National Soil Dynamics Laboratory

Highlights

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United States Department of Agriculture

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Conservation Systems Research Team discusses cover crops at the Southern Cover Crop Conference

Members of the Conservation Systems Research (CSR) Team organized and participated in the Southern Cover Crop Conference in Goldsboro and Mt. Olive, NC on July 18-19, 2016. The conference was sponsored by the southern region of Sustainable Agriculture Research Education (SARE). Approximately 350 people, representing the southern region of SARE, attended the conference (https://www.ncsu.edu/mckimmon/cpe/opd/CEFS/). The first day of the conference was dedicated to workshops, while the second day focused on field demonstrations. Participants were presented information on how to effectively utilize cover crops and enhance their benefits in southern cropping systems (Fig. 1). A farmer panel, representing farmers from across the region, discussed how they manage cover crops and production challenges related to cover crops, including drastically different annual rainfall across operations. Panel participants ranged from a small vegetable farmer to larger row crop farmers with and without livestock.

The CSR Team organized and participated in the following workshops and field demos:

- Economics of cover crops I: Profitability of cover crops in row crop production and federal cost share for cover crops. (workshop)
- Economics of cover crops II: Economic tools to use for cover crop decisions and the economics of cover crops in vegetable production. (workshop)
- Cover crop establishment, termination, and residue management: Techniques and tools. (workshop)
- Rolled rye for management of glyphosate-resistant Palmer amaranth. (workshop)
- Equipment demonstration and conservation systems overview. (Field demo, Figures 2 and 3)

Figure 1. A dense cover crop mat provides erosion protection, soil moisture conservation, and weed suppression benefits.

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Dynamically Speaking

H. Allen Torbert
Research Leader

Another growing season is ending and the National Soil Dynamics Laboratory continues to process research data collected from across the state on our various projects related to Conservation Systems, Global Change, and Waste Management. I would like to highlight the professional recognition awarded to two of our scientists at the NSDL. The designation as a Fellow is the highest recognition bestowed on members of a scientific research society in recognition of their prominence and sustained contribution to the advancement of that area of science. Generally, a society will limit this honor to less than 0.3% of its membership. I am happy to announce that Dr. Thomas Way was inducted as a Fellow of the American Society of Agricultural and Biological Engineers and Dr. Stephen Prior will be inducted as a Fellow of the American Society of Agronomy. We are honored to have such prominent scientists working here at the NSDL.

I hope you enjoy reading about some of the research efforts we have included in this issue of *Highlights*, and please visit our web site for more information about our ongoing projects.

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…Cover Crop Conference cont.

Factsheets summarizing each workshop and field demonstration will be publically available in the near future.

A post-conference planning meeting was held for individuals interested in forming the Southern Cover Crops Council (SCCC). The southern SARE region has numerous groups that conduct research on cover crops, provide information and products to stakeholders, and work with producers to adopt cover crops. The proposed mission of the SCCC is "to facilitate and enhance communication and collaboration among producers, extension, researchers, and other agricultural professionals, and transfer information and technology to promote the successful adoption and integration of cover crops into southern agricultural systems." Bringing all of these groups together will help to provide producers and those working with producers the information and resources they need to successfully adopt cover crops into their systems.

Currently, a working group has been formed with participants representing the states and island protectorates (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, Puerto Rico, South Carolina, Tennessee, Texas, U.S. Virgin Islands, and Virginia) of the Southern SARE region, producers, NRCS, 1890 institutions, and interested non-government organizations. The main goal of the working group is to formalize the structure and function of the SCCC. In the near future, you may be contacted to provide input related to functions for the SCCC. A meeting of the working group to consolidate ideas and formalize the council structure is planned for early December in Athens, GA.

Figure 2. The four-stage roller/crimper (U.S. Patent #7,987,917 B1) developed at the NSDL was demonstrated during the Southern Cover Crop Conference.

Figure 3. Typical strip tillage implement demonstrated during the Southern Cover Crop Conference to maximize below ground disruption and minimize surface soil disturbance.

Upcoming Events

Dates	Meeting	Location
Oct 18-20	Sunbelt Ag Expo	Moultrie, GA
Oct 26-27	Pesticide Applicator University	Opelika, AL
Nov 2	North Alabama Extension Corn and Soybean College	Guntersville, AL
Nov 6-9	Agronomy, Crop Science, & Soil Science Societies' Annual Mtg	Phoenix, AZ
Nov 17-18	AL Fruit & Vegetable Growers Assoc. Conf. & Tradeshow	Clanton, AL
Dec 7-8	Southern Cover Crop Council Working Group	Athens, GA
Dec 13-14	Southern Agricultural Soil Health, Cover Crops, & Water Mgmt Conf.	Jonesboro, AR
Dec 14-15	AL Corn and Wheat Short Course	Auburn, AL
Jan 4-6, 2017	Beltwide Cotton Conference	Dallas, TX
Jan 23-25, 2017	Southern Weed Science Scoeity Annual Meeting	Birmingham, AL
Jan 25-28, 2017	Southern SAWG Conference	Lexington, KY
Feb 4-7, 2017	Southern Agricultural Economics Assoc. Annual Meeting	Mobile, AL
Feb 6-9, 2017	Weed Science Society of America Annual Meeting	Tucson, AZ

NSDL scientist participates on review board regarding NASA's next Mars rover

NSDL agricultural engineer Dr. Thomas Way participated in a one-day meeting, serving on a review board, at the Jet Propulsion Laboratory (JPL) in Pasadena, CA. JPL is a federally funded research and development center managed for NASA by California Institute of Technology (Caltech). The review board provided feedback to NASA engineers regarding the wheels of the Mars rover to be launched in 2020. The rover, Curiosity (Fig. 4), is currently exploring Mars, and the rover to be launched in 2020 is anticipated to be similar to Curiosity. Dr. Way has conducted research on the performance of agricultural tractor tires and rubber tracks, on soil, and his work in this area provided background for his interaction with JPL regarding wheels of the new Mars rover.

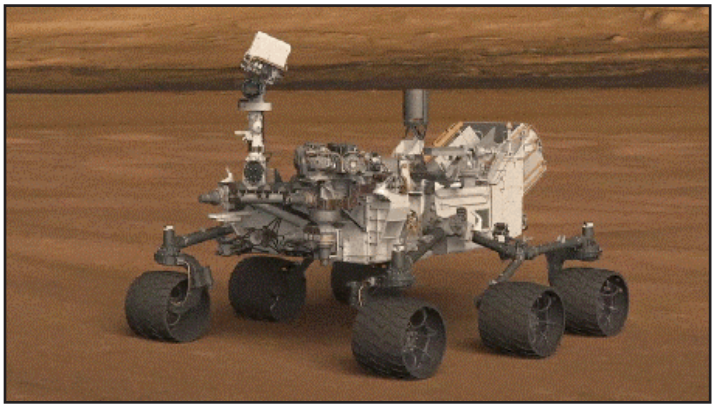

Figure 4. Curiosity is a car-sized robotic rover currently on Mars, as part of NASA's Mars Science Laboratory mission. Photo courtesy of NASA/JPL-Caltech.

Examining herbicide efficacy when converting bahiagrass pastures to row crop production

The atmospheric CO_2 level is increasing and has a positive effect on growth of most plants due to increased photosynthesis, resource use efficiency, and/or allocation to belowground structures. Pasture systems in the Southeastern US remain understudied in terms of the effects of elevated CO_2. We recently terminated a 10-year study of bahiagrass (*Paspalum notatum*) response to atmospheric CO_2 levels (ambient and plus 200 ppm CO_2) and N application (N vs. No N), which represented both managed vs. unmanaged pastures common in the Southeast (Fig. 5). Over the course of the study there was a strong effect of N on biomass production (~230% increase), while effects of elevated CO_2 were lower (~15% increase). Atmospheric CO_2 level had no impact on bahiagrass production when no N was added. Similar CO_2 and N effects were observed in belowground rhizome biomass production. Given that evidence indicates that elevated CO_2 may increase herbicide tolerance in some plants, we were interested in determining if the extensive nature of the rhizome belowground system would impact herbicide efficacy when converting a pasture back to a row crop production system. Following termination of the bahiagrass study, plots were sprayed with glyphosate and crop vigor was monitored using a handheld GreenSeeker® optical sensor. Plots were also monitored

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Recent Publications

Runion, G.B., **Prior, S.A.**, Capo-Chichi, L.J., **Torbert III, H.A.**, Van Santen, E. 2016. Varied growth response of cogongrass ecotypes to elevated CO2. Frontiers in Plant Science. 6:1182. doi:10.3389/fpls.2015.01182.

Duzy, L.M., Price, A.J., Balkcom, K.S., Kornecki, T.S. 2015. Conservation tillage under threat in the United States. Outlooks on Pest Management. 26(6):257-262.

Watts, D.B., Way, T.R., Torbert III, H.A., Armstrong, S.D. 2015. Subsurface band application of poultry litter and its influence on phosphorus concentration and retention after runoff from permanent pastures. Journal of Environmental Quality. 44:1930-1937.

Balkcom, K.S., Duzy, L.M., Kornecki, T.S., Price, A.J. 2016. Timing of cover crop termination: Management considerations for the Southeast. Crop, Forage & Turfgrass Management. 1. doi:10.2134/cftm2015.0161.

Kavetskiy, A.G.**, Yakubova, G.N., Prior, S.A., Torbert III, H.A.** 2015. Hot background" of the mobile inelastic neutron scattering system for soil carbon analysis. Applied Radiation And Isotopes. 107:299-311. doi 10.1016/j.apradiso.2015.11.012.

Kornecki, T.S., Price, A.J., Balkcom, K.S. 2015. Cotton population and yield following different cover crops and termination practices in an Alabama no-till system. Journal of Cotton Science. 19(3):375-386.

Torbert III, H.A., Ingram, J.T., **Prior, S.A.** 2015. High Residue Conservation Tillage System for Cotton Production: A Farmer's Perspective. European Agrophysical Journal. 2(1):1-14.

Price, A.J., Monks, C.D., Culpepper, S.A., **Duzy, L.M.**, Kelton, J.A., Marshall, M., Steckel, L.E., Sosnoskie, L.M., Nichols, R.L. 2016. High residue cover crops alone or with strategic tillage to manage glyphosate-resistant palmer amaranth (amaranthus palmeri) in Southeastern cotton (gossypium hirsutum). Journal of Soil and Water Conservation. 71(1):1-11.

All of our publications are available on our web site:
http://www.ars.usda.gov/sea/nsdl

… Examining herbicide efficacy cont.

for soil CO_2 efflux using Automated Carbon Efflux Systems (ACES).

After the initial herbicide application, N plots showed higher vigor; however, after 3 weeks, N plots were similar to no N plots. During this same period, no differences were observed between CO_2 treatments. Following a second herbicide application (occurring ~3 weeks after the initial herbicide application), no treatment differences were detected with the GreenSeeker ® and monitoring was discontinued after one additional week.

Soil CO_2 flux was higher under elevated CO_2 for the week prior to the first herbicide application with no effect of N management. There were no treatment effects in the interval between the first and second herbicide applications (~3 weeks). For the time period between the second application and the tillage event (~3 weeks), cumulative CO_2 loss was higher under elevated CO_2 with no N effect. Following tillage, daily CO_2 flux was higher with N only during the second week which coincided with rainfall; no other treatment effects on daily CO_2 flux were observed. Total cumulative CO_2 loss following tillage was not affected by either N or CO_2 level. Results suggest that conversion of pasture to row crop systems will not be greatly impacted by N management or atmospheric CO_2 level.

Figure 5. View of open top chambers used in the pasture study at the NSDL.

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Happenings

August 8, 2016, ARS employees of the NSDL hosted a small group from Albania. The group traveled to Auburn University through the USDA/FAS Cochran Fellowship Program: Cochran Program for Albania Agricultural Extension. Plant Physiologist, Steve Prior, provided an overview of USDA-ARS and the NSDL. Agronomist, Kip Balkcom, Agricultural Economist, Leah Duzy, Agricultural Engineer, Ted Kornecki, and Weed Scientist, Andrew Price, provided information on research being conducted by the Conservation Systems Research (CSR) Unit. The group took a tour of the facility and was introduced to machinery used in conservation systems across AL.

August 11, 2016, ARS scientists along with USDA-NRCS, and the USEPA have been selected as the recipient of the Southeast Regional 2016 Interagency Partnership Award by the Federal Laboratory Consortium for Technology Transfer (FLC) in recognition of the work regarding "By-product Gypsum to Reduce Runoff Pollution and Improve Water Quality". The FLC is a chartered organization mandated by Congress to promote, educate and facilitate technology transfer among more than 300 federal laboratories, research centers and agencies. The award will be presented at the Awards Luncheon of the Joint Midwest-Southeast Regional Meeting of FLC in Charleston, SC. The ARS individuals at the NSDL specifically named for their contributions for the award included Dr. H. Allen Torbert and Dr. Dexter B. Watts.

July 18-19, 2016, ARS employees of the NSDL attended the 2016 Southern Cover Crops Conference at the University of Mount Olive in Mount Olive, NC. Agronomist, Kip Balkcom developed and served as moderator for the Cover Crop Establishment, Termination, and Residue Management Workshop, in which Agricultural Engineer, Ted Kornecki also participated. They presented on techniques for successful cover crop termination, and tools for residue management. Agricultural Economist, Leah Duzy developed and served as moderator for the Economics Workshop where she presented on the economic benefits of cover crops. Weed Scientist, Andrew Price, presented on using rolled rye for management of glyphosate-resistant Palmer amaranth as part of the Cover Crops for Weed Control Workshop. Scientists and technicians (Corey Kichler, Trent Morton and Jeffrey Walker) provided field demonstrations of equipment used in conservation systems at the Center for Environmental Farming Systems in Goldsboro, NC. The conference was part of a Southern Region SARE Professional Development Program grant, on which Drs. Balkcom, Duzy, Kornecki, and Price were collaborators. ARS scientists from NSDL also participated in a meeting to discuss the future of a proposed Southern Cover Crop Council, moderated by Dr. Balkcom.

June 26 – 29, 2016, Dr. Ted S. Kornecki, an Agricultural Engineer of the NSDL attended the International Conference of Agricultural Engineering CIGR - AgEng 2016 at Aarhus University, Denmark. He presented on the effectiveness of different rollers/crimpers in terminating cereal rye in conservation cotton systems.

Send updated contact information, questions, comments, and/or suggestions to: NSDL-Highlights@ars.usda.gov