 50 135 40 110	At Plantin Top Dress H Top Dress H Top Dress H Top Dress H Fertiga	Broadcast Broadcast Broadcast Broadcast		9 46 10 62 10 25	23	6	6 12 12 5		
	\$0			Totals	-	177	23	6	38		
Stabilizer cost / ac											
	30		Vields	By Prac	tice						
220				By Prac	tice			210.9			
220 215 2	09.4			By Prac	-			210.9			
220 215 210 205 205 200 200 195 190 185		199.3			202.	3		210.9		201.0	
220 215 205 205 205 200 195 190 185 180		199.3	21		202.1	N		2 lbs N		201.0	
220 215 205 205 205 200 195 190 185 180	09.4	62 lbs N	21	0.6	202.1	N COS	t per	2 lbs N N co	st per		Test Weight
220 215 210 205 205 200 195 190 185 180 92	09.4	62 lbs N	21. 	0.6	202.	N	t per ·e ²	2 lbs N N co bus	st per shel ²	62 lbs N	Test Weight 56,0

Field Trial ID Previous Crop		RTNE.	R	Trial County Township		Ni	trogen R Stearns LeSauk		N source Cost/tor 82-0-0 N	1	82-0-0 \$540 \$0.33
				Soil Test	Info				Field In	fo	
	20161	NMI	1	Date OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	12/7/15 1.5 6.2 59 114		Variety Popular Row W Plantin Harves Soil Te: Tillage Manur Alfalfa Irrigate	tion idth g Date t Date xture e Histor History		sa	eer 9520 3000 4/25/10 10/20/10 ady loan Ainimun No No Ye
110 lbs N side					N	lorm	al Prac	tice			
source	\$ ton	rate	application			N	P	K	S	stabil	izer
Dry Fert Blend	\$403	150	At Planting Band			20	20	36	5		
46-0-0	\$390	100	Sidedress			46	-				
82-0-0	\$540	110	Sidedre	ss Band		110					
Stabilizer Cost / ac	\$0			Totals		176	20	36	5		
145 lbs N side	dress	F 100					Alt	ernat	tive Pr	actice	
source	\$ ton	rate	applic	ation		N	Р	K	S	stabil	izer
Dry Fert Blend	\$403	150	At Planti	ng Band		20	20	36	5		
46-0-0	\$390	100	Sidedress	Broadcast		46					
82-0-0	\$540	145	Sidedre	ss Band		145					
Stabilizer cost / ac	S 0			Totals		211	20	36	5		_



Practice	Total N Rate	ID	Yield	NUE	N cost per acre ²	N cost per bushel ²	% MT	Test Weight
110 lbs N sidedress	176	RTNERnorm	214.9	0.82	\$36.30	\$0.17	17.1	56.0
145 lbs N sidedress	211	RTNERalt	218.3	0.97	\$47.85	\$0.22	17.2	56,0

Previous Crop		TBN									
Previous Crop		D		County		1	Hubbard	ł	Cost/te		\$31
10		Pota	toes	Township		-	Todd		Urea	N cost/lb	\$0.3
	111	1111		Soil Te					Field	l Info	-
1	e 2 8	tice tice		Date	10/7/15		Variety				NK 180
	ctic ctic	Normal Farm Pract Atternative Practic		OM%	2.4		Popula				3700
1	Normal Farm Pra Alternutive Praci	Normal Farm Pra Alternative Pract		pH	5.3		Row W				3
2		5 9	Ê I	Nitrogen	10 lb/ac		Plantin	~	•		5/2/1
1	1 8		H I	P (bray)	94 ppm		Harves				10/24/1
S.	E S	E	Ë	P (olsen)	150		Soil Te				sandy loar
Alternativ	Normal F _E Alternativ	ALL NO	Normal Farm	Potassium	173 ppm		Tillage			all Chisel &	Spring F
and the second s	and the second			Sulfur	28 lb/ac		Manur				
The Street Barry				Zinc	5.14 ppm		Alfalfa		ry		
	2016	NMI					Irrigat	ed			Ye
130 lbs N top	dress						Γ	Vorm	al Pr	actice	
source	S ton	rate	ap	plication		N	Р	K	S	stabi	ilizer
10-34-0		2.5 gal		nting Dribble	-	3	10				
Riser & Zinc	22.63/ac		At Pla	nting Dribble		1.8					
35-40-60-15-5.5mg	\$421	282		lanting Band		35	40	60	15		
AMS	\$315	83		ress Broadcast		17.4		20	10		
Jrea	\$315	244.6		ress Broadcast		112.5		C.A.	10		
28-0-0	14/ac	10 gal		ertigation		30			- 65		
	- Ande	ro Bur					-		1.1		
Stabilizer Cost / ac	\$0			Totals		200	50	80	35		
100 lbs N top	dress	R.					Al	terna	tive l	Practice	
source	S ton	rate		plication		N	P	K	S	stabi	ilizer
10-34-0	7.7/ac	2.5 gal		nting Dribble		3	10				
Riser & Zinc	22.63/ac	2.5 gal		nting Dribble		1.8	100				
35-40-60-15-5.5mg	\$421	282		lanting Band		35	40	60	15		
AMS	\$315	83	Top D	ress Broadcast		17.4	_	20	10		
Urea	\$315	179	Top D	ress Broadcast		82.34			10		
28-0-0	14/ac	10 gal	F	ertigation		30			1.64		
Stabilizer cost / ac	\$0			Totals	_	170	50	80	35		
			v	ields By Pi	actico						
225			1	icius by 11	acute					218.5	
220								212.1			1
AIEID (BU/ACRE)	209.8			205.3	208	.4		E alera	6		
VN 205		3	202.5	205.5							
8 200			-								-
195					_				-		
> 190									-		
185		_		-	_				-	_	
180 L	-				-					-	
13	80 lbs N	-	0 lbs N	1.01 US 35 110	100 II PRACTICE	1000		100 lbs	N	130 lbs	N
		Top dre	ss incorporate	d with irrigatio	on. Crop s	_		_		_	
Practice	Total I	N Rate	TD	Yield	NUE	N cos ac	re ²		st per shel ²	Moisture	Test Weight
130 lbs N top dress	20	0	TBNERnorm	211.2	0.95	\$38	3.25).18	20.3	55.0

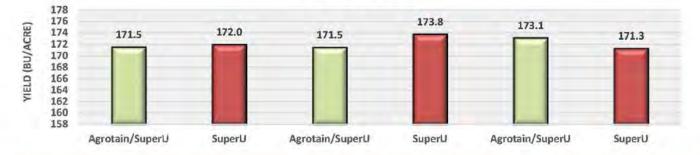


Field Trial ID Previous Crop	BBNES Com	Trial County Township		Nitrogen Stabilizer Kanabec South Fork	N source ² Cost/ton Urea N cost/lb	46-0-0 \$499 \$0.54
61	HILL	Soil Tes	t Info		Field Info	
	8 8 8	Date	3/27/16	Variety	Mycoge	n 2K395
2	Cities and the	OM%	2.2	Population		32000
1	Page Page	pH	6.6	Row Width		30
6	EEEEE	Nitrogen	N/A	Planting Date	•	4/23/16
	E Fair	P (bray)	19	Harvest Date		
E E	lem lem	P (olsen)	N/A	Soil Texture	sai	ndy loam
8	Alternative P Normal Farm Alternative P Alternative P Normal Farm	Potassium	99	Tillage	Fall Chisel & S	pring FC
		Sulfur	12	Manure Histe	ory	No
		Zinc	1.2	Alfalfa Histor	ry	No
	2016 NMI			Irrigated		No

Agrotain and Super U				Normal Practice						
source	cost	rate	application	N	Р	K	S	stabilizer		
46-0-0	\$349	150	Top Dress Broadcast	69	0	0	0	Agrotain		
46-0-0	\$499	100	Top Dress Broadcast	46	0	0	0	Super Urea		
19-16-16-4	\$417	250	Spring Preplant Band	48	41	41	10			
a 1 W a 2/										
Stabilizer Cost / ac	na		Totals	163	41	41	10			

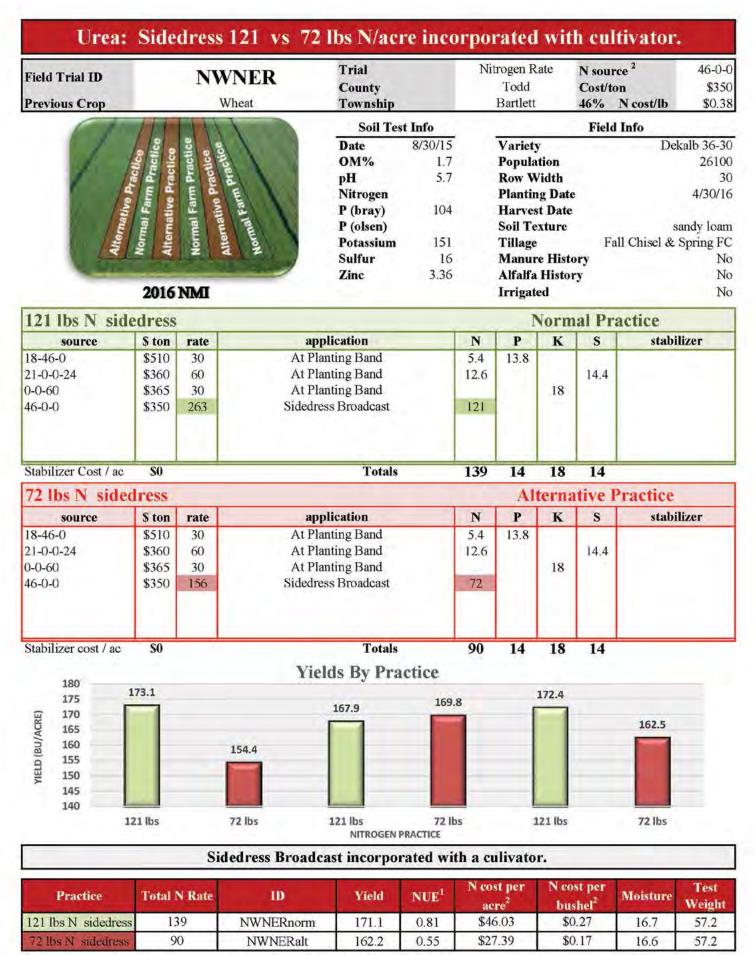
Super U					Alternative Practice						
source	cost	rate	application	N	Р	K	S	stabilizer			
46-0-0	\$499	250	Top Dress Broadcast	115	0	0	0	Super Urea			
19-16-16-4	\$417	250	Spring Preplant Band	48	41	41	10				
Stabilizer cost / ac	na		Totals	163	41	41	10				

Yields By Practice



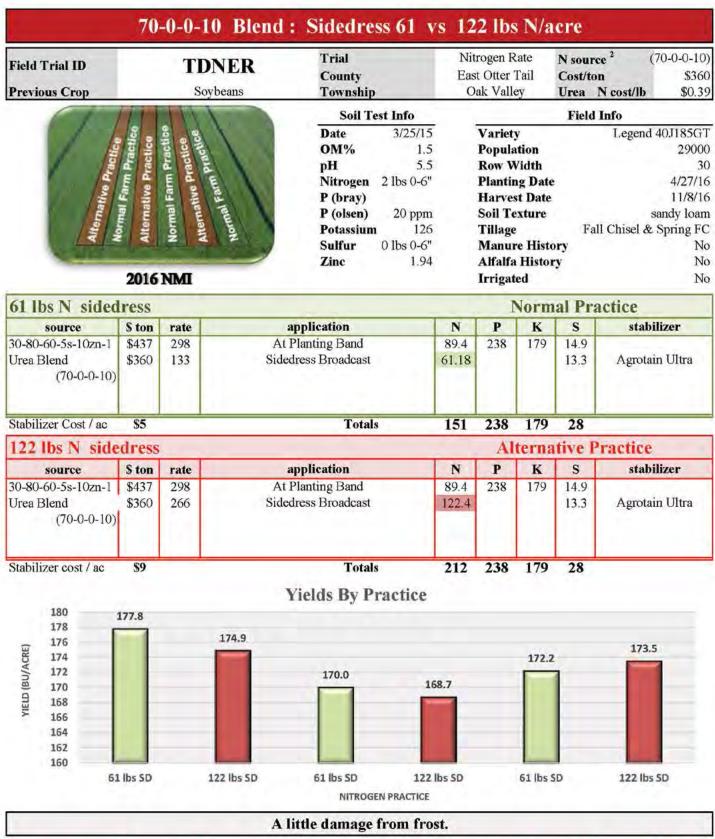
Practice	Total N	Stabilizer	ID	Yield	NUE	Stabilizer cost per acre ²	% MT	Test Weight	
Agrotain and Super U	163	Agrotain/SupU	BBNESnorm	172.0	0.95	na	21.0	53.3	
Super U	163	SuperU	BBNESalt	172.3	0.95	na	21.0	53.3	

¹ NUE (Nitrogen Use Efficiency). Pounds of nitrogen per bushel. (Total N rate/Yield)
 ² Nitrogen source(s) used in comparison only. Does not include other nutrient sources or application fees.



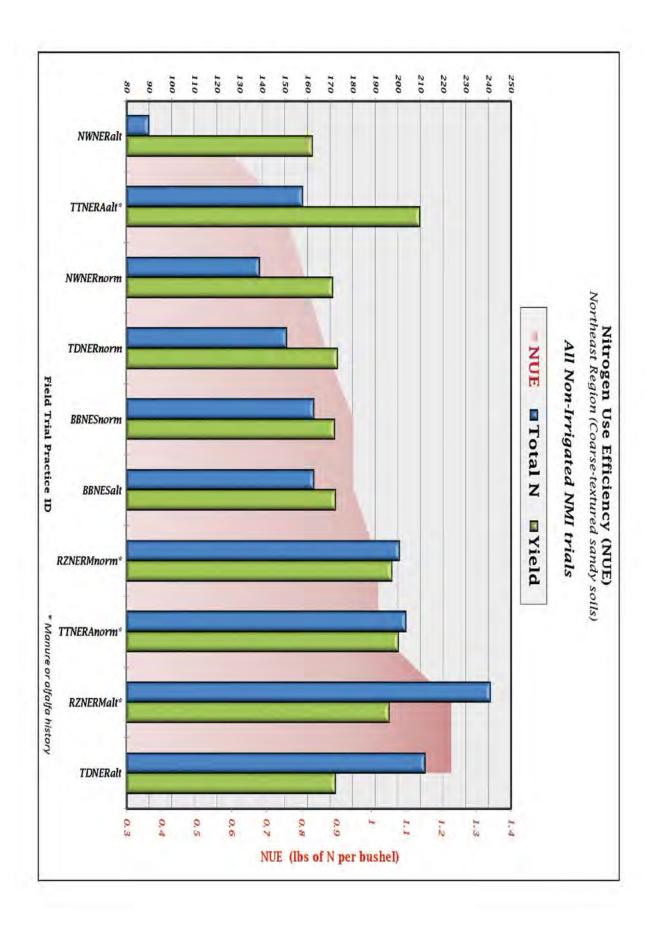
Field Trial ID Previous Crop		RZNEF Soybean	County		e after M Todd ong Prain		Cost/te		46-0-0 \$355 \$0.39
		1111	Soil Test Info					Info	0010
Atternative Practice	N 910 Alternative Practice	Normal Farm Practice Alternative Practice Normal Farm Practice	Date 10/21/1	.8 .3 98 95 re	Variety Popula Row W Plantin Harves Soil Te Tillage Manur Manur Liquid Irrigat	tion /idth og Date at Date xture e Histo e Type or Soli	M Pry	ycogen MY	3000 3 4/23/1 10/28/1 andy loar Othe Ye
0 lbs N Topdres	s						al Pr	actice	
source	\$ ton	rate	application	N	Р	K	S	stabi	lizer
Manure Credits Year 1 8.4-0-36-9.6 7-23-5 Soybean Credit	\$23 \$430 \$795	7000 125 45	Fall Preplant Broadcast Spring Preplant Broadcast At Planting Dribble	147 10.5 3.15 40	171 0 10.35	196 45 2.25	12		
Stabilizer Cost / ac 40 lbs N Topdre	\$0		Totals	201	181	243	12	Practice	
source	S ton	rate	application	N	P	K	S	stabi	lizer
Manure Credits Year 1 8.4-0-36-9.6 7-23-5 46-0-0 Soybean Credit	\$23 \$430 \$795 \$355	7000 125 45 87	Fall Preplant Broadcast Spring Preplant Broadcast At Planting Dribble Top Dress Broadcast	147 10.5 3.15 40 40	171 0 10.35	196 45 2.25	12		
Stabilizer cost / ac	S 0		Totals	241	181	243	12		
205			Yields By Practice						
200 198. 195 195 190 190 190 185 180 180 175	4	195.7	198.5	97.4		195.1		195.3	

Practice	Total N Rate	ID	Yield	eld NUE ¹ N cost per acre ²		N cost per bushel ²	Moisture	Test Weight
0 lbs N Topdress	201	RZNERMnorm	197.3	1.02	\$0,00	\$0.00	19.7	54.1
40 lbs N Topdress	241	RZNERMalt	196.1	1.23	\$15.60	\$0.08	19.9	54.0



A fitte damage from rost.										
Practice	Total N Rate	ID	Yield	NUE	N cost per acre ²	N cost per bushel ²	Moisture	Test Weight		
61 lbs N sidedress	151	TDNERnorm	173.3	0.87	\$23.94	\$0,14	16.3	56.0		
122 lbs N sidedress	212	TDNERalt	172.4	1.23	\$47.88	\$0.28	16.6	56.3		

Field Trial IDTTNERATrial CountyPrevious CropAlfalfaTownship			r.	We	e after / st Otter Scamble	Tail	N source 2 46%/ESN Cost/ton \$360 46% N cost/lb \$0.39 ESN N cost/lb \$0.63 \$0.63			
	11 12 3 3 3	1	Soil T	est Info				Field		40,0
		1	Date	I	1	Variet	v	and the second second second	-See-Co 42	086-3220
Atternative Practice	Alternative Practice Normal Farm Practice	Normal Farm Pract	OM% pH Nitrogen P (bray) P (olsen) Potassium Sulfur Zinc	Uses Tissue Tests throughout growing season		Popula Row V Plantin Harves Soil Te Tillage Manun	ition Vidth ng Date st Date exture	ry		3600 2 5/3/1 Strip Ti N Ye
	2016 NMI				- C	Irrigat	ed			N
							1. 10.10			
91 lbs N top dre								-	ictice	
source	and the second se	rate			N	P	K	S	stabi	lizer
46-0-0 11-52-0 PotSu0-0-50-17	\$679 \$927	70 I 110 I	Fall Preplant Band Fall Preplant Band Fall Preplant Band			36.4	55	18.7		
21-0-0-24 9-18-9 46-0-0	\$5.8/gal 4.	5 gal A	Fall Preplant Band At Planting Dribble Top Dress Broadcast			8.951	4.475	15.12		
ESN 44-0-0			Top Dress Broadcast						ye	s
Alfalfa Credits Year 1					69	1				
Stabilizer Cost / ac	\$0		Totak	5	204	45	59	34		
45 lbs N top dre	ess				_	Alt	terna	tive P	ractice	
source		ate	application		N	P	K	S	stabi	lizer
46-0-0	\$457	40 1	Fall Preplant Ba	nd	18.4					
11-52-0	\$679		Fall Preplant Ba		7.7	36.4		180		
PotSu0-0-50-17	and the second		Fall Preplant Ba				55	18.7		
21-0-0-24			Fall Preplant Ba		13.23			15.12	2	
9-18-9	\$5.8/gal 4.		t Planting Drib		4.475	8.951	4.475	ins Th		
46-0-0			op Dress Broad		32.2					
ESN 44-0-0 Alfalfa Credits Year 1	\$550	30 T	op Dress Broad	cast	13.2 69				ye	S
Stabilizer cost / ac	\$0	_	Total		158	45	59	34		
suchizer cost / ac	90				150	43	39	34		
230			Vields By P	ractice						
225						-	221.0			
W 220 211	L.8						-			
210		204.5	207.7	201.	-					
B 205 200				201.	~				195.1	
E 195	1				-					
> 190 185	1									
180				-			1		-	
45 lb	os N	91 lbs N	45 Ibs N	91 lbs	5 N	4	5 lbs N		91 lbs N	
Strip	5 was inadv	ertently planted			5 remo	oved fro	m aver	age yiel	ds.	
			1	and and	6 m 1	st per	N cos	st per	Moisture	Test
Practice	Total N I	Rate ID			100	2	1 August	hal ²		Weigh
Practice 91 lbs N top dress	Total N I 204	Rate ID TTNERAn	Vield orm 200.3	1.02		re ² 1.62		hel ² .21	19.3	Weigh 52.8



For more information about the Nutrient Management Initiative go to:

www.mda.state.mn.us/nmi



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