A Summary of Three Years of Corn Nitrogen Rate Trials in Fulton County

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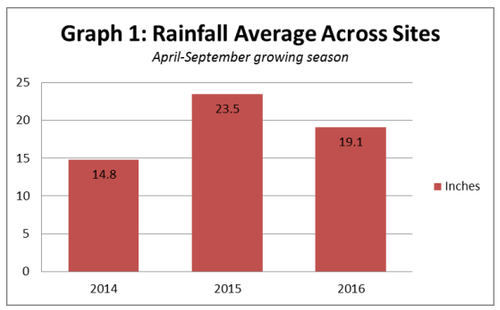
INTRODUCTION

Nitrogen is expected to be 18% of total variable costs and over 8% of total costs for the 2017 corn crop in Ohio. Helping producers and educators identify the economic optimum nitrogen rate on their farms will not only help manage costs more closely but will prevent unnecessary nitrates from entering the water. This multi-year, multi-site corn nitrogen study will increase the confidence that this rate can be calculated more accurately.

Commercial nitrogen application equipment

OBJECTIVES

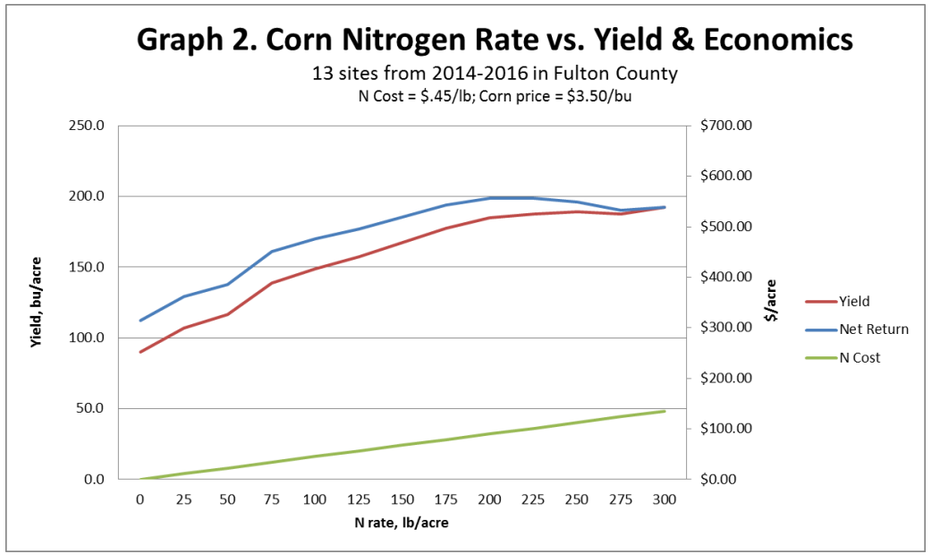
- Determine a corn yield response curve based on nitrogen rate .
- Identify an economic optimum rate based on a given corn price and nitrogen cost.
- Evaluate commercial nitrogen use efficiency at the economic optimum rate.
- Evaluate year end nitrogen levels with corn stalk nitrate tests



METHODS

Thirteen field trials were established in Fulton County during the 2014 (4), 2015 (5) and 2016 (4) corn production years to determine to determine the effect of corn nitrogen rate on yield and economics. While the trials were conducted over multiple years with nine different farmer-collaborators, the protocol was standardized as much as possible. Including:

- All field work was performed with commercial farm equipment, except 2 small plot trials.
- Trials were randomized complete block design and replicated 3-4 times.
- A minimum of four rates at equal increments were used per trial and were pre-determined by each farmer-collaborator. The most frequently used rates were 100, 150, 200, and 250 total lbs of nitrogen/acre. A zero rate was encouraged but not required.
- Nitrogen credits for starter and pre-emerge herbicide programs were determined for each collaborator and the remainder of the N rate was applied at growth state V5 (5-leaf).
- Rainfall data were collected for the April-September growing season and averaged across all sites each year.
- Corn stalk nitrate samples (CSNTs) were collected for each treatment (10 samples/treatment)10 days post-black layer and averaged for each rate.
- Yield data was collected using commercial combine yield monitors and shrunk to 15.0% moisture.
- Data were analyzed using ANOVA and factors were considered significant at p<.05. As data were averaged over 3 years, statistical significance was not indicated on this presentation.
- Economics were calculated assuming $3.50/bushel corn price and $.45/lb nitrogen cost.



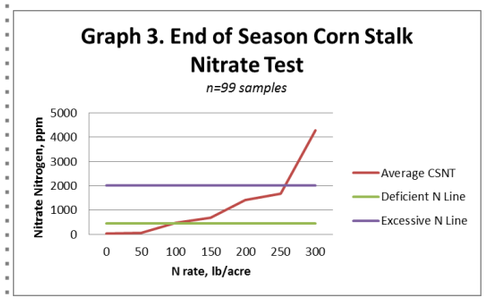
RESULTS

- Rainfall is a determining factor in the amount of nitrogen that remains available for plant growth. Generally, yields were reduced in 2015 as a result of wet weather. Both 2014 and 2016 were more normal rainfall years but variable in rainfall timing (Graph 1).
- Average yield ranged from 90 bushels per acre (zero rate) to 192 bpa (300 lb/acre rate). See graph 2. Thus indicated soil nitrogen can provide up to 90 bpa of yield.
- The economic optimum rate of nitrogen was the same at 200 and 225 lbs/ acre of nitrogen. Net return to nitrogen was $556/acre at either rate (graph 2).
- At an economic optimum rate of 200 lbs N /acre and average yield of 185 bu/acre, the commercial nitrogen use efficiency (NUE) can be calculated to to 1.08 units of nitrogen per bushel produced.
- Thirty eight percent of the corn stalk nitrate tests (n=99) showed a nitrogen deficiency (Graph 3) while 24% showed a nitrogen surplus at the end of the year. (According to Purdue stalk nitrate categories: <450 = low, 450-2000 = optimum, >2000 = excessive). Applying above 250 lbs N/acre results in excessive nitrate levels and applying below 100 lbs N/acre leads to yield deficiency.

Corn Stalk Nitrate Test (CSNT) samples

CONCLUSION

The data contained in this poster are based only on 13 sites over 3 years. Corn nitrogen rates are very elusive and as such, it is suggested that all producers conduct their own on farm research to help determine the economic optimum nitrogen rate on their farm. Many nitrogen management tools already exist and more are being developed. Replicated on farm strip trials can help producers establish a baseline economic rate that can be adjusted annually.



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