

PROTOCOL FOR ON-FARM RESEARCH TO VALIDATE WISCONSIN'S MRTN N RATE GUIDELINES FOR CORN IN WISCONSIN

New for 2010: Nitrogen credits from manure (raw or treated) can be verified using a fertilizer equivalence method, whereby one manure treatment is added to the standard protocol. Please call Carrie Laboski for additional guidance if you plan to do this. Also call Carrie if you have any questions on site selection.

Contact Information:

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Goal of the Research:

Determine corn yield response to applied nitrogen (N) to evaluate Maximum Return to Nitrogen (MRTN) N rate guidelines for a range of Wisconsin soils and cropping systems.

Rationale:

MRTN N rate guidelines for corn were introduced in fall 2005 to address the changing economics of N use in corn production. Although corn yield response to N has not changed, the rates of N that result in maximum economic return at prevailing corn and nitrogen prices have fluctuated in recent years. Implementation of MRTN N rate guidelines for corn in Wisconsin will be promoted and strengthened by corn N response experiments to evaluate the performance of MRTN N rate guidelines in a range of corn production environments.

1) Site Selection:

- a) Medium yield potential soils (MYPS) with previous crop soybean are the highest research priority, but other soils and previous crops will make valuable contributions.
- b) Previous crops: corn, soybean, small grains, alfalfa/clover (both 1st and 2nd year corn), or vegetables.
- c) Fields with a history of manure or biosolids application in the last three years can be used, but are not preferred.
- d) Do not select 1st or 2nd year corn after alfalfa fields if manure was applied.
- e) **Do not select fields with recent manure application or 1st or 2nd year corn after alfalfa, if adding manure as one treatment in this year's MRTN plots.**
- f) Before deciding to conduct on-farm research at sites which have a recent history of legumes and/or manure, it is critical that you have precise quantitative information about the manure and/or legume N sources in order to calculate accurate book value N credits from these sources

g) Uniform soils typically used for corn production.

2) Site History:

- a) Soil name and texture.
- b) Nearest city/town (for weather station information).
- c) Five-year crop and N rate/source history.
- d) Five-year manure history, application rates, and analysis.

3) Current Year Management and Weather:

- a) Tillage and surface residue cover after planting.
- b) Corn hybrid, relative maturity, planting date.
- c) Manure - precise quantitative information.
- d) Legume - precise quantitative information.
- e) Fertilizer N treatment application date, rates, placement, source.
- f) Other fertilizers applied including starter, rate, analysis, and placement (Note: starter N rate should not exceed 20 lb N/acre).
- g) Growing season weather conditions.

4) Soil Sampling:

- a) Routine soil test results (pH, organic matter, P and K).
 - i) Collect one sample consisting of at least 10 cores to a depth of 6 to 7 inches from each replication in the experiment.
- b) Preplant soil nitrate test (PPNT).
 - i) Collect one sample consisting of at least three cores from the 0-1 and 1-2 ft depths from the control (no N fertilizer applied) treatment in each replication in the experiment (3 samples/depth = 6 samples total if 3 replications).
- c) Presidedress soil nitrate test (PSNT).
 - i) When corn is 6 to 12 in. tall, collect one composite sample consisting of at least five cores from the 0-1 ft depth from the control (no N fertilizer applied) treatment in each replication in the experiment (3 samples total if 3 replications).
- d) How to submit soil samples.
 - i) Samples must be sent to the University of Wisconsin Labs at Madison or Marshfield.
 - ii) Accounts will be/have been set up to cover costs.
 - iii) Results will be returned to the cooperator and must be entered in the data collection Excel file.

5) Preharvest Stand Count:

- a) Pre-harvest stand count (number of plants in at least 50 ft of row in each replication).

6) Yield Results:

- a) Harvest methods.
 - i) Yield monitor (calibrated).
 - ii) Weigh wagon.

- iii) Hand harvest (minimum of two 25-ft lengths of row).
- b) For all methods, data must include yield (bu/acre at 15.5%) and % grain moisture.

7) Experimental Design:

- a) Randomized complete block design with three replications (See example plot diagram). Plot size is flexible. Harvested area must be the same in all replications.
- b) Treatments
 - i) Medium yield potential soils (MYPS): 0, 40, 80, 120, 160, (200) lb N/acre
 - ii) High yield potential soils (HYPS): 0, 40, 80, 120, 160, 200 lb N/acre
 - iii) If 1st year corn after alfalfa or high rates of manure (to supply nearly all N need), then the top N rate can be dropped. There should be no fewer than 5 N rates (including zero).
 - iv) Manure (treated or raw) can be used as an additional treatment. Choose a manure application rate that will supply approximately 75% of the total available N required. No additional N fertilizer should be applied to this treatment. A manure sample should be taken for analysis and exact application rate noted. This treatment still needs to be replicated and randomized.
- c) Nitrogen treatment application timing
 - i) Timing should be selected to minimize N losses on the soil at the experimental site.
 - ii) On medium- and fine-textured soils, preplant N applied within approximately 2 weeks of planting is acceptable if N treatments can be relocated after planting.
 - iii) Other times of N application may include post plant pre-emergence, or sidedress (may include split sidedress applications).
- d) Nitrogen sources
 - i) Urea or 28-32% UAN solutions must be injected or incorporated within 24 hours of application.
 - ii) Anhydrous ammonia, ammonium nitrate, ammonium sulfate are also acceptable N sources
- e) Manure timing and source
 - i) Manure can be applied in the fall or spring preplant or sidedress. If preplant applications are made, be sure to flag the plots so that N fertilizer treatments do not get applied in these areas.
 - ii) Any manure source can be used. Manure spreaders need to be calibrated and the application rate noted.

8) Data Collection:

- a) Complete the data collection Excel file. This file provides a template for all of the site information and yield data that is needed. The Excel file can be found at: <http://www.soils.wisc.edu/extension/onfarmdemo/>
- b) The data collection file should be named in the following manner: county-year-N rate trial.xls
Example: Dane-Laboski-2011-N rate trial.xls
- c) Email the completed data collection file to Todd Andraski (andraski@wisc.edu)

Example Plot Diagrams

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

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

OR

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