**NCERA-013 Yearly Report**

**For October 1, 2023 – September 30, 2024**

**Meeting Date: June 5, 2024**

**Embassy Suites Airport, Bloomington, MN**

**Attendees:**

State representatives:

Dan Kaiser, University of Minnesota, representative

Antonio Mallarino, Iowa State University, representative

Javed Iqbal, University of Nebraska-Lincoln, representative

Manjula Nathan, University of Missouri, representative

John Jones, University of Wisconsin-Madison, University of Illinois Urbana-Champaign, representative

Andrew Stammer (virtual), University of Wisconsin-Madison, representative

Dorivar Ruiz Diaz (virtual), Kansas State University, representative

Sunjeong Park, Ohio State University

Issac Cuchna, North Dakota State University

Not represented:

Michigan State University

Purdue University

South Dakota State University

**Meeting Minutes**

1. Introductions
2. Regional CIG grant (Kaiser)
   1. No updates from NRCS
   2. Will need to shift timelines due to using the funds for research timelines
3. Need to submit the NIMSS report within 60 days of 6/5/2024 - (Kaiser, Jones)
   1. Each state target to send Dan Kaiser written state report by end of June (format sent in email)
4. State Reports:

***Illinois***

* Three projects to support revisions to Illinois Agronomy Handbook P & K guidelines.
  + Andrew Margenot (fall 2023) initiated soil-test correlation study to assess critical soil-test P&K levels currently used.
  + John Jones initiating (fall 2024) long-term tillage, timing/placement study to support soil-test calibration of P&K rates and practices.
  + Margenot & Jones initiating studies (fall 2024) to examine build-up/drawdown rates. In collaboration with regional NRCS CIG project led by Dan Kaiser.
* Multiple studies planned to examine and produce revised liming recommendations in the Illinois Agronomy Handbook. Focus on adopting a buffer pH test for Illinois and optional variable rate calculations to support VRT lime.
* Faculty changes
  + John Jones hired as Assistant Professor of Agronomy & State Soil Fertility Extension Specialist
  + John will represent Illinois on NCERA-13 and at the North Central Soil Fertility Conference
* Agricultural Laboratory Testing Association (ALTA) summer workshop planned for August 19-20, 2024, in Bloomington, IL. Research and industry update presentations, as well as business meetings to take place.
  + ALTA members actively support soil fertility research across Illinois.

***Iowa***

The Iowa State University (ISU) Soil and Plant Analysis Laboratory has been closed since June 2018, after about 70 years of service to Iowa farmers, crop consultants, extension agronomists and researchers. This resulted from a combination of a long-term declining trend for samples submitted to the laboratory by farmers or crop consultants and discontinued financial support by the university. Since then, most of the university research soil and plant-tissue samples have been submitted to private soil-testing laboratories. Dr. Mallarino verified not significant laboratory bias for his new soil samples by comparing P, K, and pH test results before switching labs. Soil-test field calibration research for P, K, lime and micronutrients at ISU essentially stopped in 2023 given Dr. Mallarino impending retirement. However, work on soil test calibration methods and interpretation concepts at ISU persists by

Dr. Mallarino continued participation of the interstate project initiated in 2023 together with Dr. Daniel Kaiser (University of Minnesota UMN) and Dr. Dorivar Ruiz-Diaz (Kansas State University) "Moving Towards Consistent Soil-Test Phosphorus and Potassium Interpretations Across Soils of the Northcentral Region". The main objectives are to create a common database across the three states with existing field P and K soil-test calibration research data for corn and soybean for soils with approximately comparable topsoil chemical properties to study different procedures and concepts and potentially develop common criteria for defining soil-test critical concentration ranges and interpretation categories for these nutrients and crops.

***Nebraska***

General Comments

There is no public laboratory available for producers in Nebraska to use for soil and plant analysis. However, commercial labs such as Ward Lab have been immensely successful in promoting soil, plant, feed, manure, and water analyses among producers in the state.

Accomplishments

Phosphorus Fertilization Strategies:

We evaluated phosphorus fertilization strategies for dryland corn in a 16-year long-term study. The publication is currently under review and will contribute significantly to the literature. Data from this and other studies will be used to calibrate and validate phosphorus corn yield response in the national Fertilizer Recommendation (FRST) Tool.

Nitrogen Related Research:

Based on manure-related research trials, we recently improved manure nitrogen credits and updated extension publications. We developed digital nitrogen recommendation tools from our previous UNL nitrogen algorithm. Currently, trials are underway to improve nitrogen recommendations for corn, wheat, and sugar beet. We are conducting trials to improve nitrogen management in groundwater nitrate-contaminated areas of Nebraska. In these trials, we are evaluating enhanced efficiency fertilizers (EEFs) and crop nitrogen models to improve nitrogen use efficiency and water quality.

Impact

Manure Nutrient Availability Recommendations:

Updated recommendations were adopted by the Nebraska Department of Environment and Energy (NDEE), soil testing labs, and other agencies in Nebraska. This update increased the number of acres receiving manure (e.g., beef manure application rose from 1.2 million acres/year to 1.95 million acres/year based on 150 lbs N/acre). Results include higher economic returns due to lower manure fertilizer costs, reduced soil erosion risk on more agricultural land, and more efficient nutrient utilization with fewer potential gaseous emissions and nitrate leaching losses to groundwater in Nebraska. Overall, the updated recommendations have saved considerable costs on inorganic fertilizer, with an estimated $56 million/year saved from the increased use of beef manure nitrogen credits.

Enhanced Efficiency Fertilizers (EEFs):

Our EEFs projects addressed several questions from policymakers (Natural Resource Districts) and other stakeholders regarding the efficacy of EEFs in improving crop yield and protecting water quality. A significant outcome is that the application of EEFs led to a reduction in nitrogen application rates by 34-36 lbs/acre and decreased nitrate leaching by 41-66% without compromising corn yield in the Bazile Groundwater Management Area (BGMA). This result highlights the potential of EEFs to provide a win-win solution for nitrogen management in groundwater-contaminated regions of the Midwest.

***Minnesota***

General Comments

Minnesota continues to operate a public soil testing laboratory. Sample analysis number have been consistent to slightly higher on some homeowner samples due to out of state samples being sent from neighboring states that do not have a public lab. There have been no changes to Minnesota guidelines in the past year. However, fertilizer guideline publications have been updated within the last year.

Accomplishments

Minnesota continues to have a strong research program related to soil and plant tissue testing. From 2023 to 2024 work continued on two projects related to corn and soybean response to potassium. A rate and timing trial are in place for year 2, and 3 of four planned years and a study was continued focusing on non-exchangeable K in soils and how non-exchangeable K can relate to available K. Dr Kaiser submitted a regional CIG project which was funded which includes several Northcentral states to joint work on soil testing research. A joint research project is planned for the region along with efforts to improve databases on crop response to phosphorous in the region.

Impact

I have developed or participated in 7 podcasts and 8 presentations directly related to soil and plant tissue testing. Most of my other presentations and podcasts do contain some aspect of soil testing and fertilizer management but the 7 and 8 are more directly related to the topics. The podcasts are downloaded on average around 1000 to 1500 times per episode. I spoke to around 800 students for the 8 presentations. No journal publications were authored at this time. I did put together a small dataset of corn and hard red spring wheat response to phosphorus that was submitted for including in the FRST database.

***Ohio***

Background

Ohio does not have a state-run soil and plant testing facility. The previous state extension testing lab, Research and Extension Analytical Laboratory (REAL) closed in 1998. Using some of the equipment and testing methods from REAL lab, the Service Testing and Research Laboratory (STAR) was established in 1999. The main mission of STAR lab is to support the research community with chemical analysis of animal, plant, soil and water samples. The STAR lab makes available to Ohio State University and external researchers highly technical analytical instrumentation, offers consultation on the analytical methods and provides quality data at affordable cost. The STAR lab is self-sustaining unit. All the operational costs including labor are covered by earnings. The funds for refreshing analytical equipment are supported through the Ohio State University equipment grant. The STAR lab is located at the Ohio State University- Wooster campus.

Accomplishment

From July 2023 to June 2024, STAR Laboratory analyzed around 6,500 samples. This includes 30% plant and 22% soil analyses. The service was provided for the Ohio State University, OSU located USDA and 13 other educational institutions.

A few research projects where STAR laboratory provided analytical service is highlighted with the publication list.

Martins, E. M., Pillajo, J. Q., & Jones, M. L. (2024). Humic and Fulvic Acids Promote Growth and Flowering in Petunias at Low and Optimal Fertility. HortScience, 59(2), 235-244.

Kumar, H., Miller, S. A., & Lyon, S. W. (2023). Assessing nutrient concentrations and field-scale seepage load under an automated drainage water management system in Ohio. Smart Agricultural Technology, 6, 100328.

King-Smith, N., Molnar, K., Blakeslee, J. J., McMahan, C. M., Pillai, A. S., Mutalkhanov, M., ... & Cornish, K. (2023). Extractable latex yield from Taraxacum kok-saghyz roots is enhanced by increasing rubber particle buoyancy. Industrial Crops and Products, 206, 117698.

Yang, T., J. E. Altland, and U. C. Samarakoon. "Evaluation of substrates for cucumber production in the Dutch bucket hydroponic system." Scientia Horticulturae 308 (2023): 111578.

Lin, Yiyun, and M. Jones. "CRISPR/Cas9-Mediated Editing of Autophagy Gene 6 in Petunia Decreases Flower Longevity, Seed Yield, and Phosphorus Remobilization by Accelerating Ethylene Production and Senescence-Related Gene Expression." Frontiers in plant science 13 (2022).

Additional Notes: Personnel change

Manbir Rakkar is a new faculty on soil fertility and nutrient management position at School of Environment and Natural Resources (located in Wooster, OH). She has research and extension mixed appointment. Dr. Rakkar will be joining NCERA-13 group for Ohio and share extension and research from the Ohio State University.

***South Dakota***

Activities:

Conducted research regarding corn response to potassium on 5 farmer cooperator fields.

Outputs:

5 presentations were given regarding soil fertility to approximately 525 individuals.

One extension fact sheet and two radio interviews regarding nutrient management

Graduation of 1 master’s student with project focusing on phosphorus fertilizer recommendations in no-till management

***Wisconsin***

* The Soil and Forage Analysis Lab continues to offer soil, forage, manure, limestone and plant tissue analysis to researchers, farmers, gardeners and ag consultants. New instrumentation in 2023 and 2024 consisted of a combustion analyzer and a new ICP.New combustion analyzer and ICP
* State-funded on-farm N trial project samples are all being sent to SFAL
* Beginning to update micro methods
  + New project (Jones &amp; Stammer) started to create soil archive and use samples for method comparisons
  + Soil sampling database in WI and other states could serve the NC region
* John Jones led work to update P &amp; K recommendations for corn grain and soybean (expected release winter 2024-25).
  + From recent research 2021-2024
  + Suggests interpretation classes shift higher and have wider optimum class
  + Provide interpretations for following tests:
    - Bray-1, Mehlich-3 ICP, Mehlich-3 colorimetric P (Olsen, but will not be recommendation document)
    - Bray-1, Mehlich-3, Ammonium Acetate K
* Faculty changes
  + Natasha Rayne hired to replace Carrie Laboski with focus on manure N and sensor-based N management
  + John Jones moving to University of Illinois as state Soil Fertility Extension Specialist
* Routine soil sample volumes are slightly up year over year as of June 2024. Large numbers of nitrate soil samples and plant tissue samples for combustion analysis are also large areas of analysis. Work continues for a project related to carbon baseline measurements for parks in Dane County, involving analysis of samples for total C and organic C, along with texture by hydrometer, measurement of gravel and fine root fractions of soil.
* Funding was approved by the Wisconsin Fertilizer Research Council to evaluate soil testing methods for micronutrients. Methods include current single element methods, Mehlich-3, DTPA, AB-DTPA, and DTPA Sorbitol. This work will be conducted in collaboration with John Jones.

1. Chair Succession
   1. Dan Kaiser current Chair. John Jones (Univ. of Illinois) current secretary & incoming Chair.
   2. Workshop in 2025 (every two years)
2. NCR223 Publication
   1. Need to maintain website
      1. Migrate from Univ. of Missouri (Manjula Nathan) to KSU (Dorivar Ruiz Diaz)
      2. NRCERA-13 committee needs its own website - migrate to KSU as well
   2. Consider chapter updates
      1. Mehlich-3 extractions
      2. Phosphorus
      3. Potassium
      4. Micronutrients
      5. Survey labs (public Land Grants) to know what each state is doing
3. Other business
   1. Next meeting
      1. North Central Conference
         1. No formal NCERA-13 meeting due to 6/5/24 meeting and February 2025 workshop
      2. NCERA-13 Workshop (Feb 2025)
         1. Need to confirm locations, dates, speakers, etc.
         2. Advertise meeting with plenty of time
   2. FRST Data Submission
      1. Minimum dataset
         1. Tough to find all metadata
         2. Time consuming and does not match each state's own data handling system

Adjourn

**Committee Accomplishments**

The NCERA013 committee continues to maintain the NCR223 publication “Recommended Chemical Soil Test Procedures for the North Central Region” (<https://extension.missouri.edu/publications/sb1001>) which serves as a method manual for the region for soil testing labs. There were no changes to the publication for the current fiscal year. One discussion at the meeting was the future of the publication which is currently housed on the University of Missouri Extension Website. Manjula Nathan has been responsible for the publications but will be retiring soon. Once discussion that will need to be made at the next meeting will be where the publication should be housed in the future and reassignment of chapters among the committee members. Several of the chapters need to be looked at, specifically those where labs may be using the Mehlich-3 for nutrient extraction where the Mehlich-3 is not currently included.

Multiple committee members were part of a peer reviewed recently published in the Soil Science Society of America Journal on models and interpretation of critical soil test values that included researchers from across the United States. This paper was put together withing a sub-committee of the Fertilizer Research Support Tool committee.

Slaton, N.A. A. Pearce, L. Gatiboni, D.L. Osmond, C. Bolster, J. Dhillon. B.S. Farmaha, D.E. Kaiser, A.J. Margenot, F. Miguez, A. Moore, D. Ruiz-Diaz, D. Sotomayor, J. Spackman, J. Spargo, K. Uthman, and M. Yost. 2024. Models and Sufficiency Interpretation for Estimating Critical Soil Test Values for the Fertilizer Recommendation Support Tool. Soil Sci. Soc. Am J. 88: 1419-1437.

The NCERA013 committee hosted the joint soil testing working what included representatives from the SERA06 and NECC1012 committees. In total there were around 40 attendees, including University and industry representatives at the workshop which was held from June 3-4 in Bloomington, MN. There were presentations at the meeting from members of the different committees on soil testing and plant analysis research being conducted across the country. We also hosted the NRSP11 meeting prior to the workshop on June 3. A lot of the discussion was related to the FRST program and efforts among the various committees within FRST. The regional CIG project should foster more work within the national FRST initiative.

Impacts

The Fertilizer Response Support Tool (soiltestFRST.org) went live in 2024. There currently are data from all the participating NCERA013 states in the response database. Iowa leads the database with 580 total trials, Ohio with 522 trials, Missouri with 139, Nebraska with 68, Minnesota with 38, Indiana with 30, North Dakota with 25, South Dakota with 21, Michigan with 14, Illinois with 8, and Kansas with 5 for a total of 1450 for the region. The tool was just launched and there is no way to look at the impact that the NCERA013 data has compared to other states and regions.

The NCR223 publication is still the basis for soil testing methods for the Northcentral region. Nearly all labs use the test suggested for the region. There is some variation from state to state which does result in questions for stakeholders on why these differences exist. The regional CIG as well as a joint project from Drs. Mallarino, Ruiz-Diaz, and Kaiser will address some of these differences, attempt to standardize some of the terminology used in the region for making soil test recommendations, and in the end preserve some of the existing data such as grain P and K removal and soil test correlation and calibration data in databases that can be utilized in the future.

**Future Plans**

The committee will be organizing a regional workshop to be held near the end of February of 2025. There is some changeover due to retirements and faculty moving positions that will result in some changes to the committee membership for the next year. One key item to address the next meeting will be the chair succession. The committee implemented a 2-year chair about 10 years ago. Dr Kaiser volunteered to be chair while some of the states formalized their representatives. As previously mentioned, the future of the NCR223 publication also needs to be discussed at the next meeting. Several states identified in the state reports work related to comparing soil test methods. The committee will need to address whether any new tests should be added and whether methods should be developed for some emerging areas such as soil carbon measurements and soil health.