

Validation of Emerging Nitrogen Management Technologies for Corn in Wisconsin - 2017

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Objectives:

- 1) Develop dataset to evaluate the usefulness of the CO₂ Burst soil health test to predict N need.
- 2) Develop dataset to evaluate Crop Canopy Sensing as a method for determining a sidedress N application rate.
- 3) Assess the ability of the PSNT soil test to adjust sidedress N application rates for modern hybrids and a changing climate.
- 4) Obtain additional corn N response data to further develop the statewide MRTN database.

Site Selection:

- 1) Any field that will be corn in 2017 and which has a previous crop of corn or soybean. While alfalfa is an important previous crop, the small or nonexistent response of corn to N when it immediately follows alfalfa suggests that initial efforts should be made where larger N responses are likely. Second year corn after alfalfa is OK.
- 2) Try to find a field with relatively uniform soil series and/or soil drainage classes.
- 3) Manure history – Select fields where the most recent manure application was before August 2015. Alternatively, fields where manure was applied for the 2016 crop (application in fall 2015 or spring 2016) may also be used. However, very good information about the manure application is needed (eg. manure rate, type of manure, and ideally manure analysis) because N response may be low.

Experimental design:

Randomized complete block with 3 or 4 replications.

Plot size:

Field scale equipment: Plot size will be dependent upon the width of N application equipment and combine. The combine should harvest the center rows of the N application swath. There should be at least 1 buffer row on either side of the combine head. For example, if the N application equipment covers 16 rows and the combine is 12 rows, then the combine should harvest the center 12 rows, leaving two border/buffer rows on either side. Another example, if the N application equipment covers 12 rows and the combine is 16 rows, then each treatment will need to be 24 rows wide (two passes of the fertilizer applicator). The center 16 rows should be harvested with the combine leaving 4 buffer rows on each side of the plot. Plots should be at least 300 feet long. If harvesting with a combine equipped with a yield monitor, the yield monitor must be calibrated. For field length strips, weigh wagons are acceptable. Please call Carrie Laboski if you have questions. See grain yield results section on page 4.

Small plot: If hand harvesting, small plots can be used. Plots should be 4 rows wide and at least 35 feet long. Harvest a minimum of 20 feet from each of the center 2 rows. For each plot, all harvested ears should be shelled and a subsample retained to determine moisture content. See grain yield results section on page 4.

Treatments:

Treatment #	N Rate (lb N/a)	Time of Application
1	0	Sidedress, ~V6 or later
2	40	Sidedress, ~V6 or later
3	80	Sidedress, ~V6 or later
4	120	Sidedress, ~V6 or later
5	160	Sidedress, ~V6 or later
6	200	Sidedress, ~V6 or later
7*	200	Preplant or at emergence
8**	240	Sidedress, ~V6 or later

*Treatment 7 should be applied preplant or at emergence. This treatment will serve as a non-limiting reference area that is necessary to evaluate the crop canopy reflectance sensor. If not evaluating sensors, then this treatment is not needed.

**Treatment 8 should be used for irrigated sands/loamy sands. It can also be used in southern Wisconsin if farmers prefer a higher rate for corn following corn. This rate is generally not needed on soils other than irrigated sands/loamy sands.

Note 1: All N may be applied prior to or at planting. If that is done, crop sensing measurements may not be taken. Please discuss with Carrie Laboski in advance.

Note 2: Up to 20 lb N/a may be applied in starter fertilizer. Starter fertilizer rate and analysis must be reported in the data reporting spreadsheet.

Soil Sampling:

Please label the samples as specified to facilitate sample handling at the lab.

- 1) PPNT samples (NO_3^-)
 - a. 0-1' and 1-2' samples for each replication (3 reps x 2 depths = 6 samples)
 - i. Collect one core from each plot in a replication and composite to make one sample. Do not sample where N fertilizer has been applied.
 - ii. Sample each replication individually.
 - iii. Collect samples within 2 weeks prior to planting.
 - b. Label as follows:
 - i. YourLastName – FieldName17 – PPNT – Rep – Depth
 1. Rep = 1, 2, or 3
 2. Depth = 0-1' or 1-2'
 - c. Freeze samples until shipping.
- 2) Routine soil test (P, K, pH, OM) and CO_2 Burst test
 - a. 0-6" sample for each replication (1 depth x 3 reps = 3 samples)
 - i. Collect one core from each plot in a replication and composite to make one sample. Do not sample where N fertilizer has been applied.
 - ii. Sample each replication individually.
 - iii. Collect prior to N application, can be collected with PPNT
 - b. Label as follows:
 - i. YourLastName – FieldName17 – RFS – Rep
 1. Rep = 1, 2, or 3
 - c. Freeze samples until shipping

- d. Note after the UW Soil & Forage Analysis Lab completes routine analysis, they will ship the sample to Carrie Laboski to send to another lab for the CO₂ Burst test.
- 3) PSNT sample (NO₃⁻)
- a. 0-1' sample for each replication (1 depth x 3 reps = 3 samples)
 - i. Collect one core from each plot in a replication and composite to make one sample. Do not sample where N fertilizer has been applied. Do not sample near starter fertilizer band.
 1. If all N treatments were applied preplant, collect 6 cores from 0 lb N/a treatment.
 - ii. Sample each replication individually.
 - iii. Take samples just prior to sidedressing.
 - b. Label as follows:
 - i. YourLastName – FieldName17 – PSNT – Rep
 1. Rep = 1, 2, or 3
 - c. Freeze samples until shipping.
 - d. Record the crop growth stage when these samples are collected.

Soil Sample Shipping:

Package frozen samples in a box stuffed with newspaper for insulation. *Please use the special sample submission form for this project.* It can be found at the end of this protocol. Use one sample submission form per location. The sample IDs are partly entered on the submission form. You need to complete the sample ID with your last name and field name and also place a check box in the right column to signify that a particular sample was submitted. If you only have 3 replications, not all of the rows will have a check mark. Let Carrie Laboski know that you are conducting this trial and she will give you an account number to use on the sample submission form. Please call Carrie if you have any questions.

Ship frozen samples on a Monday so that they arrive at the lab on a week day. Sample nitrate results will be negatively affected if the sample sits over the weekend. *All samples from this project may be shipped shortly after PSNT sampling. If you are interested in having the results from the routine or PPNT samples sooner, they can be shipped separately from the PSNT samples.* Call the Soil & Forage Analysis Lab at Marshfield (715-387-2523) if you want suggestions on shipping methods.

Note after the UW Soil & Forage Analysis Lab completes routine analysis, they will save the samples for Carrie Laboski to send to another lab for the CO₂ Burst test. This is why it is important that samples are labeled clearly and consistently with the format given above and the special sample submission form is used.

Crop Canopy Sensing:

Carrie Laboski's student will be collecting crop canopy reflectance sensor measurements with a Crop Circle. It is imperative that communication regarding crop growth stage and sidedress N application timing are clearly communicated to Carrie and her student. This communication must come early enough so that we can adjust field project staffing to make time for the student to take the Crop Circle measurements within 2 days of sidedress N application.

Irrigation Water Samples (if applicable):

- 1) Contact UW-Stevens Point Water & Environmental Analysis Lab to obtain a water test collection kit.
 - a. Call 715-346-3209 (<http://www.uwsp.edu/cnr-ap/weal/Pages/Contact.aspx>)
 - b. Be sure to tell them that this is an irrigation water sample.
 - c. Please put Carrie Laboski's email (laboski@wisc.edu) on the sample submission form along with your contact information.
 - d. They will send you an invoice for \$16. Forward that invoice to Carrie, so that she can pay it.
- 2) Collect one sample of irrigation water for NO₃ analysis.
- 3) Obtain monthly irrigation totals from farmer.

Grain Yield Results:

- a) Harvest methods.
 - i) Yield monitor (calibrated).
 - ii) Weigh wagon.
 - iii) Hand picked and shelled.
- b) For all methods, data must include yield (bu/a at 15.5%) and % grain moisture.
- c) Collect pre-harvest stand counts (Optional, but really nice to have).
 - i) Record the number of plants in 50 feet of row in for each plot. This can be 25 feet from the center two rows for small plots.

Background information that needs to be documented:

- 1) Soil map unit (eg. PnA or 123) name (eg. Plano) and texture (eg. silt loam).
- 2) GPS coordinates.
- 3) Nearest city/town (for weather station information) and county.
- 4) Five-year crop and N rate/source history.
- 5) Five-year manure history, application rates, and analysis.
- 6) Tillage and surface residue cover after planting
- 7) Corn hybrid, relative maturity, planting date.
- 8) Forage legume stand at time of establishment (plants/ft² and amount of regrowth).
- 9) Fertilizer N treatment application date, rates, placement, source.
- 10) Other fertilizer applied including starter, rate, analysis, and placement (Note: starter N rate should not exceed 20 lb N/a).
- 11) Growing season weather conditions.
- 12) If applicable note if the site is tile drained or irrigated. If irrigated note monthly irrigation totals and report nitrate-N concentrations of the irrigation water.
- 13) Please completely fill out all tabs of the data reporting excel file.

Data reporting:

- 1) A spreadsheet template will be provided to assist in data compilation and reporting.
- 2) After harvest, email spreadsheet to Carrie Laboski by December 1, and she will statistically analyze data.

Example Plot Diagrams

Numbers within the diagram are N rates in lb N/a.

200 pre- plant	0	120	200	80	160	40	Rep 3
0	160	40	80	200	200 pre- plant	120	Rep 2
200	80	200 pre- plant	40	160	0	120	Rep 1

OR

200 Broadcast	200	0	120	160	80	40	0	160	40	200 Broadcast	80	200	120	200	40	0	80	200 Broadcast	160	120
Rep 1							Rep 2							Rep 3						

