Sustainable Agriculture at UGA

Looking forward for this generation and the next...



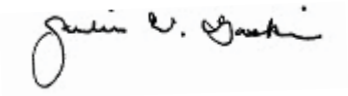

Winter 2019

Are you tired of the gray and rain yet? That is a pointless question. I have friends who moved back to Athens. They talked about moving to Portland, Oregon, but decided they couldn't stand the endless gray, rainy days there. I'm blaming them for bringing it all here. But it is February. The days are longer, there is more light, and the bloodroot is blooming at my house. So hope for a new growing season grows.

If you have been reading this newsletter, you know I am passionate about cover crops. Planting cover crops is a practice that can help heal our soil, suppress weeds, and provide beneficial insect habitat among other things. As you may have heard, we recently formed the Southern Cover Crops Council to help provide information of cover crops specific to the South and help increase cover cropping. You can read about the new website we are developing in this newsletter.

We are also having a conference this July 16 and 17th in Auburn, AL. Auburn in July you say? Well, the conference will be a day of session on various cover crop topics. On the second day, we will be out at the EV Smith farm looking at demonstration projects. Yes, it will be hot, but this is an opportunity to see summer cover crops, the effects of winter cover crops as well as various equipment at work. The conference is modelled on the Southern Cover Crops Conference held in North Carolina two summers ago. Last time we had 300 farmers and ag professionals attend from all over the South, so it should be a great networking opportunity. We will have information on cover crops in vegetables, row crops and even grazing systems. Come join us. Registration has just opened. For more information – https://CSES.Auburn.edu/SCCC.

Julia Gaskin
Sustainable Agriculture Coordinator



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New Approach to Cover Crops Offers Promise

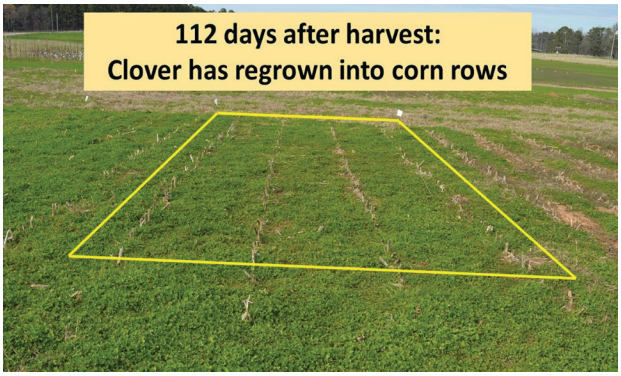
Replenishing soil organic matter after a century or more of farmland tillage is possible through prudent use of cover crops. Most cover crops used in row crop systems are winter annual plant species that are killed before planting the cash crop and replanted each year. Replanting cover crops adds cost to the production system for returns that may not be immediately recognized. Using perennial cover crops, called "living mulches", may change the dynamic of cover crop use by providing immediate benefits to crops and soil alike. Our research uses 'Durana' white clover as a living mulch in corn and cotton systems. Durana has certain qualities that make this a good choice as a cover crop. It is a legume and fixes its own nitrogen. It is a perennial so will live over multiple years. It also spreads by above ground stems (called stolons) that enable the plant to easily re-establish after a growing season. The concept is simple: Durana is planted as a solid stand in the fall of the year. A spring application of herbicide in a 10" band on 36" centers prepares the field for row-crop planting.

Corn grows in the dead strips of white clover.

As the cash crop grows, the clover is shaded and drops leaves, which releases nutrients (especially nitrogen) to the cash crop. The clover is very aggressive and controls weeds even though herbicide is not applied over the living clover.

As the season progresses, the corn shades the clover which provides added nutrients to the corn.

The Durana system only requires between 20 and 40 lbs/A of nitrogen fertilizer applied when the cash crop is planted. This is a substantial reduction from the 250 lb/A applied when cereal rye is used as a cover crop. Corn yield is about 15% lower than a cereal rye cover crop system, but the economics work in favor of the Durana living mulch system because of reduced nitrogen and herbicide costs. Early season clover growth requires additional irrigation but once corn canopy covers the clover the water needs by the system is like any other corn field.



We analyzed various chemical and physical traits associated with soil health in the Durana system compared with other cover crops. The chemical measurements indicated there is a greater amount of nutrients in the soil, more organic matter and nitrogen in the Durana system than in soils with no cover crop or planted to cereal rye. The pH was also greater in the Durana system because of reduced use of acid-generating nitrogen fertilizer. Physical traits in soils from the Durana system included

lower bulk density, increased porosity, and a higher water infiltration rate.

An organic layer builds at the soil surface as the stand of Durana ages. This picture illustrates the organic layer during the second year of Durana growth as a living mulch. We have been able to perpetuate the system for 3 years.

The results are promising and indicate the system is ready to deploy on the farm. We recently received a USDA Conservation Innovation Grant to transition the Durana living mulch system producers. We are scaling the system up to the field level at three locations in Georgia, a location in Tennessee, and one on the Coastal Plain of Alabama. The purpose the project is to define the geographical areas and soil types that are most likely to be amenable to on-farm implementation. A series of instructional videos are being developed to provide information regarding the philosophy and field operations for implementing this on-farm. Stay tuned!

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Renata Nave-Oakes, Agustin Ruis, and Sindhu Jagadamma, University of Tennessee
Kip Balcom, USDA-ARS, Auburn, AL
Chris Agee, Pennington Seed Co., Madison, GA

Research

Biocontrol in Blueberries: determining agents, distributions, and interactions with pests

Blueberries are one of Georgia's most important fruit crops. In conventional blueberry production, the most widely used method of control for blueberry pests is broad-spectrum chemical insecticides. Many of these farmers are interested in biocontrol, which are natural enemies of insect pests such as predators, parasitoids and parasites.

Currently, we know very little about the insect communities that can provide biocontrol in southeast blueberry production. In order to implement biological control, we need an intimate knowledge of the communities of predators and parasitoids in blueberries and the surrounding landscape.

Lynx spider holding egg sac next to juicy blueberry.

Over the past two years, with funding from Southern SARE, Southern Small Fruit Consortium, the Georgia Blueberry Commodity Commission, and USDA National Institute of Food and Agriculture Multistate Hatch Project GEO00884 S1073 Biological Control of Arthropod Pests and Weeds, we have collaborated with blueberry growers in the southeast counties of Georgia to do the research needed to advance biological control in blueberry orchards (Figure 2). This research will determine options for biological control methods.

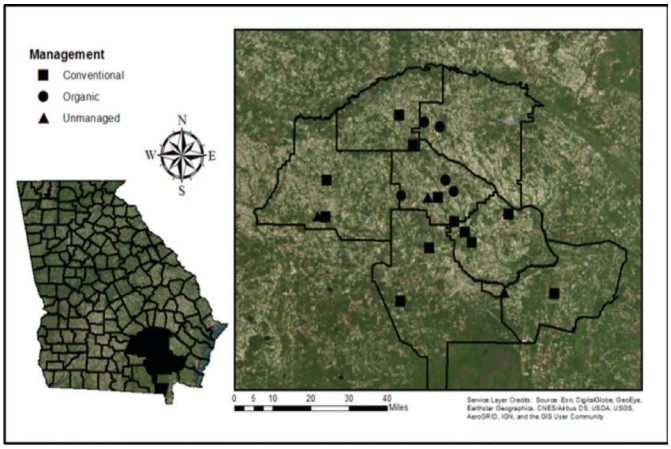

Figure 2. The geography of our study: commercial blueberry orchard locations we sampled in 2016 and 2017 in Georgia.

Our field research during peak blueberry production (May-July) shows that most of the predators were spiders. A diversity of web-building and hunting spiders were observed in the blueberry fields and the adjacent forest (Figure 3).

Figure 3. Spider communities are diverse in blueberry landscapes and spiders are the most common predator group. This figure provides a subsample of some of the spiders observed in GA blueberry or adjacent pine forest. Starting at twelve o'clock and going clock wise, jumping spider (Salticidae: Hentzia sp.), wolf spider (Lycosidae; Schizocosa sp.), spiny orbweb weaver (Araneidae: Gasteracantha sp.), jumping spider (Salticidae sp), lynx spider (Oxyopidae: Oxyopes sp.), cob web weaver (Theridiidae sp.), spiny orbweb weaver (Araneidae: Microthena sp.), and center image, orbweaver (Araneidae: Araneus sp.).

We found management influenced natural enemy populations. A greater diversity and number of predators were observed in organic and unmanaged blueberry orchards as compared to conventional systems. In addition, these natural enemies generally increased in number over the season in organic and unmanaged orchards, but populations of natural enemies under conventional management remained low the entire season. One important difference in these production systems, aside from synthetic pesticide use in conventional systems compared to naturally-derived pesticide use in organic production systems, was that organic sites always had vegetation between rows of blueberries (Figure 4). Greater numbers of natural enemies were observed on blueberry plants where vegetation was present between blueberry rows (Figure 4).

Natural enemies respond to availability of habitat. Different types of plants as well as the presence or absence of flowering weeds or grasses between blueberry rows influence the types and numbers of natural enemies. Providing grassy areas with mixed vegetation is enhances natural enemy populations and that is what we are observing in Georgia blueberry production systems.

Figure 4. Organic systems commonly have vegetation between the rows or weeds that are mown (first photo above) and conventional systems commonly use herbicides between rows or there is no vegetation present (second photo).

Our data on Georgia blueberry agricultural landscapes shows that there is a diversity of predators and parasitoids. Most studies of predator biodiversity or natural enemy diversity do not determine if predators are actually eating the pest they need to control. We are analyzing the molecular gut content of predators to determine what they are eating (MGCA; Figure 5). Our initial results show that predators in GA blueberries are not eating many spotted wing drosophila (SWD), which is the most pressing and economically detrimental pest of blueberries in the southeast. They are eating other pests, but further research is needed to clarify who is eating whom and how current pest management practices affect these predator prey relationships.

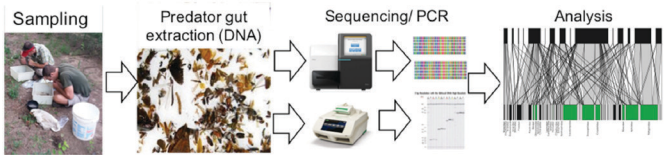

Figure 5. Empirical workflow for quantifying predator interactions on pests and other prey in the environment. Predators collected at field sites are analyzed in the lab using molecular probes and genomic sequencing to determine the identities of each individual's prey.

Our preliminary studies have just scratched the surface in understanding the communities of natural enemies in blueberry systems of the southeast. Blueberry natural enemy communities are complex, and contain many untapped possibilities. We are working to fund large scale follow up work to target understanding the structure of interactions between natural enemies and pests in blueberry systems, and one focus area is the interface between forest habitats and blueberry orchards. A wealth of biodiversity is present in the forested margins, and we know that biocontrol agents and pests use this habitat. Further research will reveal the interactions in neighboring habitats, and ways to benefit the most from forest systems and ways to enhance non-cropping areas to boost biological control services in Georgia blueberry production landscapes.

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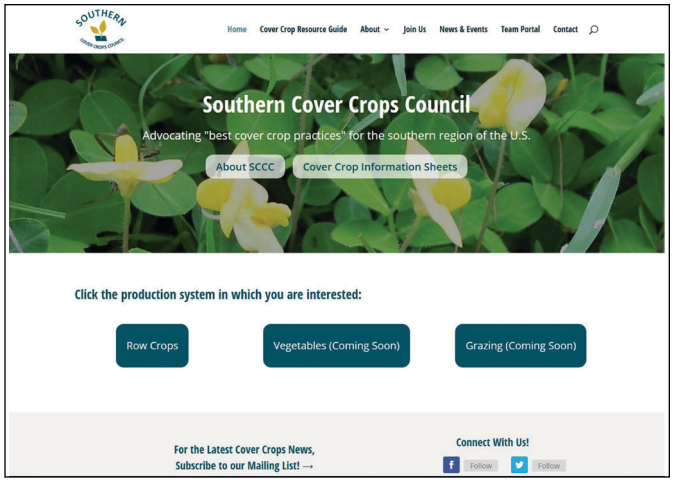
Grower's Corner

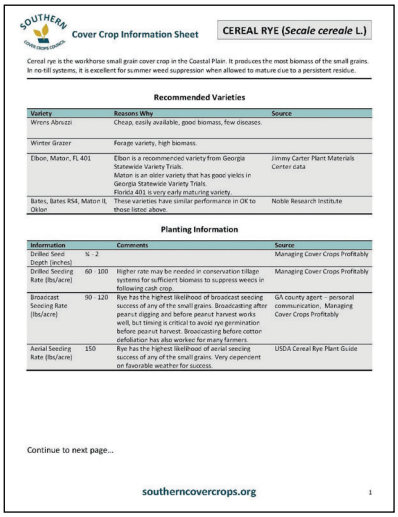
New Cover Crops Website for the Southern Region

The Southern Cover Crop Council (SCCC) was recently formed to promote the successful adoption and integration of cover crops into southern agricultural systems. We are launching our new website that has information specific to the South. Because the Southern region is so diverse, it stretches from Kentucky to Puerto Rico and from Virginia to Texas, there is definitely no one size fits all with cover crop information! The SCCC decided to group information on the website by production system and region. A farmer would choose whether they were primarily interested in row crop production, vegetable production or grazing systems. The website then takes them to a map where they will click on their state and then their county. This will take them to information specific for the production system and region.



Screenshot of the SCCC website homepage.

Right now, the website has information for row crop production in the Coastal Plain. Some of the information will be applicable for other production systems and regions. For example, there are Cover Crop Information Sheets with details and seeding rates, planting depths, good varieties as well as things to think about before you plant a particular cover crop species. Specific information for vegetable and grazing systems is being developed and should be posted in the coming year.


Cover Crop Information Sheet

CEREAL RYE (*Secale cereale* L.)

Cereal rye is the workhorse small grain cover crop in the Coastal Plain. It produces the most biomass of the small grains. In no-till systems, it is excellent for summer weed suppression when allowed to mature due to a persistent residue.

Recommended Varieties

Variety	Reasons Why	Source
Wrens Abruzzi	Cheap, easily available, good biomass, few diseases.	
Winter Grazer	Forage variety, high biomass.	
Elbon, Maton, FL 401	Elbon is a recommenced variety from Georgia Statewide Variety Trials. Maton is an older variety that has good yields in Georgia Statewide Variety Trials. Florida 401 is very early maturing variety.	Jimmy Carter Plant Materials Center data
Bates, Bates RS4, Maton II, Oklon	These varieties have similar performance in OK to those listed above.	Noble Research Institute

Planting Information

Information		Comments	Source
Drilled Seed Depth (inches)	¾ - 2		Managing Cover Crops Profitably
Drilled Seeding Rate (lbs/acre)	60 - 100	Higher rate may be needed in conservation tillage systems for sufficient biomass to supress weeds in following cash crop	Managing Cover Crops Profitably
Broadcast Seeding Rate (lbs/acre)	90 - 120	Rye has the highest likelihood of broadcast seeding success of any of the small grains. Broadcasting after peanut digging and before peanut harvest works well, but timing is critical to avoid rye germination before peanut harvest. Broadcasting before cotton defoliation has also worked for many farmers.	GA county agent - personal communication. Managing Cover Crops Profitably
Aerial Seeding Rate (lbs/acre)	150	Rye has the highest likelihood of aerial seeding success of any of the small grains. Very cooperiant on favorable weather for success.	USDA Cereal Rye Plant Guide

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southerncovercrops.org 1

An example of one of the over crop information sheets available for download.

We are grateful to the Natural Resource Conservation Service in Georgia and Southern SARE for funding this work.

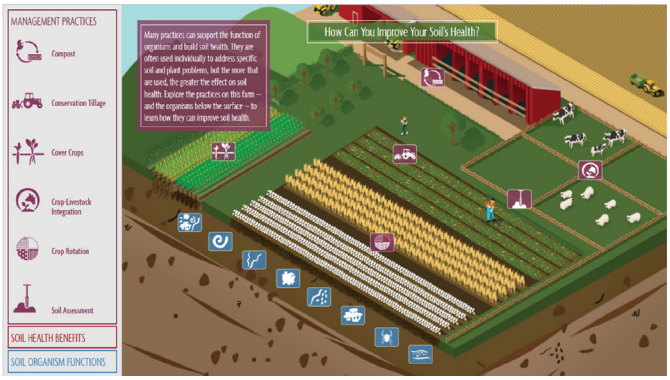
Check out the website and let us know what you think - southerncovercrops.org.

While you are at it, join the Southern Cover Crops Council and help support this important work!

Grower's Corner

SARE Learning Center: New Online Soil Health Infographic

Why is soil health so important? More and more, producers are understanding that healthy soils are more productive and lead to healthier crops. Many practices can support the function of organisms and build soil health. They are often used individually to address specific soil and plant problems, but the more they are used, the greater the effect on soil health. Explore the practices on this virtual farm — and the organisms below the surface — to learn how they can improve soil health. Explore the on-farm benefits of using cover crops, crop rotation, manure amendments, composting and more on the complex web of life below the surface of the soil. Some of the soil health management practices include: compost; conservation tillage; cover crops; crop-livestock integration; crop rotation; and soil assessment.



Screenshot of the online infographic. Clickable icons on the page will open up new sections that discuss the functions of the soil biome and ways growers can change soil health by implementing new on-farm practices.

There are many ways that healthy soil supports the growth of high-yielding, high-quality and healthy crops. The benefits range from better management of nutrients and pests to structural changes in the soil that improve water capture and storage. All of these benefits can lead to higher farm profitability. Explore the practices on this farm — and the organisms below the surface — to learn how they help improve soil health. Benefits to soil health include: aggregation/structure; available water capacity; biodiversity; reduced compaction; reduced erosion; improved profitability; improved nutrient management; improved pest management; and improved water quality.

Organisms living in the soil play important roles in promoting a healthier soil ecosystem and more resilient plants. Increasing organic matter allows for more activity and diversity of life in the soil, which in turn stimulates soil processes that lead to healthy plants. Explore the practices on this farm — and the organisms below the surface — to learn how they can improve soil health." Soil organism functions include: organic matter; mircroorganisms like bacteria, fungi, and protozoa; nematodes; arthropods; and earthworms.

To use this infographic, visit the SARE Learning Cetner, at: https://www.sare.org/Learning-Center/What-is-Soil-Health

Sustainable Agriculture Research and Education (SARE) Learning Center

Upcoming Events

Now-December 3: Natural Resource Conservation Service 2019 Organic Agriculture Webinar Series

July 16-17: Southern Cover Crops Council Conference, Auburn, AL

December 9-11: Community Food Systems Conference, Savannah, GA

For more information on publications, resources, events and programs in sustainable agriculture, visit: www.SustainaAgGa.org

You can also read all archived CAES Sustainable Agriculture Newsletters from the Resources page!