

Water Quality Enhancement Activity – WQL11 – Precision Application Technology to Apply Nutrients



Enhancement Description

The use of precision agriculture technologies to apply nutrients to fit variations in site-specific conditions found within fields.

Land Use Applicability

This enhancement is applicable on cropland and pastureland.

Nutrient Management Benefit

Precision agriculture methods are used to collect information needed to more precisely evaluate production input factors, accurately

predict crop yields, and precisely apply variable rates of nutrients. The primary benefit of precision agriculture techniques is the use of accurate information about within field variability to minimize nutrient losses and optimize inputs. Done properly this helps to protect surface and ground water resources while maximizing net production.

Criteria for Applying Precision Application Technology to Apply Nutrients

Implementation of this enhancement requires the use of nutrient management techniques. This enhancement requires:

- 1) The use of the following precision agriculture practices:
 - Variable rate technologies (VRT) for nutrient application- Computer-controlled equipment that adjusts fertilizer applications based on soil maps, vegetative indexes, or yield maps, etc. used to create management zones. Nitrogen, phosphorus and potassium fertilizer will be applied according to Land Grant University recommendations in the management zones.
 - Yield monitoring systems - Yields in the field are measured using combine-mounted sensors or volume meters. A GPS receiver mounted on the combine is required to correlate field location with yield to create a yield map.
- 2) Soil samples for nutrient analysis are taken based on soil management zones or on a maximum of a five acre grid
- 3) Base nitrogen application rates on a real time analysis of crop nitrogen needs. Examples include in season aerial photography and in field equipment based chlorophyll sensors.
- 4) Producer must have current soil tests for P and K (and Nitrogen where applicable) that are no more than 3 years old



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- 5) Nutrient application rates must be within the “Land Grant University (LGU) recommendations based on soil testing and established yield goals and considering all nutrient sources.

Documentation Requirements for Applying Precision Application Technology to Apply Nutrients:

- 1) Documentation for each Treatment area (field) and year of this enhancement describing these items:
 - Treatment acres
 - Crop grown in each treatment area
 - Soil sampling protocol (grid or zone) for each treatment area
 - Number of soil samples taken per treatment area
 - Soil test results
 - Calibration of fertilizer application equipment
 - Nutrient application rates/amounts and application dates for each treatment area
 - When using NDVI, provide an as-applied digital map of nutrients applied

- 2) A map showing where the activities are applied.

References

Precision Agriculture in the 21st Century: Geospatial and Information Technologies in Crop Management; National Research Council (U.S.). Committee on Assessing Crop Yield: Site-Specific Farming, Information Systems, and Research Opportunities, National Research Council Published by National Academies Press, 1997; ISBN 0309058937, 9780309058933; 149 pp.

Precision Farming, An Introduction, G.C. Rains and D.L. Thomas. Cooperative Extension Service, The University of Georgia College of Agriculture and Environmental Sciences; (<http://pubs.caes.uga.edu/caespubs/pubcd/B1186.htm>).

Follett, R.F. 2001. Nitrogen Transformation and Transport Processes. pp. 17-44, In R.F. Follett and J. Hatfield. (eds.). 2001. Nitrogen in the Environment; Sources, Problems, and Solutions. Elsevier Science Publishers. The Netherlands. 520 pp.

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State Criteria

- Variable Rate Technology (VRT) for nutrient application is computer controlled equipment that adjusts fertilizer application based on soil maps, vegetative indexes, or yield maps, etc. used to make management zones.
- Yield monitoring systems are yields in the field that are measured using combine-mounted sensors or volume meters. A GPS receiver mounted on the combine is required to correlate field location with yield to create a yield map.
- Geo-referenced (GIS) zone management, grid soil sampling or a combination of the two methods will be used (i.e. deep nitrate soil sampling on zone management, and surface soil test for grid sampling).
- Grid soil sampling areas (grids) will be 5 acres or less and geo-referenced zone management soil sampling areas (zones) will be 20 acres or less.
- Geo-referenced zone management, will use soil sampling zones based on GIS yield maps and/or infrared maps, similar cropping practices (i.e. past crops, manure and fertilizer management) and similar site and soil conditions throughout the entire zone (i.e. similar soil texture, soil color, organic matter, slope drainage, etc.)
- Soils shall be sampled and analyzed in accordance with Practice Specification for Nutrient Management (S-590) or NebGuide “Guidelines for Soil Sampling” (G1740).
- All soil samples must be taken prior to applying fertilizer or manure.
- If applicable, manure shall be sampled and analyzed annually in accordance with Practice Standard 633 – Waste Utilization and Nebfact “Manure Testing: What to Request” (NF02-507).
- 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 and Practice Specification (S-590) for Nutrient Management).
- Real time nitrogen management bases nitrogen application rates on crop nitrogen status during the growing season as determined by diagnostic tools such as chlorophyll meters, in-season aerial photography, or vehicle mounted sensors.
 - Use zone soil sampling to determine target nitrogen rates for the field.
 - Prior to or at planting apply a portion (20-30%) of the nitrogen requirement for the crop.
 - Fertilize check strips within the field with the full recommended rates.
 - Measure canopy nitrogen status at the V10-V12 growth stage using the selected diagnostic tool and apply nitrogen accordingly.
 - Nitrogen can be applied using high clearance fertilizer application equipment or an irrigation system capable of applying fertilizer during the growing season.
 - For additional information refer to Extension Circular EC163 – “Site-specific Nitrogen Management for Irrigated Corn” or NebGuide G1632 – “Using a Chlorophyll Meter to Improve Nitrogen Management.”



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Documentation Requirements

1. Provide a map indicating where the activities are applied.
2. Provide copy of the soil sampling protocol (grid or zone).
3. Provide a copy of the soil test results.
4. Provide copies of manure analysis, if applicable.
5. Complete the nutrient and fertilizer application table on the following page.
6. Provide a copy of the as-applied digital map of nutrients applied.
7. Complete the fertilizer/application equipment type and calibration date on the following table:

Type of Equipment	Date of Calibration

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 Application Information									
Tract & Field	Acres	Crop & Yield	Type of Soil Test (Grid or Zone) & no. of samples	Date Applied (m/d/yr)	Form	Rate (lb/a)	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	Grid - 32 samples										
		Yield											
		212											
		Yield											
		Crop											
		Yield											
		Crop											
		Yield											