South Carolina
SOYBEAN BOARD

RESEARCH REPORT

2025

INTRODUCTION

The South Carolina Soybean Board is committed to investing in research that delivers real, measurable value to soybean farmers across the state.

Funded through soybean checkoff dollars, these research efforts are designed to address the most pressing challenges facing growers while identifying new opportunities to improve productivity, efficiency, and long-term sustainability.

This research portfolio spans key areas of soybean production, including fertility management, pest and disease control, herbicide resistance, and overall cropping system optimization. Each project is led by experienced researchers and Extension specialists who work directly with growers, ensuring that trials are grounded in real-world conditions and that results are applicable across South Carolina's diverse production regions.

A central goal of the Soybean Board's investment strategy is to improve both profitability and resilience. Profitability is addressed through research that evaluates input efficiency, reduces unnecessary applications, and identifies practices that consistently contribute to higher yields. At the same time, resilience is strengthened by improving the industry's ability to respond to emerging threats such as herbicide resistance, insect pressure, and disease risk, while also adapting to environmental variability.

Equally important is the role of education and outreach. Many of these projects include a strong Extension component, providing growers, consultants, and agricultural professionals with the tools and knowledge needed to implement research findings effectively. Whether through field trials, diagnostic services, or regular updates during the growing season, this work ensures that information is not only generated, but also delivered in a way that supports better decision-making.

By supporting research that is locally driven, scientifically rigorous, and focused on practical impact, the South Carolina Soybean Board is helping to build a stronger, more resilient future for soybean production in the state.

South Carolina SOYBEAN BOARD

FINAL REPORTS

INSECT MANAGEMENT: REFINING THRESHOLDS TO PROTECT SOYBEAN YIELD

Projects: Simulating Defoliator Injury Thresholds, Stem-Feeder Injury Thresholds, and Natural Pest Population Thresholds | *Lead: Jeremy Greene*

WHY IT MATTERS

Accurate insect treatment thresholds are essential for balancing yield protection with input costs. Over-application of insecticides increases costs, while under-treatment risks economic loss.

PROJECT RESULTS

Conducted simulated defoliation and stem-feeding injury trials

Evaluated yield response across multiple growth stages

Studied natural insect populations in field conditions

KEY TAKEAWAYS

- Soybeans can tolerate more injury than previously assumed in some stages
- Growth stage plays a major role in yield impact from insect damage
- Not all visible injury results in economic loss
- Threshold-based decisions can reduce unnecessary insecticide use

MORE DETAILS: INSECT MANAGEMENT: REFINING THRESHOLDS TO PROTECT SOYBEAN YIELD

Projects: Simulating Defoliator Injury Thresholds, Stem-Feeder Injury Thresholds, and Natural Pest Population Thresholds | *Lead: Jeremy Greene*

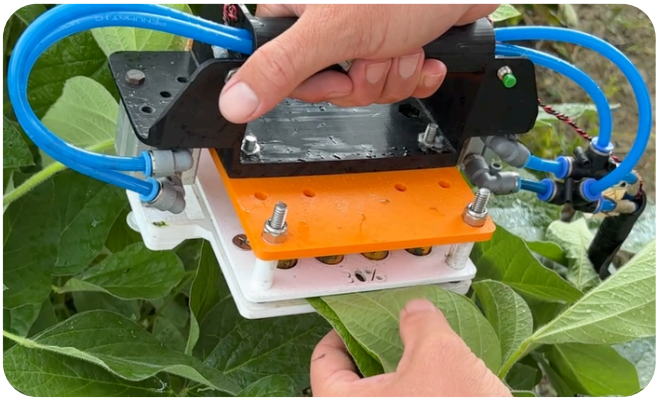
Insect control is important in soybean production, but it can be hard to know when to treat. Spraying too early or when it isn't needed adds extra cost, while waiting too long can lead to avoidable yield loss.

Soybean plants have the ability to tolerate certain levels of injury, but this tolerance varies depending on growth stage, type of damage, and environmental conditions. Without accurate thresholds, growers may overestimate the need for treatment.

This project evaluated defoliation and stem-feeding injury to better define economic thresholds under South Carolina growing conditions.

As a result of this project, Clemson researchers delivered:

- Field trials simulating defoliation and stem-feeding injury at multiple growth stages
- Quantification of yield response to varying levels of insect damage
- Evaluation of natural insect populations under field conditions
- Data to refine treatment thresholds based on economic impact
- Improved guidance for scouting and decision-making



Leaf-punch tool created using a 3-D printer was used to punch holes in leaflets and simulate defoliator injury

Simulated defoliation and natural infestations of stem-feeding insects were monitored and evaluated throughout the growing season. Researchers compared treated and untreated plots to determine the impact of insect pressure on plant health and final yield, then applied insecticides at varying thresholds to assess the effectiveness and economic return of different management strategies.

Across all trials, one of the most consistent findings was that insect presence alone is not a reliable indicator for treatment. In many cases, insecticide applications did not result in a yield benefit unless pest populations exceeded economic thresholds. This reinforces the importance of using threshold-based approaches rather than preventative applications.

PhD student Adam Whitfield applying insecticide

Future work will focus on expanding these trials across additional environments and pest complexes, as well as continuing to refine thresholds under varying production conditions. Additional outreach will also be conducted to improve adoption of these practices among growers.

The key takeaway for growers is that effective insect management depends on accurate scouting and threshold-based decisions. Applying insecticides only when economic thresholds are reached can reduce costs, preserve beneficial insects, and maintain yield potential in South Carolina soybean systems.

WEED CONTROL PROGRAMS: EVALUATING LIBERTY ULTRA IN DICAMBA-RESISTANT SOYBEANS

Project: Evaluation of Liberty Ultra in Dicamba-Tolerant Soybeans
Lead: Michael Marshall

WHY IT MATTERS

Liberty Ultra represents a newer glufosinate formulation designed to improve weed control and application flexibility. This project evaluates how Liberty Ultra performs within dicamba-tolerant systems and how it can be best positioned for maximum effectiveness.

EVALUATED LIBERTY ULTRA HERBICIDE PROGRAMS
in soybean field trials

ASSESSED CONTROL OF RESISTANT POPULATIONS
of Palmer Amaranth

GENERATED RECOMMENDATIONS
for integration into weed management systems

KEY TAKEAWAYS

- Liberty Ultra provides effective control when used in a program approach
- Application timing and environmental conditions are critical for success
- Coverage and spray conditions significantly impact performance
- Alternative systems are viable but require management precision

MORE DETAILS: WEED CONTROL PROGRAMS: EVALUATING LIBERTY ULTRA IN DICAMBA-RESISTANT SOYBEANS

Project: Evaluation of Liberty Ultra in Dicamba-Tolerant Soybeans

Lead: Michael Marshall

Herbicide resistance continues to be one of the most significant challenges in South Carolina soybean production, particularly with widespread resistance in Palmer amaranth populations. As traditional herbicide programs become less effective, growers must rely on alternative chemistries and integrated approaches to maintain effective weed control.

Glufosinate-based systems have become increasingly important in managing resistant weeds, and Liberty Ultra represents an advancement in this technology. With improved formulation characteristics, Liberty Ultra is designed to enhance weed control, optimize application efficiency, and provide more consistent performance under a range of field conditions.

This project was conducted to evaluate the performance of Liberty Ultra within dicamba-tolerant soybean systems and to identify best management practices for maximizing its effectiveness under South Carolina growing conditions.

METHODS

Field trials were established using standard soybean production practices, with applications made at multiple timings to target weeds at different growth stages. Treatments included Liberty Ultra compared alongside standard glufosinate programs, as well as integration with dicamba-based systems. Emphasis was placed on controlling Palmer amaranth, one of the most problematic and economically damaging weeds in the region.

Weed control evaluations were conducted throughout the growing season, focusing on control efficacy, speed of activity, and consistency across treatments. Crop response was also monitored to ensure that herbicide applications did not negatively impact soybean growth or development.

Untreated Check

Liberty Ultra 19 fl oz/ A

Results showed that Liberty Ultra provided effective weed control when applied under optimal conditions, particularly when used as part of a multi-pass, integrated program.

However, performance was highly dependent on application timing, spray coverage, and environmental conditions at the time of application. Programs that relied on a single application were less consistent, reinforcing the need for a program-based approach.

Future work will focus on refining recommendations and expanding evaluations across environments. The key takeaway for growers is that Liberty Ultra is an effective tool, but requires precise application and integration into diversified weed management systems.

As a result of this project, researchers confirmed that **Liberty Ultra is an effective tool for postemergence weed control in dicamba-tolerant soybean systems**, but its success depends heavily on proper use. Integrating Liberty Ultra into a comprehensive weed management program—including residual herbicides and multiple modes of action—remains essential for long-term control and resistance management.

MICRONUTRIENT MANAGEMENT: EVALUATING IN-SEASON BORON APPLICATIONS

Project: In-Season Boron Applications
Lead: Kyle Smith

WHY IT MATTERS

Boron plays a role in reproductive development, including flowering and pod set, leading some growers to adopt in-season applications in hopes of boosting yield. However, boron responses can be inconsistent, and unnecessary applications add cost without guaranteed return.

RESULTS

This project evaluated whether in-season boron applications provide a measurable yield benefit under South Carolina growing conditions.

ESTABLISHED FIELD TRIALS
evaluating foliar boron applications

COLLECTED TISSUE SAMPLES
to measure boron uptake following application

ASSESSED YIELD RESPONSE AND ECONOMIC RETURN

SHARED FINDINGS THROUGH EXTENSION MEETINGS

KEY TAKEAWAYS

- Boron applications did not consistently increase soybean yield across environments
- Yield response was highly dependent on environmental conditions and baseline fertility
- Routine boron applications may not be economically justified in most situations
- Targeted applications should be based on documented deficiency, not assumption

MORE DETAILS: MICRONUTRIENT MANAGEMENT: EVALUATING IN-SEASON BORON APPLICATIONS

Project: In-Season Boron Applications | *Lead: Kyle Smith*

Micronutrient management has become an increasing focus in soybean production systems as growers aim to maximize yield potential. Among these nutrients, boron has received particular attention due to its role in reproductive processes such as flowering, pollination, and pod development.

Despite its importance in plant physiology, boron deficiencies are relatively uncommon in many South Carolina soils, and the benefits of in-season boron applications are not always clear. As a result, many applications are made without confirmed deficiency, raising questions about their economic value.

This project was designed to evaluate the effectiveness of in-season boron applications in soybean and determine whether these treatments contribute to increased yield under South Carolina growing conditions.

Harvesting soybeans during the trials

Treatments included foliar boron applications at key reproductive growth stages, alongside untreated control plots. These applications were timed to coincide with periods when boron demand is typically highest, allowing for evaluation of potential benefits during pod development.

In addition to yield measurements, tissue samples were collected before and following application to assess boron uptake and determine whether foliar treatments effectively increased plant nutrient levels. This provided a direct comparison between plant response and final yield outcomes.

RESULTS

Key findings from the study include:

- Foliar boron applications consistently increased tissue boron concentrations
- Increased boron levels in plant tissue did not consistently result in higher yields
- Yield response varied by environment and was often negligible under non-deficient conditions
- No clear economic benefit was observed from routine boron applications

Across all locations, the lack of consistent yield response suggests that boron is not a limiting factor in most soybean production systems where soil fertility is already adequate. These results reinforce the importance of verifying nutrient deficiencies before making in-season applications.

As a result of this project, researchers have demonstrated that routine boron applications are unlikely to improve soybean yield in the absence of a confirmed deficiency. While boron remains an essential nutrient, its management should be based on soil and tissue testing rather than preventative application.

The key takeaway for growers is that boron applications should be used strategically, not routinely. Tissue testing can confirm whether boron is limiting, and in most cases, applying boron without evidence of deficiency is unlikely to provide a return on investment.

CONTINUING PROJECTS

ASIAN SOYBEAN RUST: STAYING AHEAD OF A POTENTIAL THREAT

Project: Asian Soybean Rust Monitoring System | Lead: Jonathan Croft

WHY IT MATTERS

Asian soybean rust (ASR) can cause rapid defoliation and significant yield loss when conditions are favorable. This project's overall objective was to implement a monitoring system for Asian Soybean Rust (ASR) in the Southwestern part of South Carolina as a safety net that will help identify when ASR is present in SC, allowing soybean growers ample time to make management decisions for their farms.

RESULTS

This project delivered real-time surveillance and risk communication throughout the growing season

STATEWIDE MONITORING NETWORK
focused on key soybean production regions

WEEKLY SCOUTING
of 15-23 soybean fields during risk periods

EARLY-SEASON SAMPLING
of kudzu as an indicator host beginning in April

REGULAR SOYBEAN RUST NEWSETTER
distributed to soybean growers weekly

KEY TAKEAWAYS

- No ASR was detected in South Carolina during the 2025 growing season
- Weather conditions were not conducive to disease development or spread
- Weekly reporting allowed growers to confidently avoid fungicide applications
- Monitoring systems reduce both risk and unnecessary input costs

MORE DETAILS: ASIAN SOYBEAN RUST: STAYING AHEAD OF A POTENTIAL THREAT

Project: Asian Soybean Rust Monitoring System | Lead: Jonathan Croft

Asian soybean rust remains a high-consequence disease despite inconsistent annual occurrence in South Carolina. Because infection can spread rapidly under favorable conditions, early detection is critical to protecting yield.

This project provides a statewide early warning system designed to detect ASR presence and inform timely, data-driven management decisions.

Monitoring began with early-season sampling of kudzu in April, which serves as a potential overwintering host and early indicator of ASR presence. Soybean field sampling began the week of July 7 and continued through early October, with additional late-season sampling extending into late October for confirmation.

A total of 15–20 fields were monitored weekly across southwestern South Carolina and the Pee Dee region. At each site, agents collected and evaluated approximately 75 leaves per visit. Sampling intensity and geographic distribution were designed to maximize early detection probability.

EXAMPLE EMAIL

Soybean Rust News Note 2025 #1

We are again sampling fields of soybeans across the lower coastal plain of SC to monitor for any development of Asian Soybean Rust (ASR). In 2025 we are also including weekly samples from counties in the Pee Dee region.

During the last two weeks, July 7th – 18th, samples were examined from soybeans in Allendale, Bamberg, Barnwell, Colleton, Darlington, Dorchester, Hampton, Marlboro and Orangeburg Counties and kudzu (alternate host for soybean rust) in Bamberg County. **NO** soybean rust was found during this sampling.

If you think you have rust or other foliar diseases in a field collect 25 to 50 of the leaves you are "suspicious" of. Place them in a "ziplock" type bag. Keep bag out of direct sunlight and in a cool place if possible. Do not allow it to freeze or get close to freezing. Contact your local county agronomic agent for evaluation.

Asian soybean rust in a field (Credit: NC State Extension)

All suspected detections were to be confirmed through consultation with Extension specialists. Weekly results were compiled and distributed via the Soybean Rust News Note, which included scouting updates, risk assessments, and management recommendations.

RESULTS

No ASR was detected in South Carolina during the 2025 growing season in either kudzu or soybean fields. Environmental conditions were not conducive to disease development, with below-average rainfall and no tropical storm systems to transport spores from southern overwintering regions.

Regional observations supported these findings, as ASR was also not detected in neighboring states such as Georgia. This suggests that inoculum movement into the region was minimal during the 2025 season.

The weekly Soybean Rust News Note played a critical role in communicating these findings to stakeholders. With approximately 450 recipients, the updates allowed growers to make informed decisions and avoid unnecessary fungicide applications. This represents both a direct cost savings and a reduction in unnecessary input use.

Future efforts will focus on maintaining and expanding the monitoring network while increasing grower engagement with weekly updates.

HERBICIDE RESISTANCE: CONFIRMING AND MANAGING A GROWING THREAT

Project: Target-Site Confirmation of ALS-Inhibitor Resistance in *Amaranthus palmeri* Populations Affecting South Carolina Soybean Production

Lead: Fernando Oreja

WHY IT MATTERS

Herbicide-resistant Palmer amaranth continues to threaten soybean production across South Carolina. Understanding herbicide resistance is critical to maintaining effective weed control and preserving available herbicide technologies. This project monitored herbicide resistance across South Carolina and shared findings with growers throughout the growing season.

In this study, researchers tested Palmer amaranth populations in a greenhouse environment and conducted experiments to evaluate resistance to ALS-inhibiting herbicides

KEY TAKEAWAYS

- Resistance to ALS herbicides is widespread in SC populations
- Resistance levels vary among populations, with some showing survival at very high herbicide rates
- Cross-resistance within ALS herbicides is present
- Single-mode-of-action ALS-inhibiting herbicide programs are no longer effective in many fields

MORE DETAILS: HERBICIDE RESISTANCE: CONFIRMING AND MANAGING A GROWING THREAT

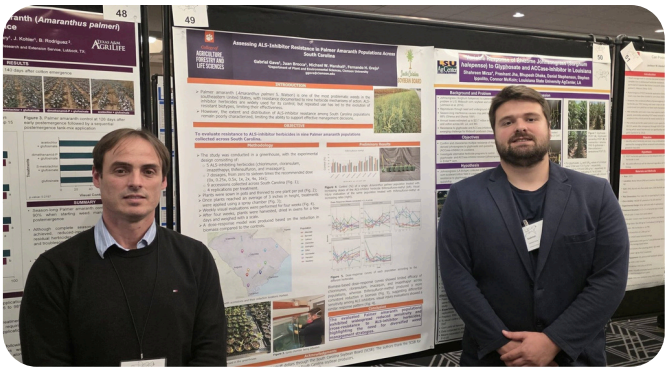
Project: Target-Site Confirmation of ALS-Inhibitor Resistance in Amaranthus palmeri Populations Affecting South Carolina Soybean Production | Lead: Fernando Oreja

Palmer amaranth is the most economically damaging weed species in soybean systems across South Carolina. Glyphosate resistance is already widespread, and recent field failures of ALS-inhibiting herbicides strongly suggest that multiple resistance is now present in SC populations.

The first phase of this project, funded by the South Carolina Soybean Board in 2025, confirmed that several Palmer amaranth populations survive extremely high ALS herbicide rates under greenhouse conditions. While this confirms resistance at the phenotypic level, the causes of resistance remain to be determined.

Understanding whether resistance is caused by target-site mutations or gene amplification is essential for making accurate herbicide recommendations, selecting effective modes of action, and slowing the spread of resistant biotypes. Without this information, growers risk repeating ineffective herbicide programs, accelerating seedbank replenishment, and increasing long-term management costs.

This project directly provided data on the presence and extent of ALS-inhibitor resistance, delivering scientifically sound and management-relevant information to South Carolina soybean growers.



Fernando Oreja and master's student, Gabriel Gava, presenting at the Southern Weed Science Society (SWSS) conference in Nashville, TN

Palmer amaranth sample populations treated with herbicide at increasing doses (increasing from left to right; yellow marker denotes untreated control)

RESULTS

In 2025, this project:

- Helped improve understanding of herbicide resistance in Palmer amaranth
- Trained a graduate student in how to screen for resistance
- Summarized early results to help guide future research and Extension efforts

Future research will focus on identifying the genetic mechanisms underlying resistance to further refine management recommendations. Information will be shared with farmers through a factsheet, meetings, and a scientific publication, while continued student training helps build local expertise.

Preliminary results confirmed that resistance to ALS inhibitors is widespread across sampled populations.

These findings demonstrate that many fields can no longer rely on single-mode-of-action herbicide programs and require diversified approaches to maintain effective control.

TURNING KNOWLEDGE INTO ACTION: NEMATODE MANAGEMENT THAT DELIVERS

Projects: Diagnosing and Surveying for Nematode Problems in Soybean-Based Row Crop Farms
Lead: John D. Mueller

WHY IT MATTERS

Nematodes remain a hidden but costly threat to South Carolina soybean production. This project focused on equipping growers and advisors with the knowledge and diagnostic testing needed to identify, manage, and reduce yield losses.

RESULTS

This project led to educational programming & materials and free nematode sampling across the state.

600+
SOIL & ROOT SAMPLES
collected and processed free of charge for growers

$12,000+
IN SAVINGS FOR SC FARMERS
to analyze root samples in a lab at no cost

KEY TAKEAWAYS

- South Carolina-specific education significantly improves diagnostic accuracy and management decisions
- Practical, scenario-based resources were highly effective for grower adoption
- Extension agents are now better equipped to support on-farm decision-making

MORE DETAILS: TURNING KNOWLEDGE INTO ACTION: NEMATODE MANAGEMENT THAT DELIVERS

Projects: Diagnosing and Surveying for Nematode Problems in Soybean-Based Row Crop Farms
Lead: John D. Mueller

Plant-parasitic nematodes continue to be one of the most significant constraints in South Carolina soybean production. Recent survey data indicate that approximately 33% of corn, cotton, and soybean fields experience yield losses of 10% or greater due to nematode pressure, representing a substantial but frequently hidden economic loss.

Unlike many above-ground pests, nematode damage is difficult to diagnose without proper sampling and laboratory analysis. Symptoms are often subtle or mistaken for nutrient deficiencies, drought stress, or other agronomic issues. As a result, many growers are managing fields without a clear understanding of nematode populations, species composition, or risk level.

This project integrates statewide sampling and diagnostics with hands-on education and training for growers, consultants, and Extension agents.

As a result of this project, Clemson extension delivered:

- Free soil and root sampling using automated field samplers, allowing agents to efficiently collect samples from 30–40 fields per day
- Laboratory analysis through the Edisto Research and Education Center (EREC) Nematode Lab
- Identification of nematodes to the species level with a rapid turnaround time (typically ≤10 days)
- Field-specific management recommendations based on results

The lab is one of the few in the U.S. capable of performing both soil and root analyses with species identification, and notably provides these services at no cost to growers.

In addition, researchers hosted in-depth workshops and developed comprehensive Extension bulletins, covering nematode biology, identification, sampling methods, and crop-specific management (corn, soybean, cotton, peanut, and sorghum).

Nematode sampling in soybean and corn fields

With 526 soil samples and 69 root samples, the project has significantly expanded both the scale of nematode diagnostics and the capacity for on-the-ground management.

From an economic standpoint, the program provides substantial savings:

- At least $20 per sample saved in lab processing costs
- Elimination of typical $10+ per field sampling fees through agent-assisted sampling

Future efforts will focus on scaling both sampling coverage and long-term management adoption. Ultimately, the goal is to shift nematode management from a reactive approach to a proactive, data-driven component of soybean production systems.

The important takeaway for growers is that effective nematode management starts with accurate sampling and species identification. With accessible diagnostics and locally developed recommendations, most nematode-related yield losses can be identified early and significantly reduced.

WHAT'S THE SECRET TO HIGH-YIELDING SOYBEANS IN SOUTH CAROLINA?

Project: Defining Management Practices that Produce High Yielding Soybean in South Carolina and Other Emerging Issues | *Lead: Michael Plumblee*

WHY IT MATTERS

Soybean yields in South Carolina have steadily improved, but reaching consistently high yields—approaching 100 bushels per acre—requires a precise combination of genetics, management, and timing. Small decisions related to planting date, variety selection, and input levels can significantly influence yield potential and profitability.

Researchers established multi-factor field trials evaluating planting date, maturity group, seeding rate, and potassium fertility in a full-season irrigated system.

KEY TAKEAWAYS

- Planting date is one of the most critical drivers of soybean yield in South Carolina
- Maturity group and variety selection strongly influence yield outcomes
- Increasing inputs (seeding rate, potassium) did not always translate to higher yields
- High-yield soybean systems require precision, not just higher input levels

MORE DETAILS: WHAT'S THE SECRET TO HIGH-YIELDING SOYBEANS IN SOUTH CAROLINA?

Project: Defining Management Practices that Produce High Yielding Soybean in South Carolina and Other Emerging Issues | *Lead: Michael Plumblee*

Recent advancements in genetics, irrigation, and precision management have made it possible to push soybean yields beyond traditional expectations. In 2023, for example, a new world record soybean yield was set in Georgia at 206 bu/ac. However, achieving these yields consistently requires an understanding of the most influential agronomic factors.

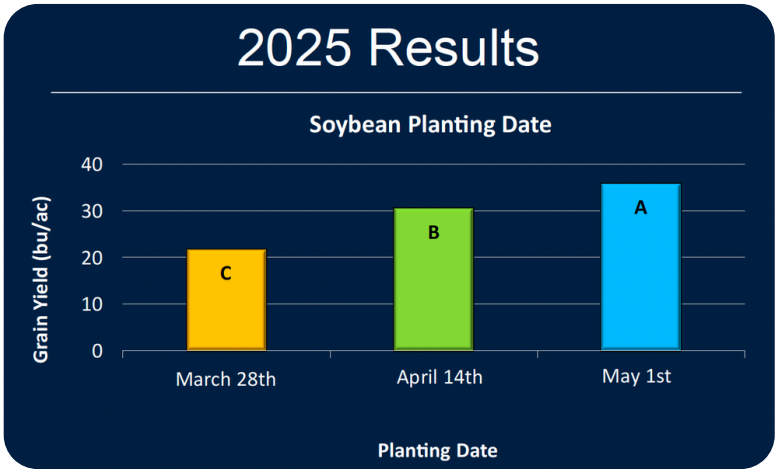
This project integrates multi-year field research with real-world production scenarios to define the management practices required to produce high-yield soybean (>100 bu/ac) while also evaluating the economic feasibility of these systems.

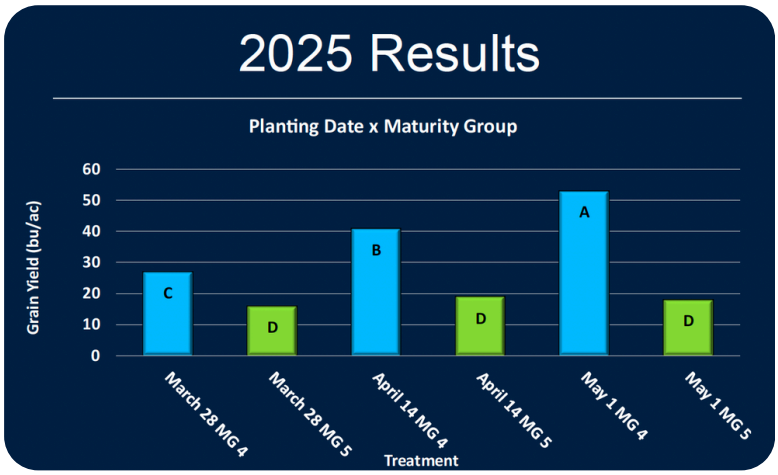
Research trials were conducted at the Edisto Research and Education Center in Blackville, South Carolina, using a full-season, strip-till production system. All plots were inoculated and irrigated using a -30 kPa threshold to minimize drought stress and allow for evaluation of yield potential under optimized moisture conditions.

The study evaluated planting date (late March, mid-April, and early May), maturity group (MG 4 and MG 5), variety selection within maturity group, seeding rate (60,000 to 150,000 seeds per acre), and potassium fertility rates. These factors were selected based on current Extension recommendations and regional production practices, with the goal of identifying which combinations most strongly influence yield.

The 2025 growing season presented significant environmental challenges, including an extended period of no rainfall from early August through harvest during critical reproductive growth stages. Although irrigation was applied multiple times to supplement moisture, yield potential was still impacted by aborted blooms and poor pod fill.

Despite these challenges, clear trends emerged from the data which supported the findings of 2024 as well. **Planting date was one of the most significant factors affecting yield,** with early May plantings consistently producing the highest yields compared to mid-April and late March timings. We have seen this same result in several planting date trials, where it appears we can plant too early in South Carolina.





Waiting for late-April to early-May is best for maximizing yield.

Maturity group and variety selection also played a significant role in yield outcomes, particularly in interaction with planting date. In 2025, the selected MG 5 variety produced excessive vegetative growth, nodes, and pods, but failed to effectively fill pods under stress conditions, resulting in lower yields. This emphasizes the importance of matching variety selection to planting window and environmental conditions.

In contrast, seeding rate and potassium fertility did not significantly impact yield in 2025, consistent with results observed in previous years. This suggests that simply increasing input levels is unlikely to improve yield without optimizing other key management factors. Future work is going to screen more germplasm planted around the early-May planting window and focus on post-bloom input opportunities.

SOYBEANS AND "HIDDEN HUNGER": ASSESSING POTASSIUM (K) DEFICIENCY AND MANAGEMENT

Project: Validating In-Season Potassium Management Opportunities in United States Soybean
Lead: Michael Plumblee

WHY IT MATTERS

Potassium (K) plays a critical role in soybean growth, influencing water use efficiency, disease tolerance, and pod fill. However, rising fertilizer costs and variable yield responses have made it increasingly important for growers to understand when and where potassium applications actually pay off.

CURRENT PROGRESS

FIELD TRIALS WERE ESTABLISHED
to evaluate multiple potassium rates and application timings

EVALUATED POTASSIUM RESPONSE
under both irrigated and non-irrigated conditions across the US

SHARED PRELIMINARY FINDINGS
through Extension meetings and grower presentations

WHAT'S AHEAD

- Continue multi-year evaluation to capture environmental variability
- Expand trials to include more on-farm locations
- Refine potassium recommendations for high-yield soybean systems
- Evaluate economic return across different K management strategies

MORE DETAILS: SOYBEANS AND "HIDDEN HUNGER": ASSESSING POTASSIUM (K) DEFICIENCY & MANAGEMENT

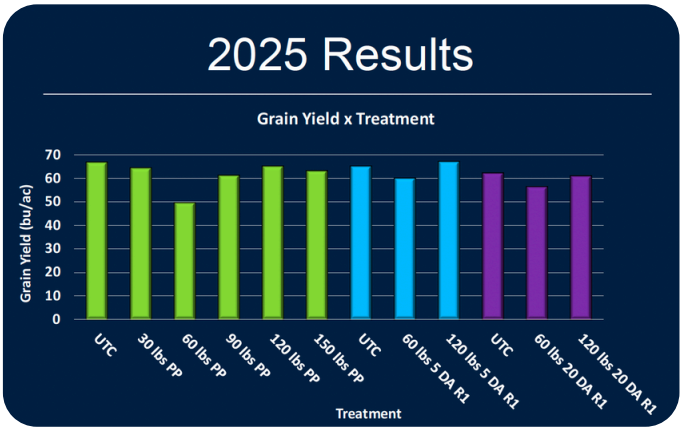
Project: Validating In-Season Potassium Management Opportunities in United States Soybean

Lead: Michael Plumblee

Potassium (K) management remains a key component of soybean fertility programs. As much as 41% yield loss has been reported from a K deficiency in soybeans. Researchers sometimes refer to this issue as "hidden hunger," because it can be yield-limiting even without any visual symptoms, making it difficult to diagnose.

Despite its importance, potassium management in South Carolina soybean systems is not always straightforward. Yield response to potassium applications can vary widely depending on soil type, existing fertility levels, and environmental conditions. In many cases, growers may apply potassium as a preventative measure without clear evidence of economic return.

This project was designed to evaluate potassium rate and timing strategies under South Carolina conditions, with a focus on identifying when potassium applications contribute to yield increases and when they do not.



Grain yield by treatment combination showed no significant differences.

Field trials were conducted at the Edisto Research and Education Center using standard soybean production practices, including strip-till and under irrigated conditions. Treatments included multiple potassium rates applied preplant, as well as in-season applications at key growth stages.

Plots were established across varying baseline soil test potassium levels to evaluate how existing fertility influences crop response.

Asgrow 69XF0 was planted on May 20th at 130,000 seeds per acre on 30-inch rows at the Edisto REC in 2025. Potassium in the form of Muriate of Potash (MOP) was applied to each plot according to the treatment combination, resulting in various rates and timings. Treatments included an untreated check, 30, 60, 90, and 120 lbs of potassium pre-plant, as well as 60 lbs five days after R1, 120 lbs five days after R1, 60 lbs 20 days after R1 and 120 lbs after R1.

Researchers collected yield measurements and tissue samples at several growth stages to assess potassium uptake and identify any deficiencies during the growing season. Environmental conditions during the 2025 growing season played a significant role in trial outcomes. Periods of limited rainfall and stress during reproductive stages influenced nutrient uptake and overall plant performance.

Based on the results from 2025, **we did not observe any significant differences among treatments for grain yield, grain protein, grain oil, or grain potassium content within the seed.** While tissue analysis often showed higher potassium concentrations in treated plots, these differences did not consistently translate into improved yield. Most of our treatment combinations, including untreated plots, maintained decent K Concentration levels throughout sampling times and reproductive growth.

As a result of this project, researchers demonstrated that potassium applications should be guided by soil test recommendations rather than by routine or automatic applications. Increasing potassium rates beyond recommended levels does not guarantee higher yields and may reduce profitability under many conditions.

In 2026, this research will continue alongside nationwide trials to determine the concentrations at which K is yield-limiting, and whether "hidden hunger" is common in South Carolina.