ES00-049

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.

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

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.

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.

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.

REFERENCES

Bahman, E., Gilley, J., Kramer, L. A., Moorman, T.B., 1998. *Grass Hedge Effects on The Transport of Phosphorus, Nitrogen and Sediment Following Field Application of Beef Cattle Feedlot Manure.* Manure Mgt. in Harmony with the Environment and Society, Soil and Water Conservation Society. Ames IA

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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

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.

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 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

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)	90
	Fair Stand (3 to 4 tons/ac)	70
	Poor Stand (< 3 tons/ac)	50
Hairy Vetch	Good	100
	Fair	75
	Poor	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/ 2/

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 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 B

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
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.

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. 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.

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		

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

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

Certification

Level 1 (Nutrient Management)	Training
Commercial Fertilizer Only No Animal Waste Stored No DOW Permit Required	KY Nutrient Mgt. Course, Part 1 RUSLE NRCS Planning Course – Modules 1 – 5 [1/] Ag. Waste Mgt. Systems: A Primer [1/]

Level 2 (Nutrient Management)	Training
Commercial Fertilizer & Animal Wastes No Animal Waste Stored No DOW Permit Required	Level 1 Requirements Plus: KY Nutrient Mgt. Course, Part 2 Nutrient Management Plan

Level 3 (Nutrient Management as part of CNMP)	Training
Commercial Fertilizer & Animal Waste Animal Waste Stored & Applied DOW Permit Required Soil Test P > 400 Use of Phosphorus Index Required	Level 2 Requirements Plus: KY Nutrient Mgt. Course, Part 3 Introduction to Water Quality [1/] Nutrient Management Plan with PI

[1/] Required by National Policy

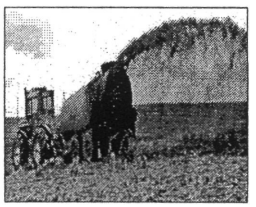
Interface with Agriculture Water Quality Act

Kentucky Nutrient Management Planning Training

February 3, 2004 Lexington, Kentucky

Henry Duncan, University of Kentucky
Amanda Abnee, University of Kentucky

KY Agriculture Water Quality Plans



- Nutrient Management Specialist certification is not required for KY Agriculture Water Quality Act plans.
- Landowners may self certify plans.
- Plans do include Best Management Practices (BMP's) based on NRCS standards.

Livestock BMP #11

Minimum Requirements:
- Comply with USDA-NRCS KY Practice Code 590
- Maintain an adopted sequence of crop rotations
- Take annual soil tests
- Analyze animal waste prior to land application
- Temporary storage of poultry litter for 30 days
- Sufficient land use must be available to utilize waste

When to include BMP #11

Crops section
- Applying fertilizer or animal manure to cropland

Livestock Section
- Applying animal manure to cropland
- Storing animal manure
- Poultry houses (BMP #11)

Nutrient Management Training
February 3, 2004

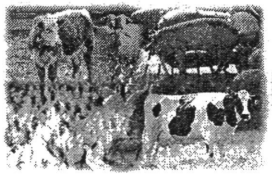
Peggy Jackson, Kentucky Division of Water
14 Reilly Road
Frankfort, KY 40601
Phone: 502-564-3410, ext. 319
E-mail: peggy.jackson@ky.gov

Where is Kentucky at with the new Federal CAFO Regulations?

- The new Federal CAFO Regulations are currently under review by State KPDES Branch to determine what Kentucky's next step will be. **The KPDES regulations are tentatively scheduled to be revised during calendar year 2004 to reflect the federal CAFO regulations.**

General comments:

- All operations on 10 or more acres must have an Agriculture Water Quality Plan.
- The process for getting permitted is the same as it has been all along. See the website for further details on application and permitting requirements: http://www.water.ky.gov/permitting/wastewaterpermitting/KPDES/cafo/default.htm
- All operations qualifying for KPDES CAFO General Permit coverage need to file a Notice of Intent (NOI) application. There is no permit fee for obtaining coverage under the KPDES CAFO General Permit.
- All operations obtaining a KPDES CAFO Individual Permit need to file Form B and Form 1. There is a $1,200 permit fee for obtaining a KPDES CAFO individual permit.
- Poultry operations with dry litter handling systems can no longer claim an exemption from getting a KPDES permit. In essence, if an operation has more than 125,000 broilers, they need a KPDES permit.
- **Any questions regarding CAFO permitting can be directed to Ronnie Thompson, DOW KPDES Branch, at 502-564-3410.**
- Producers' Compliance Guide for CAFOs: http://cfpub.epa.gov/npdes/afo/compliance.cfm
- National Management Measures to Control Nonpoint Source Pollution from Agriculture: http://www.epa.gov/OWOW/NPS/agmm/



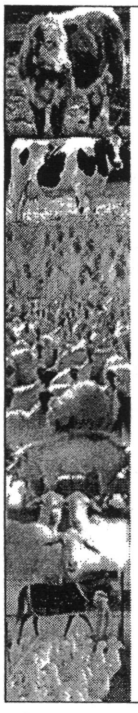
Overview of the Final EPA Concentrated Animal Feeding Operations (CAFO) Regulations

April 1, 2003

•EPA finalized regulations to reduce the amount of water pollution from large livestock operations in December 2002.

•The final rule was published on [insert date here] in the *Federal Register* (insert FR info).

•The rule became effective 60 days after publication on [insert 60 days later date].



CAFO Rule Objectives

- Simplify and clarify
- Flexibility for States
- Promote manure management practices
- Complement USDA efforts
- Promote new technologies
- Emphasis on large
- Foster voluntary efforts for medium and small AFO's
- Consistency with core NPDES

Simplify and clarify

Flexibility for States

Promote manure management practices

Complement USDA efforts

Promote new technologies

Emphasis on large:Foster effective voluntary efforts for medium and small

Consistency with core NPDES

What are EPA's goals?

Improve and protect water quality

•Control runoff from animal confinement and manure storage

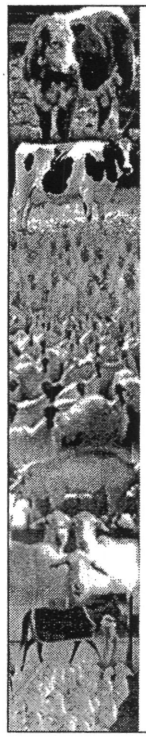
•Prevent catastrophic failure of lagoons and ponds

•Control nutrient-rich runoff from excessive land application

•Prevent inadequate manure management

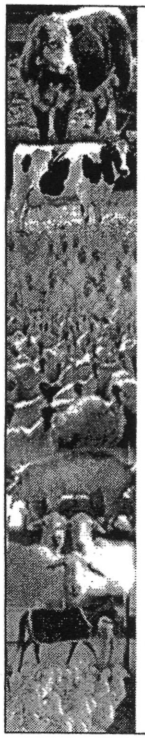
•Require appropriate manure management by CAFOs

•Encourage voluntary implementation of innovative technologies by CAFOs



Key definitions

- Animal Feeding Operation
  - *Confines animals for 45 days in 12 months*
  - *Sustains no vegetation in confinement area*
- Concentrated Animal Feeding Operation
  - *Large (ex., > 1000 Animal Units - AUs)*
  - *Medium (ex., > 300 AUs < 1000 AUs*
    - Stream running through confinement area
    - Man-made conveyance to surface water
  - *Small (ex., < 300 AUs, Designation)*
    - Same criteria as Medium
    - Significant contributor of pollutants
    - On-site inspection



How many operations will be regulated?

- Nationally, it is estimated that 15,500 CAFOs will require NPDES permits
  - *11,000 Large facilities*
  - *4,500 Medium facilities defined as CAFOs*
- In Kentucky, it is estimated that 160 operations will be defined as CAFOs:

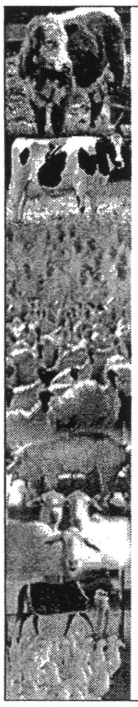
  Poultry (> 125,000 broilers) - 90

  Swine (> 2500 pigs (55lb)) - 60

  Beef (> 1000 beef cattle) - 6

  Dairy (> 700 dairy cows) - 4

•Medium CAFO include EPA's estimate for the number of small operators that may be designated.



Nutrient Management Plan Elements

- Adequate storage
- Mortality management
- Divert clean water
- Prevent direct contact
- Proper chemical handling
- Site-specific conservation practices
- Manure/soil testing
- Land application
- Records and documentation

•Adequate storage: ensure adequate storage of manure and process wastewater, including procedures to ensure proper operation and maintenance of the storage facilities

•Animal mortality: ensure proper management of mortalities (i.e., dead animals) to ensure that they are not disposed of in a liquid manure, storm water, or process wastewater storage or treatment system that is not specifically designed to treat animal mortalities

•Divert clean water: ensure that clean water is diverted, as appropriate, from the production area

•Prevent direct contact: prevent direct contact of confined animals with waters of the United States

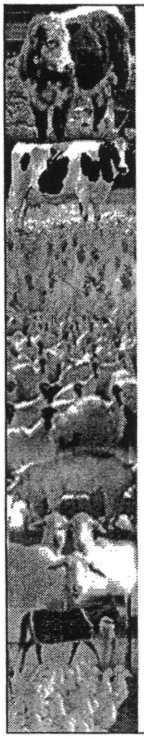
•Proper chemical handling: ensure that chemicals and other contaminants handled on-site, are not disposed of in any liquid manure, litter, process wastewater, or storm water storage or treatment system unless specifically designed to treat such chemicals and other contaminants;

•Site-specific conservation practices: identify appropriate site specific conservation practices to be implemented, including as appropriate buffers or equivalent practices, to control runoff of pollutants to waters of the United States;

•Manure/soil testing: identify protocols for appropriate testing of manure, litter, process wastewater, and soil;

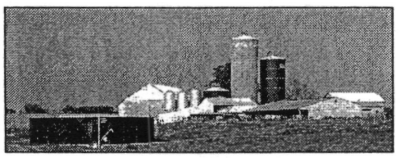
•Land application: establish protocols to land application of manure and, litter or process wastewater in accordance with site specific nutrient management practices that ensure appropriate agricultural utilization of the nutrients in the manure, litter or process wastewater; and ,

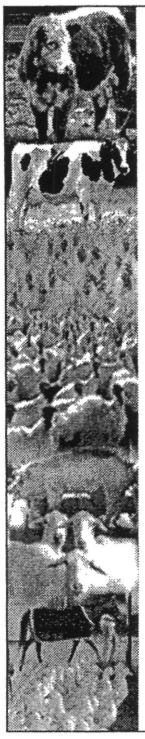
•Records: identify specific records that will be maintained to document the implementation and management of the minimum elements described above.



What proposals were <u>not</u> adopted in the Federal Rule?

- No mandatory co-permitting or integrator liability requirements
- No mandatory ground water requirements
- No required use of certified nutrient management planners
- No certification from persons receiving CAFO manure
- No lowering of CAFO thresholds





What is the implementation schedule?

- Signature – 12/15/02
- Publication date – 2/12/03
- Effective date – Within 60 days after publication (2/26/03)
- ELG Production area requirements effective for existing large CAFOs – 120 days after publication (6/12/03)
- State NPDES program revised – 1 year (2/26/04); 2 years if legal authority change required (2/26/05)

ELG production area requirements effective for existing Large CAFOs, and all ELG requirements must be incorporated into permits when issued (including land application; but note that AFOs may have until 12/31/06 to implement land application requirements)

1yr state programs revised (if no statutory changes are needed)

2 yrs state programs revised (if statutory changes are needed)

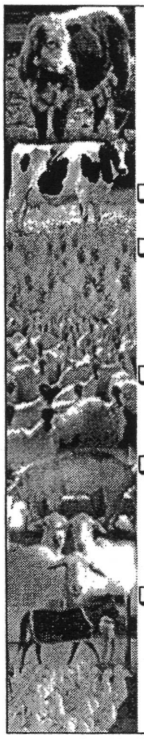
3 yrs newly defined CAFOs must be permitted and meet ELG production area requirements.

12/31/06 Effective date for all CAFOs to develop and implement a nutrient management plan, including land application requirements

New sources must apply must apply for a permit 180 days before they commence operation.

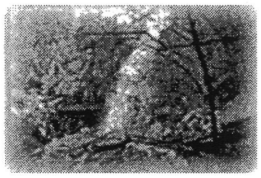
Designated CAFOs must apply for permit 90 after notice

New dischargers based on increase in number of animals, duty to apply no later than 90 days after becoming defined as a CAFO



Implementation Next Steps

- EPA formulate National Implementation Plan
- Define and/or designate existing operations as CAFOs to determine need to obtain KPDES permit (CY 2003 – ongoing)
- Update State KPDES regulations to reflect final EPA CAFO NPDES regulations (CY 2004)
- Re-issue KPDES General Permits
  - *Expire October 2005, reissue late CY 2005 to reflect new CAFO rule requirements*
- Determine measures of success and assess environmental results - enforcement, monitoring, compliance (ongoing)



Search KY: ? Options

KY Division of Water

For other Kentucky Government sites visit:
Kentucky.gov

AFOs and CAFOs

Last Updated on 11/23/2003

Operations that are defined as **Concentrated Animal Feeding Operations** (CAFOs) pursuant to 401 KAR 5:060, Section 10 are required to obtain a Kentucky Pollutant Discharge Elimination System (KPDES) Permit. In order to be defined as a CAFO, an operation must first meet the definition of an animal feeding operation (AFO), which is defined as follows.

> **A.** A lot or facility where animals have been, are or will be stabled or confined and fed or maintained for a total of 45 days or more in any 12-month period and where crops, vegetation forage growth,or post-harvest residues are not sustained over any portion of the lot or facility in the normal growing season.

Secondly, in order for an animal feeding operation (AFO) to be defined as a CAFO, there must be a specified number of animals confined at the operation.

> **B.1.** If there are more than 300 Animal Units confined and there is a discharge to the Waters of the Commonwealth, then the operation is a CAFO, or
>
> **B.2.** If there are more than 1000 Animal Units confined, then the operation is a CAFO.

It is this latter definition (**B.2**.), operations greater than 1000 Animal Units, under which the vast majority of potential CAFO operations in Kentucky would be defined.

Animal equivalents for 1000 Animal Units are:

> **Beef** -- 1000 head of beef cattle
> **Dairy** -- 700 head of dairy cattle
> **Swine** -- 2500 pigs, each weighing more than 55 lbs.
> **Poultry** -- 125,000 broilers or 82,000 laying hens or pullets

NOTE: Please direct any questions to the KPDES Branch at (502) 564-3410 or Bruce Scott at bruce.scott@ky.gov.

Once defined as a CAFO, the operation can be permitted under either a **KPDES General Permit** or **KPDES Individual Permit**, depending upon the nature of the operation.

> *(1) All operations between 1000 and 1500 animal units are eligible for coverage under a KPDES General Permit with some exceptions:*

Power Point overview of final EPA NPDES CAFO regulations (Kentucky specific)

Kentucky Division of Water Guidelines for Poultry Operations (revised 5-6-03) (PDF document)

Other Animal Feeding Operations

For all other animal feeding operations, where a liquid waste handling system is utilized, the operation must obtain a State Operational Permit (**KNDOP**) pursuant to 401 KAR 5:005. To apply for this **Kentucky No Discharge Operational Permit**, Short Form B/ND must be submitted along with any supporting documentation. There is no permit fee for a **KNDOP Permit**.

Construction Permits

For any animal feeding operation (including CAFOs), regardless of size, that plans to construct a new or expand upon an existing liquid waste handling system, a **Construction Permit** pursuant to 401 KAR 5:005 must be obtained prior to the start of construction. To apply for a **Construction Permit**, Short Form B/ND must be submitted along with any supporting documentation. There is no permit fee for a **Construction Permit**.

Applicable Regulatory Requirements for AFOs

The KNDOP regulations govern the permitting requirements and procedures for addressing AFOs. Specific cites that should be adhered to are as follows:

KNDOP Regulation 401 KAR 5:005

Agriculture Water Quality Act

The Kentucky Agriculture Water Quality Act (KRS 224.71-100 through 224.71-140) was passed by the 1994 General Assembly. The law focuses on the protection of surface water and groundwater resources from agriculture and silviculture activities. The Act creates the Kentucky Agriculture Water Quality Authority (KAWQA), a 15-member peer group made up of farmers and representatives from various agencies and organizations.

All farms (AFOs, CAFOs, and other) greater than 10 acres in size are required to adhere to the Best Management Practices (BMPs) specified in the Kentucky Agriculture Water Quality Plan. Specific BMPs have been designed for all operations to adhere to (i.e., BMP #17 for poultry operations). For more information regarding the KAWQA, see the Division of Conservation Web site.

Questions

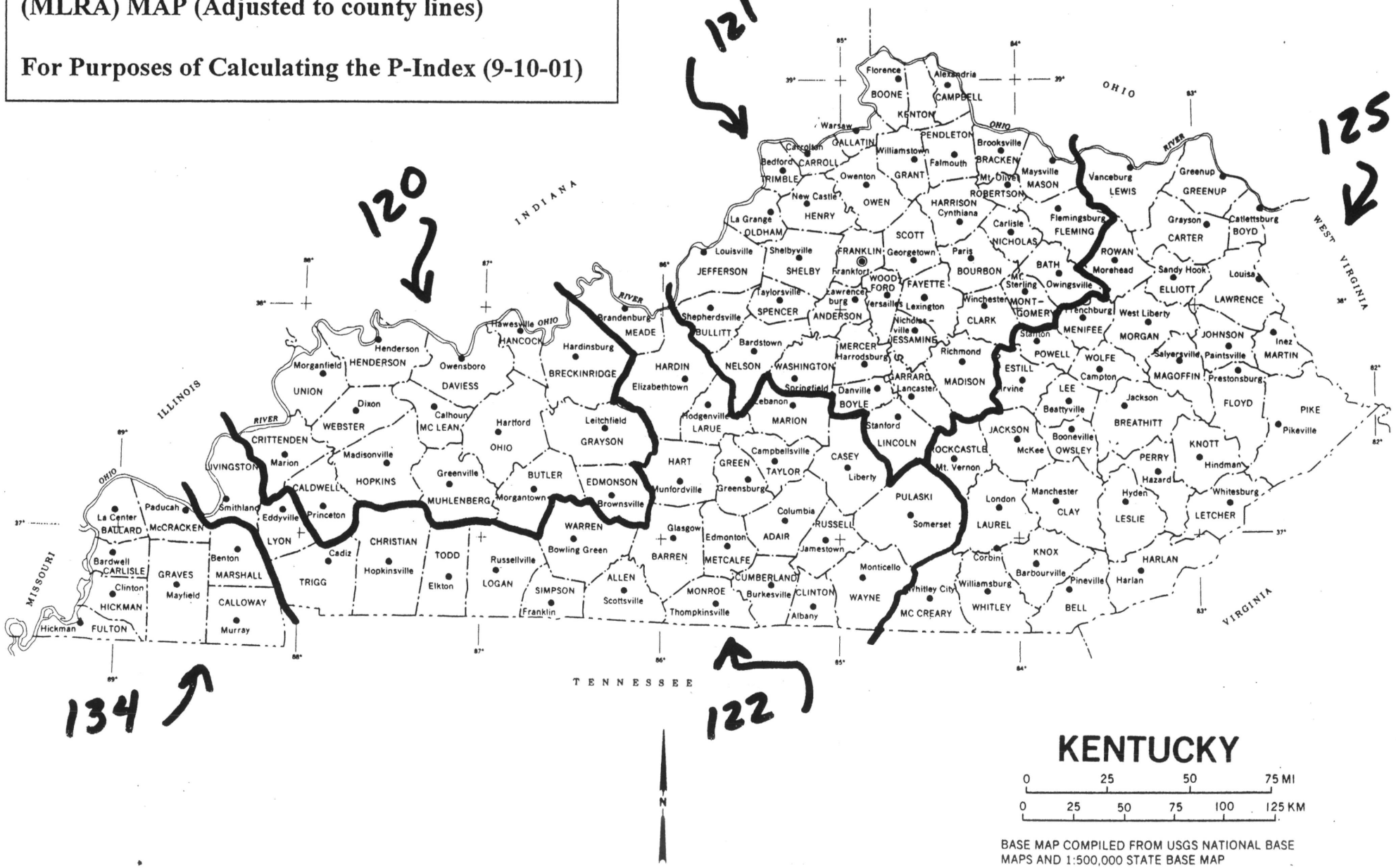
If you have any questions regarding any of these permit requirements, or need clarification as it relates to your operations, please contact the KPDES Branch at (502) 564-3410 or Bruce Scott at Bruce.Scott@ky.gov.

To Latest News and Updates

KENTUCKY MAJOR LAND RESOURCE AREA (MLRA) MAP (Adjusted to county lines)

For Purposes of Calculating the P-Index (9-10-01)

SOIL CONSERVATION SERVICE



BASE MAP COMPILED FROM USGS NATIONAL BASE MAPS AND 1:500,000 STATE BASE MAP

REVISED AUGUST 1984 4-R-33970

SOA-SCS-FORT WORTH, TEXAS 1984

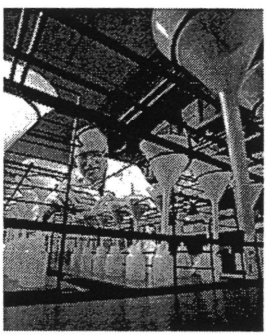
Kentucky (590) Phosphorus Threshold

Kentucky Nutrient Management
Planning Training

February 3, 2003

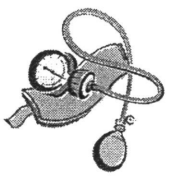
F.J. Sikora, Ph.D.
University of Kentucky

P soil tests



Blood Pressure Test

140/90 mm Hg



Comparison of 6 labs for soil test P

Lab	P (lbs/acre)	Extractant
1	74	Mehlich III
2	94	Mehlich III
3	87	Mehlich III
4	66	Bray I
5	72	Bray I
6	40	Mehlich I
7	69	Mehlich I

courtesy of Phillip Needum, OptiCrop

Comparison of 6 labs for soil test P

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Comparison of 6 labs for soil test P

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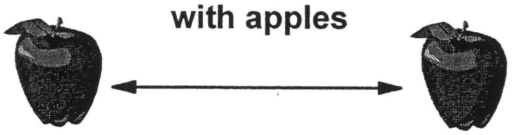
courtesy of Phillip Needum, OptiCrop

Need to compare apples with apples

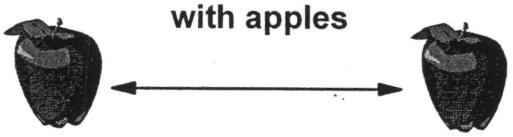


P_2O_5 or K_2O fertilizer recommendations must be made using tables or formulas developed for the soil test method employed.

In KY, University recommendations (in AGR1) are based on the Mehlich III test in units of lbs/acre P or K.

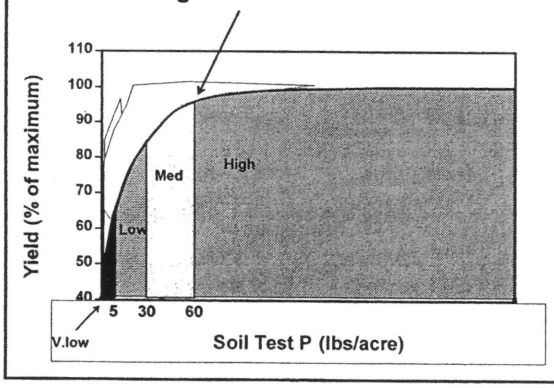
Fertilizer recommendations are made in lbs of P_2O_5 and K_2O per acre.

Need to compare apples with apples



- Nutrient Recommendations from AGR1
- Mehlich III for Soil Test P and K
- Soil test in lbs/acre

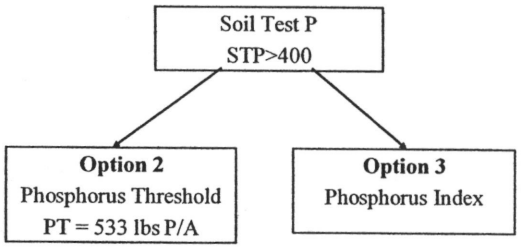
Agronomic Threshold

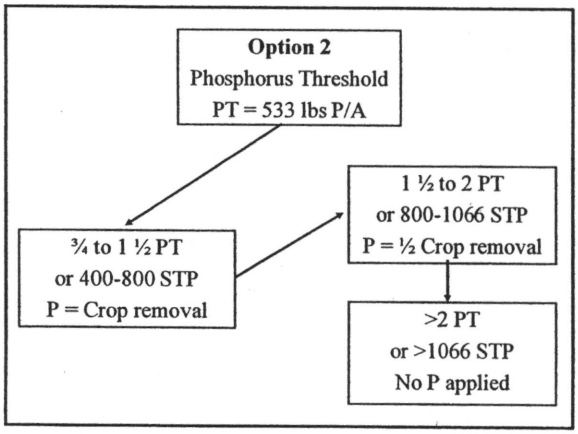


Kentucky (590) Phosphorus Index BMP's

F.J. Sikora, Ph.D.
University of Kentucky

Kentucky Phosphorus Threshold/Index





Description of Field Features and Rating Assignments (cont.)

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 watersheds as identified on the list currently on file in NRCS offices a weighted factor of 1 is assigned.

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.

Description of Field Features and Rating Assignments (cont.)

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

9. **Downstream Distance To A Spring, Stream or Other Water Body** 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.

Kentucky Phosphorus Index

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

	Field Features (weighted factors in parentheris 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 then 1 month
9.	Downstream Distance from Application Area To Spring, Stream or Water body (2.0)	Over 150	50-150	0-50	Adjacent
10.	MLRA (County Location) (1.0)	Bluegrass	All Other		

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

KENTUCKY PHOSPHORUS INDEX

Sample Field Situations

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. Feb w/o winter cover
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		

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

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.

Short Term Nutrient Management Planning

Planning Manure Application Rates for Current Year

Monroe Rasnake

Example 1. Field 101 has four acres of burley tobacco. Soil test results show adequate soil pH, P = 52, K = 298. The farmer has stacked beef feedlot manure he wants to use with the tobacco. No manure has been applied in the last year and no preplant fertilizer was used.

Option a. Uses soil test recommendation of 250 pounds of nitrogen, 110 pounds of phosphate and 200 pounds of potash per acre and calculate manure application rate to supply phosphate needs of the crop.

Option b. Uses crop removal of 175 pounds of nitrogen, 28 pounds of phosphate, and 188 pounds of potash per acre to calculate manure application rate to supply phosphate.

Example 2. Field 102 has 24 acres of corn for silage. Soil test results show a pH of 6.4, P = 40, K = 230. The farmer has dairy lagoon waste that will be applied preplant and disked in. No manure was used in the field last year and no preplant fertilizer will be used.

Option a. Uses soil test recommendations of 125 pounds nitrogen, 50 pounds of phosphate, and 100 pounds of potash per acre and calculates manure application rate based on phosphate needs of the crop.

Option b. Uses crop removal of 150 pounds of nitrogen, 72 pounds of phosphate, and 160 pounds of potash per acre. Manure application rate is again calculated based on phosphate.

Example 3. Field 103 has 45 acres that will be planted to conventional till corn for grain. The farmer wants to use fresh broiler litter to supply as many of the nutrients as possible. Soil test shows pH of 6.2, P = 37, K = 192. Soils are moderately well drained and the field was in soybeans last year. No manure was used last year and no preplant fertilizer was used.

Option a. Uses fertilizer recommendations of 175 pounds of nitrogen, 50 pounds of phosphate, and 125 pounds of potash per acre. Manure application rate is calculated to supply the nitrogen needs of the crop. This results in excess P and K being applied which will increase soil test levels next year.

Option b. Uses the same fertilizer recommendations, but manure rate is calculated based on the P needs of the crop. This results in less manure being used and additional N and K needed from fertilizer. With this option, the soil test will increase very little and more manure can be used in the future.

WORKSHEET FOR MANURE APPLICATION RATE

5/31/01

F-698 T-378 P.04 2703652667 From-UK RESEARCH CENTER 05-31-01 02:04pm

1. Background Information

a. Field ID	101
b. Field acres	4
c. Crop to be grown	Tobacco, burley
d. Manure type (Table 1)	Solid/Beef
e. ...management (Table 2)	Corn&Others/Spring/ <2d incorp.
f. ...history (Table 3)	OtherManure/ <4yrs out of 10
g. ...units (Table 5)	tons
h. Basis for calculations	Fertilizer Recom.
i. Yield unit	not needed
j. Estimated yield per acre	not needed

2. Fertilizer Recom. or Crop Removal

Fertilizer Recom.

a. Nitrogen	250 lbs/A
b. Phosphorus (P_2O_5)	110 lbs/A
c. Potassium (K_2O)	200 lbs/A

3. Fertilizer Already Applied

a. N	0 lbs/A
b. P_2O_5	0 lbs/A
c. K_2O	0 lbs/A

4. Residual N from Manure

a. Amount applied/acre last year	0.0 tons/A
b. lbs N/unit	0 lbs N/ton
c. availability coefficient (Table 3)	0
d. Available N(lbs/unit)	**0.0 lbs N/A**

5. Net Nutrient Needs

a. N (2a - 3a - 4d)	**250 lbs/A**
b. P_2O_5 (2b - 3b)	**110 lbs/A**
c. K_2O (2c - 3c)	**200 lbs/A**

6. Available Nutrients in Manure

(from Table 1 or test results)

a. N (lbs N/unit)	11 lbs/ton
avail. coefficient (Table2)	0.50
Available N	**5.5 lbs/ton**
b. P_2O_5 (lbs P_2O_5/unit)	7 lbs/ton
Available P_2O_5	**5.6 lbs/ton**
c. K_2O (lbs K_2O/unit)	10 lbs/ton
Available K_2O	**10.0 lbs/ton**

7. Application Rate to Supply Priority Nutrient

a. Priority Nutrient	P2O5
b. Priority Nutrient Needed	**110.0 lbs/A**
.....Available in Manure	**5.6 lbs/ton**
c. Manure Application Rate (units/A)	**19.6 tons/A calculated value**
d. Total Manure Applied (units)	**79 tons**

8. Nutrients Supplied by Manure

a. N (7c x 6a)	**108 lbs/A**
b. P_2O_5 (7c x 6b)	**110 lbs/A**
c. K_2O (7c x 6c)	**196 lbs/A**

9. Nutrient Balance

(-) indicates need; (+) indicates excess

a. N (8a - 5a)	need	**-142 lbs/A**
b. P_2O_5 (8b - 5b)		**0 lbs/A**
c. K_2O (8c - 5c)	need	**-4 lbs/A**

WORKSHEET FOR MANURE APPLICATION RATE

5/31/01

WORKSHEET FOR MANURE APPLICATION RATE

1. Background Information

a. Field ID	102
b. Field acres	24
c. Crop to be grown	Corn for silage or green chop
d. Manure type (Table 1)	Liquid/Dairy/Lagoon
e. ...management (Table 2)	Corn&Others/Spring/<2d incorp.
f. ...history (Table 3)	PoultryorLiquid/4-8yrs out of 10
g. ...units (Table 5)	acre-inch
h. Basis for calculations	Fertilizer Recom.
i. Yield unit	not needed
j. Estimated yield per acre	not needed

2. Fertilizer Recom. or Crop Removal

	Fertilizer Recom.
a. Nitrogen	125 lbs/A
b. Phosphorus (P_2O_5)	50 lbs/A
c. Potassium (K_2O)	100 lbs/A

3. Fertilizer Already Applied

a. N	0 lbs/A
b. P_2O_5	0 lbs/A
c. K_2O	0 lbs/A

4. Residual N from Manure

a. Amount applied/acre last year	0.0 acre-inch/A
b. lbs N/unit	0 lbs N/acre-inch
c. availability coefficient (Table 3)	0
d. Available N(lbs/unit)	**0.0 lbs N/A**

5. Net Nutrient Needs

a. N (2a - 3a - 4d)	125 lbs/A
b. P_2O_5 (2b - 3b)	50 lbs/A
c. K_2O (2c - 3c)	**100 lbs/A**

6. Available Nutrients in Manure

(from Table 1 or test results)

a. N (lbs N/unit)	109 lbs/acre-inch
avail. coefficient (Table2)	0.60
Available N	**65.3 lbs/acre-inch**
b. P_2O_5 (lbs P_2O_5/unit)	54 lbs/acre-inch
Available P_2O_5	**43.5 lbs/acre-inch**
c. K_2O (lbs K_2O/unit)	82 lbs/acre-inch
Available K_2O	**81.6 lbs/acre-inch**

7. Application Rate to Supply Priority Nutrient

a. Priority Nutrient	P_2O_5
b. Priority Nutrient Needed	**50.0 lbs/A**
.....Available in Manure	**43.5 lbs/acre-inch**
c. Manure Application Rate (units/A)	**1.1 acre-inch/A** calculated value
d. Total Manure Applied (units)	28 acre-inch

8. Nutrients Supplied by Manure

a. N (7c x 6a)	75 lbs/A
b. P_2O_5 (7c x 6b)	50 lbs/A
c. K_2O (7c x 6c)	94 lbs/A

9. Nutrient Balance

(-) indicates need; (+) indicates excess

a. N (8a - 5a)	need	-50 lbs/A
b. P_2O_5 (8b - 5b)		0 lbs/A
c. K_2O (8c - 5c)	need	-6 lbs/A

WORKSHEET FOR MANURE APPLICATION RATE

5/29/01

WORKSHEET FOR MANURE APPLICATION RATE

1. Background Information

a. Field ID	103
b. Field acres	45
c. Crop to be grown	Corn for grain
d. Manure type (Table 1)	Solid/Broiler/fresh
e. ...management (Table 2)	Corn&Others/Spring/<2d incorp.
f. ...history (Table 3)	PoultryorLiquid/<4yrs out of 10
g. ...units (Table 5)	tons
h. Basis for calculations	Fertilizer Recom.
i. Yield unit	not needed
j. Estimated yield per acre	not needed

2. Fertilizer Recom. or Crop Removal

	Fertilizer Recom.
a. Nitrogen	175 lbs/A
b. Phosphorus (P_2O_5)	50 lbs/A
c. Potassium (K_2O)	125 lbs/A

3. Fertilizer Already Applied

a. N	0 lbs/A
b. P_2O_5	0 lbs/A
c. K_2O	0 lbs/A

4. Residual N from Manure

a. Amount applied/acre last year	Enter >	tons/A
b. lbs N/unit	Enter >	lbs N/ton
c. availability coefficient (Table 3)	Enter >	
d. Available N(lbs/unit)		0.0 lbs N/A

5. Net Nutrient Needs

a. N (2a - 3a - 4d)	175 lbs/A
b. P_2O_5 (2b - 3b)	50 lbs/A
c. K_2O (2c - 3c)	125 lbs/A

6. Available Nutrients in Manure

(from Table 1 or test results)

a. N (lbs N/unit)	55 lbs/ton
avail. coefficient (Table2)	0.60
Available N	**33.0 lbs/ton**
b. P_2O_5 (lbs P_2O_5/unit)	55 lbs/ton
Available P_2O_5	**44.0 lbs/ton**
c. K_2O (lbs K_2O/unit)	45 lbs/ton
Available K_2O	**45.0 lbs/ton**

7. Application Rate to Supply Priority Nutrient

a. Priority Nutrient	N
b. Priority Nutrient Needed	175.0 lbs/A
.....Available in Manure	33.0 lbs/ton
c. Manure Application Rate (units/A)	**5.3 tons/A** calculated value
d. Total Manure Applied (units)	239 tons

8. Nutrients Supplied by Manure

a. N (7c x 6a)	175 lbs/A
b. P_2O_5 (7c x 6b)	233 lbs/A
c. K_2O (7c x 6c)	239 lbs/A

9. Nutrient Balance

(-) indicates need; (+) indicates excess

a. N (8a - 5a)		0 lbs/A
b. P_2O_5 (8b - 5b)	excess	183 lbs/A
c. K_2O (8c - 5c)	excess	114 lbs/A

WORKSHEET FOR MANURE APPLICATION RATE

5/29/01

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. 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.

NRCS Phosphorus Index 05-23-01

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.

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 Planned value**
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 below, a nitrogen or phosphorus based nutrient management plan may be implemented.

Point Total	***Potential for P movement***
< 30	**LOW** potential for P movement from the field. There is a 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.

Basic Planning Concepts

Kentucky Nutrient Management
Planning Training

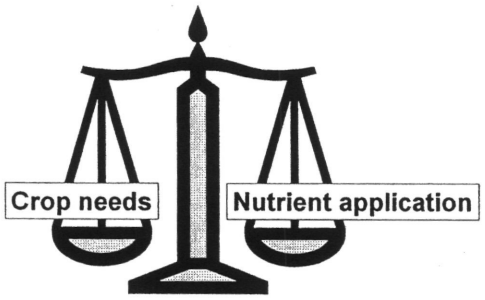
February 3, 2004

F.J. Sikora, Ph.D.
University of Kentucky

3 Easy Steps to Nutrient Management

1. Know Crop nutrient needs
2. Know Nutrient application rates

3. Achieving balance between 1 and 2



Agronomy Notes, Vol. 34, No. 2, 2002
http://www.uky.edu/Ag/Agronomy/Extension/agr_notes/agnews.htm

Initial soil test P (lb/ac)	lbs/ac of P_2O_5 to change soil test P 1 lb/ac	Change in soil test P with 200 lbs P_2O_5/ac remaining in soil
200 +	2.3	**87**
125 to 200	2.6	**77**
60 to 125	4.0	**50**
30 to 60	6.5	**31**
< 30	16.0	**12**

University of Kentucky P Soil Test Data

Soil Samples > 400 lbs/acre ('96-'98)