

MISSISSIPPI SOYBEAN PROMOTION BOARD

MISSISSIPPI SOYBEAN PROMOTION BOARD ANNUAL REPORT 2020-2021

Effect of Cover Cropping Systems on Dryland Soybean Plant-vigor, Growth, and Yield #21-2020

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Background and Objectives

Nearly 60% of all soybeans grown in Mississippi are produced in a dryland environment. Inconsistent yields are a common problem for dryland soybean production due to irregular rainfall events during the growing season. It has been suggested that the use of cover crops might help alleviate some of the issues during the growing season through improved water infiltration, soil moisture retention, nutrient availability, and enhanced soil organic matter. Currently less than 2% of cropland in Mississippi utilizes cover crops. Therefore, the goals of this project were to evaluate various cover crops in conjunction with different planting dates and nutrient sources to determine the optimal combination for integrating cover crops into a cropping system.

- Objective 1. Evaluate the effects of cover cropping systems on dryland soybean plant-vigor, growth, and yield.
- Objective 2. Evaluate the effects of cover cropping systems on “soil health” (physical characteristics, microorganisms, soil moisture, etc...).
- Objective 3. Determine the economic benefit of cover crops, source of fertilizer, and planting date on soybean production.

Report of Activity

Objective 1: Evaluate the effects of cover cropping systems on dryland soybean plant-vigor, growth, and yield.

Summary: Cover crop biomass was collected and termination for early soybean planting date was done April 7. Fertilizer was applied to all treatment combinations April 16. Early soybean planting date was accomplished May 4. For the late planting data, cover crop biomass was collected and covers terminated May 11, and late planting done June 1. Plots were maintained throughout the growing season. Soybean leaf samples were taken on July 22 for the early planting date and on July 31 for the late planting date. Midseason microorganism soil samples were taken at R5 growth stage for soil health for both early and late planted soybeans.

Soybean were harvested from the four center rows of each plot on October 6 for both planting dates. Prior to harvest plant heights were taken from each plot. A soybean seed sample was collected for nutrient analysis. Cover crops were planted on October 15 and are being maintained until a biomass sample will be collected in the spring. Soil samples were taken from each plot in mid-January. Samples were air dry and ground to prepare them for soil nutrient analysis. A subsample for each treatment was sent to

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Southern Soils Laboratory for analysis and fertilizer recommendations for the current year. A post-doc, Dr. Lorin Harvey has been conducting statistical analyses and we have been writing-up results for this objective.

Objective 2: Evaluate the effects of cover cropping systems on “soil health” (physical characteristics, microorganisms, soil moisture, etc...).

Summary: Soil samples were collected May 5 (early planting) and June 3 (late planting, processed and stored for analyses. Soil and tissue samples taken during the growing season were processed in Dr. Kingery’s laboratory on campus. Data is currently being compiled for statistical analyses. The graduate research assistant working 100% on this project graduated in August. A post-doc, Dr. Nisarga Kodadinne Narayana, specializing in laboratory/molecular biology began working on the is project in October. A presentation, “Nutrient Management and Soil Quality in Cropping Systems” was given at the annual meeting of the Mississippi Chapter of the American Society of Agronomy. Cover crops are currently being maintained until termination in mid-April and mid-May for the early and late planting dates, respectively.

Objective 3: Determine the economic benefit of cover crops, source of fertilizer, and planting date on soybean production.

Summary: In collaboration with Dr. Xiaofei Li, applicable production functions are being developed. Data is currently being compiled for analysis. Next year data is still required for completion of data analysis.

Impacts and Benefits to Mississippi Soybean Producers

In 2020, 2.0 million acres of soybeans were planted in Mississippi. Of these 2 million acres approximately 60% were planted in dryland environment. This is over 1 million acres of dryland soybeans in Mississippi that are prone to inconstant yields, due to the lack of adequate moisture during critical stages during the growing season. Dryland soybean yields were over 15 bu/ac lower than for irrigated soybeans in 2012. Identifying an affordable cover cropping system that will minimize inconsistent dryland soybean yield due to lack of timely rainfall events could provide an additional \$18 million across the state of Mississippi in dryland soybean production based on a 5% increase in yield.

End Products – Completed

Graduate Student Thesis: Effects of cover crop management on biologically related soil properties in a Mississippi dryland soybean system, published 2020.

Journal publication: Agronomy, submitted November 2020, accepted January 6, 2021, published soon.

Citation: Pokhrel, S.; Kingery, W.L.; Cox, M.S.; Shankle, M.; Shanmugam, S.G. Impact of Cover Crops and Poultry Litter on Selected Soil Properties and Yield in Dryland Soybean Production. *Agronomy* **2021**, *11*, x. <https://doi.org/10.3390/xxxxx>

Conference presentation: “Nutrient Management and Soil Quality in Cropping Systems” was given at the annual meeting of the Mississippi Chapter of the American Society of Agronomy.

End Products – Forthcoming

It is expected that at least one additional publication will be written based off ongoing activities from

this study. Additionally, several presentations will be given at relevant conferences throughout the duration of the trial.

Graphics/Tables

Figure 1. Comparison of spring cover crop biomass before planting soybean

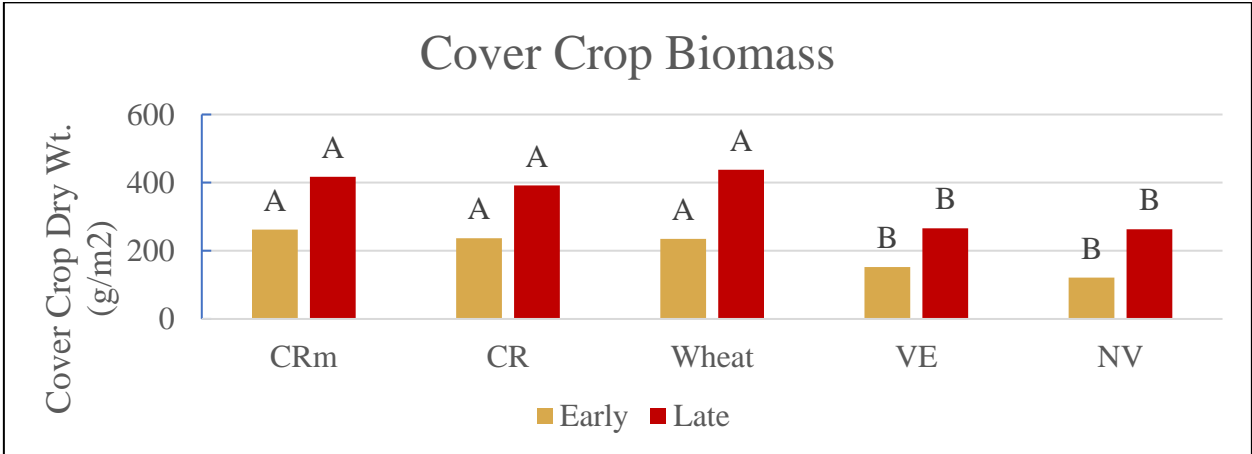


Figure 2. Soybean yield relative to planting date (Early target May 1 and Late target June 1)

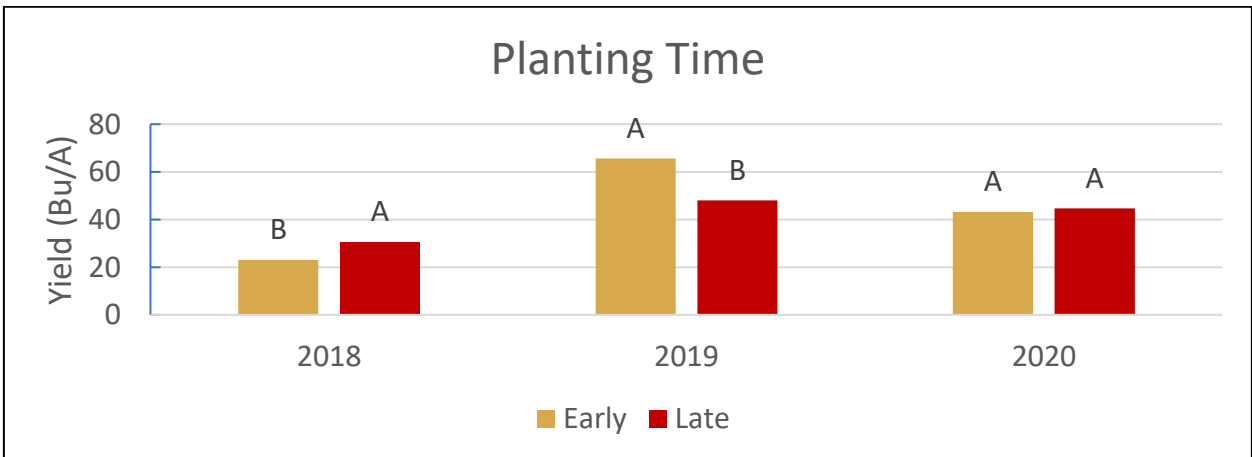


Figure 3. Soybean yield with fertilizer source at Pontotoc, MS

