

NC 1178 Annual Final Group Report

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ACCOMPLISHMENTS

The research reported by NC-1178 participants addresses various aspects of agricultural intensification including:

- ✓ Effects of Residue Management on Corn Stover Yield, and on the Harvest, Index are being studied at The Ohio State University in Columbus, OH.
- ✓ Effects of crop residue removal on long-term continuous no-till corn yields is being evaluated at the Department of Agronomy at the Kansas State University in Manhattan, KS. Study also, has shown that for the upper 10 cm of the soil profile, soil organic C values do not differ among treatments, but the 2017 values are less than the 2009 values.
- ✓ Study being conducted at the Texas A&M University at the College Station, Texas to evaluate the Effects of soil surface management on soil carbon deficit in southern pine forests.
- ✓ Also, the aforementioned project is evaluating the Effect of environmental conditions on soil CO₂ and CH₄ emissions.
- ✓ Evaluating the long-term and short-term impacts of conservation management practices (i.e. reduced-tillage, residue return, and cover cropping) on soil physical-biogeochemical properties is being conducted at the Pee Dee Research and Education Center of the Clemson University.
- ✓ At the South Dakota State University study is being conducted for Predicting the soil hydro-thermal regimes under integrated crop-livestock systems, including Long-term application of dairy manure on soil pore connectivity, and the impacts of diverse crop rotations on soil moisture, temperature and CO₂ dynamics.
- ✓ At the UNIVERSITY OF TENNESSEE study was conducted to evaluate the Soil organic carbon response from 39-years of tillage management. Also, this station currently evaluating the Haney Soil Health Assessment in an Agricultural Soil in West Tennessee.
- ✓ At the UNIVERSITY OF TENNESSEE study was also conducted to evaluate the effects of field cultivation of transgenic switchgrass on SOC dynamics.
- ✓ Evaluating N mineralization from crop residues originating in long-term no-till cropping systems and the net N immobilization with residue additions representing common North Dakota crop rotations over three (3) simulated growing seasons for high C:N (C:N >40) ratio residue materials.

- ✓ The aforementioned study also showed that Incorporating 15 % forage radish (as a simulated cover crop) (C:N <20) appears to offset N immobilization for a short period of time when combined with soybean or spring wheat residues.
- ✓ Study at the University of Minnesota has shown that Perennial forage and Grain crops produced more root biomass and increased sorptivity compared to a corn-soybean rotation during the three-year transition period from conventional to organic production.
- ✓ Project was initiated at the Stockbridge School of Agriculture of the University of Massachusetts, Amherst to develop a unique combination of microsensors that allows tracking of rhizodeposition at small spatial and temporal scales.
- ✓ Also, the aforementioned project was initiated to developed isotope tracing techniques that permits probing the response of stable soil carbon pools and greenhouse gas emissions to rhizodeposition in cropping systems. The experimental system designed under this project will yield data on plant-soil interactions in cropping systems with both ecological and economic impact.
- ✓ Study in progress in Texas A&M has shown that Rice grain yield, milling quality and biomass production are affected by soil conditions and management practices. The study also showed that the Cultivar selection and N fertilization may interact with soil nutrient supply and thus affect rice production, N use efficiency, and soil properties.
- ✓ Intensifying Cover Crop Management for Enhancing Agroecosystem Services was evaluated by the Department of Agronomy and Horticulture at the University of Nebraska-Lincoln
- ✓ A comparison effect of land application of Biochar on Carbon Sequestration from Acidic Soils of southern vs Calcareous Soils of northern Guam is being studied at the University of Guam, Mangilao, Guam-USA
- ✓ Klamath Basin Research and Extension Center at the Klamath falls, Oregon, is planning to Adapt and pilot the ESMC carbon sequestration protocol for Oregon's unique land source regions, soil types, and agricultural practices. For this purpose, they will Implement, monitor, in order to improve the effectiveness and financial viability of adopting regenerative agriculture practices on rangeland in Oregon. They will also establish a supply chain of producers for sale of credits in the ESMC marketplace and other standards to compensate producers for regenerative agriculture practices.

Incorporated in the above listed studies were observations of yield and stover indexes, soil carbon dynamics, on soil physical-biogeochemical properties. Studies also included observation on soil hydro-thermal regimes under integrated crop-livestock systems. Also, long-term application of dairy manure on soil pore connectivity was observed on some of the studies. Furthermore, the impacts of diverse crop rotations on soil moisture, temperature and CO₂ dynamics was observed among the station reports. Also, soil organic carbon, C/N ratio, as well as N-mineralization and overall soil health is being assessed by these studies.

As reported, isotope tracing techniques was used to evaluate the response of stable soil carbon pools and greenhouse gas emissions to rhizodeposition in cropping systems. Also, the plant-soil interactions in cropping systems with both ecological and economic impact was observed.

Among the reports, it had been observed that the grain yield, milling quality and biomass production are affected by soil conditions and management practices. Additionally, it was noted that the Cultivar selection and N fertilization may interact with soil nutrient supply and thus affect rice production, N use efficiency, and soil properties.

In these reports, it was also reported that the effect of ‘Biochar’ on carbon sequestration depends very much on soil properties specially the chemical characteristics of soils under study.

Furthermore, among the reports, as stated by the Oregon state University researchers are set to establish regenerative rangeland ecosystem management as a tool to reduce greenhouse gases (GHGs) emissions, increase soil carbon sequestration, and to maintain high levels of production. These researchers are also set to provide and improve producer access to markets for ecosystem services. And finally, researchers at the OSU are set to disseminate project results and scale producer adoption of regenerative practices. For this purpose, a survey has been conducted with all the participating growers/ranchers to report their history of crop and animal production in their lands.

IMPACTS:

As reported here, total of 52 peer-reviewed journal articles, 39 presentations at professional conferences, and four extension outreach presentations and workshops, eight abstracts, few technical reports and dissertations/thesis were completed which were related to these multi-State projects reported here. Also, there were six research grant awards that were associated with these Multi-State group projects. Other scholarly works and/or information dissemination activities such as Newspaper articles related to these projects were conducted or published during the reporting period. Knowledge generated from these activities may be difficult to quantify, however, the dissemination of information through the information activities (i.e., workshops), is expected to have impact on the general public as well as on agriculturalists especially as relate to carbon sequestration. Scientific communities as well as producers and public and policy makers are already making changes in their research goals, farming practices, and policy making activities. These Multi-State projects shall impact the knowledge-based management activities with the growing consciousness towards the soil health and soil carbon dynamics as may affect the carbon dioxide emission from the soil surface which may affect the global climate change.

PUBLICATIONS

Journal articles:

1. Das A., J. Layek, G.I. Ramkrushna, K. Rangappa, R. Lal, P.K. Ghosh, B.U. Choudhury, S. Mandal, B. Ngangom, U. Dey, and N. Prakash. 2019. Effects of tillage and rice residue

management practices on lentil root T architecture, productivity and soil properties in India's Lower Himalayas. *Soil & Tillage Research* 194: 1-11.

2. Lal, R. 2019. Managing soils for resolving the conflict between agriculture and nature: The hard talk. *European Journal of Soil Science*. doi: 10.1111/ejss.12857.
3. Serafim, M.E., Zaviani W.M., Ono F.B., Neves L.G., Silva B.M., Lal R. 2019. Reference values and soil quality in areas of high soybean yield in Cerrado region, Brazil. *Soil and Tillage Research* 195(104362): 1-8.
4. Xu, J., H. Han, T. Ning, Z. Li and R. Lal. 2019. Long-term effects of tillage and straw management on soil organic carbon, crop yield, and yield stability in a wheat-maize system. *Field Crops Research* 233: 33-40.
5. Yadav, G.S., A. Das, R. Lal, S. Babu, M. Datta, R.S. Meena, S.B. Patil, and R. Singh. 2019. Impact of no-till and mulching on soil carbon sequestration under rice (*Oryza sativa* L.)-rapeseed (*Brassica campestris* L. var. rapeseed) cropping system in hilly agro-ecosystem of the Eastern Himalayas, India. *Agriculture, Ecosystems & Environment* 275: 81-92.
6. Zhao, X, Liu, B-Y, Liu, S-L, Qi, J-Y, Wang, X., Pu, C. Li, S-S, Zhang, X-Z, Yang, X-G, Lal, R. Chen, F., Zhang, H-L. Sustaining crop production in China's cropland by crop residue retention: A meta-analysis. *Land Degrad Dev.* 2019; 1– 16.
<https://doi.org/10.1002/ldr.3492>
7. Alghamdi, A., D.R. Presley, M.B. Kirkham, and G. Hettiarachchi. 2020. Efficacy of amendments to improve soil physical properties at an abandoned lead and zinc mine. *Agrosystems, Geoscience, and Environment*. <https://doi.org/10.1002/agg2.20032>
8. Mitra, B., Minick, K.J., Miao, G., Domec, J.C., McNulty, S.G., Sun, G., King, J.S. and **Noormets, A.** (2020) Spectral evidence for the multiple drivers of methane fluxes from a lower coastal plain-forested wetland in North Carolina. *Agricultural and Forest Meteorology* 291: 108062, <https://doi.org/10.1016/j.agrformet.2020.108062>.
9. Aguilos M, Mitra B, **Noormets A**, Minick K, Prajapati P, Gavazzi MJ, Sun G, McNulty SG, Li X, Domec JC, Miao G, King JS (2020) Long-term carbon flux and balance in managed and natural coastal forested wetlands of the Southeastern USA. *Agricultural and Forest Meteorology* 288-289: 108022. <https://doi.org/10.1016/j.agrformet.2020.108022>
10. Hannun RA, Wolfe GM, Kawa R, Hanisco TF, Newman PA, Alfieri JG, Barrick J, Clark KL, DiGangi JP, Diskin G, King JS, Kustas WP, Mitra B, **Noormets A**, Nowak JB, Thornhill KL, Vargas R (2020) Spatial heterogeneity in CO₂ and CH₄ fluxes: insights from airborne eddy covariance measurements over the Mid-Atlantic region. *Environmental Research Letters* 15: 035008
<https://doi.org/10.1088/1748-9326/ab7391>
11. Feagin RA, Forbrich I, Huff TP, Barr JG, Ruiz-Plancarte J, Fuentes JD, Najjar RG, Vargas R, Vazquez-Lule AL, Windham-Myers L, Kroeger KD, Ward EJ, Moore GW, Leclerc M, Krauss KW,

Stagg CL, Alber M, Knox SH, Schäfer KVR, Bianchi TS, Bianchi TS, Hutchings JA, Nahrawi H, **Noormets A**, Mitra B, James A, Hinson AL, Bergamaschi B, King JS (2020) Tidal wetland Gross Primary Production across the continental United States, 2000-2019. *Global Biogeochemical Cycles*: <https://doi.org/10.1029/2019GB006349>

12. Yang Y, Anderson MC, Gao F, Hain CR, **Noormets A**, Sun G, Wynne R, Thomas V, Sun L (2020) Investigating impacts of drought and disturbance on evapotranspiration over a forested landscape in North Carolina, USA using high spatiotemporal resolution remotely sensed data. *Remote Sensing of Environment*: (In press, 2020-01-23)
<https://doi.org/10.1016/j.rse.2018.12.017>
13. Li X, Minick K, **Noormets A**, Miao G, Luff J, Mitra B, Domec J-C, McNulty S, Sun G, King J (2019) Environmental controls and micro-topographic influence on absorptive and transport fine root dynamics in a coastal forested wetland, southeastern USA. *Ecosystems*: (In press 2019-11-23)
<https://doi.org/10.1007/s10021-019-00470-x>
14. Minick KJ, Mitra B, **Noormets A**, King JS (2019) Saltwater reduces CO₂ and CH₄ production in organic soils from a coastal freshwater forested wetland. *Biogeosciences* 16: 4671–4686.
<https://doi.org/10.5194/bg-16-4671-2019>
15. Mitra B, Miao G, McNulty SG, Sun G, King JS, **Noormets A** (2019) Disentangling the effects of temperature and substrate availability on soil CO₂ efflux. *Journal of Geophysical Research – Biogeosciences*: <https://doi.org/10.1029/2019JG005148>.
16. Minick KJ, Mitra B, Li X, **Noormets A**, King JS (2019) Water table drawdown alters soil and microbial carbon pool size and isotope composition in coastal freshwater forested wetlands. *Frontiers in Forests and Global Change* 2: 7. <https://doi.org/10.3389/ffgc.2019.00007>
17. Singh, N., Abgandura, G. and Kumar, S. 2020. Short-term grazing of cover crops and maize residue impacts on soil greenhouse gas fluxes in two Mollisols. *Journal of Environmental Quality* 49:628-639.
18. Alhameid A., J. Singh, U. Sekaran, S. Kumar, E. Ozlu, and S. Singh (2019) Crop rotational diversity impacts soil physical and hydrological properties under long-term no- and conventional-till soils. *Soil Research*, 58(1), pp. 84-94.
19. Alhameid A., J. Singh, U. Sekaran, S. Kumar, and S. Singh (2019) Soil Biological Health: Influence of Crop Rotational Diversity and Tillage on Soil Microbial Properties. *Soil Science Society of America Journal*, 83(5), pp. 1431-1442.
20. Singh, J., Singh, N., and Kumar, S. 2020. X-ray CT-measured soil pore parameters as influenced by crop rotations and cover crops. *Soil Science Society of America Journal (In press)*.
21. Singh, N., Kumar, S., Udawatta, R.P., Anderson, S.H., de Jonge L.W. and Katuwal, S. Micro-computed tomography characterized soil pore network as influenced by long-term application of manure and fertilizers. *Geoderma (Under review)*.

22. Singh, J. and S. Kumar. Responses of soil microbial community structure and greenhouse gas fluxes to crop rotations that include winter cover crops. *Geoderma (Under review)*.
23. Singh, J. and S. Kumar. Seasonal changes of soil carbon fractions and enzymatic activities in response to winter cover crops under long-term rotation and tillage systems. *European Journal of Soil Science (Under review)*.
24. Singh, N., Kumar, S., Udawatta, R.P., Anderson, S.H., de Jonge L.W. and Katuwal, S. 2019. Crop-livestock integration impacted X-ray-computed-tomography-measured near-surface soil pore parameters. *Soil Science Society of America Journal (Submitted)*.
25. Singh, J., T. Wang, S. Kumar, Z. Xu, P. Sexton, J. Davis, and A. Bly Crop yield and economics of cropping systems involving different rotations, tillage and cover crops. *Journal of Soil and Water Conservation (Submitted)*.
26. Koehler-Cole, K., R.W. Elmore, H. Blanco-Canqui, C.A. Francis, C.A. Shapiro, C.A. Proctor, D.M. Heeren, S. Ruis, S. Irmak, and R.B. Ferguson. 2020. Cover crop productivity and subsequent soybean yield in the western Corn Belt. *Agron. J.* 112:2649–2663.
27. Blanco-Canqui, H., S. Ruis, C. Proctor, C. Creech, M. Drewnoski, and D. Redfearn. 2020. Harvesting cover crops for biofuel and livestock production: Another ecosystem service? *Agron J.* 112:2373-2400
28. Ruis, S.J., H. Blanco-Canqui, K. R.W. Elmore, C. Proctor, K. Koehler-Cole, C.A. Shapiro, C.A. Francis, and R.B. Ferguson. 2020. Impacts of cover crop planting dates on soils after four years. *Agron. J.* 112:1649-1665.
29. Blanco-Canqui, H., and P. Jasa. 2019. Do grass and legume cover crops improve soil properties in the long term? *Soil Sci. Soc. Am. J.* 83:1181-1187.
30. Sindelar, M., H. Blanco-Canqui, J. Virginia, and R. Ferguson. 2019. Do cover crops and corn residue removal affect soil thermal properties? *Soil Sci. Soc. Am. J.* 83:448-457.
31. Sindelar, M., H. Blanco-Canqui, J. Virginia, and R. Ferguson. 2019. Cover crops and corn residue removal: impacts on soil hydraulic properties and their relationships with carbon. *Soil Sci. Soc. Am. J.* 83:221-231.
32. Singh, S., Nouri, A., Singh, S., Anapalli, S., Lee, J., Arelli, P., and **Jagadamma, S.** 2020. Soil organic carbon and aggregation in response to thirty-nine years of tillage management in the southeastern US. *Soil & Tillage Research* 197: 104523.

33. Bansal, S., Yin, X., Savoy, H.J., **Jagadamma, S.**, Lee, J., and Sykes, V. 2020. Long-term influence of phosphorus fertilization on organic carbon and nitrogen in soil aggregates under no-till corn-wheat-soybean rotations. *Agronomy Journal* DOI: 10.1002/agj2.20200
34. Xu, S., Ottinger, S.L., Schaeffer, S., DeBruyn, J.M., Stewart, Jr, C.N., Mazarei, M., and **Jagadamma, S.** 2019. Effects of field-grown transgenic switchgrass carbon inputs on soil organic carbon cycling. *Peer J* 7: e7887.
35. Li, Y, Li, Z., Cui, S., **Jagadamma, S.**, and Zhang, Q. 2019. Residue retention and minimum tillage improve physical environment of the soil in croplands: A global meta-analysis. *Soil & Tillage Research* 194: 104292.
36. Chu, M., Singh, S., Walker, F.R., Eash, N.S., Buschermohle, M.J., Duncan, L.A., and **Jagadamma, S.** 2019. Soil health and soil fertility assessment by the Haney Soil Health Test in an agricultural soil in west Tennessee. *Communications in Soil Science and Plant Analysis* 50(9): 1123-1131.
37. Singh, S., Yan, S., Sorochan, J., Stier, J., Mayes, M.A., Zhuang, J., and **Jagadamma, S.** 2019. Soil carbon accumulation and nutrient availability in managed and unmanaged ecosystems of East Tennessee. *Soil Science Society of America Journal* 83: 458-465.
38. **Jagadamma, S.**, Essington, M.E., Xu, S., and Yin, X. 2019. Total and active organic carbon from long-term agricultural management practices in West Tennessee. *Agricultural and Environmental Letters* 4:180062
39. Ademola, A. A., S. Rahman, **L. Cihacek**, and N. Nahar. 2020. Comparison of the reactor performance of alkaline-pretreated corn stover co-digested with dairy manure under solid state. *Waste and Biomass Valorization* doi:10.1007/s12549-020-01116-z
40. De, M., J. A. Riopel, **L. J. Cihacek**, M. Lawrenko, R. Baldwin-Kordick, S. J. Hall, and M. D. McDaniel. 2020. Soil health recovery after grassland restoration. Evidence from a 40-year chronotoposequence. *Soil Sci. Soc. Am. J.* 84:568-586. doi:10.1002/saj2.200037.
41. Wander, M. M., **L. Cihacek**, M Coyne, R. Drijber, J. Grossman, J. L. Gutknecht, W. Horwath, S. Jagadamma, D. Olk, S. Snapp, L. Tiemann, and R. Turco. 2019. Developments in agricultural soil quality and health: Reflections by the Research Committee on Soil Organic Matter Management. *Frontiers Environ. Sci.* 7:109. doi:10.3389/fenvs.2019.00109.
42. **Cihacek, L. J.** and R. Alghamdi. 2020. N mineralization dynamics in no-till crop residues in the Northern Plains. *Great Plains Soil Fertility Conference Proceedings*. March 10-11, 2020. Denver, CO.
43. Zhou, C., Y. Huang, B. Jia, Y. Wang, Y. Wang, Q. Xu, R. Li, S. Wang, and F. Dou. 2018. Effects of cultivar, nitrogen rate, and planting density on rice-grain quality. *MDPI Agronomy* doi:10.3390/agronomy8110246.

44. Zhou, C., Y. Huang, B. Jia, S. Wang, F. Dou, S. O. PB. Samonte, K. Chen, and Y. Wang. 2019. Optimization of nitrogen rate and planting density for improving the grain yield of different rice genotypes in Northeast China. *MDPI Agronomy* doi:10.3390/agronomy9090555.
45. Zhang, H, Y. Li, Y. Meng, N. Cao, D. Li, Z. Zhou, B. Chen, and F. Dou. 2019. The effects of soil moisture and salinity as functions of groundwater depth on wheat growth and yield in coastal saline soils. *Journal of Integrative Agriculture* 18(11): 2472-2482
46. Ademola, A. A., S. Rahman, **L. Cihacek**, and N. Nahar. 2020. Comparison of the reactor performance of alkaline-pretreated corn stover co-digested with dairy manure under solid state. *Waste and Biomass Valorization* doi:10.1007/s12549-020-01116-z
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48. Wander, M. M., **L. Cihacek**, M. Coyne, R. Drijber, J. Grossman, J. L. Gutknecht, W. Horwath, S. Jagadamma, D. Olk, S. Snapp, L. Tiemann, and R. Turco. 2019. Developments in agricultural soil quality and health: Reflections by the Research Committee on Soil Organic Matter Management. *Frontiers Environ. Sci.* 7:109. doi:10.3389/fenvs.2019.00109.
49. **Cihacek, L. J.** and R. Alghamdi. 2020. N mineralization dynamics in no-till crop residues in the Northern Plains. *Great Plains Soil Fertility Conference Proceedings*. March 10-11, 2020. Denver, CO.
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51. Zhou, C., Y. Huang, B. Jia, S. Wang, F. Dou, S. O. PB. Samonte, K. Chen, and Y. Wang. 2019. Optimization of nitrogen rate and planting density for improving the grain yield of different rice genotypes in Northeast China. *MDPI Agronomy* doi:10.3390/agronomy9090555.
52. Zhang, H, Y. Li, Y. Meng, N. Cao, D. Li, Z. Zhou, B. Chen, and F. Dou. 2019. The effects of soil moisture and salinity as functions of groundwater depth on wheat growth and yield in coastal saline soils. *Journal of Integrative Agriculture* 18(11): 2472-2482

SCIENTIFIC PRESENTATIONS:

1. Alghamdi, R. and **L. J. Cihacek**. 2019. Mixed crop residue contribution to soil N dynamics in long-term no-till systems. Abst. No. 225-8. ASA-SSSA-CSSA International Meetings, November 10-13, 2019. San Antonio, TX.

2. Alghamdi, R. S. Datta, **L. J. Cihacek**, and S. Day. 2019. Changes in Crop and Soil Management Patterns on High Erosion Risk Soils over 2 Decades. Abst. No. 187-1232. ASA-SSSA-CSSA International Meetings, November 10-13, 2019. San Antonio, TX.
3. **Cihacek, L. J.**, S. Mathews, and R. Alghamdi. 2019. Will Improving Soil Health Require Estimation of N Mineralization a Part of Soil Testing for Fertilizer Recommendations? Abst. No. 368-1025. ASA-SSSA-CSSA International Meetings, November 10-13, 2019. San Antonio, TX.
4. Landblom, D. G., S. Senturklu, **L. Cihacek**, R. L. Maddock, and S. I. Paisley. 2019. Integrated Systems Synergy and Regenerative Agriculture in the Semi-Arid Region of Western North Dakota. Abstracts of the 74th SWCS International Annual Conference. July 28-31, 2019. Pittsburg, PA
5. Rakkar, M. K., Sheaffer, C., Jungers, J., Gutknecht, J. L., Grossman, J. M., Bergquist, G., & Li, F. 2019. Impact of Perennial and Annual Organic Transition Systems on Profitability and Soil Health Indicators. *ASA, CSSA and SSSA International Annual Meetings (2019)*. ASA-CSSA-SSSA.
6. Gutknecht, J., Gutknecht, G., Sheaffer, C., Wyse, D., Crews, T., de Oliveira, G., Brunsell, N., & Jungers, J. 2019. The carbon budget, sustainability, and viability of a novel perennial agroecosystem. In *2019 ESA Annual Meeting (August 11--16)*. Ecological Society of America.
7. Singh, N., Katuwal, S., Kumar, S., de Jonge L.W., Udawatta, R.P. and Anderson, S.H. 2019. Use of high-resolution CT scanning to characterize soil pore network as influenced by long term application of cattle manure and synthetic fertilizers. Oral Presentation at the ASA-CSSASSSA. International Annual Meeting at San Antonio, TX. November 10-13, 2019.
8. Singh, N., Dhaliwal, J.K., Katuwal, S., Kumar, S., de Jonge L.W., Udawatta, R.P. and Anderson, S.H. 2019. Near surface soil hydrological properties using computed tomography and classical approaches under grazed pasture and croplands. Poster and 5-minute rapid Oral Presentation at the ASA-CSSA-SSSA. International Annual Meeting at San Antonio, TX. November 10-13, 2019.
9. Singh, N., Dhaliwal, J.K., Sekaran, U. and Kumar, S. 2019. Assessing the impacts of cover crops and grazing under integrated crop livestock system on soil physical quality. Oral Presentation at the ASA-CSSA-SSSA. International Annual Meeting at San Antonio, TX. November 10-13, 2019.
10. Singh J., N. Singh, S. Kumar, and P. Sexton (2019) Computed tomography-measured soil pores, and selected hydrological and physical properties as influenced by different rotations, tillage, and cover crop management. "Embracing the Digital Environment" ASA-CSSA-SSSA annual meeting, San Antonio, TX.

11. Singh J., N. Singh, U. Sekaran, G.O. Abagandura, J.K. Dhaliwal, S. Kumar, and P. Sexton (2019) Responses of soil microbial community structure and greenhouse gas fluxes to crop rotations that include winter cover crops. "Embracing the Digital Environment" ASA-CSSA-SSSA annual meeting, San Anton
12. Singh, S., **Jagadamma, S.**, Walker, F., Yin, F., and Yoder, D.C. 2019. Evaluating soil health assessment approaches for the diverse agroecosystems of Tennessee. ASA-CSSA-SSSA Annual Meeting (Poster). November 10-13, San Antonio, TX.
13. Xu, S., **Jagadamma, S.**, Ashworth, A., Singh, S*, Owens, P., and Moore, P. 2019. Soil organic carbon accumulation in response to different grazing management practices. ASA-CSSA-SSSA Annual Meeting (Oral). November 10-13, San Antonio, TX.
14. Ceylan, S., Nouri, A., Jahromi, N.B, Lee, J., Walker, F.R., **Jagadamma, S.**, Yoder, D.C., and Arelli, P.R. 2019. Effect of biochar application on hydro-physical properties of fluvial deposits. ASA-CSSA-SSSA Annual Meeting (Poster), November 10-13, San Antonio, TX.
15. Yin, X., Bansal, S., Sykes, V.R., **Jagadamma, S.**, Lee, J., and Boyer, C. 2019. Carbon footprint and sustainability index of major cropping sequence and bio-cover systems under no-tillage. ASA-CSSA-SSSA Annual Meeting (Oral), November 10-13, San Antonio, TX.
16. Bansal, S., Yin, X., Savoy, H.J., **Jagadamma, S.**, Lee, J., and Sykes, V.R. 2019. Long-term influence of phosphorus fertilization and soil aggregation on soil organic carbon and nitrogen under no-tillage production systems. ASA-CSSA-SSSA Annual Meeting (Poster), November 10-13, San Antonio, TX.
17. Bansal, S., Yin, X., Sykes, V.R., **Jagadamma, S.**, and Lee, J. 2019. Long-term influence of crop sequences, bio-covers and aggregate sizes on organic carbon and nitrogen in soil profile under no-tillage. ASA-CSSA-SSSA Annual Meeting (Poster), November 10-13, San Antonio, TX.
18. Jahromi, N.B., Lee, J., Johnsen, M., Fulcher, A., Nouri, A., Walker, F.R., **Jagadamma, S.**, and Arelli, P.R. 2019. Biochar as soil amendment to improve flooded sandy soil for corn production. ASA-CSSA-SSSA Annual Meeting (Poster), November 10-13, San Antonio, TX.
19. Bansal, S., Yin, X., Singh, S., **Jagadamma, S.**, Sykes, V.R., and Lee, J. 2019. Crop sequence diversity and bio-covers under no-tillage affect greenhouse gas emissions. ASA-CSSA-SSSA Annual Meeting (Poster), November 10-13, San Antonio, TX.
20. Li, X, **Jagadamma, S.**, and Walker, F.R. 2019. Biochar as a soil amendment in a forage production system in Tennessee. Biochar & Bioenergy 2019 Conference (Poster), June 30-July 3, Fort Collins, CO.

21. Alghamdi, R. and **L. J. Cihacek**. 2019. Mixed crop residue contribution to soil N dynamics in long-term no-till systems. Abst. No. 225-8. ASA-SSSA-CSSA International Meetings, November 10-13, 2019. San Antonio, TX.
22. Alghamdi, R. S. Datta, **L. J. Cihacek**, and S. Day. 2019. Changes in Crop and Soil Management Patterns on High Erosion Risk Soils over 2 Decades. Abst. No. 187-1232. ASA-SSSA-CSSA International Meetings, November 10-13, 2019. San Antonio, TX.
23. **Cihacek, L. J.**, S. Mathews, and R. Alghamdi. 2019. Will Improving Soil Health Require Estimation of N Mineralization a Part of Soil Testing for Fertilizer Recommendations? Abst. No. 368-1025. ASA-SSSA-CSSA International Meetings, November 10-13, 2019. San Antonio, TX.
24. Landblom, D. G., S. Senturklu, **L. Cihacek**, R. L. Maddock, and S. I. Paisley. 2019. Integrated Systems Synergy and Regenerative Agriculture in the Semi-Arid Region of Western North Dakota. Abstracts of the 74th SWCS International Annual Conference. July 28-31, 2019. Pittsburg, PA
25. Rakkar, M. K., Sheaffer, C., Jungers, J., Gutknecht, J. L., Grossman, J. M., Bergquist, G., & Li, F. 2019. Impact of Perennial and Annual Organic Transition Systems on Profitability and Soil Health Indicators. *ASA, CSSA and SSSA International Annual Meetings (2019)*. ASA-CSSA-SSSA.
26. Gutknecht, J., Gutknecht, G., Sheaffer, C., Wyse, D., Crews, T., de Oliveira, G., Brunzell, N., & Jungers, J. 2019. The carbon budget, sustainability, and viability of a novel perennial agroecosystem. In *2019 ESA Annual Meeting (August 11--16)*. Ecological Society of America.
27. Dou, F. 2019. Rice varietal evaluation and nutrient management improvement for Texas production practices. Texas Rice Research Foundation Annual Report and Proposal Meeting. East Bernard, TX. February 2019.
28. Wilson, L.T., F. Dou, and Y. Yang. 2019. Sustainable Herbaceous Energy Crop Production in the Southeast United States. DOE Project Peer Review Meeting. Denver, CO. March 2019.
29. Dou, F., G. Liu, X. Li, and K. Landry. 2019. 2018 Variety Evaluation and N Application for Rice Main and Ratoon Crop Yield Potential. Texas Rice Field Day at Beaumont Research Center.
30. Dou, F., X. Li, and Y. Deng. 2019. Effect of vermiculite clays on the performance of urease inhibitors in soil ammonia volatilization. International conference on clay science and technology. Paris, France. July 2019.
31. Li, X., A. Tan, and F. Dou. 2019. Effect of cover crop mixing and application rate on soil nitrogen mineralization in an incubation study. Annual Meeting of the Soil Science Society of America. San Antonio, TX. November 2019.

32. **Golabi Mohammad H.** (2019). What do we know about the soils of Guam? their formation, properties and functions - How can we take care of these soil? Presented at the Pacific Soil Partnership as part of the activities for ‘Soil Regional Implementation Plan’ to be submitted to the ‘Global Soil Partnership Pillar of Action’ which was presented at the ‘Global Soil Partnership Annual Plenary in Rome Italy, during June 5-7, 2019.
33. Chieriel Desamito¹, **Mohammad H. Golabi.** 2019. The Impact of Land Application of Biochar on Carbon Sequestration and Agricultural Sustainability- Follow up Research. Conference of Island Sustainability, which was held in Hyatt Regency Guam, during April 8-12, 2019.
34. **Mohammad H. Golabi**ⁱ, S.A. El-Swaifyⁱⁱ. (2019). Using ‘No-tillage’ farming technique as an assessment tool in soil erosion control study on highly acidic soils formed from the volcanic origin, common in Micronesia. Extended Abstract Submitted to the: Global Symposium on Soil Erosion that was held in FAO HQ, Rome, Italy, during May 15-17, 2019.
35. **Golabi, Mohammad H.**, S.A. El-Swaify (2019). ‘Soil management strategy for enhancing soil quality in Resilient Agriculture’. Abstract submitted to: The Joint International Conference: 4Th WASWAC world conference, 20th ISCO International conference, 4th SCSi international Conference: New Delhi, India. November 5th – 9th, 2019
36. **Mohammad H. Golabi**, and Chieriel S. Desamito, and, Clancy Iyekar. (2019). Integrating the application of ‘biochar’ into Agricultural Conservation Practices for Sequestering Soil Carbon in the cultivated lands of southern Guam. Abstract Submitted to the: Soil Science Society of America’s annual meetings that was held in San Diego, California, during January 6-9, 2019.
37. **Golabi, Mohammad H.**, and Clancy Iyekar. (2017). *Evaluating the role of Soil and Water Conservation on ‘Carbon Sequestration’ for reducing the carbon dioxide (CO₂) emission into the Atmosphere – a Case study from southern Guam. Submitted to the: 1st World Conference on Soil and Water Conservation under Global Change (CONSOWA-2017) for: Sustainable Life on Earth through Soil and Water Conservation. Lleida, *Spain* June 12 - 16, 2017. *Invited Paper**
38. **Golabi, Mohammad H.**, and Clancy Iyekar. (2017). *Would the land application of ‘Biochar’ help ‘Sequester’ soil carbon hence reduces the CO₂ emission into the Atmosphere? – an environmental case study in southern Guam. Submitted to: The 8th*

Regional Conference on Island Sustainability. April 17-21, 2017 at the Hyatt Regency hotel in the island of *Guam*.

- 39. Golabi, Mohammad H.,** and Clancy Iyekar. (2017). *Evaluating the benefits of 'Biochar' on soil quality while determining its effect on 'Soil Carbon Sequestration – A pathway to Sustainability*. Abstract Submitted to the: 72nd International Annual Conference of the Soil and Water Conservation Society. *Madison, Wisconsin*, July 30th to August 2nd, 2017.

EXTENSION AND OUTREACH PRESENTATIONS/WORKSHOPS:

1. September 5, 2019. Soil pit. Kids Field Day. Manhattan, KS. 350 attended.
2. February 11, 2020. Kansas cover crop update. Midwest Cover Crops Council meeting, Kansas City, MO. 200 attended.
3. February 18, 2020. Soil and water conservation review for Certified Crop Advisors Exam Preparation. Manhattan, KS. 20 attended.
4. February 19, 2020. Cover crops seed issues in Kansas. Kansas Crop Improvement Association Annual Conference. Manhattan, KS. 60 attended.

ABSTRACTS

1. Crossman, S., D.R. Presley, and P.J. Tomlinson. 2019. Short-term effects of cover crops on soil health and yield in established no-till systems. In Annual meetings abstracts, ASA, CSSA, and SSSA, Madison, WI. Oral.
2. Presley, D.R. Evaluating soil health, soil water, and crop yield effects of cover crops in no-till on-farm experiments in Kansas and the Great Plains. 2019. In Abstracts of the First International Cover Crops Conference, Lanzhou, China.
3. Smith, L. and D.R. Presley. 2019. Soil Science Society of America and Certified Professional Soil Scientists and Life-Long Learning. In Proceedings of the 2019 Onsite Wastewater Mega-Conference. National Onsite Wastewater Recycling Association. Loveland, Colorado. Oral.
4. Starr, L., C. Stewart, P.J. Tomlinson, N.O. Nelson, D.R. Presley, G.J. Kluitenberg, and K.L. Roozeboom. 2019. Seasonal effects of cover crops and phosphorus fertilizer management on soil health parameters in a no-till corn-soybean cropping system in northeastern Kansas. *In Annual Meetings Abstracts*. ASA, CSSA, and SSSA, Madison, WI.
5. Stewart, C., L. Starr, P.J. Tomlinson, N.O. Nelson, D.R. Presley, G.J. Kluitenberg, and K.L. Roozeboom. 2019. Seasonal effects of cover crops and phosphorus fertilizer management on PLFA and microbial biomass in a no-till corn-soybean cropping system in northeastern Kansas. *In Annual Meetings Abstracts*. ASA, CSSA, and SSSA, Madison, WI.
6. Wills, S., K.S. Veum, C. Caudle, D.L. Osmond, J.L. Heitman, S. Crossman, L. Starr, P.J. Tomlinson, D.R. Presley, I. Madsen, K. Naasko, H. Tao, W.L. Pan, K.L. Lewis, P.B. DeLaune, L. Adams, F.J. Arriaga, G.C. Liles, S. Perrone, J.M. Grossman, R. O'Kelley, D.D. Myrold, C.M. Ugarte, and M. Robotham. 2019. Incorporating soil biological indicators into soil survey: Microbial community structure and enzymatic activity. In Annual meetings abstracts, ASA, CSSA, and SSSA, Madison, WI. Oral.
7. Wills, S, M. Robotham, J. Nemecek, C. Ugarte, D. Myrold, D. Presley, D. Osmond, F. Arriaga, G. Liles, J. Gross, J. Heitman, K. Naaska, K. Lewis, L. Adams, I. Madsen, P. DeLaune, P. Tomlinson, S. Crossman, L. Starr, S. Perrone, H. Tao, and B. Pan. 2019. Dynamic soil properties

for soil health assessment: Coordinating a national project. In Annual meetings abstracts, Soil and Water Conservation Society, Ankeny, IA. Oral.

8. Wills, S, M. Robotham, J. Nemecek, D.L. Osmond, J.L. Heitman, D.R. Presley, P.J. Tomlinson, H. Tao, P.B. DeLaune, K.L. Lewis, G.C. Liles, F.J. Arriaga, and L. Adams. 2019. Putting soil health indicators in context: A project using dynamic soil properties and soil survey to provide references and potentials. In Annual meetings abstracts, SSSA, Madison, WI. Oral.

RESEARCH/TECHNICAL REPORTS

1. Starr, L.M., P.J. Tomlinson, N.O. Nelson, K.L. Roozeboom, G.J. Kluitenberg, and D.R. Presley. 2019. Effects of cover crops and phosphorus fertilizer management on soil health parameters in a no-till corn-soybean cropping system in Riley County, Kansas. Kansas Agricultural Experiment Station Research Reports 5(6):30.
2. Desamito Chieriel, **Mohammad H. Golabi**, Mari Marutani. (2020). Evaluating the impact of land application of biochar and compost on soil carbon sequestration and soil fertility. Western Pacific Tropical Research Center (WPTRC), University of Guam. TECHNICAL REPORT No. 3

DISSERTATIONS/THESES

1. Crossman, Savanna. 2019. Short-term effects of cover crops on soil health and yield in established no-till systems. M.S. Thesis. Kansas State University.
<http://hdl.handle.net/2097/40211>

Fund leveraging, specifically, collaborative grants between stations and members:

Reviewing the state annual reports, it was observed that the funding from the NC 1178 multi-state grants was used as leverage to seek and obtain other grants some which were critical to the scientific work of especially when the researchers are in their early stage of their career.

GRANTS:

1. Optimizing plant-soil-microbial interactions through crop diversification to enhance sustainability in southeastern croplands. PI: **Jagadamma, S**; Co-PIs: Lee, J., Duncan, L.A., McClure, A., Raper, T.B., Kivlin, S. USDA-NIFA Foundational Program, 09-2020 to 08-2024 (\$500,000).
2. Demonstrating the impacts of cover crops for soil health and farm profitability in Tennessee. PI: **Jagadamma, S**; Co-PIs: Walker, F., Singh, S., Duncan, L., McClure, M., Upendram, S. Tennessee Department of Agriculture, 10-2019 to 09-2023 (\$341,493).
3. Evaluation of cover crop species and planting dates on cotton productivity and soil health. PI: **Jagadamma, S**; Co-PI: Walker, F., Duncan, L., and Raper, T. Cotton Incorporated, 01-2020 to 12-2020 (\$11,129).

4. Row crop production under climate change – assessment of sustainable management practices and soil additives in sand deposited fields. PI: Lee, J; Co-PI: **Jagadamma, S.** USDA-Agricultural Research Service, 09-2019 to 08-2020 (\$103,704).
5. Grant: United States Department of Energy: Enabling Sustainable Landscape Design for Continual Improvement of Operating Bioenergy Supply Systems. Total award \$9 million, sub-award to Kansas State University \$125,000.
6. Contractual agreement: USDA-NRCS: Soil Health Monitoring Network- On-Site Data Collection. Total award \$200,000.

OTHER SCHOLARLY ACTIVITIES:

Newspaper articles:

1. **Golabi, M. H.**, (2019). Protect Island's Soil. Guam PDN, December 2, 2019.
 2. **Golabi Mohammad H.** You can be the solution to soil pollution issues. Pacific Daily News. January 3, 2019. Vol. 50 No. 336
 3. **Golabi Mohammad H.** Vetiver hedgerows help prevent erosion. (Soil erosion a threat to a sustainable water supply in Guam). Pacific Daily News. March 7, 2019. Vol. 51 No. 34
 4. **Golabi Mohammad H.** (2019). Prevent soil erosion to protect our water. May 18, 2019. Vol. 51 No 106
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