



## Mississippi Corn Promotion Board 2025 Progress Report

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Project Title: Enhancing Compatibility of Cover Crops with Corn Production Systems

PI: Erick Larson, Dave Spencer, Jason Bond, Brendan Zurweller and Will Maples

Department: Plant and Soil Sciences, Water Resources Research Institute, Agricultural Economics

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### Project Summary (Issue/Response)

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Cover cropping is becoming a popular agricultural topic primarily driven by the goal of improving soil health and water quality, but the concept has been around for years. Cover crops produce vegetation which can help protect the soil from erosion, improve soil organic matter, and provide other benefits during the winter when traditional summer crops are not alive. However, this additional vegetation presents various challenges for agricultural systems which can limit return on investment, and reduce the yield of the primary crop grown thereafter. Therefore, cover crop producers often endure negative economic returns and struggle with additional management risks which discourage adoption.

Cover crops may hamper productivity of the subsequent crop by delaying planting, hampering seedling establishment, introducing allelopathy and pest issues, and confounding nutrient availability. Corn is especially vulnerable to any of these issues because it is the first crop planted in the spring, is well-known to be responsive to early planting, and is also extremely sensitive to plant stand variability. The abundant spring rainfall common in our region further amplifies already significant challenges, because it severely restricts planting date opportunities and complicates issues with stand establishment and growth disparity documented by previous MCPB sponsored research to limit corn productivity. This research indicates cover crop interference dramatically reduced corn grain yield compared to where no cover crops were grown, or cover crops were terminated with herbicides at least four weeks in advance of planting. Consequently, cover crops reduced economic returns at least \$57.02 per acre compared to traditional cropping systems. Thus, identifying limitations and developing management strategies to mitigate these challenges are needed to successfully integrate cover crops with corn production systems.

### Project Results/Outcomes

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This research will help identify factors and management practices needed to successfully integrate cover crops into Midsouth corn production systems without sacrificing economic returns or increasing production risks. We have a graduate student under our guidance working on this project who has completed their first year of research.

Winter cover crops naturally grow well past optimal spring planting times for primary crops. This introduces a huge conundrum because crops are typically far more productive and less vulnerable to stress and risks when they are planted early in the spring. Early planting is favorable because it allows crops to develop and mature when they are less subjected to summer environmental extremes, including heat and drought, and rising pest issues. Furthermore, ample cover crop vegetation will shade the soil, restricting absorption of solar radiation, keeping soils cooler and wetter. This can delay spring crop planting and hamper seedling establishment, particularly in our moist climate. Thus, growers must find a practical management solution between these plant systems, which will require compromise.

Many scientists have documented that cover crops often restrict corn emergence success, but our research indicates physiological factors are limiting corn growth and productivity. We hypothesize that cover crop vegetation is inhibiting soil absorption of sunlight and thus cool soil temperature is restricting corn development. Thus, we employed various burndown herbicide timings to fully evaluate effects on soil temperature and corn growth. Similar to previous research, cover crops reduced corn yield considerably when they were not terminated by herbicides at least four weeks prior to planting. Most importantly, our research results show dramatically warmer soil temperature with early preplant cover crop termination timing, and corn productivity was strongly correlated to soil temperature. Since growth rate corn is dictated by temperature, and the growing point of young plants is underground, managing cover crops to optimize soil temperature appears to be critically important for successfully integrating cover crops with corn production.

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## Project Results

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Another objective is to evaluate an innovative burndown program intending to selectively terminate the cereal cover crop several weeks prior to the legume component and corn planting. Our initial investigation revealed crop interference originating from cover crops was greater with cereal cover crop species, compared to legumes. Thus, this strategy intends to reduce interference of the cereal species, while promoting nitrogen fixation by the legume in order to supplement nitrogen and improve the outcome of the cover crop system. Our 2025 results produced similar corn yields regardless of whether the cereal was selectively terminated 6 wks preplant, or the cover was non-selectively terminated 6 wks or 2 wks preplant.

Furthermore, we continue to evaluate the vast array cover crop species in the market. Therefore, we conduct field trials to determine their suitability in Mississippi environments. Legumes are an important component of blends, due to their ability to fix nitrogen. However, our evaluations show many legumes are very sensitive to wet soils and struggle to survive. Thus, growers should grow water tolerant legumes, such as Berseem, Persian or Balansa clover in many Mississippi soils. Fortunately, cereal species generally produce rather similar winter growth, so differences are rather minor. Brassicas have been very susceptible to winterkill from low temperatures, so they are best suited to serve a complimentary role in a blend of species.



Legumes can vary greatly in adaptability. Persian clover (top) and Crimson clover (bottom) growth on the same day.

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## Project Impacts/Benefits

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Our research as well as others indicates growing cover crops can certainly hinder our ability to produce corn and implement early planting systems, if not managed appropriately. Abundant, lush vegetation produced by cover crops will shade the soil, restricting solar radiation from warming the soil, limiting planting opportunity and most importantly, impeding corn seedling establishment and growth. Furthermore, cover crops can mechanically impede planting efficiency, lead to nitrogen immobilization and promote numerous pest issues. Thus, growers seeking to gain benefits associated with growing cover crops should use herbicides to terminate cover crops several weeks in advance of planting in order to minimize interference and sustain productivity associated with early corn planting systems tailored for high rainfall, southern climates.

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## Project Deliverables

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- ⇒ Three cover crop publications posted on the Mississippi Crop Situation Blog in 2025
- ⇒ Two Mississippi Crop Doctors Podcasts discussing cover crops in 2025
- ⇒ Three new comprehensive MSU Extension Cover Crop Publications prepared and submitted for publication
- ⇒ 25 cover crop publications on social media (X and Instagram) creating 35,839 views and 4176 followers

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## What is the Value to Growers?

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- ⇒ The role of this program is to identify factors and management practices needed to successfully integrate cover crops into Midsouth corn production systems without sacrificing economic returns or increasing production risks.
- ⇒ Cover crops may produce soil and water quality benefits, but conversely interfere with crop production and lower returns. Thus, growers must find a practical management solution between these plant systems, which will require compromise.
- ⇒ Using herbicides to terminate cover crops prior to planting is a crucial management factor affecting the successful integration of cover crops with row crops. Preplant cover crop termination reduces interference which limits corn yield.
- ⇒ Our research indicates cover crop interference is strongly correlated to soil temperature, which is a novel finding. Results show dramatically warmer soil temperature with early preplant cover crop termination timing, and corn productivity was strongly correlated to soil temperature.
- ⇒ It is extremely important to identify problems are strongly associated with soil temperature, because there are no practical methods to overcome this shortcoming, other than using herbicides to terminate cover crops prior to planting.
- ⇒ Since growth rate corn is dictated by temperature, and the growing point of young plants is underground, managing cover crops to optimize soil temperature appears to be critically important for successfully integrating cover crops with corn production.
- ⇒ The checkoff funding graciously sponsoring this program is primarily used to support a graduate research assistantship, so a graduate student is trained under our guidance while conducting this research. The educational and professional activities associated with this program also encourage cooperation with agricultural industry, who may support us by funding research or donating resources. This project is also supported by collaborative projects generously funded through Federal Grants.



Early cover crop termination limits interference and greatly enhances seedbed soil temperature, which improves crop growth and productivity.