

## 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

Cropland, Pastureland

### Benefits

Precision agriculture methods are used to collect information needed to more precisely evaluate production input factors, accurately record crop yields, and precisely apply

variable rates of nutrients. The primary benefit of precision agriculture techniques is the use of detailed information about within field variability to maximize nutrient use efficiency. Done properly this helps to protect surface and ground water resources.

### Conditions Where Enhancement Applies

This enhancement applies to crop or pasture land use acres where:

- Crop or forage yields can be monitored and correlated to positions in the field in order to produce a geographically accurate yield map.
- Nutrients can be applied according to geographically defined management zone(s) (DMZ).

### Criteria

Implementation of this enhancement requires the use of precision agriculture technologies for nutrient management. This enhancement requires the following activities:

- a. Variable rate technologies (VRT) for nutrient application. This means computer-controlled equipment that adjusts fertilizer applications based on DMZ.
- b. The use of yield monitoring systems. Measure yields in the field using combine-mounted sensors, volume meters or other suitable technologies. Use a GPS receiver with the equipment to correlate field location with yield to create a yield map.
- c. Sample soils for nutrient analysis shall be based on DMZs.
- d. As a minimum, use yield monitoring data and soils data to create DMZs maps. Apply all nutrients according to the requirements of the DMZ based on yield expectations from yield monitoring.
- e. Soil tests for P and K must be no more than 3 years old. If soil or plant tissue tests are used for variable rate nitrogen application, the tests shall be current.
- f. All nutrient application rates must not exceed the “Land Grant University (LGU) recommendations for the target yield expectation.



Exception: In lieu of yield monitor data for crops that are not harvested using a geospatial component measurement system; work with your NRCS State Agronomist to use a method similar to the following procedure in order to implement this enhancement:

- a. Identify a realistic yield expectation (RYE) goal for the entire field-typically a 3 yr average.
- b. Define the DMZs in the field and a RYE goal for the DMZ.
  - i. This is accomplished by identifying a measured yield determining factor per DMZ (i.e., specific factor from a soil test result that correlates to yield).
- c. Using the DMZ RYE, calculate a weighted average yield goal for the field.
- d. As a check, the weighted average field RYE cannot be greater than the RYE goal for the entire field. But a single DMZ RYE can exceed the field RYE.
- e. The DMZ RYE becomes the replacement for yield monitor data.

### **Adoption Requirements**

This enhancement is considered adopted when the system as described in the criteria above have been implemented on the land use acreage. This includes the development of DMZs and the application of nutrients according to the requirements of the DMZ.

### **Documentation Requirements**

Documentation for each field where this enhancement is applied:

1. A map showing the fields where the enhancement is applied,
2. Crops grown in each field and maps with yield monitoring results,
3. Soil sampling protocol,
4. Soil test results,
5. Map(s) showing management zones for each field,
6. Calibration of fertilizer application equipment, and
7. Nutrient application rates/amounts and application dates for each DMZ.

Note: In lieu of documenting each individual item listed in the Documentation Requirements, a Certified Crop Advisor plan that contains each of the items may be substituted.

### **References**

International Plant Nutrition Institute (IPNI). 2012. 4R Plant Nutrition – A Manual for Improving the Management of Plant Nutrition (North American Version). IPNI, Norcross, GA.

Randall, G., J.A. Delgado and J.S Schepers. 2008. Nitrogen management to protect water resources. In Schepers and Raun (eds) Nitrogen in Agricultural Systems. SSSA Monograph. 49. Madison, WI. pp 911-945.

USDA-NRCS. 2010. Precision Nutrient Management Planning. Agronomy Technical Note. (TN) 190-AGR-3. Washington, DC.