Agriculture
Nutrient Management Certification
Knowledge Areas

Revised April 2024

General Nutrient Management

1. Nutrient management definition
2. Objectives of nutrient management
3. Farm nutrient cycles
4. Farm nutrient balance
5. Determining planning yields
6. Economic optimum nutrient application rate determination

Basic Soil Science

1. Soil Texture
2. Soil Structure
3. Determinants of organic matter content
4. Water holding capacity
5. Tillage effects on soil structure
6. Identification of major soil horizons categories
7. Soil properties that effect infiltration rate and runoff
8. Soil compaction
9. Crop interactions with physical and chemical properties of soils
10. Use of soil survey maps and information in nutrient management

Environmental Management

1. Hydrologic cycle and relationship of ground and surface waters
2. Effects of nutrients in ground and surface waters
3. Factors causing the decline of the Chesapeake Bay
4. Nutrient loss mechanisms to groundwater and surface water
5. Identification of environmentally sensitive site features
6. Nutrient management practices for environmentally sensitive sites
7. Critical times when nutrient losses are most likely to occur
8. Use of cropping systems to reduce nutrient losses

Sampling, Testing, and Analysis for Nutrient Management

1. Soil sampling procedures
2. Frequency of sampling
3. Causes of variability of sample results over time

Agriculture
Nutrient Management Certification
Knowledge Areas

Sampling, Testing, and Analysis for Nutrient Management (continued)

4. Relationship of nutrient availabilities to likelihood of crop response
5. Correlating numerical soil sample results to soil test levels (L, M, H, VH) and to a nutrient recommendation using a VALUES table
6. Conversion of soil test results from various testing labs
7. Pre-Sidedress Nitrate Test (PSNT) basic concepts
8. Soil sampling procedures for use with the PSNT
9. PSNT recommendation sites
10. Trouble shooting techniques for crops using plant tissue tests and soil tests
11. Appropriate growth stages and plant parts for tissue samples
12. Interpretation of small grain tissue tests
13. Manure sampling and handling of samples
14. Interpretation of manure test results
15. Interpretation of biosolids test results
16. Determination of legume nitrogen credits to future crops

Basic Soil Fertility

1. Leibig's Law
2. Recognize essential elements for plant growth and categorize as non-mineral, primary, secondary, and micronutrients
3. Relative mobility of nutrients in soils
4. How pH influences availability and toxicity of nutrients
5. The nitrogen cycle in the soil including mineralization, nitrification, denitrification, leaching, and C/N ratio concepts
6. Appropriate timing and placement of N fertilizers for agronomic and environmental benefits
7. Phosphorus cycle
8. Phosphorus loss mechanisms from ag fields, and management practices to minimize potential loss
9. General understanding of the factors used in the Phosphorus Index and how they are related to reducing Phosphorus loss
10. pH relationship to soil P forms and retention by soils
11. Appropriate timing and placement of P fertilizers for agronomic and environmental benefits
12. Potassium cycle
13. Availability of K in the B horizon
14. Timing and placement of K fertilizers

Agriculture
Nutrient Management Certification
Knowledge Areas

Basic Soil Fertility (continued)

15. Behavior of secondary nutrients
16. Common sources of secondary nutrients
17. Common sources of micronutrients
18. Placement techniques for micronutrient fertilizers
19. Cation exchange capacity related to soil properties and productivity
20. Determination and relevance of percent base saturation
21. How cations are held in soils
22. Differences in major ag liming materials
23. Lime quality
24. CEC and lime requirements
25. Use of buffer pH on soil tests to determine lime requirement
26. Timing and placement of lime
27. Lime properties effecting reaction rate of lime

Fertilizer Management

1. Mathematical conversion of P and K to P_2O_5 and K_2O
2. Types of fertilizers (bulk blends, clear liquid, etc.)
3. Nutrient analysis of various fertilizer materials
4. How climatic factors affect liquid fertilizer analysis
5. Relative losses of N from inorganic sources containing Ammonia with delayed incorporation or if surface applied
6. Basic fertilizer calculations relating grades and quantities of material applied to nutrient rates
7. Calculate ingredient blends using basic fertilizer materials to meet nutrient recommendations
8. Calibration of fertilizer applicators
9. Fertilizer application methods and advantages, disadvantages of each

Manure Management

1. Factors affecting manure volume
2. Calculations of expected manure volume generated
3. Litter volume variations between crust-out and total clean out of houses
4. Factors causing variation in manure analysis between farms
5. How species variety affects manure volume generated (example: broilers vs. breeders)
6. How storage type and time affects nutrient content

Agriculture
Nutrient Management Certification
Knowledge Areas

Manure Management (continued)

7. Relative primary nutrient concentrations of various types of manures
8. Determining availability of nutrients in manures
9. Determining nitrogen residuals from past applications
10. Forms of N in manures (atmospheric losses of N in manures from different application methods)
11. Relative losses of N from organic sources containing ammonia with delayed incorporation or if surface applied
12. Criteria for proper routing of manures to fields
13. Proper timing and placement of manure applications
14. Criteria for locating temporary and permanent litter storage facilities
15. Identification and management of high risk sites for manure application
16. Relative levels on N, P_2O_5, and K_2O in manures compared to crop removal
17. Timing and placement of supplemental fertilizers used with manures
18. Advantages and disadvantages of manure incorporation
19. Calibration of manure spreaders
20. Application limitations of various types of spreaders
21. Application limits of liquid manures based on soil type
22. Agronomic benefits of manure use

Biosolids Management

1. Determine available N, P_2O_5, and K_2O in various biosolids from a biosolids test
2. Determine N residuals from previous biosolids applications
3. Biosolids application methods and agronomic and environmental advantages and disadvantages from anaerobic and lime stabilized biosolids
4. Relative levels of N, P_2O_5, and K_2O in biosolids related to crop removal
5. Forms of N in lime stabilized and anaerobic biosolids
6. Timing and placement of supplemental fertilizers when used with biosolids
7. Identification and management of high risk sites for biosolids application
8. Buffer and setbacks related to application sites
9. Calibration of biosolids spreaders

Incentives and Regulations

1. Nutrient Management Training and Certification Regulations
2. Chesapeake Bay Preservation Act
3. Virginia Pollution Abatement permits for confined livestock- dairy, beef, swine

Agriculture
Nutrient Management Certification
Knowledge Areas

Incentives and Regulations (continued)

4. Virginia Pollution Abatement permits for confined livestock- poultry
5. Special Conditions for specific animal type in plans for VPA permits
6. Plan writing guidance documents issued by the Virginia Nutrient Management Program
7. Biosolid Use Regulations
8. State Tax Credit for planting and application equipment
9. Nutrient management provisions of the Virginia Ag BMP Cost-Share Program
10. Phosphorus rate determination for regulation compliance

Development of Nutrient Management Plan Components

1. Locate fields and determine soils using a soil survey
2. Determine soil productivity groups for different crops from soils information
3. Determine an acceptable planning yield using VALUES tables or from past yield information
4. Yield reduction factors for slope, erosion, rock outcrops, etc.
5. Use appropriate VALUES tables and soil test information to develop a crop nutrient recommendation
6. Calculate phosphorus application rates based on soil tests or crop removal.
7. Soil phosphorus saturations levels when phosphorus applications are not allowed
8. Determine allowable phosphorus applications of organic nutrient sources using Environmental Threshold method
9. Determine allowable phosphorus applications of organic nutrient sources using Virginia Phosphorus Index method
10. Determine a soil loss value for use in the Virginia Phosphorus Index using Erosion Risk Assessment
11. Understand specific nitrogen management criteria when dealing with environmentally sensitive sites as related to various nitrogen sources and crops
12. Appropriate use of Pre-Sidedress Nitrate Test (PSNT) options
13. Calculate manure quantities and volume using tables
14. Calculate biosolids nutrient availabilities and appropriate application rates from manure and biosolids tests including consideration of residual N from past applications
15. Determine N legume credits from a table
16. Develop a schedule for the timing and placement of fertilizers
17. Develop an integrated nutrient balance sheet for all nutrient sources, application rates and timings
18. Understand issues to address in a plan narrative