United States Department of Agriculture

CONSERVATION ENHANCEMENT ACTIVITY

E590A

CONSERVATION STEWARDSHIP PROGRAM

# Improving nutrient uptake efficiency and reducing risk of nutrient losses

## Conservation Practice 590: Nutrient Management

**APPLICABLE LAND USE: Crop (Annual and Mixed), Crop (Perennial)**

**RESOURCE CONCERN: Water, Air**

**ENHANCEMENT LIFE SPAN: 1 Year**

### Enhancement Description

Nutrient management encompasses managing the amount, source, placement, and timing of the application of plant nutrients and soil amendments. Nutrients are currently being applied on the farm based on the 4R nutrient stewardship principles. Enhanced nutrient use efficiency strategies or technologies are utilized to improve nutrient use efficiency and reduce risk of nutrient losses to surface and groundwater and reduce risks to air quality by reducing emissions of greenhouse gases (GHGs).

The wide variability of soils, rainfall, fertilizer rates, products, placement, and timing will all influence the actual crop yield. Enhanced fertilizer products are not a yield enhancement guarantee. Products that claim yield enhancement benefits may not be applicable to this enhancement.

**Note: Some technologies in this enhancement apply to use of commercial fertilizer only.**

### Criteria

- Documentation of producer's record of nutrient management meeting all NRCS Conservation Practice Standard Nutrient Management (CPS 590) general criteria and additional criteria to minimize agricultural nonpoint source pollution of surface and groundwater.

**Select two or more (not already utilized) strategies for nutrient use efficiency:**

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**Strategy 1:** Enhanced Efficiency Fertilizers (EEF) which contain **nitrification inhibitor** products resulting in delayed nitrification processes, by eliminating the bacteria *Nitrosomonas* in the area where ammonium is to be present.

- Materials must be defined by the Association of American Plant Food Control Officials (AAPFCO) and be accepted for use by the State fertilizer control official, or similar authority, with responsibility for verification of product guarantees, ingredients (by AAPFCO definition) and label claims.

- Application timing, method, N source, soil texture, and tillage regime are all factors that should be evaluated to determine where nitrification inhibitors should be used. Before buying an inhibitor make sure scientific evidence backs up all claims. Producers and/or consultants should be wary of any product that does not have solid scientific data demonstrating that the inhibitor activity matches the advertised benefit.

- EEF products must be recommended by state Land Grant University (LGU) and concurred with by NRCS on all treatment acres to supply at least 50% of the pre-emergent and early post emergent LGU recommended nitrogen budget requirements for the crop(s) grown. Common chemical products used to interrupt the nitrification process include, Dicyandiamide (DCD), and 2-chloro-6 (trichloromethyl) pyridine.

**Strategy 2:** Enhanced Efficiency Fertilizer (EEF) products which contain **urease inhibitor** products to temporarily reduce the activity of the urease enzyme and slow the rate at which urea is hydrolyzed.

- Materials must be defined by the Association of American Plant Food Control Officials (AAPFCO) and be accepted for use by the State fertilizer control official, or similar authority, with responsibility for verification of product guarantees, ingredients (by AAPFCO definition) and label claims.

- Application timing, method, N source, soil texture, and tillage regime are all factors that should be evaluated to determine where urease inhibitors should be used. Before buying an inhibitor make sure scientific evidence backs up all claims. Producers and/or consultants should be wary of any product that does not have solid scientific data demonstrating that the inhibitor activity matches the advertised benefit.

- EEF products must be recommended by state Land Grant University (LGU) and concurred with by NRCS on all treatment acres to supply at least 50% of the pre-emergent and early post emergent LGU recommended nitrogen requirements for the crop(s) grown.

- Common chemical products that are known to affect urease formation are N-(n-butyl) thiophosphoric triamide (NBPT) and ammonium thiosulfate (ATS).

**Strategy 3**: Slow-release or controlled release formulations of nitrogen fertilizer for at least 50% of the pre-plant and/or post emergent applications.

- Use of slow-release or controlled-release nitrogen fertilizer products to improve nutrient use efficiency.

  Uncoated Nitrogen Fertilizers include: Ureaformaldehyde (UF) reaction products, Ureaform and Methylene ureas**.**

  Coated Nitrogen Fertilizers include**:** Sulfur-coated fertilizers, Polymer-coated fertilizers and Polymer/sulfur coated fertilizers.

**Strategy 4:** Nature-based fertilizer and Soil Amendments

- Use of Nature-based Fertilizer and Soil Amendments such as bio-stimulants and bio-fertilizers to:
  - Enhance uptake and efficient use of nutrients, both applied and existing.
  - Improve soil health by enhancing beneficial soil microorganisms.
  - Stimulate root growth to increase water use efficiency.

**Strategy 5:** In-season soil nitrate sampling.

- Use pre-sidedress soil nitrate test (PSNT) to determine the need and/or amount of additional nitrogen to be applied during sidedress/topdress N application. Conduct a PSNT for the selected crop (e.g. corn) to determine if additional N fertilizer is needed.

- The use of PSNT is not recommended for all soil types and field situations. Consult your local state LGU for guidance.

**Strategy 6:** Use in-season plant tissue sampling and analysis as a complement to soil testing.

- Follow local LGU and/or laboratory guidelines for interpretations of the results and appropriate adjustments in the application of N and other nutrients. *End of season stalk*

*nitrate testing is not applicable if the enhancement is only contracted for one year, as results must be used to evaluate and adjust nutrient management in the following year, as needed.*

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**Strategy 7:** Split nutrient applications.

- Apply no more than 50% of total crop nitrogen needs within 30 days prior to planting (or in the case of hay or pasture after green up of dormant grasses). Apply the remaining nitrogen after crop emergence (or green up).
- Post emergent nitrogen may be reduced based on crop scouting, in-season soil sampling/analysis, or plant tissue sampling/analysis. Nutrient availability should be timed to crop uptake.

**Strategy 8:** Time nutrient application timing to match nutrient uptake timing.

- Apply nutrients no more than 30 days prior to planting date of annual crops. Nutrient availability should be timed to crop uptake.

**Strategy 9:** Nutrient placement below soil surface.

- Nutrients are injected or incorporated into the soil as soon as possible, no more than 24 hrs. of being applied.

**Strategy 10:** Use EEF technology for **phosphorous** fertilizer applications.

- EEF products must be recommended by state Land Grant University (LGU) and concurred with by NRCS.

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**Documentation and Implementation Requirements:**

**Participant will:**

- ☐ Prior to implementation, provide documentation for review by NRCS showing a record of implementing nutrient management meeting all applicable NRCS Conservation Practice Standard Nutrient Management (CPS 590) general criteria and additional criteria to minimize agricultural nonpoint source pollution of surface and groundwater, including existing 590A strategies. List EEF strategies or materials that have been implemented:_____
- ☐ Prior to implementation, develop and document a planned nutrient budget, yield goal, and applications (pounds/acre active ingredient, nutrients must include at a minimum N-P-K).
- ☐ Prior to implementation, select two or more new nutrient use efficiency strategies or technologies not already used. **Selections:**_____
- ☐ During implementation, keep records to document actual nutrient applications (pounds/acre active ingredient, nutrients must include at a minimum N-P-K).
- ☐ During implementation, minimize soil surface disturbance during nutrient placement.
- ☐ During implementation, notify NRCS of any planned changes to verify the planned system meets the enhancement criteria.
- ☐ During implementation, additional record keeping requirements for specific strategy or technology:
    - In-season soil nitrate sampling. Records and documentation must include results (including reference strips) and adjustments in nutrient management based on results.
    - In-season plant tissue sampling and analysis. Records and documentation must include type of test used (stalk, leaf, chlorophyll, infrared, or other plant tissue), results (including reference strips), and adjustments in nutrient management based on results.
    - Nutrient placement below soil surface. Records and documentation must include method of injection or incorporation time and depth.
- ☐ After implementation, make documentation and records available for review by NRCS to verify implementation of the enhancement.

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**NRCS will:**

- ☐ As needed, provide technical assistance to meet the criteria of the enhancement.
- ☐ Prior to implementation, provide and explain NRCS Conservation Practice Standard Nutrient Management (CPS 590) as it relates to implementing this enhancement.
- ☐ Prior to implementation, review documentation to verify a record of implementing nutrient management meeting all NRCS Conservation Practice Standard Nutrient Management (CPS 590) general criteria and additional criteria to minimize agricultural nonpoint source pollution of surface and groundwater.
- ☐ Prior to implementation, verify the development of a planned nutrient budget, yield goal, and planned nutrient applications.
- ☐ Prior to implementation, verify the selection of two or more nutrient use efficiency strategies or technologies.
- ☐ During implementation, evaluate any planned changes to verify the planned system meets the enhancement criteria.
- ☐ After implementation, review documentation and records to verify implementation of the enhancement.

**NRCS Documentation Review:**

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name _____ Contract Number _____

Total Amount Applied _____ Fiscal Year Completed _____

_____ _____

NRCS Technical Adequacy Signature Date

# 2024 Alabama Supplemental Guidance for CSP Enhancement

**ENHANCEMENT NUMBER AND TITLE**: E590A: Improving nutrient uptake efficiency and reducing risk of nutrient losses

**Conservation Practice:** E590A – Nutrient Management

BRIEF DESCRIPTION OF ENHANCEMENT: Nutrient use efficiency (NUE) concept involves three major processes in plants: uptake, assimilation, and utilization of nutrients. Enhanced nutrient use efficiency strategies or technologies can improve nutrient uptake efficiency. This enhancement is designed to reduce risk of nutrient losses to surface and groundwater and reduce risks to air quality by reducing emissions of greenhouse gases (GHGs). This enhancement applies to commercial fertilizer only. It is not applicable for manure applications or other non-commercial fertilizer nutrient sources.

*Important considerations:*

- Use the current "Nitrogen Leaching Index for Alabama (Agronomy Technical Note AL-73)", "Phosphorus Index for Alabama (Agronomy Technical Note AL-72)", and "RUSLE 2" to assess the risk of nutrient and soil loss.
- Evaluate water quality standards and designated use limitations that exist locally or statewide in managing nutrients to protect the quality of water resources.
- Plan conservation that includes practices and/or management activities that will reduce the risk of nitrogen or phosphorus movement from the field. Planning and application of conservation practices must be coordinated to avoid, control, or trap manure and nutrients before they can leave the field by surface or subsurface drainage. Nutrients must be applied with the right placement, in the right amount, at the right time, and from the right source to minimize nutrient losses to surface and groundwater.
- Select two or more strategies out of nine listed in the enhancement for nutrient use efficiency. Consider the following nutrient use efficiency technologies:
    a. Incorporation or injection,
    b. Timing and number of applications
    c. Coordinate nutrient applications with optimum crop nutrient uptake
    d. The use of guidance and rate control technology
    e. Tissue testing, chlorophyll meters, and spectral analysis technologies

PROVIDE REQUIRED DOCUMENTS AND IMPLEMENTATION REQUIREMENTS.

- ☐ Provide NRCS with the current and a suggested planned Nutrient Management Plan that includes:
    - A plan map (acres indicated), soil map and map of sensitive areas or topo map,
    - Planned crop or crop rotation,
    - Results of soil test with recommendations,
    - Results of applicable risk assessments,
    - Realistic yield goals for all crops,
    - Recommended nutrient application rates, application time, placement and sources.

- Notify NRCS of any planned changes to verify the planned system meets the enhancement criteria,
- Provide maps of the area or location(s), digital images/photos of the area and indicate area on map, and dates of completed activity

**Table 1.** Site specific information on the 4R's (right rate, right time, right source and right placement) needed to implement nutrient management. Right rate and right time information may be omitted from this table if information is included on the soil test report.

| Track/Field | Crop/year(s) | Yield goal | N Index[1/] | Right Rate (lb/ac)[2/] N | $P_2O_5$ | $K_2O$ | Right Time[2/] | Right Source[3/] | Right Placement[4/] |
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1/ N index is the nitrogen leaching index. The leaching potential of N is high (h) throughout the state as a result of high average rainfall. As a result all N applications must be within 30 days of planting a crop or within 30 days of an actively growing crop to minimize N leaching, maximize N use efficiency and meet the requirements of the nutrient management standard. For more information on N leaching see Alabama Agronomy Technical Note AI-73, "N Leaching Index for Alabama".

2/ Right time and right rate information may be included on the attach soil test results and recommendation, if so indicated see soil test in table 1.

3/ Indicated planned nutrient source, commercial or organic waste (manure/litter). If the source is manure/litter insure that all applications comply with all federal, state and local regulations including but not limited to ADEM requirements and setbacks as indicated on the conservation plan maps.

4/ Indicated planned nutrient placement to minimized nutrient loss and maximize nutrient use efficiency. For example, broadcast on spreadable area as indicated on conservation plan maps or broadcast N starter, $P_2O_5$ and $K_2O$ and band sidedress N at the planned rate.

The attached documents support the full implementation of this Conservation Stewardship Enhancement.

_____ _____

CSP Participant Name Date