Nitrogen Use Efficiency Increased with Biologicals?

The goal of this project is to determine the effectiveness of a biological product, Pivot Bio ProveN at producing or making available nitrogen. We plan to test the Hypothesis: Pivot Bio ProveN will provide an additional 25lbs of Nitrogen and increase yield by fixing atmospheric N during the growing season. This will be determined through replicated plot design, yield mapping, soil nitrate sampling preplant and post harvest.

Replicated plot will be roughly 100acres as represented in Figure 1.

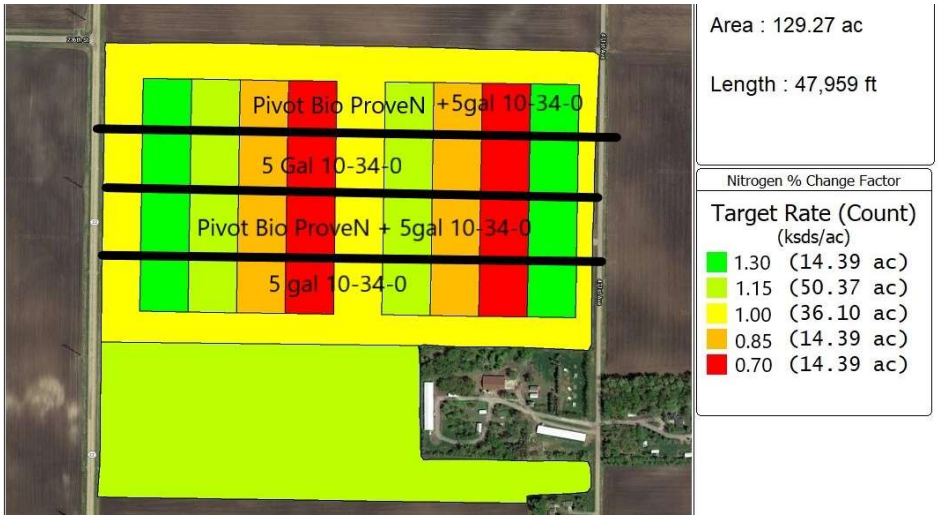

Figure 1. Plot Design – Percent N Rate Change Plot

The plot location will receive 75lbs of N preplant as UREA, DAP, and AMS at a flat rate. The remaining nitrogen will be applied as UAN 28% and ATS at sidedress (approx. v3-4). The rates used will be a standard rate of 150lbsN/ac the plot will include 70%, 85%, 100%, 115%, 130% of the standard N rates. The plot layout will be programmed into the prescription sidedress map and the as-applied map will be used to query the resulting yield maps at harvest. We will apply the PivotBio ProveN at full rate injected into 5gallons of 10-34-0 using a Dos-A-Tron system. We will use the Dos-A-Tron to prevent potential compatibility issues between the product and the 10-34-0 as well as increasing the survival potential of the Biological products. PivotBio ProveN will be applied as shown in Figure 1. The plot will provide us with multiple equal sized yield data points to adjacent rates which will be analyzed using the ANOVA test (analysis of variance) to determine the least significant difference. Prior to planting and fertilizer we will pull a 2ft nitrate test from each treatment level in each plot which will serve as a baseline N level to gauge our end result. After the plot is harvested we will re-sample each of these points and compare the remaining nitrate levels in each of the plot treatments. By comparing remaining nitrate levels on each treatment level it will help us to determine if we are seeing a consistent increase in Nitrate levels relative to applied N levels and treated or untreated with Pivot Bio ProveN.

Results:

Prior to planting we tested each zone for nitrates. The levels that we found were consistent with what we would expect following a soybean crop and fall MAP application. After this we applied 75lbs of nitrogen as UREA and AMS.

At planting time the project went smoothly with no problems. We applied the Pivot Bio product with 5gal/ac 10-34-0 through a Dos-A-Tron system so we were able to shut off the treatment completely without risk of tank contamination. Planting conditions were excellent and we established an excellent stand – we had approximately 2.8% germination loss resulting in about 35,000 plants emerged.

At side-dressing the crop was looking great and at the V3 growth stage. We applied UAN28 and ATS based upon the trial layout and prior MAP application. This finished our N program for the year.

For the remainder of the season we received very little rainfall until we were nearing the end of grain fill, this resulted in a higher than normal level of variability due to even small soil water holding capacity differences in grain yield (see figure 2.)

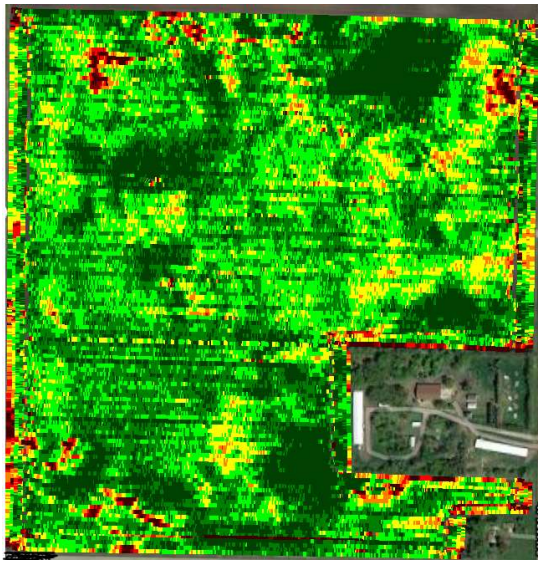

Figure 2. Yield Monitor Map

With this in mind, we did successfully collect data but unfortunately the numerical differences were not statistically significant. Figures 3 and 4 illustrate the data collected. Interestingly we didn't see much of a yield decline from the reduced nitrogen rates – I would attribute this to the drier conditions and higher than average GDD's leading to increased nitrogen mineralization. Given these conditions it is safe to say that nitrogen was not our limiting factor in this situation. We hope to conduct more testing in the future to collect statistically significant data.

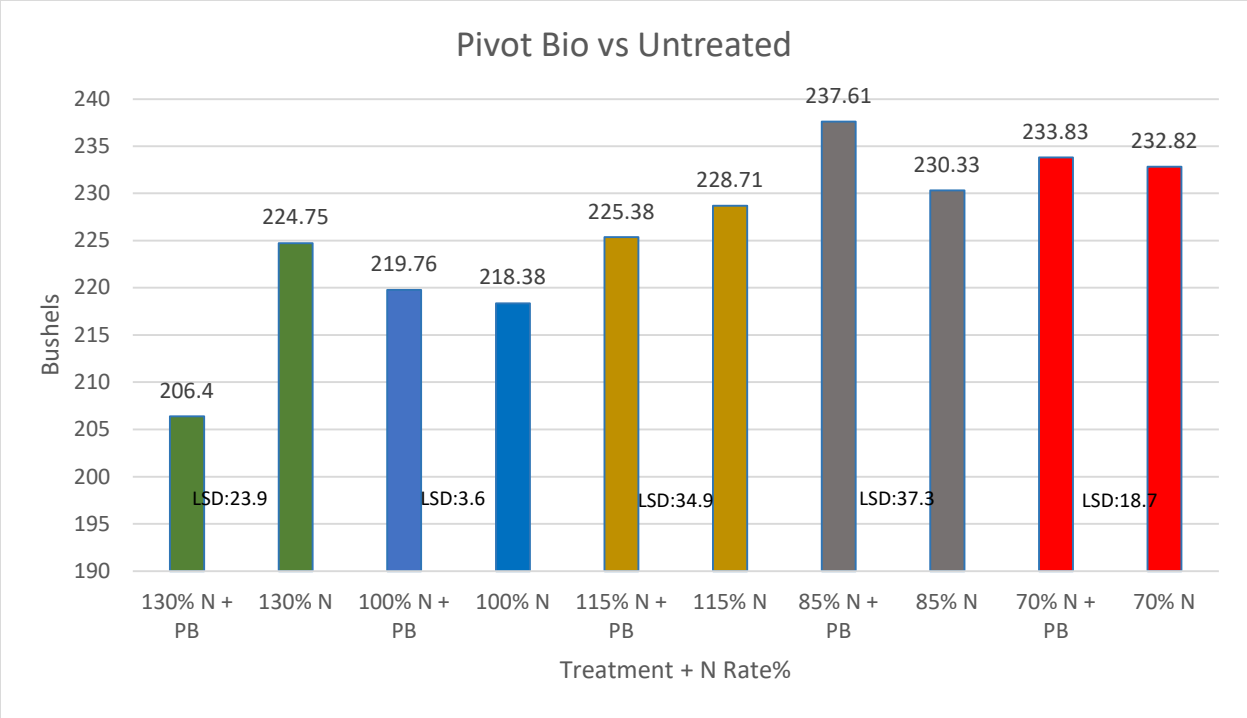

Figure 3. Results Chart

Block/Rep	130% N + PB	130% N	Diff	Deviation	Deviation Squared		#Blocks	Deg. Freedom	T-Value 90%	T-Value 95%
1	200.94	232.36	-31.42	-13.095	171.479025		4	3	2.35	3.18
2	226.58	228.94	-2.36	15.965	254.881225					
3	181.45	221.43	-39.98	-21.655	468.939025					
4	216.73	216.27	0.46	18.785	352.876225	Variance:	416.06	Standard Error:	10.1987561	
		AVG	-18.325	SS	1248.1755	Variance of Means:	104.01	LSD95%:	32.43	
								LSD90%:	23.97	

Block/Rep	100% N + PB	100% N	Diff				#Blocks	Deg. Freedom	T-Value 90%	T-Value 95%
1	218.32	218.31	0.01	-0.68	0.4624		2	1	2.35	3.18
2	221.2	218.45	2.75	2.06	4.2436					
3			0		0					
4			0		0	Variance:	4.706	Standard Error:	1.53394915	
		AVG	0.69	SS	4.706	Variance of Means:	2.353	LSD95%:	4.88	
								LSD90%:	3.60	

Block/Rep	115% N + PB	115% N	Diff				#Blocks	Deg. Freedom	T-Value 90%	T-Value 95%
1	203.72	246.11	-42.39	-39.0575	1525.488306		4	3	2.35	3.18
2	224.65	229.19	-4.54	-1.2075	1.45805625					
3	246.36	217.29	29.07	32.4025	1049.922006					
4	226.79	222.26	4.53	7.8625	61.81890625	Variance:	879.56	Standard Error:	14.8287089	
		AVG	-3.3325	SS	2638.687275	Variance of Means:	219.89	LSD95%:	47.16	
								LSD90%:	34.85	

Block/Rep	85% N + PB	80% N	Diff				#Blocks	Deg. Freedom	T-Value 90%	T-Value 95%
1	231.81	249.7	-17.89	-25.1675	633.4030563		4	3	2.35	3.18
2	221.78	232.06	-10.28	-17.5575	308.2658063					
3	270.04	217.29	52.75	45.4725	2067.748256					
4	226.79	222.26	4.53	-2.7475	7.54875625	Variance:	1005.7	Standard Error:	15.8560343	
		AVG	7.2775	SS	3016.965875	Variance of Means:	251.41	LSD95%:	50.42	
								LSD90%:	37.26	

Block/Rep	70% N + PB	70% N	Diff				#Blocks	Deg. Freedom	T-Value 90%	T-Value 95%
1	232.96	237.31	-4.35	-14.36	206.2096		4	3	2.35	3.18
2	228.16	223.08	5.08	-4.93	24.3049					
3	245.33	212.63	32.7	22.69	514.8361					
4	228.87	222.26	6.61	-3.4	11.56	Variance:	252.3	Standard Error:	7.9420327	
		AVG	10.01	SS	756.9106	Variance of Means:	63.076	LSD95%:	25.26	
								LSD90%:	18.66	

Trial Average Response to PivotBio: -0.736 bu

Figure 4. Results Table