

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

NUTRIENT MANAGEMENT

(Ac.)

CODE 590

DEFINITION

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

PURPOSE

- To budget and supply nutrients for plant production.
- To properly utilize manure or organic by-products as a plant nutrient source.
- To minimize agricultural nonpoint source pollution of surface and ground water resources.
- To protect air quality by reducing nitrogen emissions (ammonia and N_xO and NO_x compounds) and the formation of atmospheric particulates.
- 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

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.

Realistic yield 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, and soil and manure/organic by-products tests.

For new crops or varieties, industry yield estimates may be used until documented yield information is available.

Plans for nutrient management shall specify the source, amount, timing and method of application of nutrients on each field to achieve realistic production goals, while minimizing movement of nutrients and other potential contaminants to surface and/or ground waters.

Where bulk 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 the person or organization that operates the land where the waste is to be applied.

Areas contained within established minimum application setbacks (e.g. sinkholes, wells, gullies, ditches, surface inlets or rapidly permeable soil areas) shall not receive direct application of nutrients. Setbacks for manure application are found under "Additional Criteria" below.

Setbacks for other nutrient sources shall be determined on a site-specific basis and address a documented risk to water quality.

Erosion, runoff, and water management controls shall be installed, following resource management system (RMS) level of treatment on all fields, as stated in the electronic Field

Office Technical Guide (eFOTG). This includes addressing sheet and rill erosion to “T”.

Soil and Tissue Sampling and Laboratory Analyses (Testing). Nutrient planning shall be based on current soil (and tissue if used as a supplement) test results developed in accordance with Cornell University guidance, or industry practice if recognized by Cornell University. Current soil tests are those that are no older than three years.

Soil and tissue samples shall be collected and prepared according to Cornell University guidance or standard industry practice. Soil test analyses shall be performed by Cornell University laboratories or by laboratories where analytical results can be converted to Cornell University soil test equivalents.

Soil and tissue testing shall include analyses for all nutrients that are needed to develop the nutrient management plan. Request analyses pertinent to monitoring or amending the annual nutrient budget, e.g. pH, exchange acidity, soil organic matter, and extractable phosphorus and potassium. Additionally, for conversions of Mehlich 3 phosphorus to Morgan phosphorus, Mehlich 3 extractable Al and Ca are required.

Nutrient Application Rates. Soil amendments shall be applied, as needed, to adjust soil pH to an adequate level for crop nutrient availability and utilization.

Nutrient application rates shall be based on Cornell University guidelines (and/or industry practice when recognized by the university) that consider current soil test results, realistic yield goals and management capabilities. If Cornell University does not provide specific guidelines, application shall be based on realistic yields and associated plant nutrient uptake rates and efficiencies.

The planned rates of nutrient application, as documented in the nutrient management plan, 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 organic by-products are a source of nutrients, see “**Additional Criteria**” below.
- Phosphorus Application - Planned phosphorus fertilizer application rates shall match the recommended rates as closely as possible. When manure or organic by-products are a source of nutrients, see “**Additional Criteria**” below.
- Potassium Application - Potassium shall not be applied in situations that cause unacceptable nutrient imbalances in crops or forages, as determined by the farm manager and animal nutritionist.
- Other Plant Nutrients - The planned rates of application of other nutrients shall be consistent with Cornell University guidance or industry practice if recognized by Cornell University.
- Starter Fertilizers - When starter fertilizers are used, they shall be included in the overall nutrient budget, and applied in accordance with Cornell University guidelines, or industry practice if recognized by Cornell University.

Nutrient Application Timing. Timing of nutrient application (particularly nitrogen) shall correspond as closely as possible with plant nutrient uptake characteristics, while considering cropping, manure management and nutrient source system limitations, weather and climatic conditions, risk assessment tools (e.g., New York Nitrate Leaching index, New York Phosphorus Index) and field accessibility.

Nutrient Application Methods. Application methods to reduce the risk of nutrient transport to surface and ground water, or into the atmosphere shall be employed.

Minimize nutrient losses by:

- Applying nutrient materials uniformly to application area(s).
- Not applying nutrients to frozen, snow-covered or saturated soil if the potential risk for runoff exists. Use the New York Phosphorus Index (NY-PI) to evaluate runoff risk and allowable timing of manure application.

- Using “Supplemental manure spreading guidelines”. for daily spreading decisions
- Applying nutrients according to the plant growth habits, irrigation practices, and other conditions so as to maximize availability to the plant and minimize the risk of runoff, leaching, and/or volatilization losses.
- Applying nutrients associated with irrigation systems in a manner that prevents or minimizes resource impairment.

Risk Assessment

The planned rates of phosphorus application shall be consistent with the New York Phosphorus Index (PI) rating. Adjust phosphorus rates, methods and timing based on PI evaluation results.

The planned nitrogen application shall be consistent with the New York Nitrate Leaching Index (NLI) rating. Adjust nitrogen application rates, methods, and timing based on results from NLI.

Additional Criteria Applicable to Manure and Organic By-Products or Biosolids Applied as a Plant Nutrient Source

Nutrient values of manure and organic by-products (excluding sewage sludge or biosolids derived from sewage sludge) shall be determined prior to land application. Sampling frequency may vary based on the operation’s handling strategy and spreading schedule. Analyze the material with each hauling/emptying cycle for a storage/treatment facility, or no less than once per year per source. A cumulative record shall be developed and maintained. The operation’s cumulative manure analysis history shall be used as a basis for nutrient allocation to fields. Samples shall be collected and prepared according to Cornell University guidance or industry practice.

In planning for new operations, manure analyses from similar operations can be used. As a last resort acceptable “book values” recognized by the NRCS and/or Cornell University (e.g., NRCS Agricultural Waste Management Field Handbook, ASABE Standard) may be used if they accurately

estimate nutrient output from the proposed operation.

Biosolids (formed from sewage sludge) shall be applied in accordance with USEPA regulations, 40 CFR Parts 403 (Pretreatment) and 503 (Biosolids) and other state and/or local regulations regarding the use of biosolids as a nutrient source. Nutrient values of biosolids (formed from sewage sludge) and related products shall be determined prior to land application based on laboratory analysis.

Manure and Organic By-Product Nutrient Application Rates.

Manure and organic by-product nutrient application rates shall be based on nutrient interpretation procedures recommended Cornell University. At a minimum, manure analyses shall identify ammonia N, organic N, P, K and percent solids.

The application rate (in/hr) of liquid materials applied shall not exceed the soil intake/infiltration rate and shall be adjusted to minimize ponding and to avoid runoff. The total application shall not exceed the field capacity of the soil and shall be adjusted, as needed, to minimize loss to subsurface tile drains.

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

Nitrogen Application Rates

- When manure or organic by-products are used, the nitrogen availability of the planned application rates shall match plant uptake characteristics as closely as possible, taking into consideration the timing of nutrient application(s) in order to minimize leaching and/or atmospheric losses.
- Management activities and technologies shall be used that effectively utilize mineralized nitrogen. Where feasible minimize nitrogen losses through de-nitrification and ammonia volatilization.
- Manure or organic by-products may be applied on established legumes that are not planned to be killed or plowed the next crop year, at rates not to

exceed 150 lb/ac of available nitrogen in harvested plant biomass.

- When the nutrient management plan component is being implemented on a phosphorus basis, manure or organic by-products shall be applied at rates consistent with a phosphorus limited application rate. In such situations, an additional nitrogen application, from non-organic sources, may be required to supply, but not exceed, the recommended amounts of nitrogen in any given year.

Phosphorus Application Rates

- **Phosphorus Application** - The planned rates of phosphorus application shall be consistent with the NY-PI rating. The NY-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 from soil test recommendations and estimated phosphorus removal in harvested plant biomass. Refer to "Phosphorus Guidelines for Field Crops in New York." Guidance to develop acceptable rates for other crops can be found in the NRCS General Manual, Title 190, Part 402 (Ecological Sciences, Nutrient Management, Policy), and the National Agronomy Manual, Section 503.
- The application of phosphorus applied as manure may be made at a rate equal to the recommended phosphorus application or estimated phosphorus removal in harvested plant biomass for the crop rotation or multiple years in the crop sequence. When such applications are made, the application rate shall:
 - ◇ Not exceed the recommended nitrogen application rate during the year of application, or
 - ◇ Not exceed the estimated nitrogen removal in harvested plant biomass during the year of

application when there is no recommended nitrogen application.

- ◇ Not be made on sites considered vulnerable to off-site phosphorus transport unless appropriate conservation practices, best management practices or management activities are used to reduce the vulnerability.

Heavy Metal Monitoring. When biosolids (formed from sewage sludge) are applied, the accumulation of potential pollutants (including arsenic, cadmium, copper, lead, mercury, selenium, and zinc) in the soil shall be monitored 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 to be applied, a field-specific assessment of the potential for phosphorus transport and nitrate leaching from the field shall be completed annually where appropriate. This assessment will be done using the NY-PI and NLI and by identifying hydrologically sensitive areas. The assessment shall include:

- A record of the assessment rating for each field or sub-field, and
- An assessment of the surface water risk. Manure shall not be spread within 100 feet, along a surface flow path, to any down gradient surface waters. Surface water includes open tile line intakes, structures or other water flow channels. However, manure can be applied closer than 100 feet of down gradient surface waters if application is in conjunction with field specific alternative conservation practices that, when installed, achieve RMS level for water quality as stated in section III of the eFOTG under resource quality criteria. Installed practices shall include whole field erosion control measures that satisfy RUSLE 2, installed or natural buffer

areas, appropriate timing, and rate of application, incorporation or other necessary practices.

- An assessment of the ground water risk. Manure will not be spread within 100 feet of a wellhead, spring or sinkhole unless water analyses or other specific evidence shows that it can be done without contamination.

Additional Criteria to Protect Air Quality by Reducing Nitrogen and/or Particulate Emissions to the Atmosphere

In areas with an identified or designated nutrient management related air quality concern, any component(s) of nutrient management (i.e., amount, source, placement, form, timing of application) identified by risk assessment tools as a potential source of atmospheric pollutants shall be adjusted, as necessary, to minimize the loss(es).

When tillage can be performed, surface applications of manure and fertilizer nitrogen formulations that are subject to volatilization on the soil surface (e.g., urea) shall be incorporated into the soil within 24 hours after application.

When manure or organic by-products are applied to grassland, hayland, pasture or minimum-till areas the rate, form and timing of application(s) shall be managed to moderate volatilization losses.

When liquid forms of manure are applied with irrigation equipment, operators will select weather conditions during application that will moderate volatilization losses.

Operators will handle and apply poultry litter or other dry types of animal manures when the potential for wind-driven loss is low and there is less potential for transport of particulates into the atmosphere.

Weather and soil moisture conditions during manure or organic by-product application(s) shall be recorded and maintained in accordance with the operation and maintenance section of this standard.

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

Nutrients shall be applied and managed in a manner that maintains or improves the physical, chemical and biological condition of the soil.

To the extent, practicable nutrients shall not be applied when the potential for soil compaction and rutting is high.

CONSIDERATIONS

The use of management activities and technologies listed in this section may improve both the production and environmental performance of nutrient management systems.

The addition of these management activities, when applicable, increases the management intensity of the system and is recommended in a nutrient management system.

Action should be taken to protect National Register listed and other eligible cultural resources.

The nutrient budget should be reviewed annually to determine if any changes are needed for the next planned crop.

For sites on which there are special environmental concerns, other sampling techniques may be appropriate. These may include soil profile sampling for nitrogen, Pre-Sidedress Nitrogen Test (PSNT), or soil surface sampling for phosphorus accumulation or pH changes.

Additional practices to enhance the producer's ability to manage manure effectively include modification of the animal's diet to reduce the manure nutrient content, or utilizing manure amendments that stabilize or tie-up nutrients.

Soil test information should be no older than one year when developing new plans, particularly if animal manures are to be used as a nutrient source.

Excessive levels of some nutrients can cause induced deficiencies of other nutrients.

If increases in soil phosphorus levels are expected, consider a more frequent (annual) soil-testing interval.

To manage the conversion of nitrogen in manure or fertilizer, use products or materials (e.g. nitrification inhibitors, urease inhibitors and slow or controlled release fertilizers) that more closely match nutrient release and availability for plant uptake. These materials may improve the nitrogen use efficiency (NUE) by reducing losses of nitrogen into water and/or air.

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 (391), Conservation Crop Rotation (328), Cover and Green Manure (340), and Residue Management (329, 345, 346, or 344) to improve soil nutrient and water storage, infiltration, aeration, tillage, diversity of soil organisms and to protect or improve water quality.

Considerations to Minimize Agricultural Nonpoint Source Pollution of Surface and Ground Water.

Runoff reduction practices can improve soil nutrient and water storage, infiltration, aeration, tillage, diversity of soil organisms and protect or improve water and air quality (Consider installation of one or more NRCS FOTG, Section IV – Conservation Practice Standards).

Cover crops can effectively utilize and/or recycle residual nitrogen.

Consider monitoring tile outlets when applying Manure on fields with tiles.

Apply nutrient materials uniformly to the application area.

Practices that reduce the risk of nutrients being transported to ground and surface waters, or into the atmosphere include:

- Split applications of nitrogen to provide nutrients at the times of maximum crop utilization,
- Use of the nitrate stalk-test to evaluate N management.

- Avoid winter nutrient application for spring seeded crops,
- Band applications of phosphorus near the seed row,
- Incorporate surface applied manures or organic by-products as soon as possible after application to minimize nutrient losses (especially for Spring applications).
- Delay field application of animal manures or organic by-products if precipitation capable of producing runoff is forecast within 24 hours of the time of the planned application.

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 significant changes in manure nutrient content or moisture occur.

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

Consider Frost Injection of manure, or application immediately followed by frost-tillage (as described in Cornell Guidelines) where conditions allow application at low risk for runoff and little impact on soil erosion and compaction.

Nutrient applications associated with irrigation systems should be applied in accordance with the requirements of Irrigation Water Management (449).

CAFO operations seeking permits under USEPA regulations (40 CFR Parts 122 and 412) should refer to the DEC CAFO permit.

Considerations to Protect Air Quality.

Odors associated with the land application of manures and organic by-products can be offensive to the occupants of nearby homes. Consider avoiding applying these materials upwind of occupied structures when residents are likely to be home (evenings, weekends and holidays).

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When applying manure with irrigation equipment, modifying the equipment can reduce the potential for volatilization of nitrogen from the time the manure leaves the application equipment until it reaches the surface of the soil (e.g., reduced pressure, drop down tubes for center pivots). Nitrogen volatilization from manure in a surface irrigation system will be reduced when applied under a crop canopy.

Consider the combined effects of nutrient application methods and other tillage operations on greenhouse gas emissions (e.g. nitrous oxide N₂O, carbon dioxide CO₂), and the potential for carbon sequestration.

Consider impact on water quality as air quality issues are addressed.

PLANS AND SPECIFICATIONS

Plans and specifications for nutrient management 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 resource impairment.

Nutrient management plans shall include a statement that the plan was developed based on requirements of the current standard and any applicable Federal, state, or local regulations, policies, or programs, which may include the implementation of other practices and/or management activities. Changes in any of these requirements may necessitate a revision of the plan.

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

- aerial site photograph(s) or site map(s), and a soil survey map of the site,
- location of designated sensitive areas or resources and the associated, nutrient management restriction,
- current and/or planned plant production sequence or crop rotation,
- results of soil, water, manure and/or organic by-product sample analyses,
- results of plant tissue analyses, if used for nutrient management,
- realistic yields for the different crops and soil types,
- complete nutrient budget for nitrogen, phosphorus, and potassium for the crop rotation or sequence,
- an assessment of leaching and runoff potential based on the NLI and NY-PI, along with specific management practices,
- listing and quantification of all nutrient sources,
- field specific recommended nutrient application rates, nutrient credits, timing, form, and method of application and incorporation, and
- guidance for implementation, operation, maintenance, and recordkeeping.

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 and revised with each soil test cycle.
- significant changes in animal numbers and/or feed management will necessitate additional manure sampling and analyses to establish a revised average nutrient content.
- 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 fertilizer nutrients were applied and the total amount of manure or other organic by-products applied. When the rates used differ from the recommended and planned rates, records will indicate the reasons for the differences.

- Maintaining records to document plan implementation. As applicable, records include:
 - Soil, plant tissue, water, manure, and organic by-product analyses resulting in guidelines for nutrient application,
 - quantities, analyses and sources of nutrients applied,
 - dates and method(s) of nutrient applications,
 - weather conditions and soil moisture at the time of application; and where needed for the nutrient management plan, lapsed time to manure incorporation, rainfall or irrigation event.
 - crops planted, planting and harvest dates, yields,
 - dates of plan review, name of reviewer, and recommended changes resulting 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 plant nutrient sources. Extra caution must be taken when handling ammoniacal nutrient sources, or when dealing with organic wastes stored in unventilated enclosures.

Material generated from cleaning nutrient application equipment should be utilized in an environmentally safe manner. Excess material should be collected and stored or field applied in an appropriate manner.

Nutrient containers should be recycled in compliance with state and local guidelines or regulations.

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