

## BN Long-Term Nitrogen Management Study 2006

### Clay Center, NE

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#### Objectives:

Evaluate the long-term effects of nitrogen (N) fertilizer rate, tillage, the nitrification inhibitor nitrapyrin (N-Serve<sup>®</sup>, a product of Dow AgroSciences) and fertilizer timing on N use efficiency of continuous irrigated corn and the accumulation and movement of nitrate-N in the soil.

#### Procedures:

This study originated in 1986 at the South Central Agricultural Laboratory as one component of the Burlington Northern Foundation Water Quality Project. Since 1990, the study has been maintained on a scaled-down basis to evaluate long-term effects of treatments. Experimental variables have included: fertilizer N rate (0, 67, 134, 268 lb/ac N as anhydrous ammonia); tillage (conventional chisel/disk vs. no-till); and nitrapyrin (0 vs. 1 qt/ac). From 1993-2006, fertilization timing (preplant vs. sidedress) has been compared to better evaluate the effects of the nitrapyrin on the stabilization of soil nitrogen. Pioneer 33H26 was planted May 16 (29,600 ppa) and was harvested Oct. 20, 2006.

#### 2006 Results:

	Treatment Variables				Grain Yield (bu/ac)	3ft Residual N (lb/ac)	
	Timing	N Rate (lb/ac)	Tillage	N-Serve		Spring	Fall
Nitrogen		0 check			89 c	17.0 b	n/a
		67			167 b	28.8 b	
		134			202 a	35.2 b	
		269			204 a	122.4 a	
Nitrapyrin (check excluded)				With	189 a	66.1 a	n/a
				W/O	192 a	58.2 a	
Tillage			CT		167 a	70.4 a	n/a
			NT		164 a	46.9 b	
N Application Timing (check excluded)	Preplant				188 b	52.8 b	n/a
	Sidedress				194 a	71.5 a	
N Rate * Timing Interaction	Preplant	67			158	29.1	n/a
	“	134			200	34.4	
	“	268			206	94.9	
	Sidedress	67			176	28.6	
	“	134			205	36.0	
	“	268			201	149.9	
Values with the same letter are not significantly different at P=0.05 n/a: data not fully analyzed yet							

**Discussion:**

Growing conditions in 2006 were not favorable for a significant yield response to nitrapyrin. Rainfall during the Apr. 1 through Oct. 1, 2006 growing season totaled 17.35 inches (90% of normal). This was supplemented with 3.38 inches of sprinkler irrigation in 4 events. The dry, warm weather conditions were favorable for high irrigated yields, however. The only yield-limiting factor in 2006 was an outbreak of southern rust in August. This foliar disease accelerated crop maturity and led to an influx of stalk rot by harvest. This disease may have negatively impacted the corn yield potential at the highest N levels.

Like previous years, grain yield in 2006 increased with increasing nitrogen rate. Soil profile residual N typically follows the same pattern. As expected, nitrapyrin use had little effect on grain yield in 2006. However, compared to using anhydrous ammonia alone, nitrapyrin use commonly maintains a greater amount of post-season residual nitrate (NO<sub>3</sub>-N) in the soil profile, especially when the N stabilizer is applied sidedress at the highest fertilizer level. Thus, nitrapyrin tends to prevent leaching of nitrate below the crop root zone under high N fertilizer environments, keeping more of the N available for the next season's crop.

Choice of tillage system did not significantly impact grain yield in 2006. In past years, yields under conventional tillage were often significantly higher than with the use of no-till. There is often higher residual soil nitrate present following conventional tillage than no-till, especially at the highest N application level. This trend may be indicative of either greater leaching below the root zone or better use of available N occurring in the no-till treatment. It could also suggest that tillage promotes added nitrate release from decomposition of soil organic matter. The past no-till yield drag could also be due to suspected compaction that may be hindering yield potential.

**Conclusions:**

Most of the time there has been no advantage to the use of N-Serve. In years with wet springs, yield increases with N-Serve have been observed. In the 12 years from 1995 through 2006, significant yield increases with N-Serve were observed in three years. In that same period, preplant N application was superior to sidedress in four years, and sidedress superior to preplant in three years.