**Project Number:** NRSP11

**Project/Activity Title:** Building Collaborative Research Networks to Advance the Science of Soil Fertility: Fertilizer Recommendation Support Tool (FRST)

**Period Covered**: 1 July 2024- 30 June 2025

**Date of This Report:** 30 June 2025

1. **Annual Meeting (9 June 2025) Room MR2 @ Durham Convention Center, Durham, NC**
	1. **Participants**
		1. **Virtual Attendees (28):** Carl Bolster (USDA), Sylvie Brouder (Purdue), Daniela Carrijo (Penn State Univ), Gerson Drescher (Univ Arkansas), Don Edralin (NC Dept of Agric and Consumer Services), Bhupinder Farmaha (Clemson), Quirine Ketterings (Cornell), Dan Keiser (Univ Minnesota), Sandeep Kumar (NIFA), Sarah Lyons (FFAR), Emma Matcham (Ohio State), Renuka Mathur (Univ New Hampshire), Rao Mylavarapu (Univ Florida), Josh McGrath (USDA), Stephanie Murphy (Rutgers), Nathan Nelson (Kansas State), Manbir Rakkar (Ohio State), Mark Reiter (Virginia Tech), Raj Singh (Univ Arkansas), John Spargo (Penn State), Tales Tiecher (Guest Speaker), Haiying Tao (Univ Connecticut), Teferi Tsegaye (USDA), Jeff Volanec (Purdue), Forbes Walker (Univ Tennessee), Jim Wang (LSU), Candiss Williams (USDA-NRCS), & Matt Yost (Utah State Univ)
		2. **In-person attendees (18):** Nutifafa Adotey (Univ Tennessee), Shannon Alford (Clemson), Megan Bourns (Univ. Arkansas), Greg Buol NC State), John Filippi (NC State), Bronc Finch (Univ Arkansas), Bryan Hopkins (BYU), Luke Gatiboni (NC State), J. Grove (Univ Kentucky), Bob. Miller (Agri. Lab Proficiency), Amber Moore (Oregon State), Deanna Osmond NC State), Rasel Parvej (Univ Missouri), Austin Pearce (Field to Market), Eugenia Pena (West Virginia), Vaughn Reed (Mississippi State), Nathan Slaton (Univ Arkansas), & Amy Shober (Univ Delaware)
	2. **Summary of Annual Meeting Minutes**

**9:00 – 9:05** am Welcome, Luke Gatiboni *(NCSU)*

**9:05 – 10:00** Phosphorus and potassium fertilizer recommendations in Brazil and Paraguay: convergences, divergences, and paths towards harmonization. Dr. Tales Tiecher, Associate Professor at Federal University of Rio Grande do Sul, Brazil.

*Presentation overview: Dr. Tales Tiecher compared phosphorus and potassium fertilizer recommendation systems across Brazil and Paraguay, highlighting significant variability due to diverse soil and climate conditions. He noted overlapping systems, especially in southern Brazil, and emphasized the need for harmonization to improve fertilizer efficiency and environmental outcomes.*

*Despite methodological similarities, differences in nomenclature, critical levels, and consideration of factors like clay content and soil exchange capacity contribute to inconsistencies. Dr. Tiecher advocated for a shift from class-based to equation-based models to enhance comparability.*

*He also discussed efforts to standardize soil testing methods, inspired by U.S. practices and the FRST Project. A soil test working group has been formed in Brazil to review testing criteria. He explained that clay content is measured routinely using the pipette method in Brazil and Paraguay. The group also discussed regional variations in clay minerals and their impact on potassium recommendations, with Tales noting the need for further research to account for these differences. Additionally, he emphasized the importance of soil acidity management, stating that lime recommendations are based on achieving a pH of 6 or higher to prevent aluminum toxicity and improve phosphorus availability.*

*The presentation concluded with a discussion on the transition from public to private soil testing labs in Brazil and the significance of sampling depth in no-till systems due to nutrient stratification.*

**10:00– 10:20** Survey of soil sampling info Dr. Megan Bourns, Post-doctoral Fellow University of Arkansas Division of Agriculture

*Dr. Megan Bourns presented the findings from the optional section of a survey on soil testing practices for P and K fertilizer decisions across the US. The survey, conducted in early 2024, received responses from 173 stakeholders, including farmers, consultants, agronomists, and public sector employees with the final 9 questions focused on soil sampling practices and use of grid sampling and variable rate fertilization practices. Key results included that soil sampling practices sometimes change based on whether land is owned or leased, with October/November being the most common sampling time. The survey revealed that while soil testing is considered important by respondents, there may be gaps in its routine use and implementation, particularly among farmers. Megan noted that future research could explore factors influencing soil testing adoption and the relationship between sampling frequency and cost.*

**10:20-10:30** Update on Database and Collaborator Survey, Nathan Slaton, University of Arkansas Division of Agriculture

*Dr. Slaton reviewed the number of trials in the relational database which is now more than 3100 and there are a number of trials that have been completed in templates that are in queue for uploading. He also reviewed the collaborator survey from spring 2025 regarding how collaborators are using the FRST decision aid. About one-half of the FRST collaborators (40) who responded have used the tool in their professional job duties for teaching college classes, stakeholder presentation, professional presentations and developing or validating recommendations. The discussion about data included the need for recent trial data and collaboration to improve the database's robustness, while also discussing the challenges of processing legacy data and the development of templates for sulfur trials. The team is working on publishing the database in the next year and is considering additional features for the tool.*

**10:30 – 11:10** Committee updates (5 minutes each)

 **Soil Depth Report** – John Spargo (virtual) for Steve Culman, Penn State Univ. *Steve plans to*  *have a manuscript completed this summer on the main part of the soil depth project The*  *committee is narrowing its focus to address primary objectives and is planning a meeting in June*  *to review the final manuscript plan.*

**Calibration Committee Report** - Luke Gatiboni, North Carolina State Univ. *The calibration*  *committee continues to examine the final models that were selected to move forward with and*  *are developing a manuscript. More details will be presented in the FRST*  *Symposium Session*  *scheduled for Tuesday morning.*

 **Lime Calibration Report** - Amy Shober/Bob Miller/Raj Singh, Univ Delaware/ALP/Univ Ark. *The*  *group discussed soil incubation protocols based on the pilot study results which suggested that*  *an 8-day incubation period was sufficient for calcium carbonate and calcium hydroxide. Both*  *lime materials showed consistent results for lime rates that increased pH up to pH 7.0. The 8-* *day incubation avoided the need for a lot of labor and multiple water content adjustments.* *About 2/3 of the soils have been delivered to Arkansas. The incubation trials will start soon*  *and include 5 lime rates. The team also discussed soil testing methods to characterize the soils.*  *John Spargo confirmed the completed 1:1 soil pH and modified Mehlich-3 buffer.*

 **Sulfur Minimum Dataset and Database** - Matt Yost (virtual), Utah State Univ.

*Matt Yost provided an update on the sulfur committee's work, noting progress on developing a*  *minimum data set for sulfur studies and plans to publish a manuscript outlining*  *recommendations for future sulfur research. The template is being worked on to add soil test*  *methods and improve instructions before it is officially released. Sulfur has been added to the*  *tool but only in beta testing mode. Sulfur will be available on the public-facing tool once the*  *database is more robust. There are currently ~170 S trials in the database.*

**Regional CIG Reports**

**Northeast** - Haiying Tao, Univ. of Connecticut (virtual) *Haiying presented the Northeast regional*  *report, highlighting participating states, planned and conducted field experiments, and*  *challenges such as soil fertility and extreme weather.*

**South** - Jim Wang, Louisiana State Univ. (virtual) *Jim provided an overview of the South regional*  *project, focusing on phosphorus and potassium calibration, winter cover crop incorporation, and*  *ongoing trials across multiple states.*

**North Central** - Daniel Kaiser (virtual), Univ of Minnesota. *The NC project is in its first year so*  *there was not much to report.*

11:10– 11:30 NRSP11 Highlights review, Business Meeting, Leadership/Officer appointments, and Misc. NRSP Business, Luke Gatiboni (NRSP11 Project Lead) and Administrative Advisor(s) comments

*The scheduled monthly Zoom meetings will continue to serve as interim meetings for NRSP11. Attendees were encouraged to visit the NIMSS website and enroll as official members. Instructions for joining are always included in the FRST monthly collaborator meeting notes which are emailed to 120+ people each month. Luke highlighted project outputs, including publications, database growth, and collaborative efforts, and proposed a two-year term for leadership positions to ensure stable leadership transitions. The motion was made, seconded, and passed unanimously for 2-year leadership terms.*

1. **Accomplishments:** Following the official release of the FRST decision aid the FRST Project activities have focused on developing decision aid features, expanding and populating the database, and addressing other aspects of the FRST project, which are outlined below.
	1. Sulfur was added as the third element to the database in October 2024. The database currently contains 173 S trials and needs to be expanded before S is added as an option to the public-facing tool*. Matt Yost led the initiative to establish a minimum dataset for S and develop a template for collecting and uploading S trial data. A Fact Sheet on the minimum requirements for legacy dataset collection was prepared and uploaded on the website in late 2024.*
	2. *A paper summarizing the soil pH and lime requirement methods and describing the variance in lime recommendations for 6 soils was submitted for review in December 2024. The paper was submitted to the Soil Science Society of America Journal. This project was led by John Jones, Bob Miller, and Nathan Slaton. The paper is in review.*
	3. *A paper documenting the FRST tool and database was developed and published in April 2025. Megan Bourns led this effort.*
	4. Results of a nationwide survey to aid in our understanding of how independent and industry consultants use soil test information was summarized and the manuscript was prepared and submitted for peer review. Nathan Slaton and Megan Bourns led this effort.
	5. 130+ soils were collected by collaborators across the USA for a lime calibration study. Soil collection was led by Bob Miller. A pilot trial was initiated with 3 soils examining soil pH change across time as affected by incubation times and lime sources. Data is being analyzed and used to guide a larger incubation trial.
	6. North Central Region NRCS CIG Grant was awarded $1,320,416 for the proposal *Enhancing Tools to Manage Phosphorus in Agricultural Fields in the Northcentral Region to Reduce the Risk Loss to Surface Waters: A Project Supporting the Fertilizer Recommendation Support Tool (FRST)* led by Daniel Kaiser with univ Minnesota plus involvement from Kansas, Illinois, Iowa, Michigan, Minnesota, Missouri, Ohio, South Dakota, and Wisconsin. https://cig.sc.egov.usda.gov/impact/conservation-innovation-grants-awards-fiscal-year-2023
	7. Members of NRSP11 were active in promoting the FRST decision aid, performing webinars and presenting at stakeholder meetings to educate clients on soil fertility and soil testing, and educate on other project activities at local, state, national, & international meetings and social media.
		1. Slaton, N.A., Osmond, D, Spargo, J.T., Yost, M., Kaiser, D., Buol, G., Ahmad, U., & Gatiboni, L. (2024). Modernizing Fertilizer Recommendations: The Fertilizer Recommendation Support Tool (FRST) Project [Poster]. Soil and Water Conservation Society Meeting. Myrtle Beach, SC. 21-24 July 2024.
		2. Jones, J. (2024) Variations in state lime recommendations [Oral Presentation]. Agricultural Testing Laboratory Association (ALTA) Webinar <https://alta.ag/alta-webinars> 30 July 2024
		3. Howell, M. (Host) & Slaton, N.A. (2024). Episode 22: The FRST Step to Optimizing Fertilizer Use. The Dirt Podcast. [The Dirt PodKast Archives - eKonomics](https://nutrien-ekonomics.com/news/type/podcasts/). 31 July 2024
		4. Slaton, N.A., Buol, G., Osmond, D., Spargo, J., Kaiser, D., Yost, M., & Gatiboni, L. (2024). Soil Test Correlation Modeling Decisions for the FRST Decision Aid. Agricultural Laboratory Testing Association Summer Annual Meeting. Normal, IL. 19-20 August 2024.
		5. Osmond, D. (2024). Lessons Learned Controlling Agricultural Phosphorus at the Watershed Scale: Assessment, Planning, and Implementation. 2024 Fall Phosphorus Science and Emerging Research Workshop, Hosted by Agriculture Nutrient Policy Council. Washington D.C. 1 October 2024.
		6. Gatiboni, L. (2024). Soil Fertility Training including FRST as an information resource. North Carolina Department of Agriculture and Consumer Services. Raleigh, North Carolina. 7 Nov. 2024
		7. Slaton, N. A., Osmond, D. L., Spargo, J. T., Buol, G., Yost, M. A., Kaiser, D. E., & Gatiboni, L. (2024). Identifying Knowledge Gaps and Improving Crop Potassium Fertilization Recommendations Using the FRST National Database [Abstract]. ASA, CSSA, SSSA International Annual Meeting, San Antonio, TX. 11 Nov 2024 <https://scisoc.confex.com/scisoc/2024am/meetingapp.cgi/Paper/160175>
		8. Slaton, N.A. (2024). Update on FRST/NRSP11 activities. The Fertilizer Institute Research Committee Meeting. San Antonio, TX. 12 November 2024
		9. Slaton, N.A. (2024). Update on FRST/NRSP11 activities. SERA-17 Annual Meeting. Minneapolis, MN. 14 November 2024
		10. Slaton, N.A. (2025) Soil Test Round Table Discussion. MidAmerica Farmer Grower Rice and Cotton Conservation Tillage Conference. 27 January 2025 Memphis, TN
		11. Clark, J. (2025) FRST Update. Minnesota Valley Testing Labs Annual Winter Meeting. Northwood, IA. 30 January 2025
		12. Spargo, J. (2025). Modernizing Fertilizer Recommendations: The Fertilizer Recommendation Support Tool (FRST) Project. 76th Corn Improvement Conference. State College, Pennsylvania. 6 February 2025
		13. Slaton, N. (2025). FRST Update. NCERA013 Soil Testing Workshop. Coralville, IA. 25 February 2025.
		14. Yost, M., Slaton, N., Spargo, J., Kaiser, D., Gatiboni, L., & Osmond, D. (2025). What you need to know about the national fertilizer recommendation team called FRST. WERA-103 Annual Meeting. Reno, NV. 4 March 2025.
		15. Gatiboni, L. (2025). Soil test correlation and calibration for agricultural crops. May 22, 2025. Technical University – Agrarian Campus; Chisinau, Moldova.
		16. Slaton, N.A. (2025). An Overview of the Fertilizer Recommendation Support Tool Project Activities [Session 2: Soil Test Calibration; Oral]. 18th International Symposium on Soil and Plant Analysis. Advancing Agricultural Science for Global Sustainability. June 9-13, 2025. Durham, North Carolina, USA.
		17. Bourns, M. (2025). Soil Test-based Recommendations: Utility, Gaps, and Opportunities – Findings from a Stakeholder Survey [Session 2: Soil Test Calibration; Oral]. 18th International Symposium on Soil and Plant Analysis. Advancing Agricultural Science for Global Sustainability. June 9-13, 2025. Durham, North Carolina, USA.
		18. Buol, G. (2025). Estimating Probability of Relative Crop Yield Loss Based on Soil Test Phosphorus or Potassium Results Using a Non-Parametric Approach. [Session 2: Soil Test Calibration; Oral]. 18th International Symposium on Soil and Plant Analysis. Advancing Agricultural Science for Global Sustainability. June 9-13, 2025. Durham, North Carolina, USA.
		19. Gatiboni, L. (2025). Relating Soil Test Value to Fertilizer Rate: Approaches for Soil Test Calibration [Session 2: Soil Test Calibration; Oral]. 18th International Symposium on Soil and Plant Analysis. Advancing Agricultural Science for Global Sustainability. June 9-13, 2025. Durham, North Carolina, USA.
		20. Shober, A. (2025) Improving Lime Recommendations Across the U.S. [Session 2: Soil Test Calibration; Oral]. 18th International Symposium on Soil and Plant Analysis. Advancing Agricultural Science for Global Sustainability. June 9-13, 2025. Durham, North Carolina, USA.
		21. Slaton, N.A. (2025). Update on NRSP11/FRST Project. SERA-17 Annual Meeting. Virtual. 25 June 2025.
		22.
	8. **Project Staffing**: Post-doctoral fellows Megan Bourns and Rajveer Singh started 2 January 2 and 7 April 2025, respectively. The FRST Executive Committee changed with Deanna Osmond’s retirement. Deanna was replaced on the executive committee by Luke Gatiboni (NCSU).
	9. **Social Media** – no posts to social media since last report
	10. Collaboration with individuals in private Industry has been incorporated into FRST, We currently have private industry collaborators in the NRSP11 from FFAR, Precision Planting, and Rock River Laboratories, and collaborate with the Agricultural Lab Proficiency Coordinator and the Agricultural Lab Testing Association leadership on FRST activities. Other private industry collaborations involve representatives that regularly attend the meetings but are not officially listed in NIMSS as NRSP11 participants and include individuals from Calcium Products Inc., The Fertilizer Institute, The Sulfur Institute, OCP, North America, Phospholutions, and the Nature Conservancy, *Short-term outcome.*
	11. **Plans for 2025-2026 include**
		1. Publishing the data from the national consultant/farmer survey, activity led by Megan Bourns
		2. Publishing a paper and data from the soil sampling depth activity led by Steve Culman (Washington State Univ.)
		3. Publishing a paper on the pilot lime study comparing Ca(OH)2 and CaCO3 lime calibration curves, manuscript development led by Rajveer Singh
		4. Publishing a paper on the lime rate survey comparing lime requirement methods and recommendations for six soils among land grant universities (Led by John Jones, Univ. Illinois)
		5. Publishing the soil test correlation and calibration data that has been accumulated in the relational database in Ag Data Commons.
		6. Initiating and completing a laboratory study from 120+ soils collected by Bob Miller and collaborators using protocols established by the Lime Calibration committee and publishing the dataset, led by Amy Shober, Bob Miller & Rajveer Singh.
		7. Planning a symposium for the Fall 2025 ASA-CSSA-SSSA meeting that will be held in Salt Lake City, UT.
		8. Finalizing analysis of western P and K recommendations led by Matt Yost,
		9. Add a calibration model to the FRST decision tool
		10. Seek funding to add a model for the probability of a positive response to fertilization that complements the correlation using relative yield
		11. Continue to recruit industry representatives as participants in NRSP11.
	12. **Outputs**
		1. Since 1 October 2024, members of the FRST project have collaboratively published one (1) peer-reviewed journal article with another in peer review, created or revised five (5) fact sheets, updated the FRST user manual, organized one (1) symposium at an international meeting, and made 20+ scholarly presentations at local to international events. Fact Sheet and peer-reviewed paper references are provided in the Publications section.
		2. The [Fertilizer Recommendation Support Tool](https://soiltestfrst.org/) website continues to be a source of information and includes our publications, fact sheets, and links to the tool and user manual.
		3. We hold monthly planning meetings for the executive team and monthly collaborator meetings that are attended by 30-40 FRST participants featuring one or two presentations informing the group of research or topics related to soil-test-based nutrient management. The collaborator meetings are foundational to our objective of creating a community of practice.
		4. The two foundational outputs of NRSP11 are the relational database and the decision support tool or [Fertilizer Recommendation Support Tool](https://soiltestfrst.org/). The relational database now has data from more than 3000 trials from the 50 US states and Puerto Rico and continues to grow as “growing the database” is a major objective for NRSP11. The web-based decision support tool is readily available for public use.
	13. **Activities In 2024-2025**, committees with representatives from each region were launched to
		1. Investigate a lime calibration project (Led by Amy Shober, Univ Delaware),
		2. Develop a minimum dataset for sulfur (Led by Matt Yost, Utah State Univ),
		3. Model calibration data to develop data-based P- and K-rate recommendations (Led by Luke Gatiboni, North Carolina State Univ.)
		4. Refine the decision support tool programming (e.g., programming committee; Led by Greg Buol, North Carolina State University).
		5. Seek literature and additional data to populate the database, especially for underrepresented states and crops (Bourns, Singh, & Collaborators)
		6. Review soil test terms and fertilizer recommendation strategies used by land grant institutions (Slaton, Univ. Arkansas)
	14. **Milestones**
		1. The relational database has exceeded 3,150 trials
		2. Sulfur was added as a 3rd nutrient to the relational database
		3. Lime survey data were developed into a paper and submitted for peer review
		4. The pilot lime study was completed
		5. 137 soils were collected from across the USA for a calibration trial which was launched in May 2025
2. **Impacts**
	1. The FRST webpage was viewed 35,000 times by 4,200 users (761 returning users) and the FRST decision aid was viewed 2,000 times by 1,300 users between 3 July 2024 and 26 June 2025 supporting significant stakeholder and researcher interest in the science behind soil-test-based fertilizer recommendations. Users are from 118 different countries but primarily from the USA (65%), India (10%), Canada (3%), Philippines (~2%), and Brazil (~2 %).
	2. Four proposals (1 umbrella proposal and 3 regional proposals) originating from FRST initiatives have been awarded $2.9 million by NRCS. FRST Collaborators have been supported by ~$0.9 million of funding and in-kind support for 57 field trials from OCP-North America.
	3. A dataset was published documenting a national survey of soil testing and fertility recommendations in the USA with 233 downloads and 1000+ views in Ag Data Commons.
	4. Nine manuscripts involving 66 unique collaborating authors have been published as Open Access in ASA-CSSA-SSSA international journals. The papers have high visibility and citation (86 total citations) supporting strong interest from the scientific community.
	5. The impact of the collaborative nature of FRST is difficult to measure, but the FRST project has included 66 different scientists on 9 peer-reviewed papers, 65 scientists who contributed to a national survey dataset published in Ag Data Commons, 30-45 collaborators from private and public institutions regularly attend monthly virtual meetings, and 15-20 scientists are involved in each activity committee. The FRST Project is collaborative and inclusive, provides discipline-specific mentoring, and provides training for young scientists who often have little or no experience or mentorship in soil test correlation and calibration.
	6. The FRST Project has inspired Brazilian scientists to come together and start evaluating the diversity of recommendations within Brazil with hopes of establishing a database to archive soil test correlation data similar to the FRST relational database.
	7. The FRST Project provides an annual update at SERA-17 meetings and involves 4 regional soil testing groups including WERA103, NECC2312, NCERA13, and SERA6 in its management.
3. **Publications**: *The NRSP11 Project published one (1) peer-reviewed paper in Agricultural and Environmental Letters, one manuscript was submitted to the Soil Science Society of America Journal (In review); three (3) fact sheets and 2 legacy data guides were updated or published on the FRST website; , a data entry template for sulfur was developed and tested, and the user guide for the FRST Decision Support Tool was updated. Note the listed publications are efforts exclusive or directly related to the FRST activities and do not include publications of individual member research projects.*
	* 1. Buol, G., Osmond, D., Slaton, N., Spargo, J., Lyons, S., Pearce, A., Uthman, Q., Yost, M., & Kaiser, D. (2024). Fertilizer Recommendation Support Tool, V 1.5.0.0. (Revision) FRST-Tool Page (usda.gov) https://soiltestfrst.org/
		2. Slaton, N.A., Buol, G., & Spargo, J.T. (2025). FRST Legacy Data Collection Guide (P and K). <https://soiltestfrst.org/wp-content/uploads/2024/12/FRST-Legacy-Data-Guide-P-and-K-11.26.2024.pdf>
		3. Slaton, N.A., Buol, G., & Yost, M. (2025). FRST Legacy Data Collection Guide (S). [FRST-Legacy-Data-Guide-S-11.26.2024.pdf](https://soiltestfrst.org/wp-content/uploads/2024/12/FRST-Legacy-Data-Guide-S-11.26.2024.pdf)
		4. Jones, J., Miller, B., Spargo, J., Sikora, F., Rakkar, M., Slaton, N.A., & Osmond, D. (2024). Survey to Determine the Methods Used to Measure Soil pH and Lime Requirements in the United States and Puerto Rico. Fact Sheet #7 (Jan. 2025). <https://soiltestfrst.org/resources/national-lime-rate-survey/>
		5. Bourns, M., Buol, G., Gatiboni, L., Spargo, J., Yost, M., Slaton, N., & Osmond, D. (2025). FRST Relational Database for Preserving Soil Test Correlation and Calibration Data. Fact Sheet #8 (Jan. 2025). <https://soiltestfrst.org/resources/frst-soil-test-database/>
		6. Bourns, M., Buol, G., Gatiboni, L., Spargo, J., Yost, M., Slaton, N., & Osmond, D. (2025). Decision Aid for Soil Test P and K Interpretation. Fact Sheet #9 (Jan. 2025). <https://soiltestfrst.org/resources/frst-soil-test-database/>
		7. Bourns, M., Buol, G., Spargo, J. T., Gatiboni, L., Yost, M. A., Slaton, N. A., & Osmond, D. L. (2025). The Fertilizer Recommendation Support Tool: A relational database and decision interface tool. *Agricultural & Environmental Letters, 10,* e70016. <https://doi.org/10.1002/ael2.70016>
		8. Jones, J., Miller, R.O., Osmond, Sikora, F., Spargo, J.T., & Slaton, N.A. (2025). Review of U.S. land grant institution soil pH and agricultural lime requirement methods and recommendations. *Soil Science Society of America Journal, xx,* xxx-xxx. **Submitted/In Review** December 2024. S-2024-12-03.53-R
4. **Authorizations**: Nathan A. Slaton, Administrative Advisor