Corn Yield Response to Nitrogen Rate (2014-2016)

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Objective

To determine the effects of nitrogen rate on corn yield and profitability.

Background (all farms, all years)

Crop Year: 2014-2016
County: Fulton
Drainage: Systematic, 50' laterals or closer
Previous Crop: All soybeans except one wheat
Population: 31,000-35,000 seeds per acre
Variety: all seed had 2 or more traits
Tillage: No-till, minimum and conventional
Soil Test: all in maintenance range or higher
Starter: all used a blended N-P analysis except 2 sites with only N in starter
Rainfall Average (April-September):
2016 – 19.1"
2015 – 23.5"
2014 – 14.8"

Methods

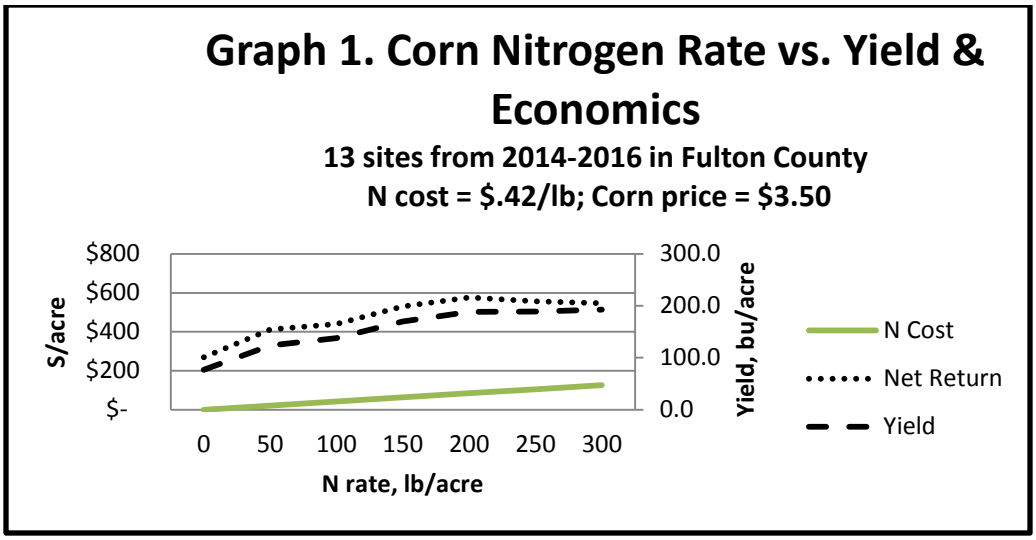
Nitrogen rate trials were set up at thirteen sites over 2014-2016. Generally, trials were set up with four to five treatment rates replicated four times in a randomized complete block design. Rates were in increments of 50 lbs of total nitrogen per acre (0-250 lbs total N per acre). Plots were the width of the collaborating farmers' planters and at least 1,000 feet long (field length). The trials were planted, sprayed and harvested with commercial farm equipment. The treatments were made with commercial nitrogen application equipment. Corn was sidedressed with the balance of the total N rate for each treatment when corn was at vegetative growth stages V3-V6. Corn Stalk Nitrate Tests were conducted at black layer (Graph 3). Yields and moistures were measured using a calibrated yield monitors and shrunk to 15% moisture (Table 1, Graph 1). Rainfall data is based on the average of the active CoCoRaHS stations in Fulton County (Graph 2).

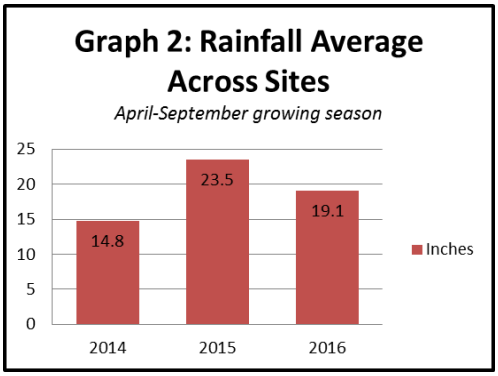
Results

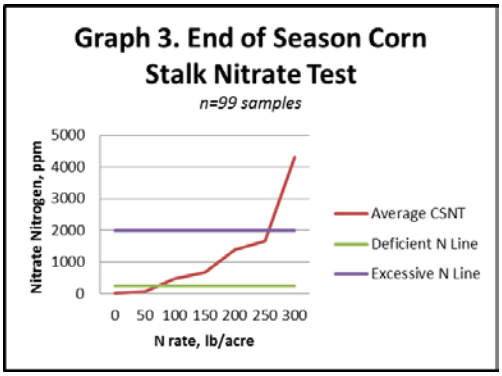
Table 1. Corn Yield response to Nitrogen Rate 2014-2016

Nitrogen Rate	2014 Yield (4 sites)	2015 Yield (5 site)	2016 Yield (4 sites)	Avg Yield (all sites)	Revenue Minus N Cost
(pounds/N)	bushels per acre				($/ac)
0	-	76.9	-	76.9	$269
50	117.9	108.5	140.7	123.6	$412
100	171.2	84.7	169.8	137.8	$440
150	183.2	183.2	184.9	169.7	$531
200	196.5	181.4	184.1	188.5	$576
250	189.9	192.4	184.5	189.2	$557
County Average	183.1	161.3	177.6	174.0	-
Ohio Average	176.0	153	159.0	162.7	-

*Based on $3.50/bu corn and $.42/lb N (Source: OSUE 2016 Corn Budget)







Discussion

The maximum economic return rate across the average of 13 sites is 200 lbs of total nitrogen for an average yield of 188.5 bu/ac, $576/ac and a commercial nitrogen use (NUE) rate of 1.06 lbs N/bushel. Agronomic returns continued to increase slightly above the maximum economic return. However, rates above 250 lbs N/ac resulted in excess nitrate-nitrogen in the end of season CSNTs.

Economic optimum nitrogen rates vary greatly by nitrogen cost, corn price, soil type, rainfall timing and amounts, application practices and other factors. Conducting nitrogen rate trials on a specific farm is the best way to determine the economic optimum rate for that farm.

Acknowledgement

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