SERA-17 MEETING, San Antonio, TX, November 13-14, 2019

Multistate Research Activity Accomplishments Report

Project/Activity Number: SERA17
Project/Activity Title: Organization to Minimize Nutrient Loss from the Landscape
Period Covered: 1 October 2018 – 30 September 2019
Date of this Report: March 13, 2020
Annual Meeting date: November 13-14, 2019

Summary and Minutes of the Annual Meeting

The annual SERA-17 meeting was held in the Henry B. Gonzalez Convention Center. The meeting was opened by Gurpal Toor, University of Maryland, 2019 Chair of SERA-17, at 7:50 AM. The meeting included three discussion topics, each with an overview presentation followed by a facilitated discussion. The Business Meeting, discussion of emerging issues, and planning for the 2020 Annual Meeting followed.

Discussion Topic 1: Edge-of-field (EOF) phosphorus (P) loss monitoring: Adventures, lessons learned, future perspectives

The presentation and discussion were led by Nathan Nelson, Kansas State University, and Antonio Mallarino, Iowa State University. In both states, the cover crop was a small grain – typically winter wheat and rapeseed or triticale and rapeseed. Research results suggested that cover crops had an inconsistent effect on runoff. The cover crop slowed runoff and reduced peak discharge relatively consistently. However, the cover crop performed less favorably in years with more rainfall. Total P loss was not affected by cover crops, but there was a consistent increase in dissolved P loss. Subsurface P placement decreased dissolved P losses. Even with injection, a spike in P losses following application was observed. Cover crops decreased erosion by 60-70%; therefore, they still helped to protect soil. Rainfall simulation studies may give different results than in-field observations. Cover crops may increase tile drainage, while decreasing surface runoff. In a recent review, Duncan et al. (2019) found similar results being reported, i.e., soil health practices can flip P losses. This was an output from SERA-17 that came from discussion of experimental results.

Other considerations: Control structures installed on concrete pads – more work during installation, but less time spent on maintenance. There will be data loss, which makes data review and correction incredibly important. High sediment loss interferes with sample collection. Data loss due to submergence of sites is a significant challenge. Interference by mice, ladybugs, raccoons, worms also affected sites. To fill in missing data, statistical models can be used.

Outcomes: A synthesis paper with data from U.S. and Canadian sources would be very valuable. Database development and data archiving, with help from the National Ag Library for data storage.

Discussion Topic 2: Strengthening the Science Behind Phosphorus Indices

The presentation and discussion were led by Carl Bolster, USDA-ARS, Kentucky. The purpose of a P index ranges from improving management to regulation. Many P indices have been developed based on professional judgement. There are limited examples of P Index validation, i.e., testing P indices against observed data. When P loss data do not exist, an alternative for validation is to compare index output with data generated from processed-based fate and transport models. The first steps in evaluating a P index include:

- Does this index make physical and mathematical sense?
- Is the P Index formulated so that it's consistent with process-based models?
- Does it include dominant processes?
- Is it supported by data?

Moving forward: How do we improve scientific validity of P indices? How do we communicate strengths and weaknesses without overselling or undermining? How do we account for inherent uncertainty? Important questions: What factors should be included in a P index? Are factors correctly weighted? Do we correlate with biological response in lakes and streams? It is important to be parsimonious with inputs, so that the index will actually be used. The next step is taking a P index from a risk assessment tool to management recommendation and planning tool, e.g., having the program generate the "top three" BMPs based on results. This would not require much additional work.

Outcomes: SERA-17 is forming a P Index committee. The goal will be to provide guidance to those who want to update a P Index, as well as to develop a review article that outlines the science behind P index structures. Gurpal Toor serves as the contact for this committee.

Discussion Topic 3: Strengthening the Science Behind Soil Test Phosphorus Recommendations

The presentation and discussion were led by Deanna Osmond, North Carolina State University. Soil test methods have evolved over time. Fertilizer recommendations based on the test results still follow two philosophies: build up and maintenance or sufficiency. The Southern Region soil testing workgroup (SERA-6) wants to reorient the focus on soil test recommendations and how different states make recommendations. There is much concern about environmental loss risk versus agronomic P application. A survey of what's currently recommended in the South showed extreme differences among states in how much P is recommended for very low testing soils and at what soil test P level no more applications are recommended. The group is working to develop a database of soil test correlation and calibration data, with a goal of scientifically defensible fertilizer recommendations across state lines.

Outcomes: Consensus was that this effort is critical to the SERA-17 mission. There currently is a significant gap between the critical level for production and the change point for what's important environmentally. This issue will become more important as harmful algal blooms (HABs) proliferate across the country. How do we talk about agronomic recommendations environmentally? A presentation to the Hypoxia Task Force would be very timely and beneficial. SERA-17 and the soil testing workgroups (e.g., SERA-6) should address the difference between STP and a P Index. Deanna Osmond serves as the contact for this project.

SERA-17 Business Meeting

Minutes recorded by Lindsay Pease and John Kovar, with contributions from Gurpal Toor, Deanna Osmond, and Amy Shober.

Administrators Report: Andrew Sharpley will be recognized by the International Fertilizer Association (IFA) as the Norman Borlaug Scholar in Paris, France. Congratulations to Andrew from SERA-17! Some recommendations: i) update publications on website; ii) update fact sheets for relevance; iii) link fact sheets on website and get them out to broader audience; iv) update SERA-17 objectives to include research needs.

Not all universities recognize SERA-17 as a multi-state project, so members need to affiliate with the National Information Management & Support System (NIMSS).

Control of the SERA-17 website has been passed around from group to group. North Carolina State University is now the permanent home. Part of the meeting fees go toward website hosting. The website should be used to update those who missed previous meetings, highlight the group work that we are doing, and inform visitors about progress on the various projects.

Future Meetings: The next SERA-17 meeting will be held in August 2020 in Crookston, MN. Lindsay Pease, University of Minnesota, will host. Discussion topics may include an update on edge-of-field monitoring and data, problems with soil acidification and the resulting shift in P solubility, an update on the soil test P database, low-cost sensors, snowmelt runoff, and buffer effectiveness. The 2021 meeting will be held in conjunction with the annual ASA-CSSA-SSSA meetings in Salt Lake City, UT.

Current SERA-17 Leadership: John Kovar, USDA-ARS, Ames, IA (Chair); Merrin Macrae, University of Waterloo, Ontario, CA (Incoming Chair); Gurpal Toor, University of Maryland (Past Chair)

Accomplishments:
The 2019 SERA-17 meeting brought together approximately 50 participants, including several graduate students, with diverse backgrounds from the U.S. and Canada. Discussion centered on three topics: edge-of-field (EOF) P loss monitoring, strengthening the science behind P indices, and strengthening the science behind soil test P recommendations. Considerable interest was expressed on these topics and specific activities were proposed to advance the science, including development of a database and data archiving for edge-of-field P loss data, forming a

P Index committee to provide guidance to those who want to update a P Index, and assisting the regional soil test workgroups in developing a database of soil test P correlation and calibration data, with a goal of scientifically defensible fertilizer recommendations across state lines.

Impact:
SERA17 members have a long history of tackling complex problems and developing solutions for better managing P and other nutrients and protecting the environment. For example, discussions held at this year's meeting will result in a synthesis paper addressing edge-of-field P losses, and development of a review article that outlines the science behind PI structures. The ongoing discussion of the SERA 17 members with the regional soil testing workgroups will contribute to the development of a database of soil test P correlation and calibration data.

Publications:
Duncan, E.W., Osmond, D.L., Shober, A.L., Starr, L., Tomlinson, P., Kovar, J.L., Moorman, T.B., Peterson, H.M., Fiorellino, N.M. and Reid, K. (2019), Phosphorus and soil health management practices. Agricultural & Environmental Letters, 4:1-5. doi:10.2134/ael2019.04.0014