



## Planter Closing Wheel Performance for Cotton in a Conservation System

Various types of closing wheels (presswheels) are available for row crop planters. A pair of closing wheels is located at the rear of each single-row planting unit, and they firm the soil around the seed to help provide good seed-soil contact (Figure 1). Seven closing wheel types were examined on a row crop planter for cotton in a conservation system during a three-year experiment on two soils (sandy loam and clay) in the outdoor soil bins at NSDL. Cotton was planted into a rye cover crop which had been rolled prior to cotton planting, so the rye residue was lying down on the soil surface.

These seven closing wheel types were used, one at a time, on the planter for planting cotton in each of the two soils: (1) Dawn “Curvtine I” closing wheels with a Dawn Press Plate on each closing wheel (Dawn Equipment Co., Inc., Sycamore, IL), (2) John Deere “cast-iron closing wheels” (John Deere, Moline, IL), (3) John Deere “disk closing system”, (4) John Deere “standard rubber-tire closing wheels”, (5) Martin SCW 70/72 Spading Closing Wheel Set (Martin Industries, LLC, Elkton, KY), (6) May Wes Adjustable Closing Wheel Arm with Poly Star Closing Wheels (May Wes Manufacturing, Hutchinson, MN) and (7) Yetter 6200-102 Close-Till System closing wheel set (Yetter Manufacturing Inc., Colchester, IL). Three of the closing wheel types (John Deere cast-iron closing wheels, John Deere disk closing system, and John Deere standard rubber-tire closing wheels) had smooth perimeters and four (Dawn, Martin, May Wes, and Yetter) had spiked perimeters. The planting depth was 3/4 inch for both soils. The germination

### Dynamically Speaking

As the weather warms and the Spring planting season starts, the National Soil Dynamics Laboratory is very busy establishing this year’s experiments scattered all over the State of Alabama. But, as we prepare to move forward, I believe that it is very fitting to say a word of thanks to one of our staff, Mr. Bobby Washington, who will retire at the end of April 2017. Mr. Washington is an Agriculture Engineer by title, but he has provided engineering expertise in a wide range of research related and facility related issues for nearly 33 years. Both his unmatched problem solving skills and his cheerful attitude will be greatly missed.



H. Allen Torbert  
Research Leader

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.

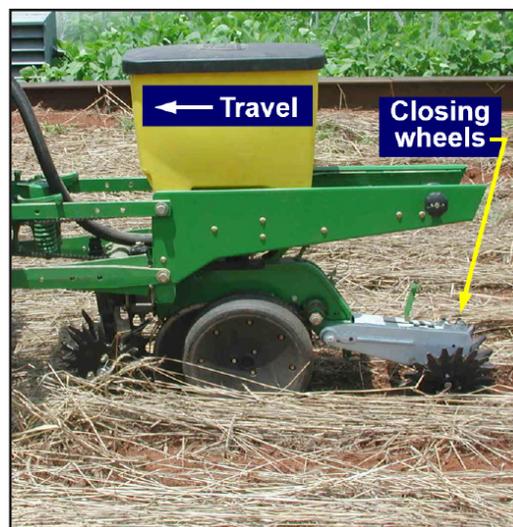


Figure 1. Single-row planting unit planting cotton in rye residue. Closing wheels here are the May Wes type.

rate of the cotton seed, specified by the seed company, was 80%. Using this 80% germination rate, we set the planter seed spacing to provide 2.5 germinated seeds per foot of row length. At 10 days after planting, we counted the number of emerged plants per foot of row length.

**...Closing wheels cont.**

Table 1. Average emergence by type of closing wheel.

Closing wheels	Average Emergence <sup>[a]</sup>
Dawn	1.41
John Deere cast-iron	1.56
John Deere disk closing system	1.46
John Deere standard rubber-tire	1.45
Martin	1.40
May Wes	1.49
Yetter	1.45

[a] Average emergence at 10 days after planting (plants/ft of row length)

There were no statistically significant differences in the number of emerged plants for the seven closing wheel types and the values, averaged across the three years and two soil types, are shown in Table 1.

The greatest average emergence occurred for the John Deere cast-iron closing wheels (Figure 2); however, the results showed that all seven closing wheel types could be used for planting cotton in a heavy residue conservation tillage system.



Figure 2. John Deere cast-iron closing wheels.

<b>Upcoming Events</b>		
Dates	Meeting	Location
May 3	AL Invasive Plant Council Annual Mtg	Alexander City, AL
June 7-9	Soil and Water Conservation Society (SWCS)-AL Chapter Annual Mtg	Irondale, AL
June 22	Yield monitor calibration and use of yield data	Shorter, AL
July 30 - Aug 2	SWCS 72nd International Annual Conference	Madison, WI
Oct 17-19	Sunbelt Agricultural Expo	Moultrie, GA

## **Irrigation and Fertilizer Placement Effects on Greenhouse Gas Emissions from Ornamentals**

Atmospheric concentrations of the three major greenhouse gases (carbon dioxide, methane, and nitrous oxide) have steadily increased in modern times with agriculture second only to energy production in emissions. While much research has evaluated the impact of agriculture across the areas of row crops, forestry and animal production systems, very little research has focused on the scale of contributions from specialty crop industries such as horticulture. As of 2009, the economic impact of the nursery, greenhouse and sod industry was \$2.8 billion in Alabama and \$148 billion nationally. However, the impact of this industry’s contribution to greenhouse gas emissions, and ultimately climate change, is unknown.

A horticulture container study using common Japanese boxwood (*Buxus microphylla* var. japonica) – a common plant in urban and suburban landscapes - was conducted to evaluate the interaction of irrigation (overhead vs drip) and fertilizer placement (dibble vs incorporated) on greenhouse gas emissions (Figure 3). Plants were grown in 3 gallon containers with a standard pine bark:sand growth media and a standard rate of slow release fertilizer. All containers were irrigated (0.25 in) three times daily. Greenhouse gas samples were collected weekly using standard methods and analyzed with gas chromatography from summer 2013 to spring 2014. Total carbon dioxide loss was not affected by irrigation or fertilizer treatments.

Total nitrous oxide loss was least for drip-irrigated plants, regardless of fertilizer placement. For overhead-irrigated plants, nitrous oxide loss was greatest with incorporated



Figure 3. Experimental pot layout to examine irrigation and fertilizer placement on greenhouse gas emissions.

### ...Irrigation and fertilizer cont.

fertilizer. Loss of methane was generally low throughout the study. Findings suggest that utilizing drip irrigation could decrease nitrous oxide loss to the atmosphere, regardless of fertilizer placement method. However, when limited to overhead irrigation, dibbled fertilizer could reduce nitrous oxide loss. Ongoing efforts are continuing to identify other best management practices for reducing greenhouse gas emissions from container produced ornamental crops.

## Farmer Survey Opportunities

Opportunity #1: USDA Sustainable Agriculture Research and Education program (SARE), the Conservation Technology Information Center (CTIC), and the American Seed Trade Association (ASTA) are sponsoring the 2017 Cover Crop Survey. This survey is aimed at gauging how farmers are using cover crops across the U.S. and also learning from those farmers not using cover crops to help better understand the information and knowledge gaps. If you are a farmer, please spend 10-15 minutes and take the survey. If you are not a farmer, please forward the following link to farmers in your network. Please visit [www.tinyurl.com/2017coverssurvey](http://www.tinyurl.com/2017coverssurvey) to take the survey.

Opportunity #2: If you are a farmer, remember to register for the 2017 Census of Agriculture at [www.agcounts.usda.gov/cgi-bin/counts](http://www.agcounts.usda.gov/cgi-bin/counts). For partners wanting to promote the Census, visit [www.agcensus.usda.gov/Partners/index.php](http://www.agcensus.usda.gov/Partners/index.php).

## Conservation Tillage under Threat in the United States

Conservation tillage, after being widely adopted in the past few decades, is now threatened by the development of herbicide resistant weeds. In 2012, approximately 315 million acres of the 390 million acres of cropland across the U.S. were harvested. Roughly 44% of total cropland area used conservation tillage practices, including no-tillage. In 1989, there were approximately 0.77 acres of conservation tillage for every acre of conventional tillage, including reduced tillage. By 2012, the ratio had grown to 4.05 acres of conservation tillage for every acre of conventional tillage. New technology, such as herbicide-resistant crops, greatly helped to increase the adoption rate of conservation tillage practices, yet current herbicide-resistant weed challenges are a real and expanding threat to conservation tillage.

### Recent Publications

Aulakh, J.S., Saini, M., **Price, A.J.**, Faircloth, W.H., Van Santen, E., Wehtje, G.R., Kelton, J.A. 2015. Herbicide and rye cover crop residue integration affect weed control and yield in strip-tillage peanut. *Peanut Science*. 42:30-38.

**Balkcom, K.S., Duzy, L.M.**, Mitchell, C.C., Delaney, D.P. 2016. A simple approach to enhance multiprobe soil cone penetrometer analyses. *Soil Science Society of America Journal*. 80:1619-1628. doi:10.2136/sssaj2016.05.0157

**Duzy, L.M., Balkcom, K.S., Price, A.J.** 2017. Influence of row spacing, herbicide technology, and tillage on fiber quality and economic returns. *Journal of Cotton Science*. 20:341-355.

**Kornecki, T.S., Prior, S.A., Torbert III, H.A.** 2016. Effects of a custom cover crop residue manager in a no-till cotton system. *Applied Engineering in Agriculture*. 32(4):333-340. doi:10.13031/aea.32.11567.

**Rodriguez, J.B.**, Self, J.R., Arriaga, F.J. 2016. A simple, gravimetric method to quantify inorganic carbon in calcareous soils. *Soil Science Society of America Journal*. 80:1107-1113. doi:10.2136/sssaj2015.09.0355

Shao, M., Kishimoto, T., Satow, T., Takeda, J., **Way, T.R.** 2017. Traction and braking force on three surfaces of agricultural tire lug. *Engineering in Agriculture, Environment and Food*. 10:39-47.

**Torbert III, H.A., Gebhart, D.L.** 2015. Development of a soil test for determining the impact of soil disturbance. *Agrociencia*. 16(3):214-220.

**Watts, D.B., Runion, G.B.**, Nannenga, K.E., **Torbert III, H.A.** 2015. Impacts of enhanced-efficiency nitrogen fertilizers on greenhouse gas emissions in a coastal plain soil under cotton. *Journal of Environmental Quality*. 44:1699-1710.

**Yakubova, G.N., Kavetskiy, A., Prior, S.A., Torbert III, H.A.** 2016. Application of Geant4 simulation for analysis of soil carbon inelastic neutron scattering measurements. *Applied Radiation And Isotopes*. 113:33-39. doi 10.1016/j.apradiso.2016.04.013.

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Producers are faced with difficult management decisions regarding herbicide-resistant weeds. Despite many of these acres currently being under USDA-NRCS conservation program contracts, the difficulty of controlling herbicide resistant weeds places many acres at risk of being converted to higher-intensity tillage systems. The shift to higher-intensity tillage facilitates burial of small weed seed and/or the increase of pre-emergence and pre-plant incorporated herbicide activity to control problematic weeds, especially in dryland crop production. However, in the past decade in the U.S., there has been a renewed interest in cover crops and their management for both carbon sequestration and agronomic purposes.

*Continued on p. 4*

## ... Conservation tillage under threat cont.

Starting in the late-1990s, scientists at NSDL initiated research using a Brazilian style cover crop management technique utilizing a roller-crimper, in conjunction with herbicides, to terminate mature cover crops (Figure 4). High biomass cover crops promote soil moisture conservation after termination, as well as weed suppression. High residue cover crops are increasingly being recommended to help alleviate herbicide resistance selection pressure through their weed suppressive characteristics. Another renewed cover crop management interest is using cover crop mixes to increase the biological diversity of conservation agriculture systems; however, little research has been published in this area.

Research at the NSDL has shown that high-residue cover crops can be combined with conservation tillage and efficacious weed control programs to aid in pest management, particularly herbicide-resistant weeds, without returning to conventional tillage.

*Article adapted from 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.*



Figure 4. Terminating cereal rye using a roller-crimper.

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## Happenings

**November 6-9, 2016**, Research Scientists attended the 2016 ASA, CSSA, & SSSA Annual Meeting in Phoenix, AZ. Dr. Kip Balkcom presented "Strip Tillage for Single and Twin-Row Peanut," and moderated a session entitled "Land Management and Conservation." Dr. Leah Duzy presented "Managing Cover Crops: An Economic Perspective," Dr. Allen Torbert presented "Potential adherence of gypsum to forage as a consideration for excessive ingestion by ruminates," Dr. Dexter Watts presented "Gypsum's Influence on Corn Yield and P Loss from an Eroded Southern Piedmont Soil," Dr. Stephen Prior presented "Long-term pasture under elevated CO<sub>2</sub> and N management: CO<sub>2</sub> flux patterns upon return to cultivation," and Dr. Juan Rodriguez presented "Modification of the AB-DTPA Soil Test to Correct Blue-P Analysis." At the meeting Dr. Balkcom was named Chair of the "Land Management and Conservation Section." Dr. Prior was inducted as a Fellow of the ASA. He was recognized for his research on rising atmospheric CO<sub>2</sub> effects on above and below ground processes in terrestrial ecosystems, providing oversight on efforts to optimally integrate animal manure into sustainable agricultural practices that preserve environmental integrity, and his editorial, section chair, and committee service for the ASA.

**December 7-8, 2016**, ARS Research Scientists participates in a planning meeting for a proposed Southern Cover Crop Council (SCCC) in Athens, GA. Drs. Kip Balkcom and Leah Duzy serve as representatives from Alabama on the planning team charged with forming and organizing the SCCC. The SCCC represents all states and territories located in the Southern SARE region.

**December 13-14, 2016**, Research Scientists were invited to present at the Southern Agricultural Soil Health, Cover Crops, and Water Management Conference in Jonesboro, AR. Dr. Kip Balkcom presented on establishing and managing cover crops. Dr. Leah Duzy presented on the economic benefits of conservation practices. Dr. Ted Kornecki presented on the use of roller/crimpers in conservation systems. Dr. Andrew Price presented on weed management benefits associated with cover crops.

**January 31 – February 2, 2017**, Research Scientists were invited to present at the Conservation Production Systems Conference in Douglas, GA. Dr. Kip Balkcom presented on managing cover crops, equipment, and planting. Dr. Leah Duzy presented on the economics of conservation tillage systems and Dr. Andrew Price presented on managing weeds in conservation tillage systems.

**February 5-7, 2017**, Research Scientists attended the 2017 Southern Branch ASA Annual Meeting in Mobile, AL. Dr. Dexter Watts presented "Effectiveness of Using FGD Gypsum to Reduce Dissolved P Losses from a Corn Field in the Southern Piedmont Region", Dr. Kip Balkcom presented "Fertilizer Effects on a Winter Cereal Cover Crop", Dr. Leah Duzy presented "Long-Term Effects of Conservation Systems on Productivity for the Old Rotation", Dr. Allen Torbert presented "Gypsum Adherence to Forage: Consideration for Excessive Ingestion By Ruminates", Dr. Stephen Prior presented "Elevated CO<sub>2</sub> and Nitrogen Effects on Soil CO<sub>2</sub> Flux from a Pasture Upon Return to Cultivation", Dr. Brett Runion presented "Effects of Tillage and N Fertilizer on Cotton Growth, Yield, and Fiber Quality" and Dr. Galena Yakubova presented "Soil Carbon Analysis Using Gamma Rays Induced By Neutrons". Also, Dr. Watts serves as President of the Southern Branch ASA.

**February 8, 2017**, Research Scientists were invited by the Electric Power Research Institute (EPRI) to speak at the FGD gypsum in Ag Workshop at the Generation Advisory and Council Committee meeting, in Newport Beach, Ca. Dr. Dexter Watts made a presentation titled "the Influence of FGD Gypsum on Reducing P Losses from Pastures and Row Cropping Systems" and Dr. Allen Torbert made a presentation titled "Update on USDA-NRCS National Conservation Practice Standard for Gypsum and Utilization of Gypsum as a Bedding Material in Poultry Broiler Houses".

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

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