

PURDUE NITROGEN TRIALS

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Background

More than 800 million pounds of N fertilizer are applied to Indiana's corn crop annually (Indiana Agricultural Statistics Service, 2005). The price of anhydrous ammonia (NH₃) N fertilizer has increased by more than 40% in the past year (\$0.26 per lb N as NH₃ in January 2005 to \$0.37 per lb N as NH₃ in January 2006). The increased price of N fertilizer materials is directly tied to the price of natural gas, the primary feedstock for producing NH₃ (and all other N fertilizers), so fertilizer N prices are generally expected to increase with the price of natural gas in the future. High N fertilizer prices have prompted interest in reevaluating and refining N rate recommendations.

Procedures

Nine N rate trials were conducted on Purdue farms during the 2006 growing season to begin collecting data for evaluating current N rate recommendations. The previous crop at all locations was soybean. Characteristics of the sites are listed in Table 1. Nitrogen rate treatments varied among sites but generally ranged from zero applied N or starter rates on the low end to 200-230 lbs N/A on the high side. The N was applied below the soil surface as 28% UAN solution around the V4-V5 corn growth stage except at the Lafayette site where it was applied in a band on the soil surface at V12. Soil NO₃ samples were taken to a depth of 12 inches just before sidedress N application.

Table 1. Location, soil type and selected characteristics of N trial fields conducted on Purdue farms in 2006. Yield attained with the lowest N rate tested is also listed.

Location	Predominant soil series and texture	O.M.	Soil NO ₃ -N	Lowest N rate	Yield at lowest N
		%	ppm	lbs/A	bu/A
Butlerville	Cobbsfork silt loam	1.2	6	20	67
Columbia City A	Rawson silt loam	1.8	9	29	104
Columbia City B	Glynwood loam	3.7	na ¹	29	76
Farmland	Blount silt loam	3.1	7	0	44
Lafayette	Toronto silt loam	2.1	15	0	129
Lawrence Co.	Muren silt loam	na	na	14	88
Vincennes	Ade fine sandy loam	1.3	7	18	72
Wanatah	Sebewa loam	2.9	7	24	146
West Lafayette	Chalmers silty clay loam	2.9-4.1	7	22	150

¹ na = not available.

Findings

There were basically three types of yield responses seen in the 9 trials. At West Lafayette and Wanatah, high yields were attained with little N and optimum yield was attained at fairly low N rates (Figure 1 A, Table 2). The N rate needed to attain agronomic and economic optimum yields was 130-165 lbs N/A and yields were above 200 bu/A. Yield at the Lafayette site might have been expected to respond in this same manner due to the high yield with little N, but this site was planted and fertilized late due to wet soil conditions early in the season.

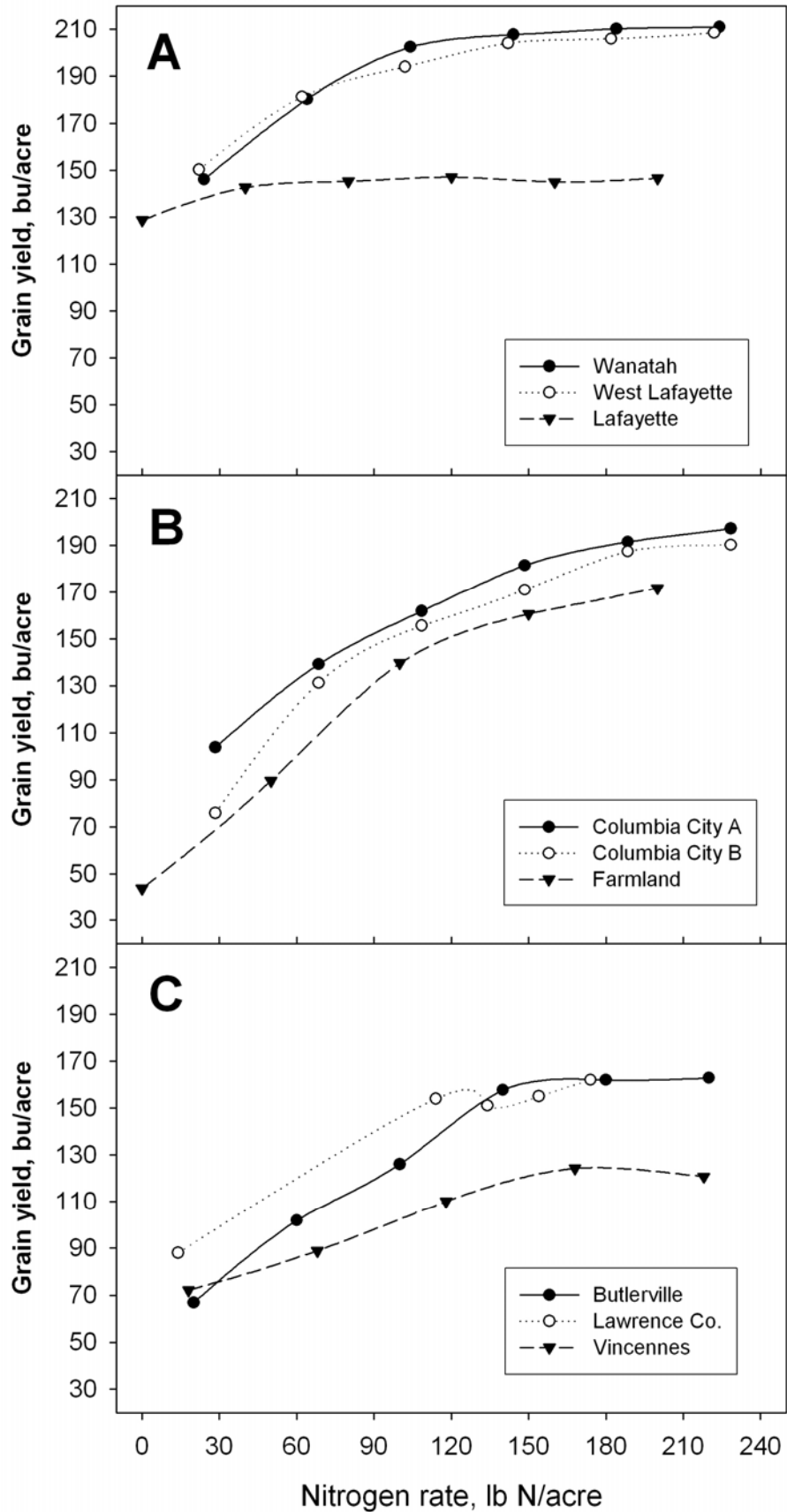
The two Columbia City trials and the Farmland trial had a different N response than West Lafayette and Wanatah. Yield with the lowest N rate was low to moderate and yield increased greatly with additional N (Figure 1 B, Table 2). Maximum yield for these fields was attained at or slightly above the highest N rates tested (211-232 lbs N/A). Economic optimum yields were achieved with 190-202 lbs N/A and optimum yields ranged from 170-200 bu/A.

Butlerville, Lawrence Co., and Vincennes had relatively low yield at low N and optimum agronomic and economic yield were attained at moderate levels of N, 118-153 lbs N/A (Figure 1 C, Table 2). Maximum yields were not high, ranging from 122 to 162 bu/A.

Table 2. Nitrogen rate resulting in optimum agronomic and economic yield of corn in N trials conducted on Purdue farms in 2006.

Site	Agronomic optimum		Economic optimum			
	N rate	Yield	at \$3/bu 30¢/lb N		at \$3/bu 40¢/lb N	
			N rate	Yield	N rate	Yield
	lbs N/A	bu/A	lbs N/A	bu/A	lbs N/A	bu/A
Butlerville	146	162	146	162	146	162
Columbia City A	232	197	210	196	202	195
Columbia City B	211	189	196	189	190	188
Farmland	216	173	198	172	193	172
Lafayette	50	146	50	146	50	146
Lawrence Co.	118	156	118	156	118	156
Vincennes	153	122	153	122	153	122
Wanatah	147	210	135	209	131	209
West Lafayette	165	207	146	206	140	205

Figure 1 A-C. Grain yield response to applied N in 9 trials conducted on Purdue farms.



Conclusions

The N trials reported in this paper along with others presented at the conference from additional 2006 trials and from previous research is just a start in our work of reevaluating and refining N rate recommendations.

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