Corn Yield Response to Nitrogen (0-250 lbs/ac)

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Objective

To determine the effects of total nitrogen rate and nitrogen use efficiency (NUE) on corn grain yield.

Background (all farms)

Crop Year:	2015	Previous Crop:	Soybeans
County:	Fulton	Soil Test:	Maintenance range or higher
Drainage:	Systematic, 50’ laterals or closer	Starter:	Blended N-P analysis
		Seeding Rate:	32,000-35,000 seeds/ac

Methods

This trial evaluates corn yield response to nitrogen. Generally, all participating farmers had similar practices with regard to fertility, herbicide program, traits and soil testing. All plots were replicated at least 4 times (except where noted) in a randomized complete block design. Rates used were 0-250 total units of nitrogen per acre with credits given for starter fertilizer. Plots were field length (approximately 1,200 feet long) except where noted. The farmers’ equipment dictated the planting and harvesting width. Each farmer planted/harvested their own trial and applied their own sidedress nitrogen.

Data

Plot centers were harvested with commercial combines. Yield and moisture data was collected with calibrated yield monitors and shrunk to 15% moisture. Nitrogen use efficiency (NUE) was calculated by dividing total units of nitrogen applied by yield. Normalized Difference Vegetative Index (NDVI) readings were taken with Greenseeker handheld sensors approximately four weeks after nitrogen was applied and corn stalk nitrate tests (CSNT) were taken approximately 1-2 weeks after black layer to evaluate nitrate nitrogen remaining. Weather data was obtained from the closest National Weather Service station or by the farmer.

Economics

All treatments have economics calculated based on $3.50/bushel corn marketing price and a cost of $.46/lb Nitrogen (Source: 2015 OSU Ag Econ Corn Budget). Net return is calculated as gross revenue minus nitrogen cost or as Return less N.

Results

OFR Trial: Corn Yield Response to N Rate #1

Location: Delta
Rainfall (May-Sept): 20.4" (producer's records)
Soil Type: Hoytville clay loam/Haskins loam
Tillage: No-till
N Source: NH_3

	Yield (bu/ac)	Nitrogen Use Efficiency (lb N/bu)	Return less N
0 lbs N/ac	116.0 D	--	$406/ac
100 lbs N/ac	180.8 C	.55	$587/ac
150 lbs N/ac	220.3 B	.68	$702/ac
200 lbs N/ac	250.5 A	.80	$785/ac
250 lbs N/ac	265.5 A	.94	$814/ac
LSD (P<.05)	17.9 (CV 4.88)		

OFR Trial: Corn Yield Response to N Rate #2

Location: Fayette
Rainfall (Apr-Sept): 22.1" (CoCoRaHS)
Soil Type: Fulton silty clay loam
Tillage: No-till
N Source: 28% UAN

	Yield (bu/ac)	NUE (lb N/bu)	Return less N
0 lbs N/ac	73.8 D	--	$258/ac
100 lbs N/ac	87.0 D	1.2	$259/ac
150 lbs N/ac	114.4 C	1.3	$331/ac
200 lbs N/ac	139.7 B	1.4	$397/ac
250 lbs N/ac	164.4 A	1.5	$460/ac
LSD (P<.05)	19.7 (CV 9.05)		

OFR Trial: Corn Yield Response to N Rate #3

Location: Fayette
Rainfall (Apr-Sept): 22.1" (CoCoRaHS)
Soil Type: Fulton silty clay loam
Tillage: No-till
N Source: 28% UAN

	Yield (bu/ac)	NUE (lb N/bu)	Return less N
0 lbs N/ac	73.6 D	--	$258/ac
100 lbs N/ac	101.1 C	.99	$308/ac
150 lbs N/ac	119.0 BC	1.3	$348/ac
200 lbs N/ac	145.2 AB	1.4	$416/ac
250 lbs N/ac	157.9 A	1.6	$438/ac
LSD (P<.05)	26.3 (CV 11.7)		

Discussion:
Fulton County sustained above average early season rainfall in 2015. Much of this rainfall led to leaching or denitrification of already-applied nitrogen. These trials show a statistically significant difference in yield across the various nitrogen rates. In 2015, the data supports higher rates of nitrogen being applied unless timely late season applications can be made.

Nitrogen Use Efficiency (NUE) was likely affected by early season rainfall. Trials 2 and 3 suggest that yield and economic optimums required NUE greater than 1.0 lbs N per bushel produced. In trial 1, yield and economic optimums were approximately .94 lbs N per bushel produced.

Please refer to 2014 Yield Response to Nitrogen OFR Results in Fulton County (www.go.osu.edu/fultononfarmresearch) and note the importance of multi-year data to determine an economically optimum nitrogen rate you your farm. Generally speaking, 2014 yield response to nitrogen results followed a more average economic optimum nitrogen rate whereas 2015 data supports a higher than average economic optimum nitrogen rate due, in part, to excess rainfall in the early part of the growing season.

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