

# 2017 Activity Sheet

## Nutrient Management Guidance for Variable Rate and Grid/Zone Soil Sampling

### Minimum Criteria to Qualify for Nutrient Management Options Nitrification/Urease Inhibitors, Variable Rate, Grid/Zone Soil Sampling, Soil Nitrate/Plant Tissue Test

Purpose: To minimize nutrient loss to the environment by following the guidelines of the Missouri Nutrient Management (590) conservation practice standard.

#### **General Criteria Applicable to All Options:**

- Follow the applicable Missouri NRCS Nutrient Management (590) conservation practice standard (<http://efotg.nrcs.usda.gov/treemenuFS.aspx>, | Section IV. Conservation Practices | Nutrient Management (590) | Nutrient Management Standard (590)).
- Soil samples used to make nutrient recommendations must be collected and analyzed according to conservation practice standard guidelines
  - Collect 12-24 soil cores from field areas of 20 acres or less, or no larger than 3 acres in the case of grid soil samples.
  - The soil sampling plan shall ensure that fields are sampled a minimum of every four years.
  - Soil samples used to develop a nutrient management plan shall be no more than two years old.
- Soil sample analysis for nutrient status must be performed by a Missouri Soil Testing Association (MSTA) approved laboratory. A current list of approved laboratories may be found at <http://soilplantlab.missouri.edu/soil/msta.aspx>.
- Laboratory testing methods for soil testing must be approved by University of Missouri-Columbia Extension. Approved soil testing methods may be found at <http://soilplantlab.missouri.edu/soil/recommendations.aspx>.
- All nutrient recommendations (nitrogen, phosphorus, and potassium) must be based on University of Missouri-Columbia Extension guidelines, unless MU does not provide these recommendations. In the absence of MU guidance, recommendations from other land-grant universities may be used. The official source of University of Missouri-Columbia recommendations is the **Recommendations Online** web-based tool found at <http://soilplantlab.missouri.edu/soil/scripts/manualentry.aspx>.
- Unless the activity guidelines specifically waive the requirement, all nutrient applications shall be within 10 percent of minimums stated in an applicable soil test recommendation, plus or minus 10 percent by individual nutrient. This guidance applies to both 20-acre subfield samples as well as grid soil samples.

*For additional information contact your local USDA Service Center.*

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- A budget of nutrients shall be developed for the contracted acres that specifies the nutrients recommended, utilized (crop removal), and residual in the soil *for the entire soil test cycle (4 years)*. Fields may be combined up to 80-acre areas for budgeting purposes, when soil test analyses for the fields are within 10 percent. If grid soil samples are collected, the budget shall be developed for the 20-acre field or combined field area using averaged soil sample analyses within the field area.
- Plans shall document the source, amount, timing, and method of application of nutrients from all sources, including manures and commercial fertilizers. A nutrient budget conforming to the requirements of the Nutrient Management (590) conservation practice standard shall be developed that considers all sources of nutrients (NPK).
- All recommendations must be based on realistic yield goals. Realistic yield goals shall be based on these criteria:
  - Actual yield data collected from the field for five or more years. Ignore highest and lowest years and calculate mean of the remaining three. Add 10 percent to the mean yield to allow for potential to improve yield.
  - Crop yield estimates from county soil survey adjusted by soil-based crop productivity indices. Crop productivity indices can be found in “Productivity of Missouri Soils,” published by NRCS.
  - County average yield data collected by the National Agricultural Statistics Service.
- Nitrogen from all sources will be credited when calculating total nitrogen to apply. Any nitrogen applied in phosphorus fertilizers such as MAP and DAP must be deducted from pre-plant nitrogen applications, and must be included in the nutrient budget.
- Nitrogen from previous legume crops shall be included in the nutrient budget and shall be deducted from the amounts of nitrogen required. Provide the source of data used to determine legume contributions.
- When the soil test results indicate that lime is needed, the nutrient management plan must show the timing and rates for the lime application. When the amount of lime needed is less than 600 pounds of ENM (Effective Neutralizing Material) the application may be waived.
- Fall applications of nitrogen fertilizer for spring-seeded crops are **not permitted** for any of the nutrient management options in this Activity with the specific exception of fall-applied anhydrous ammonia with nitrification inhibitor (see guidance in next section).

#### **Additional Criteria Specific to Nutrient Management with VRT or Grid/Zone Soil Sampling:**

- An individual grid soil sample typically represents two or three acres. Zone soil samples may represent larger areas smaller than 20 acres, the standard and maximum soil sampling area. The area represented by each soil sample shall be specified in planning documents.
- Each individual grid soil sample Laboratory methods and fertilizer recommendations must follow guidance from the University of Missouri-Columbia Extension Service.
- Regardless of the sample area chosen, each soil sample shall be comprised of no fewer than eight individual soil cores that are mixed together. A subsample can then be taken from the mixed soil cores.
- Commonly the fertilizer recommendations for individual soil samples are processed with software that interpolates between known recommendations at known locations (GPS locations, Lat/Lon, UTM, etc.) to estimate a recommendation from an unsampled location. The interpolation software usually creates a smoothed map of sampled and unsampled locations for the field. This map is often called a “recommendation map,” or the “as-recommended” map.

- The recommendation map is uploaded to a fertilizer applicator that controls fertilizer rate according to the recommendation for each field location.
- In order to verify that fertilizer application matches recommendations, an “as-applied” map needs to be generated by the fertilizer applicator.
- Receipts documenting the purchase of fertilizer shall be included. Receipts must show the date purchased, the fertilizer formulation (source or analysis), and amount. The field(s) on which the purchased fertilizer product was applied shall be identified.
- NOTE: In the case of variable-rate nitrogen application using crop canopy sensors, the process is different. Using a pre-determined algorithm, down-facing color sensors compare the green color of target areas to a well-fertilized reference area of a field. If the target area indicates a nitrogen need the fertilizer applicator applies the recommended amount of nitrogen. This process is rapid (performed in “real-time”) so that actuators at the back of the applicator are responding to the canopy color at the front of the applicator as it moves through the field.

***Disclaimer: This EQIP Activity Sheet is provided as an assistance tool only and is not meant to substitute for the applicable Missouri NRCS conservation practice standard(s) and Statement(s) of Work. Satisfactory compliance with the applicable technical guidance requires reading, understanding, and implementing the conservation practice standard(s) and Statement(s) of Work.***

### Appendix—Documentation Checklists

#### **Documentation Checklist—Nutrient Management with Variable-Rate Phosphorus and Potassium Application Using Grid or Zone Sampling**

**Note: Specific documentation requirements are listed in the Statement of Work for Nutrient Management (No. 590; See Section IV of the Missouri Electronic Field Office Technical Guide [eFOTG] at [http://efotg.nrcs.usda.gov/efotg\\_locator.aspx?map=MO](http://efotg.nrcs.usda.gov/efotg_locator.aspx?map=MO) under “conservation practice Statements of Work”).**

1. Copies of original soil test report forms from a MSTA-certified laboratory. Soil tests shall be: (a) dated, (b) no older than two years old, and (c) collected from field areas of 20 acres or less.
  
2. Budget of nutrients recommended, utilized, and residual for each field and year of the 4-year soil test cycle. Fields may be combined up to 80-acre areas for budgeting purposes, when soil test results for subfield areas are within 10 percent. Applications on *organic operations* shall not exceed 10 percent of recommended amounts but may be less than recommendations for individual nutrients (nitrogen applications must be within 10 percent of the recommended amount).
  
4. Prescription (recommendation) maps for nitrogen fertilizer. Maps should be dated and be expressed in the same units as the fertilizer recommendations.
  
5. As-applied (fertilizer application) maps for nitrogen fertilizer. Maps should be dated and be expressed in the same units as the fertilizer recommendations.
  
6. Receipts showing the amounts of nitrogen fertilizer applied on the acres in the contract.
  
7. Harvest information including harvest date and yields.
  
8. Signed certification sheet (*MO-CONS-10 or equivalent*).

### Documentation Checklist—Nutrient Management with Variable-Rate Nitrogen Application Using Crop Canopy Color Sensing

**Note:** Specific documentation requirements are listed in the Statement of Work for Nutrient Management (No. 590; See Section IV of the Missouri Electronic Field Office Technical Guide [eFOTG] at [http://efotg.nrcs.usda.gov/efotg\\_locator.aspx?map=MO](http://efotg.nrcs.usda.gov/efotg_locator.aspx?map=MO) under “conservation practice Statements of Work”).

1. Copies of original soil test report forms from a MSTA-certified laboratory. Soil tests shall be: (a) dated, (b) no older than two years old, and (c) collected from field areas of 20 acres or less.
2. Budget of nutrients recommended and utilized for each field and year of the 4-year soil test cycle. Fields may be combined up to 80-acre areas for budgeting purposes, when soil test results for 20-acre subfields are within 10 percent. Applications on *organic operations* shall not exceed 10 percent of recommended amounts but may be less than recommendations for individual nutrients (nitrogen applications must be within 10 percent of the recommended amount).
3. Records showing the amounts of phosphorus and potassium applied.
4. Prescription (recommendation) maps for nitrogen fertilizer. Maps should be dated and be expressed in the same units as the fertilizer recommendations.
5. As-applied (fertilizer application) maps for nitrogen fertilizer. Maps should be dated and be expressed in the same units as the fertilizer recommendations.
6. Receipts showing the amounts of nitrogen fertilizer applied on the acres in the contract.
7. Harvest information including harvest date and yields.
8. Signed certification sheet (*MO-CONS-10 or equivalent*).