National Soil Dynamics Laboratory

Highlights

Spring 2012

United States Department of Agriculture

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Contents

Ornamental Horticulture has Potential to Reduce Greenhouse Gas Emissions

Global environmental change is receiving significant attention from the scientific community. Increases in the levels of greenhouse gases (GHG) in the atmosphere [carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O)] are believed to be a primary driving factor behind global warming. Much of the work on reducing GHG losses and carbon (C) sequestration has been conducted in row crop and forest systems; however, little work has focused on contributions from sectors of the specialty crop industry such as ornamental horticulture. Ornamental horticulture impacts rural, suburban, and urban landscapes and also has the potential to reduce GHG emissions and increase C sequestration.

Currently, we are conducting studies with the Department of Horticulture at Auburn University to determine the impact of the ornamental horticulture industry on GHG emissions and C sequestration. One aspect focuses on the effect of nursery container size and fertilizer placement to begin identifying practices that may impact GHG losses. Dwarf yaupon hollies were grown in four commonly used container sizes. GHG losses were sampled weekly. CO_2 and N_2O losses were greater for larger pots, while CH_4 losses were negligible. In addition, gumpo azaleas were grown using three fertilizer placement methods (dibble, incorporation, and surface broadcast) to evaluate GHG losses. CO_2 losses were lowest with the dibbled method, while N_2O losses were highest when fertilizer was incorporated. Again, CH_4 losses were negligible. Results from this work begin to address uncertainties regarding the environmental impact of the horticulture industry on climate change, while providing baseline data of GHG losses from container production systems.

A second effort focuses on determining techniques for increasing C storage in urban and suburban landscapes. We are evaluating different plant species and potting media to determine how these factors affect C sequestration in the landscape. The Horticulture Department has ongoing work developing alternative substrates for nurseries. We utilized three growth

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Dynamically Speaking

H. Allen Torbert
Research Leader

The National Soil Dynamics Laboratory has finished another year in its long history and we are looking forward to continuing our efforts to conduct research for the American farmer. As the spring planting season approaches, we are busy preparing to implement our many experiments scattered across Alabama. But, as we prepare to go forward, I believe that it is fitting to say a word of thanks to two of our staff, Mrs. Larraine Long and Mr. John Walden, who retired at the end of 2011. Mrs. Long served as our receptionist for a very long time, and decided to retire after 29 years of US government service. Mr. Walden worked in our shop with the technical title of *Model Builder*. This translated into John building anything and everything in the shop we needed for our research. His retirement came after 50 years of government service and his experience and expertise will certainly be missed.

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

National Soil Dynamics Laboratory
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Upcoming Events

Dates	Meeting	Location
April 14	Organic Gardening & Small Scale Farming Workshop	Cullman, AL
May 8–10	SE-EPPC & ALIPC Conf.	Auburn, AL
May 23–25	SWCS-AL Ann. Mtg.	Eufaula, AL
July 12	Sunbelt Ag Expo Field Day	Moultrie, GA
July 21–25	SWCS Ann. Mtg.	San Antonio, TX

Recent Publications

Aulakh, J.S., A.J. Price, and K.S. Balkcom. 2011. Weed management and cotton yield under two row spacings in conventional and conservation tillage systems utilizing conventional, glufosinate-, and glyphosate-based weed management systems. Weed Technol. 25:542-547.

Kornecki, T.S., F.J. Arriaga, and A.J. Price. 2012. Roller type and operating speed effects on rye termination rates, soil moisture, and yield of sweet corn in a no-till system. HortSci. 47:217-223.

Shaw, D.R., A.S. Culpepper, M. Owen, A.J. Price, and R. Wilson. 2012. Herbicide-resistant weeds threaten soil conservation gains: Finding a balance for soil and farm sustainability. Issue Paper 49, CAST, Ames, IA.

Balkcom, K.S., J.M. Massey, J.A. Mosjidis, A.J. Price, and S.F. Enloe. 2011. Planting date and seeding rate effects on sunn hemp biomass and nitrogen production for a winter cover crop. Article ID 237510. In. J. Agron.

Balkcom, K.S., J.L. Satterwhite, F.J. Arriaga, A.J. Price, and E. van Santen. 2011. Conventional and glyphosate-resistant maize yields across plant densities in single– and twin–row configurations. Field Crops Res. 120:330-337.

Murphy, A.-M., C.H. Gilliam, G.B. Fain, H.A. Torbert, T.V. Gallagher, J.L. Sibley, and C.R. Boyer. 2011. Low-value trees as alternative substrates in greenhouse production of three annual species. J. Environ. Hort. 29:152-161.

Nyakatawa, E.Z., D.A. Mays, T.R. Way, D.B. Watts, H.A. Torbert, and D.R. Smith. 2011. Tillage and fertilizer management effects on soil-atmospheric exchanges of methane and nitrous oxide in a corn production system. Appl. Environ. Soil Sci. Article 47530.

Reberg-Horton, S.C. J.M. Grossman, T.S. Kornecki, A.D. Meijer, A.J. Price, G.T. Place, and T.M. Webster. 2011. Utilizing cover crop mulches to reduce tillage in organic systems in the southeastern USA. Renew. Agric. Food Syst. 27:41-48.

Runion, G.B., H.M. Finegan, S.A. Prior, H.H. Rogers, and D.H. Gjerstad. 2011. Effects of elevated atmospheric CO_2 on non-native plants: Comparison of two important southeastern ornamentals. Environ. Control Biol. 49:107-117.

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

… Ornamental Horticulture

substrates: 1) Pinebark (industry standard); 2) Clean Chip Residual; and 3) Whole Tree. Common woody ornamentals were grown in these differing substrates and then outplanted to the field. Initial soil samples were collected for determination of soil C. An Automated Carbon Efflux System (ACES) was installed adjacent to plants to continuously monitor C lost through soil respiration. Periodically, soil samples were taken and plants were measured to provide information on both inputs (biomass) and outputs (respiration). Early results indicate that potting media and plant species have significant effects on C sequestration in the landscape.

Automated Carbon Efflux System (ACES) installed adjacent to plants to continuously monitor C lost through soil respiration.

Our studies are beginning to provide baseline information regarding how changes in production practices reduce GHG losses and increase C storage for the horticulture industry. This information will help fine-tune Best Management Practices to maximize productivity and profitability in a changing environment. In addition, determining C sequestration potential of various landscape species when planted into urban and suburban landscapes could provide homeowners a means of directly contributing to mitigation of climate change.

To date, this research has resulted in four peer reviewed journal articles, a detailed technical report, and numerous conference proceedings and presentations at regional and national scientific meetings.

Customers Give Input

The Conservation Systems Research (CSR) unit participated in a one day customer workshop on February 22 at The Hotel in Auburn, AL. This workshop was designed for customers to provide input to ARS scientists on future research activities. The results of the workshop will be used to assist in planning the next 5-year research cycle of the Agricultural System Competitiveness and Sustainability National Program (NP) 216.

This workshop coincided with other workshops occurring simultaneously at host cities across the U.S. Host cities included Ames, IA; Beltsville, MD; Miles City, MT; and Spokane, WA, in addition to Auburn, AL. Scientists representing multiple research locations along with representative customers travelled to the various host cities to discuss future research priorities. Auburn scientists and customers were joined by visitors from Dawson, GA; Starkville, MS; and Stoneville, MS.

On Wednesday morning, workshop participants viewed presentations about recent research activities from each research unit represented at the host city. In addition to information related to local research programs, all customers participated in a webinar that allowed them to view presentations from National Program leaders about NP 216 efforts across the U.S., identify the role customers would play in the project planning process, describe how the 5-year project planning and evaluation process occurs, and ask questions.

On Wednesday afternoon, customers at each host city provided input on research needs based on an identical set of questions administered to all customers at each location. The questions were generated from survey responses that all customers had answered, prior to the workshop. A second webinar was held at the end of the day to allow customers at each host city to provide an overview of research areas they felt were important. This also allowed National Program staff and scientists to learn about research needs from other regions across the U.S., in addition to their respective regions.

Customers shared information and technology needs related to improving the sustainability of a variety of agricultural systems across the country. The feedback provided by the customers is currently being consolidated and will be used to assist in planning the next 5-year research cycle for all research locations within NP 216.

All the customers at the Auburn meeting provided excellent suggestions that resulted in a successful customer meeting. We are especially grateful to the customers who supported the CSR unit with their participation – Mr. Buddy Adamson (ALFA), Mr. Jerry Byrd (Alabama Peanut Producers), Dr. Kokoasse Komplekou (Tuskegee Univ.), Mr. Jimmy Miller (producer), Mr. Shep Morris (producer), Mr. Tim Mullek (producer), Mr. Eric Schwab (NRCS), and Dr. Joe Touchton (Auburn Univ.). We appreciate their valuable insight and for taking time out of their schedules to attend the workshop. We feel that we can use this information to continue our goal of providing quality production oriented research across the Southeast.

Turkish Scientists Collaborate on Soil Compaction, Subsurface Poultry Litter Application

Three agricultural engineering researchers from Turkey were at the NSDL as visiting scientists for three months in late 2011. Dr. Engin Çakir and Dr. Erdem Aykas are on the faculty in the Agricultural Engineering Department at Ege University in Izmir, Turkey and Dr. Ahmet Çelik is on the faculty in the Department of Agricultural Machinery at Ataturk University in Erzurum, Turkey. Dr. Çakir received his Ph.D. from the Auburn University Department of Biosystems Engineering in 1995 and conducted his Ph.D. research at the NSDL.

The three visiting scientists worked with researchers at NSDL and the Biosystems Engineering Department of Auburn University on a soil compaction experiment at the NSDL soil bins. The compaction experiment was conducted in a sandy loam and a clay loam soil. Soil compaction from tractor tires was determined through measurements of soil bulk density, soil penetration resistance using a soil cone penetrometer, and the depth of ruts formed in soil.

Dr. Engin Çakir

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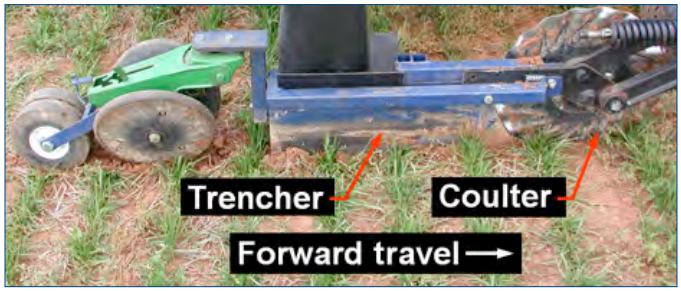
… Turkish Scientists Collaborate

Dr. Çelik also worked with agricultural engineer Dr. Thomas Way and soil scientist Dr. Dexter Watts on subsurface band applications of poultry litter. Dr. Way has led the development of a prototype implement to apply litter in soil for row crops and pastures. The implement works well in reducing the amount of phosphorus, nitrogen, and other nutrients that are carried off fields in runoff water, and in placing litter nutrients close to crop roots.



Subsurface litter applicator

Drs. Celik, Way, and Watts worked on the trencher device of the implement in the NSDL soil bins. The trencher forms a shallow trench in soil and the implement then applies a subsurface band of litter in the trench. The performance of the trencher, the double-disk opener of a row crop planter unit, and a single-disk opener typical of some seeding implements were studied. They investigated how well the three devices cut through corn, cotton, wheat, and soybean residue lying on the soil surface. The double-disk openers performed well in cutting through the four types of residue. The trencher assembly was equipped with a leading coulter disk (above) and the coulter cut the soybean and cotton residue well, but not so well in the wheat and corn residue. Further work will modify the design of the trencher assembly to improve its performance in wheat and corn residue.

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Happenings

Dr. Kip Balkcom gave presentations at the Adaptation Exchange: Farm Management Strategies and Technologies to Reduce Climate-Related Risks meeting in Quincy, FL, at the Louisiana Agricultural Technology and Management Conference in Marksville, LA., the Southern Branch–ASA meeting in Birmingham, AL, and participated in two expert panels for wheat production across Alabama at grower meetings in Tanner and Montgomery.

The NSDL hosted a group of 16 students from the Universidad Nacional de Agricultura (National University of Agriculture) in Honduras. **NSDL scientists** spoke about their research work and provided a tour of the facilities and equipment demonstrations.

Drs. Allen Torbert, **Dexter Watts**, **Francisco Arriaga**, and **Kip Balkcom** presented papers at the American Society of Agronomy–Crop Science Society of America–Soil Science Society of America annual meetings in San Antonio, TX. **Drs. Torbert** and **Watts** were elected *Leaders* for the *Military Land Use and Management* and *By-product Gypsum Uses in Agriculture* communities, respectively.

Dr. Francisco Arriaga spoke at the Conservation Tillage Production Systems Training Conference in Hawkinsville, GA.

Dr. Ted Kornecki and **Corey Kichler** demonstrated conservation agriculture equipment at the Alabama Fruit and Vegetable Growers Assn. Conference in Auburn, AL. **Kirk Iversen** spoke at the same conference.

Dr. Kip Balkcom and **Leah Duzy** presented papers at the Beltwide Cotton Conferences in Orlando, FL.

Drs. Kip Balkcom and **Andrew Price** attended the Alabama Farmers Federation Alabama Cotton Commission 30th anniversary celebration in Prattville, AL.

Dr. Ted Kornecki and **Corey Kichler** presented a paper on cover crop rolling/crimping technology at the Southern Sustainable Agriculture Working Group annual conference in Little Rock, AR.

Dr. Andrew Price presented a paper at the Southern Weed Science Society annual meeting in Charleston, SC. Dr. Price also serves on the Weed Resistance and Technology Stewardship committee.

Dr. H. Allen Torbert presented a paper at the American Coal Ash Association Winter Meeting in Tampa, FL.

Kirk Iversen and **Corey Kichler** presented the *Conservation Systems Research* exhibit at a number of meetings, including Beltwide Ag Expo (Moultrie, GA), Conservation Covers: Effective Cover Cropping in the MidWest (Decatur, IL), Beltwide Cotton Conferences (Orlando, FL), Southern Sustainable Agriculture Working Group Conference (Little Rock, AR), Conservation Production Systems Training Conference (Hawkinsville, GA), Wiregrass Cotton Expo (Dothan, AL), AL-FL Peanut Producers Trade Show (Dothan, AL), Alabama Fruit & Vegetable Growers Assn. Conference (Auburn, AL), and the Georgia Organics Conference (Columbus, GA). The exhibit features information about conservation tillage and cover crops and the research programs of **Kip Balkcom**, **Andrew Price**, **Francisco Arriaga**, **Ted Kornecki**, and **Leah Duzy**.

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