

MISSISSIPPI SOYBEAN PROMOTION BOARD

Evaluating Nutrient Availability Following Cover Crops in Mississippi Soybean Production Systems. Project 40-2022

Final Report

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Background and Objectives

Numerous studies evaluating cover crops and their influence on soil nutrient availability have been carried out across the U.S. While these studies tout greater nutrient availability following a cover crop, the actual agronomic value to the subsequent cash crop in a nutrient deficient situation is largely unknown. Similarly, knowledge of the effects of cover crops on P₂O₅ and K₂O availability in Mississippi soybean production systems is lacking. Insufficient P or K availability in soils result in lower soybean yields. A previous large-scale study conducted throughout Mississippi determined that soybean yields could be increased by an average of 8 to 10 bushels with the addition of P₂O₅ or K₂O fertilizers when soil nutrient values were determined to be insufficient by the state soil testing lab. With this information available, no research has been conducted in Mississippi to determine how cover crops may affect the subsequent soybean crop when P or K may be limiting, and how these cover crop systems may interact with a fall P or K fertilizer regime.

Objectives:

1. Determine if cover crop systems will improve nutrient availability and subsequent soybean yields in a possible nutrient deficient situation.
2. Determine if cover crop systems will improve nutrient availability and subsequent soybean yields following a routine P and K fall fertilization regime.
3. Determine how soil moisture is effected by cover crop and fertilizer regime.

Report of Progress or Activity

1. *Determine if cover crop systems will improve nutrient availability and subsequent soybean yields in a possible nutrient deficient situation.*

Two study fields were used (P field and K field). Both fields were sown with cover crops in Fall of 2020 and 2021. Plots were terminated with paraquat at 1 qt/ac prior to planting soybean. Soybean (AG47XF0) was planted at 120k population in both years. A significant interaction was seen between years, so results are presented by year.

In 2021, for cover crop only (no supplemental fertilizer) in P field, only tillage radish, winter wheat, and cereal rye produced a higher soybean yield than the no-cover treatment. The K field saw no-cover outyield the cereal rye, winter wheat and crimson treatments. In 2022, no statistical differences were found in soybean yield when only analyzing cover crops without supplemental fertilizer. Although within the LSD, there was a trend for brassica to provide higher soybean yield than other cover crops or the no-cover treatment.

2. *Determine if cover crop systems will improve nutrient availability and subsequent soybean yields following a routine P and K fall fertilization regime.*

In 2021, supplemental P increased soybean yield in tillage radish, crimson, and no-cover treatments but decreased yields in cereal rye and winter wheat. In 2022, supplemental P increased soybean yield in no-cover only. In 2021, supplemental K increased soybean yield in crimson clover only while in 2022, supplemental K increased yields in all treatments versus no supplemental fertilizer.

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3. *Determine how soil moisture is effected by cover crop and fertilizer regime.*

With the departure of Dr. McCoy from MSU, moisture sensors were not installed and this objective was not completed.

Impacts and Benefits to Mississippi Soybean Producers

Each year provided conflicting results which may be due to several factors. Climatic conditions varied from sufficient moisture in 2021 to droughty in 2022 which lowered overall yields. High nitrogen mineralization, especially within grass cover crops likely affected yields. This study indicates that soybean yields may be satisfactory following cover crops, but individual year successes may be dependent on factors outside our control. Supplemental P offered more yield increase in normal moisture years whereas supplemental potassium tended to increase soybean yields in dry years. Cover crops do provide long-term benefits however several short-term pitfalls can exist. Cover crops may recycle nutrients back into the soybean root zone however they may not be readily available (tied up in cover crop biomass) in the first few years of using cover crops.

End Products

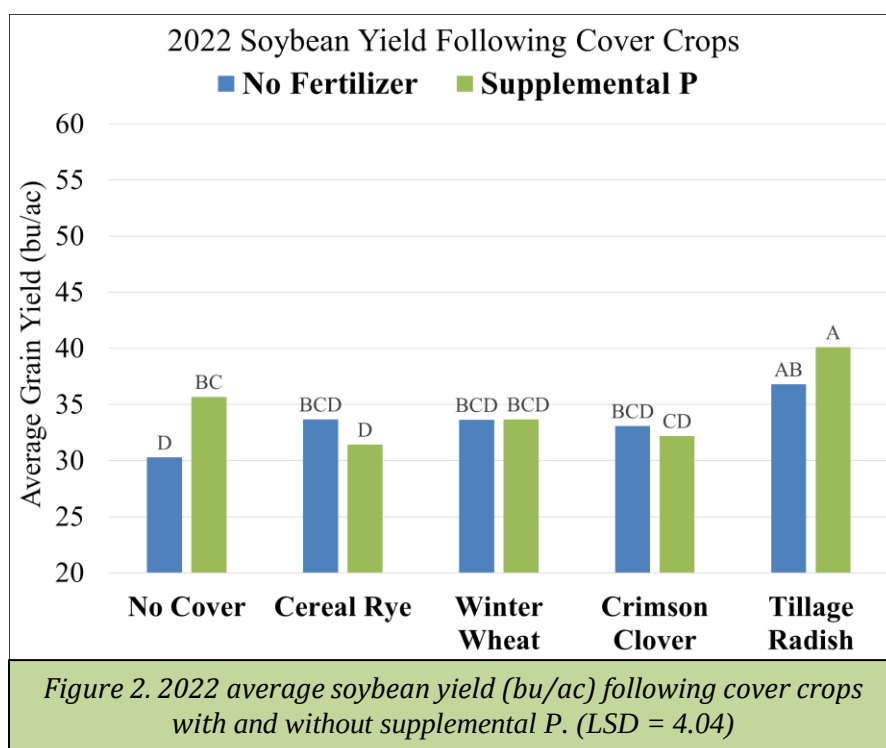
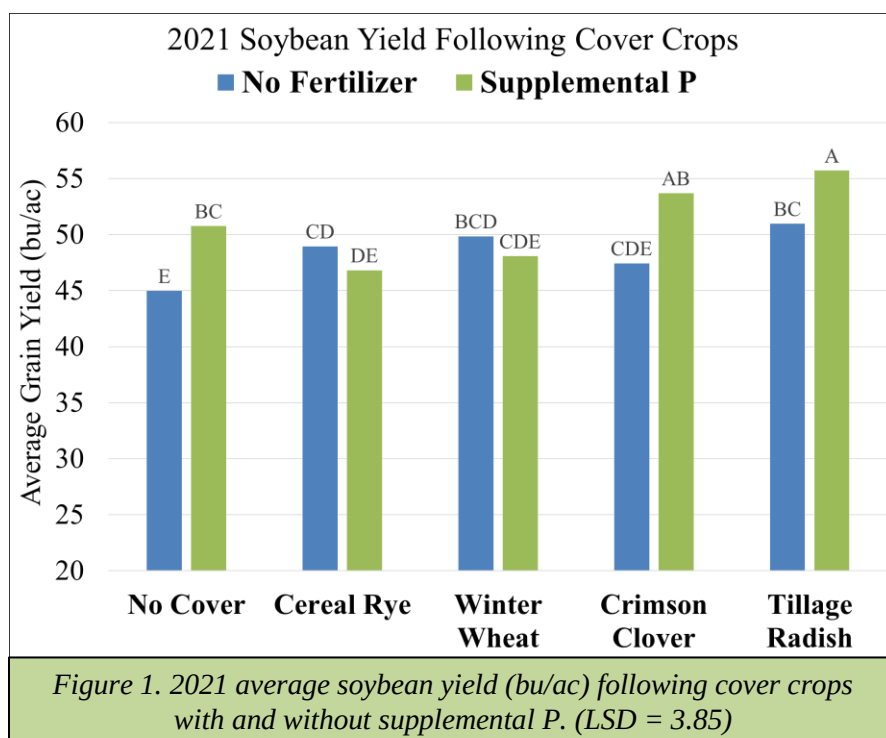
Oral Presentations

Cover Crop Field Day (Pontotoc)	March 2022
Cover Crop Field Day (Monroe)	March 2022
NMREC Agronomy Field Day	August 2022
Monroe County Row Crop Production Meeting	February 2023
NMREC Row Crop Production Meeting	February 2023
NACAA Improvement Conference, Des Moines, IA (accepted)	August 2023

Poster Presentations

NMREC Producer Advisory Council	February 2022
NMREC Producer Advisory Council	February 2023

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