United States Department of Agriculture
Natural Resources Conservation Service

Water Quality Enhancement Activity – WQL08 –Apply Split Applications of Nitrogen Based on a Pre-Sidedress Nitrogen Test on Cropland

Enhancement Description
The use of a Pre-Sidedress Nitrogen Test (PSNT) to determine the need and/or rate of additional nitrogen to be applied during a sidedress application.

Land Use Applicability
This enhancement is applicable on corn grown on cropland.

Benefits
Sidedress applications of ammonia-N based on a PSNT may lower the total amount of ammonia fertilizers applied, therefore controlling the conversion of ammonia to nitrate and ultimately to nitrogen gas through nitric oxide (an ozone precursor) and nitrous oxide (a greenhouse gas). Nitrate, while taken up by plants as a nutrient, is also unstable in soil and can move with water through the soil into surface and ground water. Also, the above conversion processes produce nitrous oxide as a byproduct. Nitrous oxide is a potent greenhouse gas which has 310 times the global warming potential of carbon dioxide on a molecular basis. Using split applications of ammonia-N based on a PSNT will help to reduce nitrate contamination of surface and ground water, and reduce an enterprise's nitrous oxide emissions, improving its overall greenhouse gas footprint.

The PSNT is primarily used to test if side-dress N fertilizer is needed on fields with a history of manure application. PSNT attempts to:

- Gauge the pool of potentially mineralizable organic N in the soil, and
- Link that pool with a likelihood of a yield response from additional N fertilizer at side-dressing time.

Criteria for Applying Split Applications of Nitrogen Based on a Pre-Sidedress Nitrogen Test on Crop Land

Where to use the PSNT:

- Corn fields, 2 years or more after a sod where the manure rate or mineralization rate is uncertain.
- Where calculations indicate that the full complement of manure was not applied to meet the expected N needs of the crop.
- Cases where N mineralization rates are expected to be higher than average.

- When there is uncertainty as to whether enough manure was actually applied to meet expected corn crop N requirements.

Where not to use the PSNT:

- Corn fields that had pre-plant / early post-plant broadcast fertilizer N applications (other than <40 lbs starter N/acre in the band).
- Corn fields that are first year corn after modest amount of alfalfa with grass. No yield response is expected from side-dress N, therefore there is no need to conduct PSNT.

Additional Criteria:

1. Producer must currently apply ammonia-based nitrogen fertilizer as part of the cropping system.
2. Producer must have a current soil test (no more than 5 years old).
3. Producer must have a Pre Side-dress Nitrogen Test (PSNT)
4. Nutrient application rates are within the "Land Grant University" recommendations based on soil tests and established yield goals considering all nutrient sources.
5. For full implementation of this enhancement, the producer shall apply crop nutrients using two or more separate applications during each cropping season in a rotation following the recommendations of the PSNT for all annual corn crops. If the PSNT indicates that no additional nitrogen fertilizer is needed, no additional nitrogen shall be applied.
6. Soil surface disturbance shall be minimized.

Documentation Requirements for Applying Split Applications of Nitrogen Based on a Pre-Sidedress Nitrogen Test on crop land

1. Written documentation for each year of this enhancement describing the following items:
   - Recommendations from the PSNT
   - Dates of application of nutrient applications to provide evidence of split applications
   - Type(s) of nutrients (fertilizer and organic) applied
   - Treatment area(s)
   - Soil test results
   - Crops grown and yields (both yield goals and measured yield)
   - Calibration of application equipment

2. A map showing where the enhancement is applied.

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State Criteria

This supplement is specific to how to conduct sampling and how to interpret the analysis report.

- Nutrient application rates are within University of Nebraska recommendations based on soil tests and established yield goals considering all nutrient sources (refer to Practice Standard 590 & S-590).
- All soil samples must be taken prior to applying fertilizer or manure.

Sampling Procedure & Analysis - (Refer to Practice Specifications for Nutrient Management (S-590) or Iowa State University Extension "Nitrogen Fertilizer Recommendations for Corn in Iowa" (Pm-1714).

1. Soil samples for the PSNT should be taken to a depth of 12 inches when the corn is 6 to 12 inches tall.
2. Collect a minimum of 15 cores for each sample according to the following. If the field has had manure applied, 20-25 cores should be collected.
    a. Samples should be collected for each management zone and should never represent an area greater than 40 acres. Guidance for stabling management zones can be found in NebGuide "Guidelines for Soil Sampling" (G1740) or S-590, Section 2 "Defining Soil Sampling & Nutrient Budget Areas".
3. Immediately send samples to laboratory for nitrate analysis. Analyses should be conducted by laboratories that have successfully met the requirements and performance standards of the Soil Science Society of America.

Interpretation:

Manure soils, first-year corn after alfalfa and second-year corn after alfalfa – Soils that have received recent application of animal manures or have decaying sods with alfalfa roots seem to mineralize more plant-available N after the time of soil sampling than do other soils. These soils are treated as a separate category when making N fertilizer recommendations. These recommendations are given in Table 1.

1. The first step for making recommendations from table 1 is to decide whether the top half of the table or the lower half of the table best describes the current prices for grain.

Table 1 Nitrogen fertilizer recommendations for manure soils[a] and corn after alfalfa

Grain & Fertilizer Prices	Soil Test Nitrate	Recommended N Rate	
		Excess[b] Rainfall	Normal Rainfall
	(ppm N)	--------Lb. N/ acre-------	
Unfavorable (1 bu buys 7 lb. of N)	0-10	90	90
	11-15	0	60
	16-20	0	0[c]
	>20	0	0
Favorable (1 bu buys 15 lb. of N)	0-10	90	90
	11-15	60	60
	16-25	0	30
	>25	0	0

[a]A field should be considered manured if animal manures wee applied with a reasonable degree of uniformity since harvest of the previous crop or in 2 of the past 4 years.
[b]Rainfall should be considered excess if rainfall in May exceeded 5 inches.
[c]Addition of 30 lb. N/acre may have no detectable effects on profits, but producers could reasonably elect to apply this rate.

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2. The second step is to decide whether the "excess rainfall" column or the "normal rainfall column of the table best describes weather conditions before the soils were sampled.
3. The third step is to use the results of the soil test to select the appropriate N rate specified. Interpolation between specified N rates is appropriate when site conditions fall between those given.

Corn after soybean and corn after corn

1. The first step in making a fertilizer recommendation for this crop category is to select a critical concentration for nitrate (i.e. the concentration that distinguishes between adequate and inadequate supplies of available N). A critical concentration of 25 ppm-N is appropriate in absence of additional information.
2. The second step is to adjust the critical concentration if excess rainfall occurred at the site shortly before the soils were sampled. Reducing the critical concentration by 3-5 ppm is advised if rainfall is more than 20 percent above normal amounts between April 1 and time of soil sampling.
3. The third step is to estimate fertilizer needs by subtracting the concentration of soil-test nitrate (ppm-N) from the chosen critical concentration (ppm-N). This value is then multiplied by 8. A factor of 8 is used because studies have shown that it usually takes about 8 lb. of N/acre before planting to increase soil-test nitrate-N by 1 ppm.
    - Example: A soil test of 15 ppm and critical concentration of 25 ppm results in a recommendation of 80 lb. of N per acre to be applied.
      (25 ppm – 15 ppm) x 8 = 80 lb. N/acre needed.

Documentation Requirements:

1. Provide a map indicating where the activities are applied.
2. Provide copies of soil test reports.
3. Provide copy of PSNT recommendation.
4. Provide copies of manure analysis results (if applicable).
5. Complete the table for nutrient and fertilizer application on the following page.
6. Complete the fertilizer/application equipment type and calibration date on the following table:

Type of Equipment	**Date of Calibration**
Liquid Applicator	*3/1/09*

I certify that the following information meets specifications and has been provided to NRCS:

1. Written documentation of the activity performed per documentation requirements..
2. Copies of dated receipts for equipment or services purchased.

I understand that it is my responsibility to obtain all necessary permits and to comply with all laws, regulations and ordinances pertaining to the application of these activities.

Certified by: _____ **Date:**_____

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Field Information				Commercial Fertilizer and Manure Information									
Tract & Field	Acres	Crop & Yield	Date of last soil test (m/d/yr)	Date Applied (m/d/yr)	Form of Commercial Fert. or Manure	Rate (lb/a)	Application Method	If Manure, Days to Incorp.	N Avail. (lb/a)	P Avail. (lb/a)	Total N Avail. (lb/a)	Total P Avail. (lb/a)
T1234 & F1	*78.9*	Crop	PSNT 5/21/09	11/30/08	Beef Solids	16 T/a	broadcast	No incorp.	64	656	154	656
		Corn		5/1/09	28-0-0 liquid	10 gal/a	broadcast	na	30	0		
		Yield		6/15/09	28-0-0 liquid	20 gal/a	broadcast	na	60	0		
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