

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

NUTRIENT MANAGEMENT

(Acre)

CODE NY590

DEFINITION

Managing the amount, source, placement, form and timing of the application of nutrients and soil amendments.

PURPOSES

- ◆ To budget and supply nutrients for plant production.
- ◆ To minimize agricultural nonpoint source pollution of surface and ground water resources by properly utilizing manure or organic by-products as a plant nutrient source.
- ◆ To maintain or improve the physical, chemical and biological condition of soil.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all lands where plant nutrients and soil amendments are applied.

CRITERIA

General Criteria Applicable to All Purposes

Plans for nutrient management shall comply with all applicable Federal, state, and local laws and regulations.

Plans for nutrient management shall be developed in accordance with policy requirements of the NRCS General Manual Title 450, Part 401.03 (Technical Guides, Policy and Responsibilities) and Title 190, Part 402 (Ecological Sciences, Nutrient Management, Policy); technical requirements of the NRCS Field Office Technical Guide (FOTG); procedures contained in the National Planning Procedures Handbook (NPPH), and the NRCS National Agronomy Manual (NAM) Section 503.

Persons who review or approve plans for nutrient management shall be certified through any certification program acceptable to New York NRCS.

Plans for nutrient management that are elements of a more comprehensive conservation plan shall recognize other requirements of the conservation plan and be compatible with its other requirements.

A nutrient budget for nitrogen, phosphorus, and potassium shall be developed that considers all potential sources of nutrients including, but not limited to animal manure and organic by-products, waste water, commercial fertilizer, crop residues, legume credits, and irrigation water.

Where agricultural wastes are to be spread on land not owned or controlled by the producer, the nutrient management plan, as a minimum, shall document the amount of waste to be transferred, the nutrient analysis of the material, and who will be responsible for the use of the waste.

Realistic yield goals shall be established based on soil productivity information, historical yield data, climatic conditions, level of management and/or local research on similar soil, cropping systems. For new crops or varieties, industry yield estimates may be used until documented yield information is available.

Erosion, runoff, and water management controls shall be installed, as needed, on all fields.

Soil Sampling and Laboratory Analysis (Testing)

Nutrient planning shall be based on current soil test results developed in accordance with Land Grant University guidance or industry practice if recognized by the Land Grant University. Current soil tests are those that are no older than three years.

Soil samples shall be collected and prepared according to the Land Grant University guidance or standard industry practice. Soil test analyses shall be performed by laboratories that are accepted in one or more of the following programs:

- ◆ State Certified Programs,
- ◆ The North American Proficiency Testing Program (Soil Science Society of America), or

- ◆ Laboratories whose tests are accepted by the Land Grant University in the state in which the tests will be used.

Soil testing shall include analysis for any nutrients for which specific information is needed to develop the nutrient plan. Request analyses pertinent to monitoring or amending the annual nutrient budget, e.g. pH, electrical conductivity (EC), soil organic matter, exchange acidity, nitrogen, phosphorus, and potassium.

Plant Tissue Testing

Tissue sampling and testing, where used, shall be done in accordance with Land Grant University standards or recommendations.

Nutrient Application Rates

Soil amendments shall be applied, as needed, to adjust soil pH to the specific range of the crop and rotation for optimum availability and utilization of nutrients.

Recommended nutrient application rates shall be based on Land Grant University recommendations (and/or industry practice when recognized by the university) that consider current soil test results and realistic yield goals. If the Land Grant University does not publish specific recommendations for a particular crop, nutrient application shall be based on realistic yield goals and associated plant nutrient uptake rates and efficiency.

The planned rates of nutrient application, as documented in the nutrient budget, shall be determined based on the following guidance:

- ◆ **Nitrogen Application** - Planned nitrogen application rates shall match the recommended rates as closely as possible. When manure or other organic by-products are a source of nutrients, see “Additional Criteria” below.
- ◆ **Phosphorus Application** - Planned phosphorus application rates shall match the recommended rates as closely as possible, except when manure or other organic by-products are a source of nutrients. When manure or other organic by-products are a source of nutrients, see “Additional Criteria” below.
- ◆ **Potassium Application** - Excess potassium shall not be applied in situations in which it causes unacceptable nutrient imbalances in crops or forages. When forage quality is an issue associated with excess potassium application, state standards shall be used to set forage quality guidelines.
- ◆ **Other Plant Nutrients** - The planned rates of application of other nutrients shall be consistent with Land Grant University guidance or industry practice if recognized by the Land Grant University in the state.
- ◆ **Starter Fertilizers** - Starter fertilizers containing nitrogen, phosphorus and potassium may be applied in accordance with Land Grant University recommendations, or industry practice if recognized by the Land Grant University within the state. When starter fertilizers are used, they shall be included in the nutrient budget.

Nutrient Application Timing and Method

Timing and method of nutrient application shall correspond as closely as possible with plant nutrient uptake characteristics, while considering cropping system limitations, weather and climatic conditions, and field accessibility.

Nutrients shall not be applied to frozen, snow-covered, or saturated soil if the potential risk for runoff exists. The Leaching Index and Phosphorus Index will be used to evaluate both leaching and runoff risk respectively.

To evaluate leaching potential, use of the computer program NPURG is suggested or use the following procedure:

- Determine the soil hydrologic group from the SOILS-5 data base.
- Find the Leaching Index (LI) from the Leaching Index Maps for each soil mapping component, as described in the Soil Rating for Nitrate and Soluble Nutrients in Section I-3 of the Water Quality Workbook 1988.
- Interpret NPURG leaching potentials.

A LI below 2 inches indicates that the potential for soluble nutrient leaching below the root zone is low. Apply nitrogen in accordance with recommendations.

A LI between 2 and 10 inches indicates that the potential for soluble nutrient leaching below the root zone is intermediate. Additional site evaluations are in order. Practices

specified under LI's greater than 10 inches should be considered.

A LI greater than 10 inches indicates that the potential for soluble nutrient leaching below the root zone is large. The following practices shall be implemented as applicable to reduce the potential for nitrate leaching to groundwater:

- Strict timing of application of nitrogen in accordance with recommendations of Cornell Cooperative Extension.
- Use of management practices such as cover crops to take up excess nutrients and prevent their movement out of the root zone.

Additional Criteria Applicable to Manure or Organic By-Products Applied as a Plant Nutrient Source to Minimize Non-Point Source Pollution

Nutrient values of each source and/or type of manure and/or organic by-product shall be determined prior to land application based on laboratory analysis. Analysis shall be conducted at least every 2 years.

Sampling program shall consider major system changes such as feed or feeding, manure storage and treatment practices, and seasonal variations.

Sewage sludge, treated sewage sludge and other by-products shall be tested as outlined in subsequent sections.

Operations with no previous manure analysis shall obtain 2 analyses within 6 months.

Nutrient Application Rates

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The application rate (in/hr) for material applied through irrigation shall not exceed the soil intake/infiltration rate. The total application shall not exceed the field capacity of the soil.

The planned rates of nitrogen and phosphorus application recorded in the plan shall be determined based on the following guidance:

- ◆ **Phosphorus Application** - The planned rates of phosphorus application shall be consistent with the New York Phosphorus Index (PI) rating. Manure applied shall be based on nitrogen rates on low or medium risk sites. Manure applied shall be based on estimated phosphorus removal rates on high risk sites. No manure shall be applied on very high risk sites as identified in the PI. The PI does not apply to abuse areas that are converted to pasture and managed according to conservation practice standard Prescribed Grazing (528)

Acceptable phosphorus based manure application rates shall be determined as a function of soil test recommendation or estimated phosphorus removal in harvested plant biomass. Guidance for developing these acceptable rates is found in the NRCS General Manual, Title 190, Part 402 (Ecological Sciences, Nutrient Management, Policy), and the National Agronomy Manual, Section 503.

- ◆ **Nitrogen Application** - When the plan is being implemented on a phosphorus standard, manure or other organic by-products shall be applied at rates consistent with the phosphorus standard. In such situations, an additional nitrogen

application, from non-organic sources, may be required to supply the recommended amounts of nitrogen.

- Manure or other organic by-products may be applied on legumes at rates not to exceed the estimated removal of nitrogen in harvested plant biomass. The Leaching Index shall be used to assess leaching potential on all fields that receive manure or other organic by-products.

Sewage Sludge Application

Nutrient values of sewage sludge shall be determined prior to land application based on laboratory analysis.

Heavy Metals Monitoring

When products containing heavy metals (such as copper sulfate foot baths, sewage sludge and related products) are applied, the accumulation of potential pollutants (including arsenic, cadmium, copper, lead, mercury, selenium, and zinc) in the soil shall be monitored. Monitoring and application shall be conducted in accordance with the US Code, Reference 40 CFR, Parts 403 and 503, and/or any applicable state and local laws or regulations.

Field Risk Assessment

When animal manure or other organic by-products are applied, a field-specific assessment of the potential for phosphorus transport and nitrogen leaching from the field shall be completed annually where appropriate. This assessment will be done using the Phosphorus and Leaching Indices, and

by identifying hydrologically sensitive areas. The assessment shall include:

- ◆ a record of the assessment rating for each field or sub-field, and
- ◆ information about conservation practices and management activities that can reduce the potential for phosphorus movement and nitrogen leaching from the site.

When such assessments are done, the results of the assessment and recommendations shall be discussed with the producer during the development of the plan.

Manure shall not be spread within 100 feet of surface water or surface inlets where hydrologic connectivity exists unless it is in conjunction with specific conservation practices that, when installed, achieve the resource management system level for water quality as stated in the FOTG. Installed practices shall include necessary erosion control measures, buffer areas, appropriate timing, rate of application, and incorporation and other necessary practices.

Manure will not be spread within 100 feet of a wellhead, spring or sinkhole unless specific evidence shows that it can be done without contamination.

Additional Criteria to Improve the Physical, Chemical, and Biological Condition of the Soil.

Nutrients shall be applied in such a manner as not to degrade the soil's structure, chemical properties, or biological condition. Use of nutrient sources with high salt content will be minimized unless provisions are used to leach salts below the crop root zone.

Nutrients shall not be applied to flooded or saturated soils because the potential for soil compaction and creation of ruts is high.

CONSIDERATIONS

Consider induced deficiencies of nutrients due to excessive levels of other nutrients.

Consider the use of planned grazing systems to reduce the amount of manure that must be handled, stored and spread.

Consider additional practices such as Conservation Cover (327), Grassed Waterway (412), Contour Buffer Strips (332), Filter Strips (393), Irrigation Water Management (449), Riparian Forest Buffer (391A), Conservation Crop Rotation (328), Cover and Green Manure (340), and Residue Management (329A, 329B, or 329C, and 344) to improve soil nutrient and water storage, infiltration, aeration, tillage, diversity of soil organisms and to protect or improve water quality.

Consider cover crops whenever possible to utilize and recycle residual nitrogen.

Consider application methods and timing that reduce the risk of nutrients being transported to ground and surface waters, or into the atmosphere. Suggestions include:

- ◆ splitting applications of nitrogen to provide nutrients at the times of maximum crop utilization,
- ◆ avoiding surface winter nutrient application for spring seeded crops,
- ◆ banding fertilizer applications of phosphorus near the seed row,

- ◆ applying nutrient materials uniformly to application areas or as prescribed by precision agricultural techniques, and/or
- ◆ immediately incorporating land applied manure or organic by-products,
- ◆ delaying field application of animal manure or other organic by-products if precipitation that is capable of producing runoff and erosion, or leaching to a subsurface drainage system is forecast within 24 hours of the time of the planned application.

Consider minimum application setback distances when using commercial fertilizer to protect from environmentally sensitive areas, such as sinkholes, wells, gullies, ditches, surface inlets or rapidly permeable soil areas.

Consider the potential problems from odors associated with the land application of animal manure, especially when applied near or upwind of residences.

Consider nitrogen volatilization losses associated with the land application of animal manure. Volatilization losses can become significant, if manure is not immediately incorporated into the soil after application.

Consider the potential to affect National Register listed or eligible cultural resources.

Consider using soil test information no older than one year when developing new plans, particularly if animal manure is to be a nutrient source.

Consider other sampling techniques on sites where there are special environmental concerns. (For example: Soil profile sampling for nitrogen, Pre-Sidedress Nitrogen Test (PSNT), or soil surface sampling for phosphorus accumulation or pH changes.)

Consider ways to modify the chemistry of animal manure, including modification of the animal's diet to reduce the manure nutrient content, to enhance the producer's ability to manage manure effectively.

Consider analyzing manure when changes in manure nutrient content could occur.

Consider the effect of pathogens and other disease-causing organisms in nutrient sources. These should be utilized in a manner that minimizes their disease potential.

PLANS AND SPECIFICATIONS

Plans and specifications shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose(s), using nutrients to achieve production goals and to prevent or minimize water quality impairment.

The following components shall be included in the nutrient management plan:

- ◆ aerial photograph or map and a soil map of the site,
- ◆ current and/or planned plant production sequence or crop rotation,

- ◆ results of soil, plant, water, manure or organic by-product sample analyses,
- ◆ realistic yield goals for the crops in the rotation,
- ◆ quantification of all nutrient sources,
- ◆ recommended nutrient rates, timing, form, and method of application and incorporation,
- ◆ location of designated sensitive areas or resources and the associated, nutrient management restriction,
- ◆ an assessment of leaching and runoff potential based on the LI and PI, along with specific management practices to be adapted or considered,
- ◆ guidance for implementation, operation, maintenance, recordkeeping, and
- ◆ complete nutrient budget for nitrogen, phosphorus, and potassium for the rotation or crop sequence.

When applicable, plans shall include other practices or management activities as determined by specific regulation, program requirements, or producer goals.

In addition to the requirements described above, plans for nutrient management shall also include:

- ◆ a statement about the relationship between nitrogen and phosphorus transport and water quality impairment. The discussion about nitrogen should include information about nitrogen leaching into shallow

ground water and potential health impacts. The discussion about phosphorus should include information about phosphorus accumulation in the soil, the increased potential for phosphorus transport in soluble form, and the types of water quality impairment that could result from phosphorus movement into surface water bodies.

- ◆ a statement about how the plan is intended to prevent the nutrients (nitrogen and phosphorus) supplied for production purposes from contributing to water quality impairment.
- ◆ a statement that the plan was developed based on the requirements of the current standard and any applicable Federal, state, or local regulations or policies; and that changes in any of these requirements may necessitate a revision of the plan.

OPERATION AND MAINTENANCE

The owner/client is responsible for safe operation and maintenance of this practice including all equipment. Operation and maintenance addresses the following:

- ◆ periodic plan review to determine if adjustments or modifications to the plan are needed. As a minimum, plans will be reviewed annually and revised where appropriate.
- ◆ protection of fertilizer and organic by-product storage facilities from weather and accidental leakage or spillage.

- ◆ calibration of application equipment to ensure uniform distribution of material at planned rates.
- ◆ documentation of the actual rate at which nutrients were applied. When the actual rates used differ from or exceed the recommended and planned rates, records will indicate the reasons for the differences.
- ◆ Maintaining records to document plan implementation. As applicable, records include:
 - soil test results and recommendations for nutrient application,
 - quantities, analyses and sources of nutrients applied,
 - dates and method of nutrient applications, including type of incorporation, if any,
 - crops planted, planting and harvest dates, yields, and crop residues removed,
 - results of water, plant, and organic by-product analyses, and
 - dates of review and person performing the review, and recommendations that resulted from the review.

Records should be maintained for five years; or for a period longer than five years if required by other Federal, state, or local ordinances, or program or contract requirements.

Workers should be protected from and avoid unnecessary contact with chemical fertilizers and organic by-products. Protection should include the

use of protective clothing when working with plant nutrients. Extra caution must be taken when handling ammonia sources of nutrients, or when dealing with organic wastes stored in unventilated enclosures.

The disposal of material generated by cleaning nutrient application equipment should be accomplished properly. Excess material should be collected and stored or field applied in an appropriate manner. Excess material should not be applied on areas of high potential risk for runoff and leaching.

The disposal or recycling of nutrient containers should be done according to state and local guidelines or regulations.

REFERENCES

Cornell Guide For Integrated Field Crop Management, Printed Annually, Cornell Cooperative Extension, Cornell University, Ithaca, NY, 14853

Cornell Field Crops and Soils Handbook. Second edition, 1987, Cornell Cooperative Extension, Cornell University, Ithaca, NY, 14853

Cornell University "Cropware", Nutrient Management Planning Software, Cornell Cooperative Extension, Cornell University, Ithaca, NY, 14853

Nutrient Management Workbook For New York State. Extension Series E94-2, January 1994

Liquid Manure Application Systems Design Manual, Dougherty, M., L. D. Geohring, and P. E. Wright, February 1998, Northeast Regional Agricultural Engineering Service. NRAES-89 Cooperative Extension, 152 Riley-

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