



Highlights

Spring 2023

NSDL Breaks Ground on New Soil Research Buildings in Auburn, Alabama

Plans for new NSDL facilities are moving forward, and while the actual construction phase has yet to begin, NSDL held a groundbreaking ceremony on November 28, 2022. Retiring Senator Richard Shelby, who was instrumental in securing the \$71 million construction allocation for the new facilities, was the featured speaker. Dr. Torbert, NSDL Research Leader, welcomed everyone to the event and Mr. Archie Tucker, Southeast Area Director for ARS, served as the Master of Ceremonies. Notable among these speakers were Dr. Simon Liu, Administrator of the USDA Agricultural Research Service (ARS), and Auburn University President Christopher Roberts.

The new research facility will include two state-of-the-art research buildings (83,298 SF) at Auburn University's Research Park and two additional buildings (11,899 SF) at a second site near the AU campus. Figure 1 is a rendering of the completed buildings at Research Park. These buildings are expertly designed for current research efforts and will greatly expand our capacity to conduct state-of-the-art agricultural research. The buildings will house research on conservation cropping systems, environmentally sound animal waste management, and global climate change, as well as other research efforts focused on improved poultry production practices, cotton



Figure 1. A rendering of the new Agricultural Research Service research facility that will be located at Research Park in Auburn, AL.

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... NSDL Buildings cont.



Figure 2. NSDL staff and dignitaries that attended the groundbreaking ceremony at Research Park on November 28, 2022.

disease control, improved forage production, and biochar use in agriculture. Our staff and special dignitaries, shown in Fig. 2, look forward to inviting all of you to the Grand Opening that is expected sometime in 2026.

Beneficial Microbes for Improved Soil Health and Sustainable Forage Production

There is a common saying that “you are what you eat”. Well, in the center of what we all eat is the soil. Whether to grow a food crop for direct human consumption or to grow crops and forages for animal grazing to promote animal growth and subsequent human consumption, a healthy soil promotes a healthy human. The search for sustainable solutions that will improve soil health for plant and animal production without sacrificing yield is essential. Since the middle of the last century, chemical fertilizers and manures, such as poultry litter have supported high crop yield. However, long-term intensive use of these inputs has caused negative effects in these soil systems that include environmental pollution and contamination of surface and ground water. These negative impacts are similar in forage systems as production continues to expand in order to meet demands.

The southeast United States is prone to leaching and nutrient runoff to water bodies, especially considering the amount of cattle produced in the region that use forages as the principal source of nutrition. In addition, the combination of high humidity with limited air movement, could favor development of disease that may hinder forage produc-

Upcoming Events 2023		
Dates	Meeting	Location
April 25, 2023	Alabama Invasive Plant Council 20 th Annual Conference	Auburn, AL
July 11-13, 2023	American Peanut Research and Education Society (APRES) Annual Meeting	Savannah, GA
July 27-29, 2023	Southern Peanut Growers Conference	Miramar Beach, FL
Aug. 6-9, 2023	SWCS International Annual Conference	Des Moines, IA
Oct. 17-19, 2023	Sunbelt Ag. Expo	Moultrie, GA

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... Microbes cont.

tion. Plant growth-promoting rhizobacteria (PGPR) could play a significant role in the future development of a sustainable forage production and nutrition management system.

Lessons learned from previous research conducted with PGPR at the NSDL led to the establishment of a new program for sustainable forage production at NSDL. Dr. Tony Adesemoye (Fig. 3) recently joined the NSDL to help coordinate this new research area. He is investigating PGPR to improve forage nutrient use efficiency, disease management, and microbiome feedback. Dr. Adesemoye's collaborative research efforts with multiple faculties in two states has started evaluating PGPR as an alternative or supplement to fertilizer for tall fescue and bermudagrass under field conditions in Alabama and Tennessee.



Figure 3. Dr. Tony Adesemoye working with forages in the greenhouse.

In preliminary laboratory studies, Dr. Adesemoye has observed how PGPR may reduce growth and effects of pathogens (Fig. 4). Dr. Adesemoye believes that there is a lot to be harnessed from exploring direct and indirect mechanisms of *Bacillus* PGPR in relation to potential cooperation with other beneficial microbes such as mycorrhizal fungi and *Trichoderma* species. Development of new technologies based on beneficial microorganisms for forage will help improve environmental sustainability and profits for forage and livestock producers in the Southeast and across the United States.

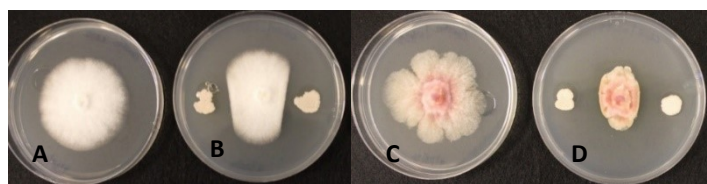


Figure 4. PGPR hindering the growth of pathogens in the laboratory. (A) *Fusarium oxysporum*, (B) reduced growth of *F. oxysporum* with *Bacillus* PGPR, (C) *Fusarium graminearum*, and (D) reduced growth of *F. graminearum*

Recent Publications

All our publications are available on our web site:

<http://www.ars.usda.gov/sea/nsdl>

Bartley, P., Erbrick, L., Knotts, M., Watts, D.B., Torbert III, H.A. 2023. Influence of flue gas desulfurization gypsum on phosphorus loss in pine bark substrates. *Agriculture*. 13:283. <https://doi.org/10.3390/agriculture13020283>.

Hamid, A., Wilson, A.E., Torbert III, H.A., Wang, D. 2023. Sorptive removal of phosphorus by flue gas desulfurization gypsum in batch and column systems. *Chemosphere*. 320:138062. <https://doi.org/10.1016/j.chemosphere.2023.138062>.

Kalvakaalva, R., Prior, S.A., Smith, M., Runion, G.B., Ayipio, E., Blanchard, C., Wall, N., Wells, D., Hanson, T.R., Higgins, B.T. 2022. Direct greenhouse gas emissions from a commercial pilot-scale aquaponics system. *Journal of the ASABE*. 65(6):1211-1223. <https://doi.org/10.13031/ja.15215>.

Kornecki, T.S., Kichler, C.M. 2022. Development of a no-till transplanter for walk-behind tractors. *Journal of the ASABE*. 38 (6):865-872. <https://doi.org/10.13031/aea.15126>.

Kumari, A., Price, A.J., Koores, N., Gamble, A., Li, S. 2023. Effect of crimson clover on the critical period of weed control in conservation tillage corn. *Frontiers in Agronomy*. 4:1068365. <https://doi.org/10.3389/fagro.2022.1068365>.

Runion, G.B., Prior, S.A., Durstock, M., Sanz-Saez, A., Price, A.J. 2023. Effects of elevated CO₂ on the response of glyphosate resistant and susceptible Palmer amaranth (*Amaranthus palmeri* S. Wats.) to varying rates of glyphosate. *Archives of Agronomy and Soil Science*. <https://doi.org/10.1080/03650340.2023.2173741>.

Tekeste, M., Way, T.R., Birkenholz, W., Brodbeck, S. 2023. Effect of increased deflection tire technology on soil compaction. *Journal of the ASABE*. 66(1):75-84. <https://doi.org/10.13031/ja.14794>.

Ul Khabir, I., Topps, D., Jhumur, J., Adesemoye, A.O., Brown, J., Newman, A., Robertson, B., Iqbal, J., Saleem, M. 2023. Linking rhizosphere soil aggregates with belowground and aboveground plant traits. *Ecologies*. 4(1): 74-87. <https://doi.org/10.3390/ecologies4010007>.

Ulbrich, N.C., Motta, A.C., Magri, E., Prior, S.A., Albuquerque, C.G., Gavelaki, F., Barbosa, J.Z., Wendling, I., Poggere, G.C. 2023. Accumulation capacity of nickel and zinc in yerba mate cultivated in soils with contrasting parent materials. *Biological Trace Element Research*. <https://doi.org/10.1007/s12011-023-03593-4>.

Yakubova, G.N., Kavetskiy, A.G., Sargsyan, N., Prior, S.A., Torbert III, H.A. 2022. Neutron-gamma soil analysis for digital agriculture. In Shamshiri, R.R., Shafian S., editors. *Digital Agriculture, Methods and Applications*. Rijeka, Croatia: IntechOpen. <https://doi.org/10.5772/intechopen.102128>.

Planting Date Critical for Rye Biomass

Previous cover crop research has focused on identifying practices to produce large amounts of aboveground cover crop biomass to maximize soil coverage for erosion control, enhance soil moisture conservation for short-term drought protection, serve as a tool to suppress weeds that may also include herbicide-resistant weeds, and provide a carbon source for subsequent soil organic matter formation. Planting early and applying some N fertilizer can enhance cereal (i.e., rye) cover crop biomass production on coarse-textured Coastal Plain soils.

Unfortunately, growers are not always able to plant inside optimal planting periods that maximize biomass, due to fall harvest activities. As a result, growers tend to compensate by increasing seeding rates and/or applying greater N rates, but both practices increase costs. No previous research has verified increasing these inputs enhances biomass production to justify the additional costs.

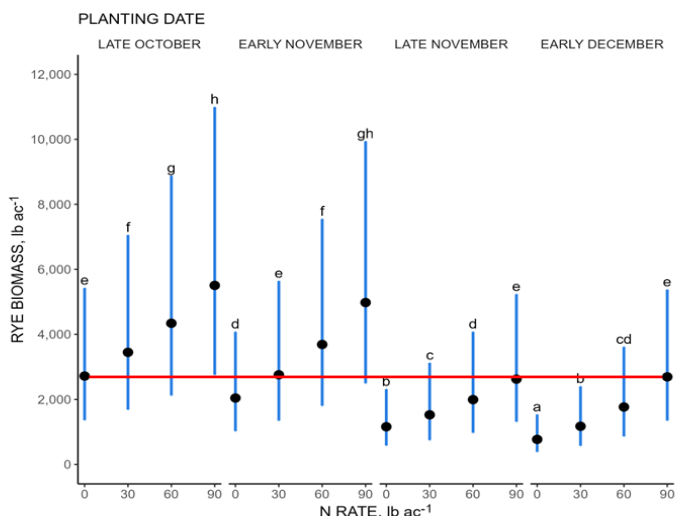


Figure 5. Average rye biomass production across the 2015-2020 seasons at Headland, AL. Error bars are 95% confidence intervals around means (black dots).

A six-year (2015-2020) study to compare different planting date and N rate combinations across two rye seeding rates (60 and 90 lb/ac) showed a clear distinction between early and late planting dates when averaged over rye seeding rates (Fig. 5). Applied N improved biomass production, but the effect decreased as planting date was delayed. The red line highlights the equivalent biomass production for late October planted rye that received no N fertilizer (**low cost**) compared to early December planted rye that received 90 lb N/ac (**high cost**). Increasing N fertilizer did not offset environmental constraints imposed by late

Happenings

The Auburn location's Special Emphasis Program members organized a meeting to have Auburn University's Lauren Ozment of the EAGLES program come to speak with us about disability employment awareness month. We had 19 federal employees attend the meeting. The program provides a post-secondary education opportunity for students with intellectual disabilities to engage in a 2-4 year campus experience to help students achieve their employment and independent living goals upon completing the program.

In celebration of African American History month, the Auburn location's special emphasis program organized a tour of the Jule Collins Smith Museum of Fine Art in Auburn, Alabama. The group got to view an exhibit called "Radical Naturalism- Kevin Brisco: Migratory Roots". The group had 28 federal employees participate in the tour, which is almost 70% of the Auburn location's employees.

Drs. Kip Balkcom and Andrew Price along with Mr. Corey Kichler hosted participants of an Alabama Soil Health Tour sponsored by NRCS. Participants learned about past, current, and future work related to conservation tillage and cover crops, viewed new equipment under development at the lab, and toured the current facilities.

Dr. Kip Balkcom was invited to present information about cover crop management to participants during two different sessions at the Cotton and Rice Conference held in Baton Rouge, LA.

Dr. Kip Balkcom was invited to present information about cover crop management to participants that included growers and industry representatives (60 people) at the Mississippi Peanut Growers Association Annual Meeting held in Hattisburg, MS.

Dr. Kip Balkcom was invited to organize and moderate a session titled "Unintended Consequences for Cover Crops" during the Southern Cover Crop Conference in Baton Rouge, LA. The session was one of different sessions participants could choose to attend during the conference. Participants (~250) included growers, other scientists, and industry representatives.

Dr. Kip Balkcom was invited to present information about planting date and N timing for a cereal cover crop to participants of the 2023 CIG Wiregrass Cover Crop Field Day in Headland, AL. Attendees included growers and agricultural practitioners (~40 people) from across the region.

rye planting dates with currently available genetics. For growers to maximize biomass production in the region, results indicate planting rye by early November is imperative, while increasing inputs for late-planted rye is not cost effective.

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