United States Department of Agriculture
Natural Resources Conservation Service

2011 Ranking Period 1

Water Quality and Air Quality Enhancement Activity – WQL08 – Split applications of nitrogen based on a PSNT or other crop-based indicators

Enhancement Description
Using pre-sidedress soil nitrate test (PSNT), tissue testing, or chlorophyll meters to determine the need and/or amount of additional nitrogen to be applied during a sidedress/topdress N application.

Land Use Applicability
Cropland.

Benefits
Efficient use of nitrogen (N) fertilizer is important for economical crop production as well as water and air quality enhancement. Split sidedress or topdress applications of fertilizer N improve the efficiently of nutrient uptake and protect water and air resources. Pre-plant soil test nitrogen analysis can be poorly correlated with growing season soil N availability and often does not provide sufficient insight upon which to base sidedress or topdress N applications. Additionally, sidedress or topdress applications of N based on a PSNT, tissue tests, or handheld chlorophyll meter tests may lower the total amount of fertilizer applied, including ammonia fertilizer, minimizing ozone damage and greenhouses gases. Nitrate, while required by plants as a nutrient, is unstable in soil and can move with water through the soil into surface and ground water. Using split applications of N based on a PSNT, tissue tests, or chlorophyll meter tests will minimize nitrate contamination of surface and ground water, improve N use efficiency, and reduce harmful N emissions, improving the overall greenhouse gas footprint.

Criteria
The **PSNT** is primarily used for corn crops to test if additional N fertilizer is needed (sidedress application) on fields with a history of manure application, sewage sludge, or other residual organic products or where a legume crop or a legume cover crop has been grown. PSNT attempts to:

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

Tissue testing is commonly used for crops where growing season nitrogen applications are made through drip or sprinkler irrigation systems, where growers may utilize high-nitrogen manure (i.e. vegetable production), where weekly adjustments in fertilizer are needed, or where crop nutritional problems may be suspected. Tissue Testing is completed:

a. At various times of the growing season when nutrient supply (or availability) may limit crop quantity or quality, and
b. Guides growers in deciding whether supplemental N application is needed

Chlorophyll meters (there are two types – reflectance type and transmission/absorption type) are used to measure chlorophyll content of a crop (which correlates closely to leaf N) to determine if additional topdress or sidedress N is needed. Chlorophyll Meter Testing is:

a. A pre-sidedress or topdress test completed at the critical time just before the major N demand by the crop, and
b. Predicts a yield/quality response from additional N fertilizer at sidedress time

Requirements for Applying Split Applications of Nitrogen Based on a PSNT, tissue tests, or chlorophyll meter tests on cropland

1. Use PSNT on corn fields, 2 years or more after a sod where the manure rate or mineralization rate is uncertain.
2. Where calculations indicate that the full complement of manure was not applied to meet the expected N needs of the crop.
3. In cases where N mineralization rates are expected to be higher than average.
4. When there is uncertainty as to whether enough manure was actually applied to meet expected N requirements.
5. Conduct PSNT when corn is 6-12 inches tall from the soil surface to top of canopy (or other based on land grant university guidelines and recommendations). Representative samples should be collected from the 0-12 inches depth (one composite sample should contain approximately 30-40 soil cores).
6. Tissue and chlorophyll tests require numerous measurements that will be representative of a particular field.
7. Tests must be timed so that applied nitrogen will be at the root level or else be utilized by the plant at the critical time (i.e. before jointing begins for small grains).
8. Time the tests so that there will be enough moisture to move applied nitrogen into root zone (this does not apply to foliar N applications).

Use Tests with Caution where:

a. On corn fields that are first year corn after legumes. Be sure to account for N that will become available from previous crop.
b. Where composts, cover crops, or manures, have been applied (i.e. organic production). Be sure to account for N that will become available during the growing season from the previous crop.

Additional Requirements

1. Producer must currently apply all nitrogen fertilizer pre-plant as part of the cropping system.

2. The producer must apply crop nutrients using two or more separate applications during each cropping season in the rotation, following the recommendations of PSNT, tissue tests, or chlorophyll tests, for annual crops. If the PSNT of quick tests (tissue or chlorophyll tests) indicate that no additional nitrogen fertilizer is needed, then no nitrogen fertilizer will be applied.
3. Nutrient application rates must be within the "Land Grant University" recommendations based on soil tests and established yield goals considering all nutrient sources.
4. Soil surface disturbance shall be minimized.

Documentation Requirements

Written documentation for each year of this enhancement describing the following items:

1. A map showing where the enhancement is applied.
2. Recommendations from the selected tests.
3. Dates of split nutrient applications.
4. Type(s) of nutrients (fertilizer and organic) applied including rate, form and timing.
5. Treatment area(s)
6. Soil test results, if PSNT is used
7. Crops grown and yields (both yield goals and measured yield)
8. Calibration of application equipment

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Document timing and number/locations of samples collected, Nitrogen fertilizer type, formulation, timing, method and rate of application.

PSNT and Soil Test must be from an accredited laboratory.

Additional References:

The Presidedress Soil Nitrate Test. UW Extension Publication A3630
http://learningstore.uwex.edu/

Sampling Soils for Testing: UW Extension Publication A2100
http://learningstore.uwex.edu/

UW Madison Soil & Plant Analysis Lab:
http://uwlab.soils.wisc.edu/madison/index.htm?../fees.htm&contents.asp?menu=1