

## Nebraska On-Farm Research: Precision Nitrogen Management Project Utilizing Active Crop Canopy Sensors for Corn N Management

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### Objective

The following is the protocol for testing in-season, active crop canopy sensors for N management at the sub-field level and comparing them to the producer's usual N management and the on-farm economic optimum N rate (EONR). This protocol may be used for those with pre-plant only N capabilities, in-season N capabilities, variable-rate capabilities, or flat-rate only capabilities.

### Why Participate?

Participating in this study will allow you to try new technologies and evaluate what techniques will improve nitrogen management on your farm. You will work closely with Nebraska Extension to accomplish the project. We hope this study provides valuable information for your operation. In addition, in aggregate, these studies will provide valuable information to improve N management in Nebraska.

All cooperating producers will receive \$1,300 per study in recognition of their time and resource commitments and to mitigate the risk of potential yield loss.



**Figure 1.** UNL high clearance applicator for in-season application for this study.

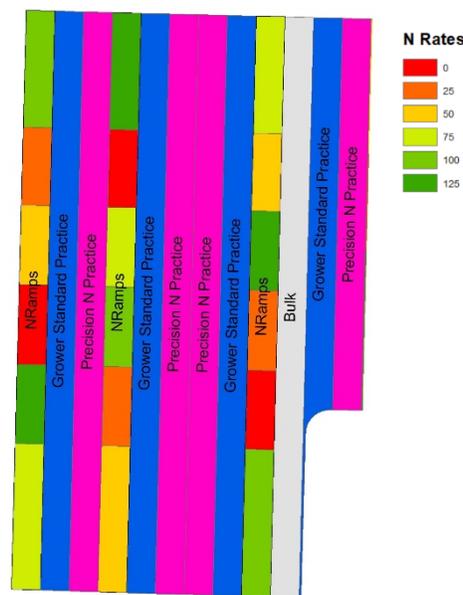
## Study Details

**Layout:** A total of 4 replications are needed for this trial (Figure 2). Rows planted in each treatment need to be equal to or greater than corn head width. The same hybrid and management practices should be used across the entire study area.

*Treatment 1: Grower Standard Practice (blue).* This treatment would represent the common N management practice used by the producer every year (Figure 2).

*Treatment 2: Precision N Practice (pink).* This practice will utilize a model to determine the optimum N rate. There are a number of commercially available active crop canopy sensing systems that can prescribe N rates in real-time as a high clearance applicator moves through the field. These systems are suited for sidedress applications between V8 and V12 growth stages in corn as well as applications in wheat. The field layout will be based on the producer's current equipment available, the UNL team currently operates a high clearance applicator (Figure 1) with an Ag Leader OptRx system that can apply in 8, 12, or 16 (30" row) widths in corn. The cooperators will need to apply a base rate (approximately 75 lb-N/ac) in the *Precision N Practice* field-length strips as well as the N rate blocks, likely using a variable rate systems at or around planting. The UNL team will require either 28% or 32% UAN delivered to the field site at the date of application (between V8 and V12) to successfully accomplish the *Precision N Practice* application.

*Optional - Economic optimum nitrogen rate:* Where possible, nitrogen rate blocks will be established at 3-4 locations in the field near the field length treatment strips (Figure 2). Rate blocks will be 300-feet long and twice the width of the harvester head. Four to five nitrogen rates will be used within each rep with increments of 25-50 lb/ac. Blocks would be located at contrasting "zones" within the field (e.g. high yield vs low yield; high slope vs non-slope). Timing of establishment of the nitrogen blocks will follow both the producer and the "next level" of nitrogen application (e.g. planting or split-application). Knowledge from the producer, yield monitor data, or grid sampling will be used to determine the location of the blocks.



**Figure 2.** Generic layout of treatments

## Grower Requirements

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**Site Selection:** (NOTE: sites within **2 hours drive** of Lincoln are preferred due to the need to haul the high clearance applicator)

- No previous cover crop?
- No manure applications in last 10 years?
- No cattle grazing on corn stalks?
- Corn-soy or corn-corn rotation?

**Are you willing to:**

- Plant only 1 hybrid in study field?
- Flag or mark GPS location of each treatment?
- Apply base N rates according to the field trial layout plan?
- Provide all necessary inputs for crop production
- Complete background agronomic form about site and practices?
- Collect yield data with a **well calibrated** yield monitor? (Contact UNL Extension if assistance with this process is needed.)
- Submit harvest data to UNL Extension within 30 days of harvest or by Dec. 15?
- Allow UNL Extension to use submitted and collected data for research, educational, and informational purposes?

**If yes on all of the above you are a great candidate for this study. Please proceed with the questionnaire below to help us plan the best study scenario for you:**

- Approximately how many years of yield monitor data do you have? \_\_\_\_\_
- How do you currently estimate the optimum N rate for your fields? \_\_\_\_\_  
\_\_\_\_\_
- Do you have pre-plant N capability? \_\_\_\_\_
- What form of N do you apply pre-plant? \_\_\_\_\_
- Do you have variable rate capabilities for pre-plant N? \_\_\_\_\_
- Do you have in-season N capabilities or willing to hire in-season N application? \_\_\_\_\_
- What form of N do you apply in-season? \_\_\_\_\_
- Do you have variable rate capabilities in-season or willing to hire? \_\_\_\_\_
- Irrigated or non-irrigated? \_\_\_\_\_
- Farm/field location? \_\_\_\_\_
- Describe you current N management plan: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

- Any field history we should know about? For example, was there a study conducted on this field in the past 5 years? Have you managed this field differently in the past? Was part of the field a feedlot, old farmstead, etc? \_\_\_\_\_

For those that implement the optional economic nitrogen rate blocks:

- The UNL team has partnered with Granular to be able to conduct enhanced data collection on the optional economic optimum nitrogen rate blocks. You have the option to opt in or out of this partnership. Opting in will allow us to better understand the economic optimum N rate at your site, develop better recommendations in the future, and improve the technology that is evaluated on your site. We will work with Granular to collect many additional measurements on the site, including detailed soil characterization of texture, OM, pH, and macro and micro nutrients, soil ammonium and nitrate data throughout the growing season, and biomass/tissue samples. You will have access to all the data we collect. The yield data from the N-rate strips will be shared with Granular. You will not share the field length strip data unless you opted to use the Granular model. As always, data will be reported in aggregate or anonymously. We are happy to visit more and discuss your questions or concerns.
  - Opt in
  - Opt out
  - I need more information and would like to visit with the research team

**Because this study is sponsored by USDA-NRCS, all participants will need to complete an eligibility check. Please respond to the following two questions to help the NRCS begin the assessment.**

1. Are you currently a participant in USDA Farm Programs?  YES  NO
2. Have you ever had, or do you currently have, an EQIP or CSP contract with NRCS?  YES  NO

Name \_\_\_\_\_

Address \_\_\_\_\_

County \_\_\_\_\_

Farm number (if known) \_\_\_\_\_

Tract number of field to be used for the study (if known) \_\_\_\_\_

**Disclaimer:** The Nebraska On-Farm Research Network does not endorse the use of products tested in on-farm replicated strip trials. While treatments are replicated within trials and may be replicated across multiple sites under various conditions, your individual results may vary.

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