**NATURAL RESOURCES CONSERVATION SERVICE**

**CONSERVATION PRACTICE STANDARD**

# NUTRIENT MANAGEMENT

**(Acre)**

**CODE 590**

## DEFINITION

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

## PURPOSES

- 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 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.

Employees of NRCS and other persons who approve plans for nutrient management shall be certified through a certification program acceptable to NRCS in the state of Kentucky. Persons who develop (but not approve) nutrient management plans are not required to become certified. Note: Certification may be required for persons who develop nutrient management plans when regulatory permits or other special rules require technical assistance from a certified nutrient management specialist.

Plans for nutrient management that are elements of a more comprehensive conservation plan or waste management system shall recognize other requirements of the respective plan and be compatible with the other plan 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. Note: As crops, method of application, feed ration or consistency of the manure change, it will be necessary to re-calculate an appropriate nutrient application rate using a nutrient budget.

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, and soil and manure/organic by-products tests. For new crops or varieties, industry yield recommendations may be used until documented yield information is available.

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

Erosion, runoff, and water management controls shall be installed, as needed, on fields that receive nutrients.

**Site/Field Risk Assessment**

Evaluate each field, site, or farm for risk of vulnerability of nitrogen and phosphorus to impact water resources using available information, such as soil ratings for leaching of soluble nutrients, soil infiltration rates, geology reports, sinkhole maps, stream classification, proximity of site to wells and streams, etc.

The *Phosphorus Index for Kentucky* * and other NRCS approved assessment tools will be used as needed to assess the potential risk of phosphorus movement into water on all fields or portions of fields that will have nutrients (no sewage sludge or bio-solids) applied on them.

* *Required assessment on all fields with a residual soil test P level above 400 lbs/acre. The 400 lbs/acre is based on a routine soil test that measures extractable Phosphorus as determined by the Mehlich 3 method.* ***The current version of the Phosphorus Index for Kentucky can be referenced in Appendix C of this standard and in Chapter 3 of the NRCS Agricultural Waste Management Field Handbook.*** *This handbook is on file in local NRCS offices.*

When a field-specific assessment of the potential for phosphorus transport from the field is completed, the plans 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 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.

**Soil Sampling and Laboratory Soil Analysis (Soil Testing)**

Nutrient management planning shall be based on soil test information obtained by laboratory procedures that are in accordance with the University of Kentucky College of Agriculture (University) or industry practice if recognized by the University. Note: The University of Kentucky uses the Mehlich 3 method to measure extractable phosphorus. Refer to information that is available from the University of Kentucky for recommended soil sampling frequencies. *Note: Current soil analysis information from each field planned for nutrient applications will be needed during the development of a nutrient management plan. A current soil analysis is less than 1 year old.*

Soil samples shall be collected and prepared according to the University guidance. Note: All soil test recommendations will be made on the assumption that a representative soil sample has been properly taken from the field or area to receive the nutrient application. Soil analyses shall be performed by laboratories that belong to the North American Proficiency Testing Program (Soil Science Society of America) and whose tests are conducted consistent with laboratory test procedures as published by the University of Kentucky.

A routine soil test 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. buffer pH, water pH, phosphorus, potassium, zinc, magnesium and calcium.

**Plant Tissue Testing**

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

**Nutrient Application Rates**

Recommended nutrient application rates shall be based on soil sampling laboratory analysis, nutrient analysis, plant tissue testing or other NRCS approved analysis tools. The recommendations from these analyses must consider available information obtained from current soil test results, realistic yield goals and crop management plans.

Individual nutrient recommendations will be formulated on a philosophy that considers University of Kentucky Lime and Fertilizer recommendations or crop nutrient removal potential. ***Estimated crop nutrient removal values (nutrients removed in harvested plant biomass) approved by NRCS for several key crops grown in Kentucky can be referenced in Appendix A, Table 6 of this standard.***

Excess nutrients shall not be applied in situations in which it causes unacceptable nutrient imbalances in crops or forages.

**Nitrogen (N), Phosphorus (P) and Potassium (K)** - The planned rates of nutrient application, as documented in the nutrient budget, shall match the recommended rates as closely as possible for all nutrients including nitrogen, phosphorus and potassium. More information about nutrient availability from certain sources, storage/application losses, and removal values can be referenced in ***Appendix A, Tables 1-6 of this standard.***

Note: The following information applies to all applied nutrients such as from commercial (mineral based) fertilizers, animal wastes and other sources:

**When the soil test results indicate a level of phosphorus that is 400 lbs/acre or less,** the University of Kentucky Lime and Fertilizer recommendations or NRCS approved estimated crop removal values will be used to determine application rates based on nitrogen as the limiting nutrient.

When the plan is being implemented on a nitrogen basis, manure or other organic by-products shall be applied at rates that are limited by the amount of nitrogen in the material. Credit for available nitrogen provided from cover crops and previous crop residues shall be considered in the nutrient budget. Refer to ***Appendix A, Table 4 (Estimated Nitrogen Availability To Succeeding Crops From Legumes)*** for related information.

In certain cropping situations such as involving soybeans, alfalfa and other legumes, nitrogen application may not be recommended according to the University of Kentucky Lime and Fertilizer recommendations. In these situations, manure or other organic by-products (containing nitrogen) may be applied at rates not to exceed the estimated removal of nitrogen in harvested plant biomass.

***Estimated crop nutrient removal values approved by NRCS are referenced in Appendix A, Table 6***

**When the soil test results indicate a level of phosphorus above 400 lbs/acre, *nutrient* application rates will be determined by using one of the following options: Phosphorus Threshold (PT) or Phosphorus Index (PI).**

**Option 1 - Soil Test Phosphorus Threshold (PT) Values.** In situations where the soil test phosphorus (STP) levels are below 400 lbs/acre, nitrogen based nutrient applications may be applied. As soil test levels increase above 400 lbs/acre, planned phosphorus application rates (from any nutrient source) shall be determined as based on estimated phosphorus removal in harvested plant biomass at levels prescribed in the phosphorus threshold. When soil test phosphorus exceeds 1066 lbs/acre no further applications of phosphorus (from any nutrient source) shall be made to the field/area.

When the Phosphorus Threshold option is utilized, the following information applies:

401-800 STP - Phosphorus applications at rates not to exceed the estimated removal of phosphorus in the harvested plant biomass.

801-1066 STP - Phosphorus applications at rates not to exceed 1/2 of the estimated removal of phosphorus in the harvested plant biomass.

(Reference the ***Phosphorus Threshold for Kentucky in Appendix C (P Matrix,Option 1) of this standard*** for more information.)

**Option 2 - Phosphorus Index (PI) Rating.**

Low or Medium Risk Sites - Nitrogen based nutrient application.

High and Very High Risk Sites - Phosphorus based or no nutrient application.

- In some instances the (PI) rating may be in the low or medium risk category when soil test phosphorus is above 400 lbs/acre. In these instances, nutrient application rates based on nitrogen may be planned. University of Kentucky Lime and Fertilizer

recommendations or NRCS approved estimated crop removal values for nitrogen will be used to determine nutrient application rates based on nitrogen.

- When soil test phosphorus exceeds 1066 lbs/acre no further applications of phosphorus (from any nutrient source) shall be made to the field/area.

(Reference the ***Phosphorus Index Worksheet for Kentucky in Appendix C (P Matrix,Option 2) of this standard*** for more information.)

**Phosphorus Application** - When phosphorus based applications are planned, the amount of nitrogen applied shall be limited according to University of Kentucky Lime and Fertilizer recommendations or NRCS approved estimated crop removal values for nitrogen. When the plan is being implemented on a phosphorus basis, manure or other organic by-products shall be applied at rates that are limited by the amount of phosphorus in the material.

A single 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.
- 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.

Note: Refer to the University of Kentucky Lime and Fertilizer recommendations as a basis for applying phosphorus according to plant requirements when crop removal is not an option.

Note: When applying a phosphorus based nutrient application, an additional nitrogen application, from non-organic sources, may be required to supply the recommended amounts of nitrogen for the host crop.

Additional information about the Phosphorus Threshold and Phosphorus Index can be requested from local NRCS offices.

- **Micronutrients and Other Plant Nutrients -** The planned rates of application of micronutrients and other nutrients shall be consistent with University guidance. When manure or other organic by-products are a source of nutrients, see “Additional Criteria” as applicable, which is referenced in the next column.
- **Starter Fertilizers** - Starter fertilizers containing nitrogen, phosphorus and potassium may be applied in accordance with University recommendations. When starter fertilizers are used, they shall be included in the nutrient budget.
- **Soil Amendments and Lime** - Soil amendments shall be applied, as needed, to adjust soil pH to the specific range of the crop for optimum availability and utilization of nutrients. Application will be consistent with University guidance.

**Nutrient Application Timing**

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 generally not be applied in fields/areas with frozen, snow-covered, or saturated soils, however the following guidelines and exceptions apply:

- Mineral fertilizers (only) may be land applied on frozen soils in fields/areas within 30 days of the beginning of crop growth unless heavy precipitation is forecasted before thawing.
- Solid waste (animal manure w/bedding) applications may be land applied on frozen soils in fields/areas unless heavy precipitation is forecasted before thawing. When solid wastes are applied on frozen soils, an application set back of at least 75

feet from streams, sinkholes and other sensitive areas is recommended. Additional federal, state and local guidelines may apply to application setbacks.

- Liquid (animal manure) waste applications shall not be applied on frozen soils. Liquid applications may be land applied in fields/areas within 30 days of the beginning of crop growth when soil conditions are favorable unless heavy precipitation is forecasted before the liquid can be absorbed into the soil profile.
- These exceptions will only apply if Best Management Practices (BMP's) are applied such as filter strips, crop residue management, vegetative cover management, application set backs and other strategies are implemented properly so as to reduce the risk of pollution.

**Nutrient Application Methods**

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

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

Animal manure applications are primarily based on plant available nutrient content. However, the volume applied (tons, gallons, cubic feet, acre-inches) on a per acre basis during each application event and the soil conditions at the time of application are also of concern. For these reasons a sound nutrient management plan must contain strategies for application that consider manure nutrient values, volume applied during each application and other site specific limitations.

**Nutrient Analysis/Testing**

Nutrient values of manure and organic by-products (excluding sewage and bio-solids) shall be determined (by laboratory analysis) prior to land application.

**Exception:** When preparing nutrient management plans on "new" animal feeding operations, (those without manure in storage), approved “book values” for estimated manure nutrient content may be used as a basis for planning application rates until a manure analysis can be obtained. Approved "book values" are those recognized by the NRCS and the University. ***Approved book values for animal manures recognized by NRCS and the University can be referenced in Appendix A, Tables 1,2,3,5 of this standard.***

When an analysis of the manure is available, an application amount can be determined using known nutrient values at the time of application. Testing of the manure shall include an analysis for total nitrogen and total phosphorus. The analysis results can be converted to pounds of nutrients per ton for solids and/or pounds of nutrients per 1000 gallons for liquids. Note: Once historical laboratory manure analysis data is established, annual analysis is not required unless operational changes occur with manure storage facilities, storage intervals, feed rations and other situations.

Recommended procedures for collecting and preparing manure samples can be referenced in ***Appendix B of this standard***.

**Manure Nutrients: Application Rate Limitations**

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 manure or organic by-products applied as a source of plant available nitrogen and phosphorus shall be determined based on guidance as outlined in following sections. More information about manure nutrient application rates can be referenced in Chapter 3 of the NRCS Agricultural Waste Management Field Handbook.

Estimated ***crop nutrient removal values approved by NRCS can be referenced in Appendix A, Table 6*** of this standard.

**Manure Volume - Expected Land Application Rates of Manure Based on Volume Limitations**

The plant available nutrient amounts in manure can vary due to time in storage, storage methods, ration content and other reasons.

With this in mind, certain manures may contain low amounts of nutrients. If these types of manure are applied at rates according to potential crop uptake, utilization and removal, large volumes may be applied during each application event. These excessively large volumes of applied manures may increase the risk of movement offsite and/or cause a buildup of toxic compounds in the soil. For these reasons the following volume limitations will apply for all manure applications in Kentucky:

***Volume Limitations***

Solids - maximum 10 tons/application (or)
Liquids – maximum ½ inch/acre/application (maximum 56 tons/acre/application).

Note: Volume limitations (as quoted above) are based on adequate field conditions present at the time of application. Further information concerning recommended field conditions can be referenced in subsequent sections of this standard. Certain crops such as tobacco may be sensitive to excessive nutrient and chemical loading that could occur with high annual volumes of applied animal waste.

**Note: A unit conversion table can be referenced in *Appendix D of this standard*.**

**Heavy Metals Monitoring**

When sewage sludge is 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/local laws or regulations.

**Additional Criteria to Minimize Agricultural Non-point Source Pollution of Surface and Ground Water Resources**

Nutrient applications at any time must be managed in consideration of soil moisture content, rainfall expectations, land slope and other adequate field conditions.

Additional awareness must also be given to manure applications within proximity to streams, sinkholes, waterbodies, wetlands and other sensitive landscape features. Application rates, methods and timing will need to be considered prior to manure applications (in each field) in order to prevent pollutant discharge.

Plans developed to minimize agricultural nonpoint source pollution of surface or ground water resources shall include practices and/or management activities that can reduce the risk of nitrogen or phosphorus movement from the field.

**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 when 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 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, tilth, 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:

- split applications of nitrogen to provide nutrients at the times of maximum crop utilization,

- avoiding winter nutrient application for spring seeded crops unless nutrient availability to the crops can be timed with subsequent emergence and growth,
- band applications of phosphorus near the seed row,
- applying nutrient materials uniformly to application areas or as prescribed by precision agricultural techniques, and/or
- immediate incorporation of land applied manures or organic by-products,
- delaying field application of animal manures or other organic by-products if precipitation capable of producing runoff and erosion is forecast within 24 hours of the time of the planned application.

Consider minimum application setback distances 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 manures, especially when applied near or upwind of residences.

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

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

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

Consider annual reviews to determine if changes in the nutrient budget are desirable (or needed) for the next planned crop.

On sites on which there are special environmental concerns, consider other sampling techniques. (For example: Soil profile sampling for nitrogen, Pre-Sidedress Nitrogen Test (PSNT), Pre-Plant Soil Nitrate Test (PPSN) 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 and to enhance the producer's ability to manage manure effectively.

**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,
- guidance for implementation, operation, maintenance, record keeping, and
- complete nutrient budget for nitrogen, phosphorus, and potassium for the rotation or crop sequence.

If increases in soil phosphorus levels are expected, plans shall document:

- the soil phosphorus levels at which it may be desirable to convert to phosphorus based implementation,
- the relationship between soil phosphorus levels and potential for phosphorus transport from the field, and
- the potential for soil phosphorus drawdown from the production and harvesting of crops.

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:

- discussion 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 waters.
- discussion 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 the nutrient management plan 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/revised with each soil test cycle.
- 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,
  - crops planted, planting and harvest dates, yields, and residues removed,
  - results of water, plant, and organic by-product analyses, and
  - dates of review and person performing the review, and recommendations.

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 shall 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 the 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/recycling of nutrient containers should be according to state and local guidelines or regulations.

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# APPENDICIES

**Kentucky NRCS Nutrient Management Standard 590**

## Appendix A

Table 1 - Manure and Nutrients As Excreted Per 1000-lb. Live Weight/Day

Table 2 - Percent of Original Nutrient Content of Manure Retained by Various Management Systems

Table 3 - Percent of Nutrients from Manure Available to a Crop During the Year of Application in Comparison with Fertilizer Nutrients (Based On Application Conditions)

Table 4 - Estimated Nitrogen Availability to Succeeding Crops from Legumes

Table 5 - Estimates of Available Nitrogen from Manure Application in Previous Year

Table 6 - Crop Nutrient Removal Values

## Appendix B

Manure Sampling Procedures

## Appendix C

Kentucky Phosphorus (P) - Matrix

Kentucky Phosphorus (P) - Index

## Appendix D

Unit Conversion Table

**APPENDIX A**

## Table 1 - Manure and Nutrients As Excreted Per 1000-lb. Live Weight/Day

| Animal Type | Volume of Manure (cu.ft.) [1/] | Dry Matter Manure (lbs) | Total Nitrogen (lbs) | Total P as $P_2O_5$ (lbs) | Total K as $K_2O$ (lbs) |
|---|---|---|---|---|---|
| Beef (all cattle and calves) [2/] | 1.00 | 8.5 | .34 | .21 | .25 |
| Dairy Cows [2/] | 1.32 | 12.0 | .45 | .21 | .35 |
| Dairy Heifers [2/] | 1.30 | 12.0 | .45 | .21 | .35 |
| Swine – Lactating Sows w/litters [2/] | .96 | 11.0 | .52 | .41 | .35 |
| Swine – Gestating Sows, Boars, Gilts [2/] | .50 | 5.5 | .26 | .20 | .17 |
| Swine – Nursery and Finishing Pigs [2/] | 1.70 | 11.0 | .52 | .41 | .35 |
| Poultry Litter - Layer [2/] | .93 | 16.0 | .84 | .69 | .36 |
| Poultry Litter - Breeder Layer [2/] | .93 | 16.0 | .84 | .69 | .36 |
| Poultry Litter - Pullet [3/] | .73 | 11.4 | .62 | .55 | .31 |
| Poultry Litter - Breeder Pullet [3/] | .73 | 11.4 | .62 | .55 | .31 |
| Poultry Litter - Broiler [2/] | 1.26 | 22.0 | 1.10 | .69 | .48 |
| Horses [3/] | .80 | 11.0 | .28 | .11 | .23 |
| Sheep and Lambs [3/] | .62 | 10.0 | .45 | .16 | .36 |

[1/] Poultry litter weighs about 27 lbs/cu ft (considering bedding). Swine, dairy, beef , horses and sheep waste (solids) weighs about 60 lbs/cu ft. Liquids weigh about 62.4 lbs/cu ft.

[2/] Adapted from 1993 ASAE Standards. Reference: University of Kentucky (IP-57) *Potential for Livestock and Poultry Manure to Provide the Nutrients Removed by Crops and Forages in Kentucky*, Issued 9-1999

[3/] Adapted from 1992 NRCS Agricultural Waste Management Field Handbook.

**APPENDIX A**

**Table 2 - Percent of Original Nutrient Content of Manure Retained by Various Management Systems** [1/]

*This table will be used for estimation purposes when results from a laboratory analysis are unknown at the time of land application. When laboratory analysis results are known, proceed to Table 3.*

| | Beef | | | Dairy | | | Poultry | | | Swine | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Management System** | **N** | **P** | **K** | **N** | **P** | **K** | **N** | **P** | **K** | **N** | **P** | **K** |
| Manure stored in open lot (cool humid region) | 70 | 80 | 70 | 85 | 95 | 95 | | | | 70 | 80 | 70 |
| Manure liquids and solids stored in a covered essentially watertight structure | 85 | 95 | 95 | 85 | 95 | 95 | | | | 85 | 95 | 95 |
| Manure liquids and solids stored in an uncovered essentially watertight structure | 75 | 90 | 90 | 75 | 90 | 90 | | | | 75 | 90 | 90 |
| Manure liquids and solids (diluted less than 50%) held in waste storage pond | 80 | 95 | 95 | 80 | 95 | 95 | | | | 80 | 95 | 95 |
| Manure and bedding held in roofed storage | 80 | 95 | 95 | 80 | 95 | 95 | 70 | 95 | 95 | | | |
| Manure and bedding held in unroofed storage leachate lost | 75 | 85 | 85 | 75 | 85 | 85 | | | | | | |
| Manure stored in pits beneath slatted floor | 85 | 95 | 95 | 85 | 95 | 95 | 90 | 95 | 95 | 85 | 95 | 95 |
| Manure treated in anaerobic lagoon or stored in waste storage pond after being diluted more than 50% | 35 | 50 | 65 | 35 | 50 | 65 | 30 | 50 | 60 | 30 | 50 | 60 |

[1/] Adapted from 1992 NRCS Agricultural Waste Management Field Handbook.

**APPENDIX A**

**Table 3 - Percent of Nutrients from Manure Available to a Crop During the Year of Application in Comparison with Fertilizer Nutrients**

(Based On Application Conditions) [1/]

| Nutrient | Availability Coefficient | |
|---|---|---|
| | **Poultry or Liquid** | **Other Manures** |
| **Nitrogen** | | |
| Corn & Others: Corn, Tobacco, Annual Grasses or Sorghum | | |
| *Spring Applied* | | |
| Incorporation: 2 days or less | 0.60 | 0.50 |
| Incorporation: 3-4 days | 0.55 | 0.45 |
| Incorporation: 5-6 days | 0.50 | 0.40 |
| Incorporation: 7 days or more | 0.45 | 0.35 |
| *Fall Applied* | | |
| w/o cover crop | 0.15 | 0.20 |
| w/ cover crop | 0.50 | 0.40 |
| Small Grains (pre-plant) | 0.50 | 0.40 |
| Pasture (Fall or early Spring) | 0.80 | 0.60 |
| **Phosphate** | 0.80 | 0.80 |
| **Potash** | 1.00 | 1.00 |

[1/] Note: Information from Table 2 or from a laboratory analysis will be used as a basis for Table 3.

Table 3 Source: AGR-146 "Using Animal Manures as Nutrient Sources" 8/2000 University of KY.

**APPENDIX A**

**Table 4 - Estimated Nitrogen Availability to Succeeding Crops from Legumes** [1/]

| Crop | Description | Residual N (lb/ac) |
|---|---|---|
| Alfalfa or Red Clover | Good Stand (> 4 tons/ac)<br>Fair Stand (3 to 4 tons/ac)<br>Poor Stand (< 3 tons/ac) | 90<br>70<br>50 |
| Hairy Vetch | Good<br>Fair<br>Poor | 100<br>75<br>50 |
| Soybeans | | ½ lb per bushel or 20 lbs/ac if not known |

[1/] Table 4 will be used to calculate the nitrogen credits (when legumes are grown prior to the present crop) in the nutrient budget. Nitrogen credits will be considered in estimating crop removal when it is used as a basis for planning nitrogen applications. When the nitrogen application is based on University of Kentucky Lime and Fertilizer Recommendations, estimated available nitrogen from previous crops will be considered in the recommendation.

**Table 5 - Estimates of Available Nitrogen from Manure Application in a Previous Year** [1/]

| Frequency of Manure Applications | Manure Type (N availability coefficients**) | |
|---|---|---|
| | Poultry or Liquids | Other |
| Less than 4 out of 10 years | 0.03 | 0.05 |
| 4-8 out of ten years | 0.07 | 0.15 |
| More than 8 out of ten years | 0.12 | 0.25 |

[1/] From D.B. Beegle, Penn State University. **Percentage of total Nitrogen applied last year.

[2/] Table 5 will be used to calculate the nitrogen credits (when manure is applied in years prior to the present crop) in the nutrient budget. Nitrogen credits will be considered in estimating crop removal when it is used as a basis for planning nitrogen applications. When the nitrogen application is based on University of Kentucky Lime and Fertilizer Recommendations, estimated available nitrogen from previous crops and manure/fertilizer applications will be considered in the recommendation.

**APPENDIX A**

**Table 6 - Crop Nutrient Removal Values***

| | Nutrients Removed (lbs/yield unit) | | | | |
|---|---|---|---|---|---|
| **Crop** | **Yield Unit** | **Lbs per Yield Unit** | **Total Kjeldahl Nitrogen** | **$P_2O_5$** | **$K_2O$** |
| Alfalfa hay [1/] | Ton | 2000 | 50.00 | 14.000 | 55 |
| All other cool season grass/legume hay (except alfalfa) [1/] | Ton | 2000 | 35.00 | 12.000 | 53 |
| Rye for grain [2/] | Bushel | 56 | 1.16 | .330 | .32 |
| Oats for grain [2/] | Bushel | 32 | .62 | .250 | .19 |
| Barley for grain [2/] | Bushel | 48 | 0.90 | 0.410 | 0.30 |
| Corn for grain [1/] | Bushel | 56 | 0.70 | 0.400 | 0.35 |
| Corn for silage or green chop [1/] | Ton | 2000 | 7.50 | 3.600 | 8.0 |
| Winter wheat for grain [1/] | Bushel | 60 | 1.20 | 0.500 | 0.30 |
| Sorghum for grain [1/] | Bushel | 56 | 0.95 | 0.410 | 0.30 |
| Soybean for beans [1/] | Bushel | 60 | 3.00 | 0.700 | 1.10 |
| Tobacco, burley [1/] | Pound | 1 | 0.07 | 0.011 | 0.075 |
| Tobacco, dark air-cured [1/] | Pound | 1 | 0.07 | 0.006 | 0.06 |
| Tobacco, dark fire-cured [1/] | Pound | 1 | 0.07 | 0.006 | 0.06 |
| Forage from pastureland [3/] | Ton | 2000 | | | |
| Big Bluestem, Indiangrass, Little Bluestem, Switchgrass [4/] hay | Ton | 2000 | 20.00 | 6.800 | 25 |
| Bermudagrass [4/] hay | Ton | 2000 | 37.60 | 8.700 | 33.6 |
| Reed Canary Grass [4/] hay | Ton | 2000 | 27.00 | 8.200 | 25 |

| | | | | | |
|---|---|---|---|---|---|
| Eastern Gamagrass hay | Ton | 2000 | 35.00 | 16.100 | 31.2 |

## APPENDIX A

*/ Nutrient removal values for crops and forages referenced n the NRCS Nutrient Management Standard 590.

[1/] Assessment of the Potential for Livestock and Poultry Manure to Provide the Nutrients Removed by Crops and Forages in Kentucky. IP-56) 1999 University of Kentucky, Lexington Kentucky Table 5 Adapted from Wells and Thom (1994) and Lander et al. (1998). University of KY AGR-1.

[2/] Estimated Crop Nutrient Removal Values according to NRCS's Agricultural Waste Management Field Handbook, Chapter 6 when harvested as a hay crop.

[3/] Nutrient removal for forage from pastureland estimated as 30% of the values given for all grass/legume species harvested as hay (except alfalfa).

[4/] Reid, R. L., G. A. Jung, and D. W. Allinson, 1988. *"Nutritive Quality of Warm Season Grasses in the Northeast"*. Bulletin 699, West Virginia University, College of Agriculture and Forestry

[5/] Jung, G. A., Schaffer, J. A., Stout, W. L., *"Switchgrass and Big Bluestem Responses to Amendments on Strongly Acid Soils"*. Agronomy Journal 80:669-676.

Note: Table 6 will be used to calculate crop nutrient removal potentials in the nutrient budget. When the nutrient management plan is based on the amount of nitrogen applied (in consideration of crop removal) , estimated available nitrogen from previous crops and manure/fertilizer applications (Tables 4 and 5) will be considered. However, University of Kentucky Lime and Fertilizer Recommendations will be utilized as the basis for planning nutrient applications unless crop removal is used. When University of Kentucky Lime and Fertilizer recommendations are used, estimated available nitrogen from previous crops and manure/fertilizer applications will be considered in the recommendation.

**APPENDIX B**

# MANURE SAMPLING PROCEDURES

For laboratory testing, manure can be handled as a solid, semi-solid, or liquid. Semi-solid manure usually requires thorough agitation before pumping and sampling.

## When to Sample

Sample manure as close to the time of land application as possible. Sampling at the time of application will not provide manure recommendations that can be used to adjust the amount of manure applied. However, the results can be used to adjust the amount of inorganic fertilizer applied and can also be used at the next application event. If you apply manure several times a year, sample when you apply the bulk of the manure. Ideally, manure sampling should be done in the field as manure is applied. This ensures that losses that occur during handling, storage, and application are taken into account.

## Manure Sampling in the Field

Dry or Solid Field Sampling. To sample manure from barns, holding areas, dry stacks, or feed lots, collect a sample as follows:

Use the "hand and bag" method to collect all solid manure samples. Place a one-gallon re-sealable freezer bag turned inside out over one hand. Grab a handful of manure with covered hand and turn the freezer bag right side out over the sample with the free hand. Seal the bag and place it in another freezer bag to prevent leaks. Label the bag and send to the lab or freeze it immediately to prevent nutrient losses. Take three samples for dry or solid manure. Combine the samples and mix. Place in zip-lock bag.

## Liquid Manure Sampling

When sampling liquid manure agitate the manure in the storage facility to obtain a representative sample for laboratory analysis.

## Liquid Manure Applied with Spreaders

1. Immediately after filling the tank spreader, use a clean plastic bucket to collect manure from the unloading port or the opening near the bottom of the tank. Be sure the opening does not have solids accumulated that can contaminate the samples.

2. Stir the manure in the pail and immediately fill a one-quart flexible plastic bottle about 25 percent full. Do not use a glass bottle as it might explode from pressure build-up. Squeeze as much air out of the bottle as possible before capping.

3. Put your name, date and sample number on the bottle and the information sheet.

4. If the sample cannot be sent to the laboratory within a few hours, it should be refrigerated. Place the sample in a plastic bag, seal the bag, and keep cool until it is sent to the laboratory. Ship so that the sample arrives promptly at the laboratory.

**Liquid Manure Applied by Irrigation Systems**

1. Place catch pans or buckets randomly in the field to collect the liquid manure that is applied by an irrigation system.

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2. Immediately after the manure has been applied, collect the manure from each pan or bucket and combine in one bucket to make a composite sample.

3. Mix the manure and fill a one-quart flexible plastic bottle about 25 percent full. Seal and label the bottle and seal in a plastic bag. If the sample cannot be shipped to the laboratory right away, keep refrigerated. Ship to arrive promptly in the laboratory.

**Dry or Solid Manure Sampling**

**Paved Lots**

1. Collect manure by scraping a shovel across 25 feet of paved feedlot. Repeat this process six to eight times. Avoid samples from areas that are very wet or contain large amounts of feed or hay.

2. Use the shovel to thoroughly mix manure by scooping the outside of the pile to the center of the pile.

3. Collect a sample using the "hand and bag" method described in the section on dry or solid field sampling.

**Barn Gutter**

1. Shovel a manure sample to the depth of the gutter from the gutter.

2. Remove the manure from the gutter and place it on the barn floor. Mix the sample by hand (wearing freezer bags) with a kneading motion. When collecting samples from a gutter, be sure to include the liquid that is in the bottom of the gutter.

3. Collect a sample using the "hand and bag" method.

4. Repeat steps one through three from other locations in the gutter to collect three sub samples. Combine the sub samples and mix. Place in zip-lock bag and squeeze out all of the air before closing.

**Dry Stack**

This is manure stored outside in a stacking shed or above ground solid waste storage facility.

1. Using a pitchfork or shovel, take manure from several locations throughout the dry stack and place it in a pile. Collect samples from the outside/center of stack.

2. Mix the manure with a shovel by scooping the outside of the pile to the center of the pile.

3. Collect a sample by the "hand and bag" method.

Repeat steps one through three to collect the three sub samples. Combine the sub samples and mix. Place in a zip-lock bag and squeeze out all of the air before closing.

**Shipping**

Samples should be shipped express mail to the lab the same day they are collected. If not, they should be refrigerated immediately. It is advisable to keep samples on ice even during shipment to the laboratory.

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## LITTER SAMPLING PROCEDURES

**All litter is not managed the same way. Nutrient content can vary considerably.** Every poultry producer should have his or her litter analyzed for nutrient content. If the litter is fed to cattle, an analysis is critical. Litter is fed to cattle for crude protein and ash content. Litter with a crude protein content of 28 percent and an ash content less than 15 percent is ideal for feeding. Since calcium, phosphorus, potassium and trace minerals make up about 12 percent of the ash content, anything above that amount is probably soil. Since soil is worthless for feed, care must be taken when removing litter from the houses.

### Sample Collection

**General Sampling**. Several small samples should be collected in clean 5 gallon buckets. Mix the contents of the 5 gallon buckets for a composite sample. Place a one-gallon resealable freezer bag turned inside out over one hand. Grab a handful of manure with covered hand and turn the freezer bag right side out over the sample with the free hand. Seal the bag and place it in another freezer bag to prevent leaks. Label the bag and send to the lab or freeze it immediately to prevent nutrient losses. Label the bags with permanent marker as follows:

1. Name
2. Address
2. Address
3. Type of chicken
4. Number of flocks representing the sample
5. House number
6. Method of sampling (in-house, from stack, during loading, in-field)

As a precautionary measure include the same information on a 3 by 5 card and place inside the outside freezer bag.

### Other Methods of Sampling

**In-House.** Ten to 15 samples are collected throughout the house before cleanout. Three to four samples should be collected under or near the waterers and the rest collected throughout the remainder of the house. Dig only as deeply as you plan to scrape. Be careful not to include any soil in the sample. This method of sampling will allow reports back before land application so that an appropriate land application amount can be determined. This method is labor intensive.

**During cleanout**. Samples are collected as litter is loaded onto the spreader or as it is temporarily stockpiled prior to spreading. Individual samples should be collected throughout the cleanout. This method of sampling will not allow time for lab results return before land application occurs. This method will reflect an analysis of what is actually scraped out of the houses.

**During spreading**. A plastic sheet or gallon plastic jugs cut in half are placed in the field to collect litter as it is spread. This method is most accurate. This method will not allow time for lab results to be returned in time. However, results can be used the following application event.

**Stockpile**. Litter stored for a period of time is subject to heat and this can change its chemical characteristics. Since temperatures will peak in 10 to 20 days after initial stacking, samples should be collected after the temperature drops and as close to spreading or feedings time as

possible. Individual samples should be collected at several points as with the general sampling procedures. Make sure to dig into the stack 2 to 3 feet for representative sample.

**Shipping.** Samples should be shipped express mail to the lab the same day they are collected. If not, they should be refrigerated immediately. It is advisable to keep samples on ice even during shipment to the lab.

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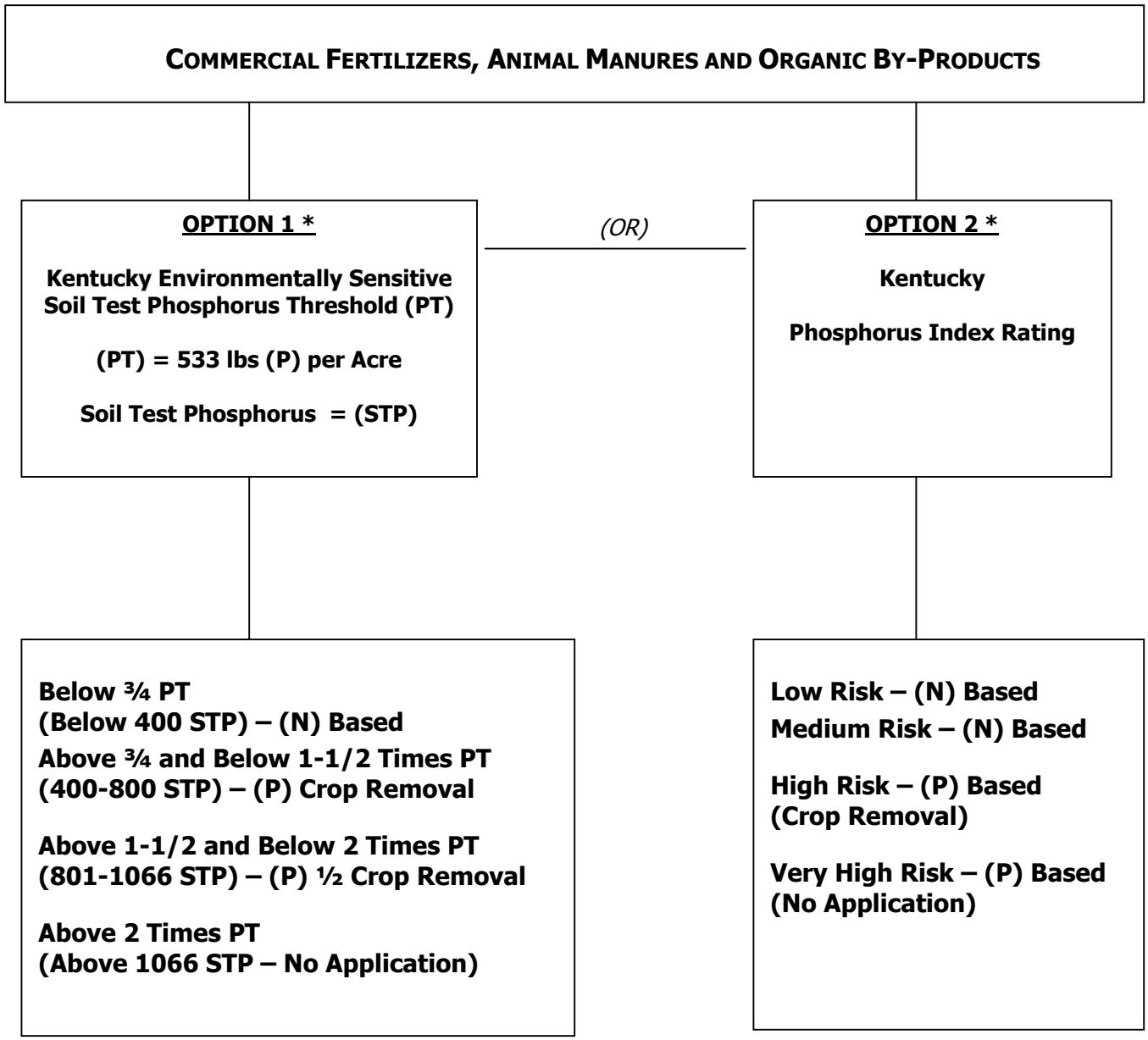
## ***KENTUCKY PHOSPHORUS (P) MATRIX***




*Note: A nitrogen (N) based plan can be implemented when STP is below 400. When STP is equal to or greater than 400, the use of either Option 1 or Option 2 is required in all cases.

**APPENDIX C**

# NUTRIENT MANAGEMENT PLANNING USING A PHOSPHORUS INDEX

A Planning Tool to Assess & Manage Phosphorus in Kentucky As Part of a Nutrient Management Plan On Agricultural Lands

The Phosphorus (P) Index is one of two options available when (P) is to be considered as a basis for nutrient management plans when nutrients will be land applied. Specific guidance about the use of each of the options can be referenced in the Kentucky NRCS technical standard for Nutrient Management (590). All nutrient management plans will consider the land application of commercial fertilizers and animal manures/wastes as sources of plant available crop nutrients. These plans will require the use of soil and manure laboratory analysis to determine the level of (P) in the soil and in the manure in order to balance land applications according to crop removal. All laboratory analysis for soil and manure will be conducted according to procedures as established by the University of Kentucky soil testing laboratory. NRCS Nutrient Management plans will be applied based on the consideration that effective erosion control practices are being applied on the fields receiving nutrient applications.

The Phosphorus Index method considers conditions which affect movement of phosphorus to streams and other waterbodies. These conditions include the hydrologic characteristics of the soil, type of cover on the soil, field slope, amount of P in the soil, presence of vegetative buffers, application rate, time of application, and method of application etc. The P Index is intended to be used as an assessment tool to indicate the potential movement of P on the landscape by taking into account various transport and source factors. Once the potential impact of P is realized, the P Index can be used to develop a nutrient management plan with acceptable application rates and best management practices. ***If the P Index indicates that a low or medium risk situation is present for the field planned for land application, the nutrient management plan may be developed with either a Nitrogen (N) or Phosphorus (P) basis.***

The ultimate goal is to promote effective utilization of nutrients, specifically from organic sources, and at the same time maintain agricultural profitability and environmental quality. ***The P Index is not intended to place any restrictions on landuse or other regulatory purposes that could be construed by manipulating index parameters.***

***The (P) Index is not applicable to the planning and application of human septage sludge. When planning the application of septage and sewage sludge refer to Kentucky regulations for guidance.***

## PHOSPHORUS AND THE ENVIRONMENT

In Kentucky, as in many other states, large inputs of P to agricultural fields may occur. Unlike commercial fertilizers which can be delivered in quantities as recommended by a soil test report, the amount of nutrients available to plants in animal manure or other organic byproducts can vary significantly. Plant needs for phosphorus are in most cases less than nitrogen, however, essentially equal amounts of these nutrients are available to plants from manure and waste water produced at animal feeding operations. When nitrogen plant needs are met from the application of manure, P is usually over-applied. Continuous applications at these rates can present environmental concerns.

### DESCRIPTION

The Kentucky P Index uses ten specific field features to obtain an overall rating for each field. Assigned to each of the field features are ***weighted factors*** of 1, 2, or 3. Not all field features have the same influence and input because research has shown that relative differences exist in their importance to P loss.

**APPENDIX C**

Also assigned to each of the ten features are ***value ratings*** of LOW (1 point), MEDIUM (2 points), HIGH (4 points), or VERY HIGH (8 points). Multiplying the ***weighted factor*** by the appropriate ***value rating*** yields points for that specific field feature. Based on a summation of the field feature points, the field falls into an overall category rating of LOW, MEDIUM, HIGH, or VERY HIGH. If a field receives an overall rating of HIGH or VERY HIGH, management practices may be implemented to reduce the rating to MEDIUM.

**Field Features and Weighted Factors Used in the P Index**

| Field Features | Weighted Factor |
|---|---|
| 1. Hydrologic Soil Group | 1 |
| 2. Residual Soil Test (P) Level | 3 |
| 3. Field Slope Percent | 1 |
| 4. Land Cover Percent | 3 |
| 5. Vegetative Buffer Width | 3 |
| 6. Agricultural Impaired Watershed | 1 |
| 7. Application Timing | 3 |
| 8. Application Method | 3 |
| 9. Distance To Spring/Stream/Waterbody | 2 |
| 10. MLRA (County Location) | 1 |

Currently, these weighted factors are based on the professional judgment of the various technical specialists who contributed to the development of the NRCS standard (590). As more research becomes available, the P Index will be periodically reviewed and updated.

## *Description of Field Features and Rating Assignments*

1. ***Hydrologic Soil Group*** **(HSG)** considers the drainability of the soil. A soil with a HSG of "A" is well drained. A soil with a HSG of "D" is poorly drained. A soil that is poorly drained is more likely to have runoff occur. HSG is given a weighted factor of 1.

2. ***Residual Soil Test (P)*** considers the level of (P) in the soil prior to the application of nutrients. This level is determined by a current soil test analysis. A current soil test analysis is less than 1 year old. As soil test levels increase following repeated applications, the index points will need to be recalculated. Soil test (P) is given a weighed factor of 3.

3. ***Field Slope Percent*** considers the average percent of slope for the field. Field slope is given a low weighted factor of 1 because it is considered in the Erosion Rate.

4. ***Land Cover Percent*** considers the percent ground cover (average over the field) immediately following the waste application. The waste application may be surface applied, injected or incorporated. Ground cover is considered to be perennial sod or crop stubble that is evenly spread over the soil surface of the application field/s. Perennial sod shall have a minimum of 3-4 inches of plant height. Land cover is given a low weighted factor of 3 because it is also considered in the application of erosion control practices.

5. ***Vegetative Buffer Width*** considers the filtering effect of vegetative buffers at downstream edges of fields. Filtering effect must be from sheet flow across the buffer. Filter strips, field borders, contour buffer strips, and riparian forest buffers are all examples of vegetative buffers. Due to the vast amount of favorable research that reinforces the effectiveness of buffers, this feature is given a weighted factor of 3.

6. ***Application Area is in a Watershed Identified as Being Impaired Due to Agricultural Applied Nutrients.*** These areas are identified on state supplied listings. If the application fields are in the watershed as identified on the list currently on file in NRCS offices, a weighted factor of 1 is assigned.

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7. ***Application Timing*** considers historical weather data for periods where most rainfall occurs and the active growing period for crops in Kentucky. The months where most rain occurs may also be the time when crops are inactive. *Note: applications in flood prone areas shall be made with extreme caution.* Based on these conditions, this feature is given a weighted factor of 3.

8. ***Application Method*** considers the risk for P movement based on how it is applied to the field (surface applied or incorporated). This field feature is given a weighted factor of 3.

9. ***Downstream Distace to a Spring, Stream, or Other Waterbody*** as measured from the closest upstream distance from the point of nutrient application in the field. This field feature is given a weighted factor of 2.

10. ***Major Land Resource Area (MLRA)*** refers to the county location of the fields where nutrients will be applied in consideration of documented soil and geological relationships. This field feature is given a weighted factor of 1.

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*Kentucky Phosphorus Index*

*Multiplying the **weighted factor** by the **value rating,** yields points for that specific field feature.*

| **Field Features** (weighted factors in parenthesis below) | **Field Feature Value Ratings** | | | |
|---|---|---|---|---|
| | **Low** (1 point) | **Medium** (2 points) | **High** (4 points) | **Very High** (8 points) |
| 1. Hydrologic Soil Group (1.0) | A | B | C | D |
| 2. Residual Soil Test (P) Level (3.0) | Between 400-500 | Between 501-800 | Between 801-1066 | Above 1066* |
| 3. Field Slope Percent (1.0) | <2 | 2-5 | 6-12 | >12 |
| 4. Land Cover Percent* (3.0) *estimated after application | 60-90 | 30-60 | 15-30 | 0-15 |
| 5. Vegetative Buffer Width (3.0) (ft) | >29 | 20-29 | 10-19 | <10 or No Buffer |
| 6. Application Area Is In A Watershed Identified As Being Impaired Due To Agricultural Applied Nutrients (1.0) | NO | | | YES |
| 7. Application Timing (3.0) | June - Sept | April, May, Oct., March or Nov. w/ winter cover | March or Nov. w/o winter cover, Feb. w/ winter cover | Dec., Jan., Feb. |
| 8. Application Method (3.0) | Injected | Surface applied and incorporated within 48 hr. | Surface applied and incorporated within 1 month | Surface applied and unincorporated for greater than 1 month |
| 9. Downstream Distance From Application Area To Spring, Stream or Waterbody (2.0) | Over 150 | 50-150 | 0-50 | Adjacent |
| 10. MLRA (County Location) (1.0) | Bluegrass | All Other | | |

Note: Additional Phosphorus Will Not be Applied When Soil Test (P) Level is above 1066.

**APPENDIX C**

# *KENTUCKY P INDEX WORKSHEET*

| Farm: | | Date: |
|---|---|---|
| Tract: | | |

| | | FIELD FEATURE VALUE RATINGS (1, 2, 4, or 8 points) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Field #:_____ Acres:_____ | | | | Field #: _____ Acres:_____ | | | |
| **Field Features** | **Weighted Factor (WF)** | Existing value | WF x Existing value | **Planned value** | WF x Planned value | Existing value | WF x Existing value | **Planned value** | WF x Plannedvalue |
| 1. Hydrologic Soil Group | 1 | | | | | | | | |
| 2. Residual Soil Test (P) | 3 | | | | | | | | |
| 3. Field Slope Percent | 1 | | | | | | | | |
| 4. Land Cover Percent | 3 | | | | | | | | |
| 5. Vegetative Buffer Width | 3 | | | | | | | | |
| 6. Ag. Impaired Watershed | 1 | | | | | | | | |
| 7. Application Timing | 3 | | | | | | | | |
| 8. Application Method | 3 | | | | | | | | |
| 9. Distance To Waterbody | 2 | | | | | | | | |
| 10. MLRA Location | 1 | | | | | | | | |
| *FIELD FEATURES INDEX TOTALS* | | Existing Total* | | **Planned Total** | | Existing Total* | | **Planned Total** | |

Note: If ***existing total*** results in a "**Low" or "Medium"** rating as indicated on the following page, a nitrogen, or phosphorus based nutrient management plan may be implemented.

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| *Field Vulnerability for Phosphorus Loss* | |
|---|---|
| **Total Points from P Index** | **Generalized Interpretation of P Index** |
| < 30 | **LOW** potential for P movement from the field. Low probability of an adverse impact to waterbodies. |
| 30 - 60 | **MEDIUM** potential for P movement from the field. The chance of organic material and nutrients getting into waterbodies exists. Buffers, setbacks, lower manure rates, cover crops, crop residue practices alone or in combination may reduce impact. |
| 61 - 112 | **HIGH** potential for P movement from the field. The chance of organic material and nutrients getting to waterbodies is likely. Buffers, setbacks, lower manure rates, cover crops, crop residues, etc. in combination may reduce impact. |
| > 112 | **VERY HIGH** potential for P movement from the field and an adverse impact on waterbodies. |

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**APPENDIX D**

## UNIT CONVERSION TABLE

Unit for solid manure = Ton
Unit for liquid manure = 1000 gal or acre inch
P (elemental phosphorus) x 2.29 = $P_2O_5$ (phosphorus)
K (elemental potassium) x 1.2 = $K_20$ (potash)
Percent (%) x 20 = pounds per ton
Percent (%) x 80 = pound per 1000 gallons
Percent (%) x 2254 = pounds per acre inch
mg/L x 9,992 = pounds per ton
mg/L x 0.008 = pounds per 1000 gallons
mg/L x 0.225 = pounds per acre inch
Pounds per ton x 4.17 = pounds per 1000 gallons
Pounds per ton x 113 = pounds per acre inch
Pounds per 1000 gallons x 0.24 = pounds per ton
Pounds per 1000 gallons x 27.2 = pounds per acre inch
Pounds per acre inch x 0.037 = pounds per 1000 gallons
Pounds per acre inch x 0.0089 = pounds per ton
1 gallon = 8.34 pounds
1/2 acre inch (liquids) = 27,200 gallons or 1815 cubic feet or 56 tons
1 mg/L = 1 ppm
1 acre = 43,560 square feet
1 cubic foot = 7.5 gallons
62.5 pounds = cubic foot (liquids)
Swine, Dairy, Beef, Horse, Sheep manure = (solids) 60 lbs cubic foot or 33 cubic feet/ton
Swine, Dairy, Beef, Horse, Sheep manure = (liquids) 62.5 lbs cubic foot or 32 cubic feet/ton
Poultry = 27 lbs cubic foot or 74 cubic feet/ton