Application of Variable Rate Technology in NRCS Programs

S. Corey Brubaker
State Conservation Agronomist
Nebraska NRCS

Environmental Quality Incentives Program (EQIP)

• EQIP is a cost-share assistance program to help producers implement a variety of conservation practices including nutrient management.
Environmental Quality Incentives Program (EQIP)

- The purpose of the nutrient management practice is to manage the amount, source, placement, form and timing of nutrients and soil amendments to minimize potential environmental impacts.

Environmental Quality Incentives Program (EQIP)

There are five nutrient management scenarios available through EQIP.

- Basic
- Basic – Organic
- Basic – Manure
- Enhanced
- Advanced Precision
Basic Nutrient Management

- Soil tests and record keeping are required.
- Soil samples will be taken on 40-acre grids or less.
- Required documentation:
  - Soil test results
  - Yield goals
  - Nutrient application rates
  - Source, timing and placement of nutrients applied
- Cost Share = $2.02/ac

Organic Nutrient Management

- Soil tests and record keeping are required.
- Soil samples will be taken on 40-acre grids or less.
- Manure and/or compost analysis
- Required documentation:
  - Soil test results
  - Analysis results of materials applied
  - P-index results
  - Yield goals
  - Nutrient application rates
  - Source, timing and placement of nutrients applied
- Cost Share = $10.70/ac
Basic Nutrient Management with Manure

- Soil tests and record keeping are required.
- Soil samples will be taken on 40-acre grids or less.
- Manure and/or compost analysis
- Required documentation:
  - Soil test results
  - Analysis results of materials applied
  - P-index results
  - Yield goals
  - Nutrient application rates
  - Source, timing and placement of nutrients applied
- Cost Share = $6.22/ac

Enhanced Nutrient Management

- Soil tests and record keeping are required.
- Soil samples will be taken on 40-acre grids or less.
- Requires that nutrients be split applied or the use of inhibitors or slow the release products.
- Requires use of in-season or post season nutrient tests such as the Pre-sidedress nitrate test or Corn Stalk Nitrate Test.
**Enhanced Nutrient Management**

- Required documentation:
  - Soil test results
  - Results of in-season or post season tests
  - Yield goals
  - Nutrient application rates
  - Source, timing and placement of nutrients applied
  - Whether or not an inhibitor was used

- Cost Share = $11.98/ac

---

**Advanced Precision Nutrient Management**

- Soil and/or plant tissue testing, record keeping, zone, grid or real-time sampling, and variable rate nutrient applications are required.

- Required Documentation
  - Soil test results
  - Results of additional tests
  - Management zone maps
  - Yield goals
  - Nutrient application rates/variable rate maps
  - Source, timing and placement of nutrients applied

- Cost Share = $18.63/ac
Conservation Stewardship Program (CSP)

- The Conservation Stewardship Program (CSP) is a voluntary conservation program that encourages producers to address resource concerns in a comprehensive manner by undertaking new conservation activities; and improving, maintaining, and managing existing conservation activities.

Conservation Stewardship Program (CSP)

- CSP participants receive an annual land use payment for the operation-level environmental benefits they produce. Under CSP, participants are paid for conservation performance: the higher the operational performance, the higher their payment.
Conservation Stewardship Program (CSP)

- Producers can increase their score by selecting practices or enhancements to address identified resource concerns or improve upon existing conservation measures.
- In the upcoming CSP sign-up there are 75 enhancements addressing a variety of resource concerns. Of those, at least four require some type of precision management.

Precision Management Enhancements

- AIR07 – GPS targeted spray application
- SQL01 – Controlled traffic system
- WQL11 – Precision nutrient application
- WQT01 – Irrigation system automation
GPS Targeted Spray Application

Enhancement Description:
- Utilize electronically-controlled or managed chemical spray application technology to more precisely apply agricultural pesticides to their intended targets.

Criteria:
- The implementation of this enhancement requires the use of GPS data loggers in order to document site-specific compliance with all label requirements for drift mitigation, and additionally, one or more of the following techniques:
  1) Precision guidance systems that reduce ground or aerial spray overlap to less than 12 inches
  2) Variable rate technologies (VRT) that allow the rate of pesticide application to dynamically change for site specific applications
GPS Targeted Spray Application

Additional Criteria:

3) “Smart sprayers” that utilize automatic sensors and computer controlled nozzles to turn individual nozzles on and off

4) Computer guided application systems that integrate real time meteorological data and computer model guidance to reduce pesticide drift from aerial application

5) Re-circulating spray technologies that capture and reuse overspray to reduce overall pesticide application rate and off-site spray drift

6) Electrostatic spray technologies to reduce overall application rate and off-site spray drift

GPS Targeted Spray Application

Documentation Requirements:

- Type of electronic spray control technology used
- Dates technology is used
- Acres treated
Controlled Traffic System

Enhancement Description:
• Controlled traffic confines heavy traffic from tractor drive wheels/tracks, combine wheels, fertilizer or manure spreaders and grain carts to specific lanes in crop fields year after year.

Controlled Traffic System

Criteria:
• Implementation of this enhancement requires the use of a controlled traffic system on annually planted cropland that includes the following:
  1) Limit wheel/track traffic to no more 50 percent of the row middles or a maximum of 50 percent of the area of the field.
  2) Wheel/track traffic is in the same lanes for all passes, all equipment and years.
  3) No tire or rubber track that is greater than 26 inches wide (for 30-inch rows). For 20-inch or 15-inch rows, use skip rows to provide space for primary tracks (36-inch maximum width tires/tracks for a 40-inch space).
Controlled Traffic System

Criteria:
- The minimum components required to maintain the controlled traffic system enhancement activity are:
  1) All equipment must cover the same width or multiples of that width
  2) Number of traffic lanes are minimized
  3) For full width tillage Geographic Positioning System (GPS) is required to maintain the designated traffic lanes
  4) For narrow width or drilled crops, a skip row system or GPS is required
  5) Do not deep till (> 4 inches) the controlled traffic paths.

Controlled Traffic System

Documentation Requirements:
- List of fields with controlled traffic system,
- Crops rotation for the fields,
- Equipment used,
- Row spacing and number of planter units,
- Planting width for drills,
- Wheel/track spacing and operational width for tractors, combines, grain carts, harvesters, sprayers, manure spreaders, etc. Tires on planters and drill can be ignored, and
- Sketch of the traffic paths and wheel/track spacing.
**Precision Nutrient Application**

Enhancement Description:

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

**Precision Nutrient Application**

Criteria:

- This enhancement requires the following activities:
  1) Variable rate technologies (VRT) for nutrient application.
  2) The use of yield monitoring systems to create a yield map.
  3) Sample soils for nutrient analysis shall be based on defined management zones (DMZs).
  4) As a minimum, use yield monitoring data and soils data to create DMZ maps.
Precision Nutrient Application

Criteria:

4) Apply all nutrients according to the requirements of the DMZ based on yield expectations, soil test results and/or crop monitoring.

5) 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.

6) All nutrient application rates must not exceed the “Land Grant University (LGU) recommendations for the target yield expectation.

Precision Nutrient Application

Documentation Requirements:

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 & soil test results

4) Map(s) showing management zones for each field

5) Calibration of fertilizer application equipment

6) Nutrient application rates/amounts and application dates for each DMZ
Irrigation System Automation

Enhancement Description:

- This enhancement entails using GPS guided variable rate irrigation or other innovative technologies that allow irrigation water application based on variable site conditions within a field.

Irrigation System Automation

Criteria:

- Implementation of this enhancement requires compliance with the requirements of the Irrigation Water Management Conservation Practice Standard
- Development and utilization of an irrigation prescription based on soil characteristics, topography, or crops.
  a. Use of a GPS guidance and control system which will provide for the variable application of irrigation water based on variations of soils, topography, or crops; or
  b. Use of an automated control system based on technologies other than GPS which will provide for variable application of irrigation water based on variations of soils, topography, or crops.
**Irrigation System Automation**

Documentation Requirements:

- Documentation showing the operation of a variable rate irrigation system and how it accounted for variations of soils, topography, or crops, and
- Copy of the irrigation prescription and irrigation logs.

**Contact Information:**

S. Corey Brubaker  
Nebraska NRCS  
100 Centennial Mall N., Rm. 152  
Lincoln, NE 68508

ph. (402)437-4164  
e-mail: corey.brubaker@ne.usda.gov

Nebraska NRCS Website:  
www.ne.nrcs.usda.gov