Water Quality Enhancement Activity – WQL04 – Plant tissue tests and analysis to improve nitrogen management

State Criteria (same as NATIONAL CRITERIA)
Additional Criteria for Nebraska
This enhancement requires a current soil test and the use of one of the three tissue testing options listed below.

Soil Sampling and Analysis

1. Soils shall be sampled and analyzed in accordance with Practice Specification for Nutrient Management (S-590) or NebGuide (G1740) "Guidelines for Soil Sampling".
2. All soil samples must be taken prior to applying fertilizer or manure.
3. If applicable, manure shall be sampled and analyzed annually following University of Nebraska recommendations. See NebGuide (G1450) "Sampling Manure for Nutrient Analysis" and NebGuide (G1780) "Manure Testing: What to Request".
4. Nutrient application rates are within University of Nebraska Lincoln (UNL) recommendations based on soil tests and established yield goals considering all nutrient sources (refer to Practice Standard 590 and Practice Specification (S-590) for Nutrient Management).

Cornstalk Nitrate Testing and Analysis

Sampling Procedures & Analysis:

1. Stalks should be sampled between one and three weeks after black layers have formed on 80% of the kernels.
2. Each sample will consist of fifteen 8-inch stalk segments taken from 6 inches above the soil surface:
    a. Samples should be collected for each management zone and should never represent an area greater than 40 acres. Guidance for establishing management zones can be found in NebGuide (G1740) "Guidelines for Soil Sampling" or Specification for Nutrient Management (S-590), Section 2 "Defining Soil Sampling & Nutrient Budget Areas".
3. Wrap samples in paper, rather than plastic, to avoid mold growth.
4. 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 of the Test Results

1. Use the following table to determine management suggestions. If any of the results are in either the low or excess category, conduct a thorough review of the nitrogen fertilization program to determine where improvements could be made.

Plant Nitrogen Status	Stalk Nitrate (ppm)	Management Suggestions
Low	0-250	High probability that Nitrogen is deficient
Marginal	250-700	Nitrogen Management should be re-evaluated
Optimal	700-2000	Yields are not limited by Nitrogen
Excessive	Greater than 2000	Nitrogen supply greater than needed.

2. Refer to Practice Specifications for Nutrient Management (S-590), UNL NebFact NF01-49 "*The Corn Stalk Nitrate Test*" available at: http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=2027&context=extensionhist

or Iowa State University Extension Publication PM 1584 "*Cornstalk Testing to Evaluate Nitrogen Management*" available at: http://www.extension.iastate.edu/Publications/PM1584.pdf.

Real Time Monitoring of Crop Nitrogen Status using a Chlorophyll Meter

The chlorophyll meter allows fine-tuning nitrogen management by monitoring leaf greenness throughout the growing season allowing early detection of potential nitrogen deficiencies so that they may be corrected before a yield reduction occurs. They work best for situations were nitrogen can be incrementally applied to the growing crop, such as with fertigation, but can also be used to time the application of supplemental nitrogen using high clearance application equipment.

1. Apply ½ to ¾ the recommended nitrogen rate prior to planting.
2. Fertilize reference strips within the field with the full recommended rates plus 20%.
3. Multiple reference strips should be established across the field to account for in-field variability.
4. Measure canopy nitrogen status beginning at the V10-V12 growth stage using the following procedure and monitor crop status on a weekly basis until tassel or until no additional nitrogen will be applied.

Sampling Procedures & Analysis:

1. Chlorophyll meter readings should be compared at a minimum of three locations in each field.
2. At each location, the average reading of 30 plants from the reference area and the adjacent bulk field should be compared. Avoid taking readings from plants that do not represent typical plant spacing.
3. The same leaf should be sampled from each plant. Avoid very old and very young leaves.
4. Take reading on about the same location on each leaf. It works well to collect the reading from a point one-half the distance from the leaf tip to the collar, and halfway between the leaf margin or edge and the leave midrib.

Interpretation of Chlorophyll Meter Readings:

1. After recording the average meter readings from the bulk field and reference area at several location in each field, a N sufficiency index can be calculated as follows:

$$\text{Sufficiency Index} = \frac{\text{Average Bulk Reading}}{\text{Average Reference Strip Reading}} \times 100\%$$

2. UNL Extension indicates that experience shows that a sufficiency index lower than 95% indicates an N deficiency that should be corrected or it may lead to a yield reduction.
3. If nitrogen can be applied incrementally to the growing crop, apply nitrogen in 20-40 lb increments and continue to monitor crop status on a weekly basis until tassel. Otherwise, apply enough additional nitrogen to meet UNL recommendations.
4. For additional information refer to UNL NebGuide (G1632) "Using a Chlorophyll Meter to Improve N Management".

Plant Tissue Testing & Analysis

Plant tissue analysis can be an important tool in diagnosing crop growth problems and, when coupled with soil testing, useful in refining nutrient inputs. The primary limitation with this method is the lag time from submitting the sample to the lab and getting the results.

Sampling Procedures & Analysis:

1. Collecting and appropriate, representative plant sample is essential for accurate lab analysis. Multiple sub-samples should be collected at random from representative areas in the field and combined into a single sample for analysis (follow the same protocol you would for collecting soil samples). If sample size is too large, cut plant parts into smaller sections, mix thoroughly, and collect a sub-sample to send in for analysis.
2. For corn prior to tassel the youngest mature leaf from 15-20 plants should be collected for a sample.
3. Dirty or dusty samples should be *lightly* rinsed to remove soil particles from the tissue surface. Do not over-rinse as soluble nutrients may be leached out.
4. Samples should be air dried or placed in a paper bag for shipping.
5. Contact the laboratory doing the analysis for additional information on sampling and analysis.

Documentation Requirements (SEE NATIONAL ENHANCEMENT ACTIVITY JOBSHEET)

Additional State Documentation Requirements:

1. Provide a map indicating where the activities are applied.
2. Complete the nutrient and fertilizer application table on the following table.
3. Provide copies of the following tests:
    a. Soil test results for treatment areas,
    b. Stalk test or leaf tissue test results including reference strips,
    c. Manure analysis results (if applicable).

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:_____

United States Department of Agriculture
Natural Resources Conservation Service

Field Information		Test Information		Commercial Fertilizer and Manure Information								
Tract Field &, Acres	Crop & Yield	Indicate Type of test & date	Test Date(s) (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)
Ex. T1234 & F1	*Crop*	*Stalk test 9/15/09*	*9/10/09*	*11/30/08*	*Beef Solids*	*16 t/a*	*Broadcast*	*No incorp.*	*64*	*656*	*170*	*656*
79.8 ac	*Irrigated Corn*			*3/30/09*	*32-0-0 liquid*	*15 gal/a*	*Broadcast Pre-plant*	*na*	*53*	*0*		
	Yield			*5/25/09*	*32-0-0 liquid*	*15 gal/a*	*Broadcast Post-emergence*	*na*	*53*	*0*		
	200											
	Crop											
	Yield											
	Crop											
	Yield											
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