Bringing Research to Farmers

SOYBEAN RESEARCH & INFORMATION NETWORK

JULY 2023 — SOY SNIPPETS

Cover Crops

Cover crops provide agronomic benefits. Research shows they can improve soil characteristics like organic matter content, aggregate stability, nutrient and water holding capacity and more. They can also support weed and pest control. However, incorporating cover crops into an agronomic system presents many challenges and decisions. Soy checkoff investments in research, tools and other resources help farmers manage all aspects of cover crops, from species selection and seeding to termination.

Cover Crops Support Nutrient Cycling

LA

Cover Crops | Louisiana | Laura Temple

One of the many agronomic benefits of cover crops is their ability to take up and store nutrients. Decomposing cover crop biomass then releases those nutrients in a plant-available form for future crops.

"Very little information is available to describe the nutrient contribution of cover crops and the resulting impact on the following cash crops," says Brenda Tubaña, professor in the School of Plant, Environmental and Soil Sciences at Louisiana State University. "Understanding the relationships between cover crop biomass and nutrient recycling will help farmers take full advantage of this benefit of cover crops."

The Louisiana Soybean and Grain Research and Promotion Board invested soy checkoff dollars in Tubaña's research, allowing her team to establish a test plot to study cover crops nutrients in a soybean–corn rotation. Her study quantified nutrient uptake and biomass production of cover crops at different planting dates, as well as measuring changes in soil nutrient levels.

The trials used a cover crop mix of legumes, specifically crimson clover and hairy vetch, with tillage radish, a brassica. The legumes build up nitrogen levels, and both types of cover crop hold sulfur in their biomass in a readily available form for the next crop. This is important because sulfur emissions have gone down, resulting in less acid rain, which used to transfer enough

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Planting date impacts the development of cover crop biomass in Louisiana. September planting generated the most biomass. Photo: Daniel Forestieri

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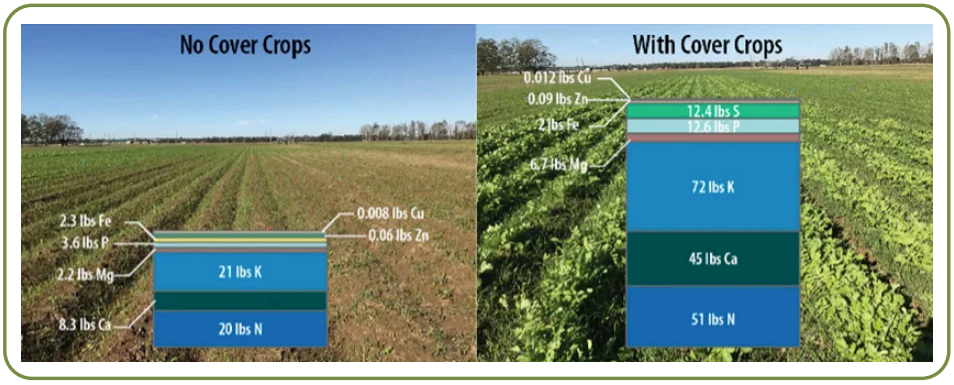

Average nutrient recovery in pounds per acre per year by native weeds with no cover crop compared to a cover crop mix containing equal amounts of hairy vetch, crimson clover and tillage radish. Note: Boron, manganese and molybdenum were also recovered but at lesser amounts than zinc. Photos: Brenda Tubaña

sulfur from the atmosphere to the soil for crops to use.

"Our goal is to provide information on nutrient credits for each cover crop species on a given amount of biomass," Tubaña says. "This information would help farmers plan for both the type of fertilizers and rates to apply for the next crop."

Her team varied planting timing and measured biomass and the nutrient content of each cover crop species just before burndown in February, to estimate nutrient uptake from cover crop biomass. The team also took soil samples in each plot before burndown and at key vegetative growth points for each cash crop. In soybeans, they sampled the soil before the R1 stage, and in corn, they sampled the soil at the V8 to V9 growth stage.

Available Soil Nutrients

"We saw improvement on soil nutrients in plots with cover crops compared to plots without cover crops," Tubaña explains. "Soil showed noticeable differences in phosphorus, sulfur and potassium content."

She says most of the nutrients in the cover crop biomass were released within six to eight months after burndown. Because nitrogen is more mobile and the turnover took place in just four to six weeks, her soil sample timing didn't fully capture this flush of nitrogen to the soil. If cover crop termination is timed correctly, nitrogen should be available as the following cash crop is germinating and emerging.

Biomass clippings from cover crops and soil samples are captured before cover crop termination to measure nutrient cycling by cover crops. Photo: Daniel Forestieri, Louisiana State University

The charts below (Fig. 1A-B) capture trends in the pounds per acre of phosphorous and sulfur during the first three years of the trials. The plots with cover crops consistently held more nutrients. The yellow arrows along the X axis indicate when the soybeans or corn were actively growing.

"During the first two years of these cover crop trials, they were yield neutral," Tubaña says. "We started seeing increases in yield in year three, and we continue to monitor yield as these trials continue."

Cover Crop Management

Tubaña notes that cultural management practices directly impact the amount of biomass cover crops produce, translating to the amount of nutrients they store. Her team planted cover crop trials in September, October and November.

"While earlier plantings in September generated the most biomass, we saw that they have the potential to compete with the cash crop," she reports. "Our results suggest that in Louisiana, planting cover crops in October prevents competition for nutrients with the soybean or corn crop the following spring, but still produces adequate biomass to absorb and store nutrients throughout the late fall and winter."

The research also looked at the impact of providing the cover crops with starter fertilizer to improve stand establishment.

"We saw no effect from fertilizing cover crops," Tubaña says. "If they are planted and established early enough, like in October, they don't need starter fertilizer to produce a good stand."

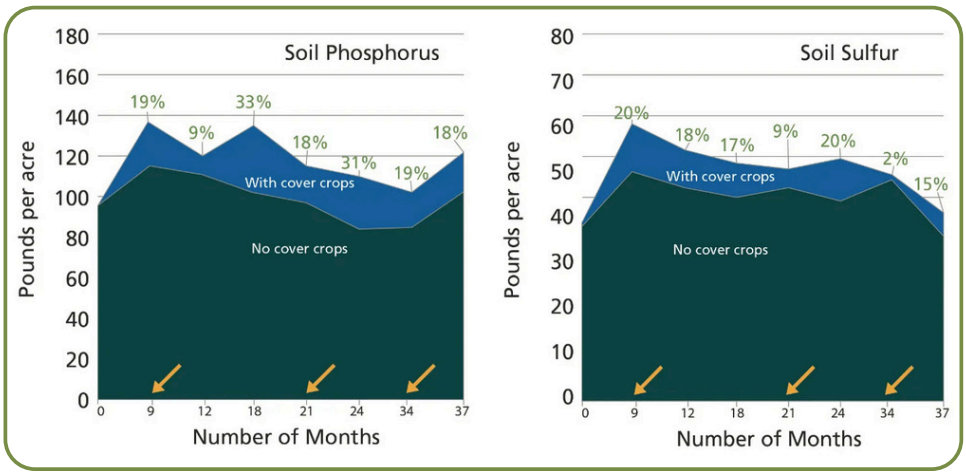

Figure 1A-B. *Soil Phosphorus (A) and Sulfur (B) in pounds per acre with and without cover crops over three years.*

Cover Crops Could Be Another Weapon Against Weeds Beyond the Soil Surface

Cover Crops

By Carol Brown

One potential benefit of cover crops rarely discussed is that the increased biological activity in the soil by the cover crop could contribute to the degradation of weed seeds. Sarah Lancaster, Kansas State University assistant professor and extension specialist, is leading a study supported by the North Central Soybean Research Program that may confirm if cover crops support depletion of the weed seedbank. Researchers in five states are measuring how increased microbial activity due to cover crop can affect viability of Palmer amaranth and waterhemp seeds.

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Cover Crop Interaction with Soybean Planting Date

Crop Management/Cover Crops **OH**

By Laura Temple

Research has confirmed that early soybean planting dates correlate to yield. Other research documents the value of cover crops. However, research involving cover crops with an early planting date is lacking, says Laura Lindsey, Ohio State University Extension soybean specialist.

She designed a research trial to learn about the impact of cover crops at different planting dates, funded by Ohio Soybean Council checkoff funds. Initial results link yield to stand counts. In the location that showed the most interaction between cover crops and soybean emergence found that plantings the second half of April appeared to provide both strong yields and the benefits of cover crops.

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Exploring Extended Crop Rotation Benefits for Soil Health and Productivity

Cover Crops/Agronomy **MO**

By Carol Brown

Research at the University of Missouri's Sanborn Field is comparing crop rotations from 1 year up through 5 years, both with and without cover crops, to find the best combination for improved soil health, water quality, crop productivity and profitability. Missouri Soybean Merchandising Council is helping to fund the research. According to agronomist Tim Reinbott, assistant director at the Central Missouri Research, Extension and Education Center near Columbia, extended crop rotations have been shown to improve biological, chemical and physical soil traits. He started the rotations in 2016, so all the plots have completed full cycles.

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Planting Green: Incorporating Cover Crops in Minnesota Soybeans

Soybean Diseases **MN**

By Carol Brown

Planting green, or planting the cash crop into living cover crops, allows farmers in areas with shorter growing seasons, like northern Minnesota, reap the benefits of cover crops, like reduced erosion, weed suppress and improved soil health. University of Minnesota Extension crop educators and extension specialists are working with the Minnesota Wheat On-Farm Research Network, crop advisors and farmers to fine-tune the best ways to use cover crops in northwestern and west-central Minnesota. The project is supported by the Minnesota Soybean and Wheat Research and Promotion Councils. Their goals include finding the combination of cereal rye cover crop seeding rates and termination timing that provides the most benefits to the cash crops and the soil.

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Do Cover Crops Impact Weed and Crop Germination?

TN

Cover Crops/Weed Management

By Laura Temple

Researchers don't fully understand the mechanics of how cover crops suppress weeds. Avat Shekoofa, Assistant Professor with the Department of Plant Sciences, University of Tennessee Institute of Agriculture, explored the potential allelopathic effects of various cover crop species on both weeds and soybeans as part of a larger cover crop study. This multi-year study started with national soy checkoff support, followed by funding from the Tennessee Soybean Promotion Board. Plants can release biochemicals, called allelochemicals, that interact with other plants. Through leaching, being exuded by roots, or other processes, allelochemicals can inhibit seed germination and plant development.

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#SOYSNIPPETS Q&A

How do cover crops fit into soybean production?

Cover crops are a key component in managing soil health. Farmers, researchers and soybean industry stakeholders discuss the logistics, benefits and challenges to incorporating cover crops into a system. Join the conversation on Twitter, Facebook or YouTube.

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Funded by the soybean checkoff

Planting Cover Crops Into Standing Soybeans

Cover Crops

PA

By Laura Temple

In areas like Pennsylvania, cover crops are commonly drilled in soybean fields after harvest. However, raising either full-season soybeans with longer maturity or double-crop soybeans limits time to plant and establish cover crops before temperatures stop growth. Heidi Reed, an agronomy educator with Penn State Extension, worked with farmers through the Pennsylvania Soybean On-Farm Network, funded by the Pennsylvania Soybean Board, to learn if planting cover crops into standing soybeans would expand the species they could use. Cooperating farmers chose cover crop species or mixes from a group of nine options and planting methods. The goal was to time broadcast seeding as soybean leaves yellowed, just before leaf drop.

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Exploring the Role of Cover Crops in Long-Term Slug Management

Cover Crops/Soybean Pests

DE

By Laura Temple

Can cover crop species and termination timing help manage slug pressure? An annual survey of crop losses from insects consistently finds slugs among the top pests in Delaware, according to David Owens, extension entomologist specialist based at the University of Delaware Carvel Research and Education Center. He says slugs are hard to manage because farmers don't have firm economic thresholds for treatment or effective management options. He is leading on-farm research to generate data about how adjustments to cover crop practices, like species choice and termination timing, may help manage slug populations over time, thanks to Delaware Soybean Board support.

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