2001 SERA-IEG 17 MINIMIZING PHOSPHORUS LOSSES FROM AGRICULTURE
Annual Meeting
July 19-21, 2001
State College, PA

July 19, 2001

Tour of watershed research at the USDA-ARS Pasture Systems and Watershed Management Research Unit, Mahantango Creek Research Watershed.

Picnic at Penn's Cave.

July 20, 2001

Meeting called to order by Chairman, Miguel Cabrera, Univ. of Georgia.

Welcome from Dr. Jack Watson, Penn State College of Agricultural Sciences and Dr. Ray Bryant, USDA-ARS Pasture Systems and Watershed Management Research Unit.

NRCS Report – Chuck Lander

SERA-17 has been key in development of NRCS nutrient policy and new 590 Standard. States will be requested to submit P Index and State 590 standards to NRCS for review. Also, NRCS is looking for process based model to predict P loss based on management systems.

Several opportunities exist for SERA-17 and it's members:

- Funding is pending for development of a nutrient management course for NRCS
- $5 million in research/demonstration funds for innovative manure treatment systems
- $200- 250,000 next year for the National P Project
- Funding for the Purdue Manure Management Planner program. They want to complete this for all states.

P Index Session – Mod. Greg Mullens, Virginia Tech

P Source Availability in the P Index – Philip Moore, USDA-ARS, Fayetteville, AR

Very close relationship between P in runoff and SRP in surface applied manure. Soil test P more important if manure is incorporated. An important question is: How long does manure P control P loss? Conflicting results in research.

SRP in manure can be reduced by:

- Adding Fe or Al
- Diet modification
- Combination of both of these
- Loss of P from liquid swine manure less than dry poultry manure likely due to some incorporation of the liquid manure.

SRP in manure an important factor thus we need a standard method for determining this. The following key issues were discussed relative to this method:

- Sample drying and grinding
- Manure to solution ratio
- Shaking time
- Role of mineralization in maintaining SRP
- Difference between liquid and solid manures
- ICP vs Colorimetric P analysis

What about plant residues as a source factor?

- Iowa looking at this
- MD work indicates that there is release of DP from residue in no-till
- Clemson work showed higher DP concentration but lower total runoff load with residue
- Even some grass waterways can be a P source

<u>Transport Issues in the P Index – Bil Gburek, USDA-ARS, University Park, PA</u>

Keep the transport part of the P Index as simple as possible. Use information that is already available as much as possible. When considering changes in the P Index always look at the impact on the results.

Research on the transport factors in the P Index is behind the work on source factors. Big limitation is that we can not easily test the P Index on a field scale. Source is generally field based but transport is both field and landscape based. Probably little change in the runoff or erosion components of the P Index but the connectivity part of the transport needs work. This is currently being approached in many different ways. They are trying to develop a technically defensible connectivity measure using watershed curve number and stream density.

Questions:

- Can climate be incorporated into the P Index?
- What about including BMPs in the P Index?
- How can we test the P Index on a watershed scale?

Remember that the P Index is an index, not a model.

Screening Tools in the P Index – Bill Jokela, Univ. of Vermont

These are tools used to determine if a complete P Index is necessary.

Current Screening Tools:

- MD 3x Agronomic soil test critical level
- PA Mehlich 3 P > 200 ppm or field edge < 150 ft from water
- VT Any one of the following is high: Runoff class, HEL class, Flooding frequency, Soil test P.
- IN Rate the following factors from 0 to 4. If the total is > 6 run the P Index
    - RKLS from RUSLE
    - Runoff class
    - Leaching index
    - Distance
    - Soil test P
- CO Manure will be applied and Mehlich 3 P > 30 ppm and runoff will reach water
- DE Mehlich 3 P > 200 ppm on slope > 5%; Mehlich 3 P > 100 ppm on slope > 25%
- IA Impaired waterbody and P > 30 ppm Bray 1 P and any organic source of P applied

Criteria for screening tools

- Does is capture high P Index fields?
- Is it selective enough?
- Is it easy to use?

Screening tools are a very political issue. There is concern that we are not running the P Index on all fields.

Animal Science Issues – Mod. Brad Joern, Purdue

Dairy Nutrition, Katharine Knowlton, Virginia Tech

70 - 80 % of feed P is excreted by dairy cows
90 - 95% of this P is in feces

There is a direct relationship between P intake and excretion. Her data shows the very significant relationship between increased cost per cow and increased acres required for P based manure application as the level of P in the dairy ration is increased. The requirement is 0.34% the mean being fed was 0.49% and the highest level being fed was 0.65%.

We need a field indicator of overfeeding of P to get farmers to change their management. Dou at the University of Pennsylvania is working on the relationship between water soluble P in manure as an indicator of P in the diet.

Poultry Nutrition, Paul Patterson, Penn State

We need to meet but not exceed the P requirements. You can pull most if not all of the supplemental P from layers or broilers at specific times in the life cycle.
We need to consider the biological availability of P from different sources to poultry. For example:

- Animal P = 100%
- Alfalfa = 80%
- Corn = 30%
- Soybeans = 25%

Phytate is limiting availability of P. Adding Phytase:
- Wheat and Barley are naturally higher in phytase
- Transgenic soybean meal with phytase
- Transgenic mice with phytase secretion in saliva
- High Ca decreases phytate degradation resulting in increased excretion in layers
- Vitamin D increases bone ash and therefore P retention
- There are opportunities for use of multiple enzyme mixtures

P management recommendations for poultry
- Minimize animal stress
- Phase feeding
- Sex separate rearing
- Litter amendments
- Export manure

P management recommendations forSwine
- Feed waste accounts fro 6-10% of P in manure
- Fine grinding of feed increases P availability
- Heat treating improves P utilization
- Concerns with stability of phytase enzymes with heating for palletizing
- Water delivery of phystase may be better for swine

Nutrient Criteria - Mod. Wes Jarrel

Overview

Need to look at how we will be evaluated at the watershed level.
- Bioavailability in water
- Particulate phase – composition and behavior
- Time scale

Nutrient Criteria – George Gibson, USEPA

Periphyton vs chlorophyll a being debated as the primary response variable for setting standards. We understand eutrophication and how to reduce it by reducing N and P but the rate of response and degree of recovery is variable.

Modeling water quality in Reservoirs
- Identify quality variable of concern
- Relate quality variable to cause
- Identify user values
- Estimate corresponding critical values for cause variable
- Apply watershed management practices designed to minimize the likelihood that the critical value will be exceeded

Criteria must be based on water body type and geography. They are also trying to get at the cultural contribution.

Nutrient Criteria procedure
- Physical classification of the water body
- Reference conditions ie. Baseline for determining cultural contribution based on reference sites
- Look at historical information and data
- Use models for interpret the condition
- RTAG expert review and consensus
- Consider downstream effects
- Periodic review and calibration

Outline for developing criteria is available for lakes and reservoirs, and rivers and streams. Criteria are regionalized in to extensive subregions based on 1972 USDA land use data. Regional criteria can be modified by the states for designated use. As long as they are lower than regional criteria, no problem. If they are higher they have to be justified to EPA. States have three years to come up with their criteria otherwise the regional criteria are used.

Nutrient criteria publication available. They hope to soon have reference conditions for all regions for lakes and rivers.

The criteria set the goal, but then we need to convert this to a load and then figure out where the load is coming from and what management will be required to lower the load and meet the criteria.

Stakeholder Perspectives in the Mid-Atlantic Region – Mod. Tom Sims, Univ. of Delaware

Ross Orner, Dairy Farmer in Pennsylvania and Member of the State Conservation Commission

Need to keep the reality of farming in mind as we develop nutrient management programs

Try to have science lead the policy.

Alan White, New York City Watershed Program

$35 million from New York City for watershed programs to control P and pathogens
- 250 whole farm nutrient management plans
- All construction costs fully covered
- Operating costs assumed by farmer
- There is local ownership of the programs
- All programs are voluntary
- 92% of farms in the watershed have signed up
- Farmers recognize the problem now they want solutions
- Farmers need to know the benefits of implementing BMPs

Time is an issue because solving this problem will take a long time. Long term they need to look for ways to achieve mass balance. Looking for ways to balance the source, use BMPs to reduce losses, and use buffers to protect the stream edge.

Bill Roher, Delaware Nutrient Management Commission

Gave an overview of the nutrient management situation in Delaware, Maryland and Virginia. Similar regulation in Delaware and Maryland. Looking at accountability in plan implementation.

Workgroup Meetings

Testing – Gary Pierzynski
BMPs – Chuck Lander
Transport – Bil Gburek
Aquatics – Wes Jarrell
Modeling – David Radcliffe

Charge to Workgroups:
- Develop goals
- Outline activities
- Report back to the group in the morning

Poster Session – Bil Gburek, USDA-ARS Univeristy Park, PA

24 Poster papers were presented

CAFO Regulations Work Session – Tommy Daniel, Univ. of Arkansas

A work session was held by the CAFO comment subcommittee in the evening to work on the response to EPA from SERA-17 and the Tri-Societies on the proposed CAFO regulations.

July 21, 2001

National P Project – Andrew Sharpley, USDA-ARS University Park, PA

Source Water

– Derek Nussbaum-Wagler, Purdue Univ.

USLE based on DI water. If dispersion with local water is similar to DI water then ok However, dispersion also varies with soil type. Results with DRP in runoff varied with source water. Purdue working on source water with indoor rainfall simulator using soils from NC, MO, and IN. They want to do a test with benchmark soils looking at Turbidity, Total suspended solids, dissolved reactive P, Total dissolved P, etc.

– Tommy Daniel, Univ. of Arkansas

Normalizing source water with filter system.
US Filter system costs $1200 and $300 to replace filters
Flow 15 gal/min and they need 5 gal/min
Using 3 units ~ 9000 gal.
Can work with US Filter to approximate different rain water
Eventhough the water is unbuffered, the soil does not overwhelm the water pH

– Dewayne Mays, NRCS, Lincoln, NE

Working with Greg Mullens and Jessica Davis
Looking at P methods on benchmark soils, trying to relate these methods to actual runoff
Will be putting this in the National Soil Characterization Database

– Andrew Sharpley, USDA-ARS, University Park, PA

We need to think about how this project contributes to technology development.

Symposium on Monday morning at the upcoming ASA meetings.

CAFO Regulations – Tommy Daniel, Univ. of Arkansas

Update on the comments being prepared by SERA-17 and the Tri-Societies to EPA on the proposed CAFO regulations.

Burning Issues Forum

P Index Validation – Andrew Sharpley, USDA-ARS, University Park, PA

We need to give serious thought to how we might validate the complete P Index

P Index Validation - Bahman Eghball, USDA-ARS, Lincoln, NE

Evaluated P Index and found that for total P in a stepwise regression, erosion accounted for 78% and adding runoff increased this to 88%. Source factors were not significant for total P but were significant for soluble P.

Original P Index: r^2 for total P = 0.52 and r^2 for particulate P = 0.50
Original P Index with heavier weight to erosion $r^2 = 0.77$
Much lower for soluble P.

P Index Implementation Project – Antonio Mallarino, Iowa State Univ.

Beginning implementation project in Iowa

New York City watershed project

This project may provide useful data for validating the implementation of the P Index

SERA-17 Web Site, Steve Hodges, NC State Univ.

Activity:

- >47000 hits since January 2001
- 2500 hits on P Methods Manual publication
- > 800 hits on Aquatic System Response publication
- 200- 300 hits on other publications
- CAFO document – 300 downloads in first 24 hrs, 742 total downloads

Workgroup Reports

Testing – Gary Pierzynski

- Water soluble P in manure
  - Simple methods for routine use vs. research methods
  - Book values vs. analysis
  - Use of water soluble P in P Index and management recommendations

BMPs – Chuck Lander

- Producing materials for use by planners developing and implementing P based plans
- Review NRCS practice standards for applicability to P based planning
- How are BMPs handled in the P Index
-

Transport – Bil Gburek

- Try to get more hydrologists involved
- Subsurface transport of P
- Field scale transport processes
- Transport in the P Index
- P Index vs. Modeling P loss
- How can we use runoff box data
- Interactions between source and transport

Aquatics – Dory Franklin (New Chair)

- Wider distribution of the publication: A Procedure to Estimate the Response of Aquatic Systems to Changes in Phosphorus and Nitrogen Inputs
- Nutrient Criteria and involvement of SERA-17 in RTAGs
- Coordination with the transport workgroup
- Aquatics methodology publication
- Edge of field to water
- Wetlands

Modeling – Dave Radcliffe

- TMDL modeling
- Taxonomy of P models
- How do they work?
- What are the main underlying approaches?
- What are the gaps in the current models?
- Identify field and watershed datasets that can be used to test models and the P Index
- Use of models to refine the various pieces of the P Index.
- Field scale modeling

Committee Activities Report – Miguel Cabrera, Univ. of Georgia

- SERA-17 members participation in RTAGs
- Membership subcommittee updating membership list
- Activity report prepared
- Proposed CAFO regulations comments
- Encouraged relationship with COST group in Europe
- SERA-17 represented by Dory Franklin at the Nutrient Criteria Stakeholder Meeting

Ideas for future:

- Reinvigorate the workgroups
- Increased participation in the RTAGs
- Greater interaction with COST
- Document committee organizational guidelines

Reorganization and Plans for Next Year – Doug Beegle, Penn State Univ.

Doug Beegle took over as chairman of SERA-17 and thanked Miguel Cabrera for his service to the committee as chairman.

Philip Moore was elected chair elect and will take over at the end of the 2002 meeting.

2002 Meeting

Two locations were offered for the 2002 meeting of SERA-17

- Wilmington, NC – Steve Hodges
- Fort Collins, CO – Jessica Davis

It was decided that we would meet at one of these locations in 2002 and the other in 2003. Steve and Jessica would work out the order between them and then the 2002 host, in consultation with the executive committee, would select a meeting time in mid-June to early-July 2002.

The meeting format was discussed and it was decided to put more emphasis on the workgroups and build a significant part of the program next year around the workgroup activities. Also, try to organize the meeting to be less presentations and more discussion.

Minutes prepared by: Douglas Beegle, Penn State University