South Carolina
CORN BOARD

RESEARCH REPORT

2025

LETTER FROM THE CHAIRMAN

In its first year, the South Carolina Corn Board has focused on using your checkoff investment to **fund impactful research, improve farm safety, and support practical tools** that enhance corn production across the state.

Dear Corn Producer,

Thank you for your support of the South Carolina Corn Checkoff, which began with your assessments in July 2024. Your seven-member Board is committed to managing these funds responsibly and delivering meaningful benefits to corn producers across the state.

Through strong partnerships with Clemson University researchers and Extension specialists, the Corn Board supports projects that deliver real-world value at the farm level. Each research initiative is selected with a clear purpose: to generate actionable results that help growers reduce risk, optimize inputs, and improve yields. Research findings are translated into practical recommendations through field days, workshops, publications, and one-on-one engagement with growers and advisors. This ensures that the knowledge gained through checkoff investments is not confined to research plots, but actively applied in fields across the state.

This report highlights our work to date. In our first year, we focused on production research to provide direct, on-farm value. From improving emergency response through grain entrapment training, to advancing nematode management, to evaluating the performance of modern corn hybrids, each project contributes to a larger goal: helping South Carolina corn producers remain profitable, competitive, and sustainable.

We are fortunate to have strong leadership in Dr. Bennett Harrelson, our Executive Director, who is available to assist with any questions or concerns. We welcome your feedback and encourage you to reach out to me or any Board member with suggestions as we work to maximize the value of your checkoff investment.

By supporting research, education, and promotion, we are working to ensure that South Carolina corn producers are well-positioned not just for the next season, but for generations to come.

John Long
Chairman, South Carolina Corn Board

South Carolina CORN BOARD

FINAL REPORTS

SAVING LIVES ON THE FARM: EXPANDING GRAIN ENTRAPMENT TRAINING & RESPONSE

Project: The Impact of Grain Entrapment Trainings on South Carolina Fire and Rescue Teams and Grain Farmers | *Lead: Maryann Lovern*

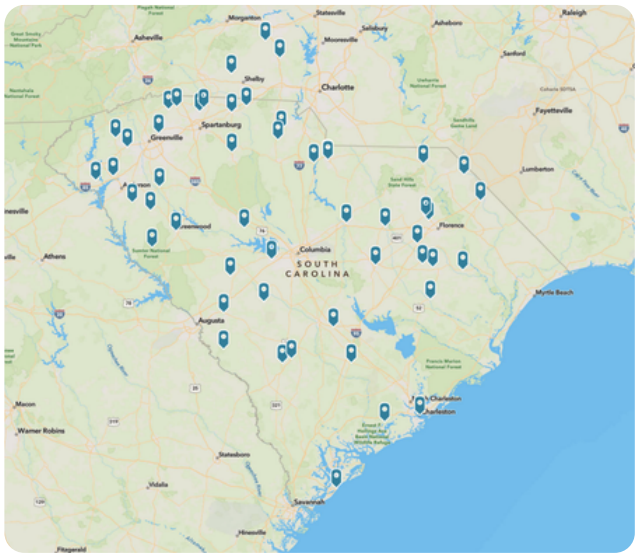
WHY IT MATTERS

Grain entrapment incidents are rare but often fatal. Rapid response and proper training are critical to saving lives.

DEVELOPED STATEWIDE MAPPING TOOLS
for grain rescue device locations

TRAINED 50+ FIRE AND RESCUE DEPARTMENTS
using a hands-on grain entrapment simulator

EXPANDED AWARENESS AND PREPAREDNESS
through statewide outreach



Map of trained departments in South Carolina

MORE DETAILS: SAVING LIVES ON THE FARM: EXPANDING GRAIN ENTRAPMENT TRAINING & RESPONSE

Project: The Impact of Grain Entrapment Trainings on South Carolina Fire and Rescue Teams and Grain Farmers | Lead: Maryann Lovern

Grain bin entrapment remains one of the most dangerous and time-sensitive emergencies in agriculture. Once a victim is engulfed, survival depends heavily on how quickly trained responders with proper equipment can arrive on-site. Research shows that extracting a victim without removing surrounding grain can require forces exceeding 400–900 pounds, creating a high risk of injury or fatality.

In South Carolina, access to grain rescue equipment and trained personnel is uneven, particularly outside major corridors like I-95. This creates gaps in response time that can directly impact survival outcomes. For farmers, this project addresses a critical but often overlooked risk by improving emergency preparedness at the local level.

This project focused on both mapping infrastructure and expanding training capacity across the state. All fire departments in South Carolina were contacted through a coordinated outreach effort, including a "phone-athon" conducted by agricultural safety interns. This effort achieved a 100% response rate, allowing for complete statewide data collection.

Data collected included:

- Location of grain rescue devices
- Type of equipment (e.g., GSI Res-Q Tube, Great Wall of Rescue, Turtle Tube)
- Primary and secondary contact personnel
- Departments trained in grain entrapment rescue

Two interactive, web-based maps were developed: a statewide map of rescue equipment locations and a map of trained fire and rescue departments in SC and neighboring states.

Hands-on training was conducted using a Grain Bin Entrapment Simulator, allowing first responders to practice rescue procedures under realistic conditions. Trainings emphasized proper use of rescue tubes, grain removal techniques, and coordination with farm operators.

Training first responders using a Grain Bin Entrapment Simulator

Future work will focus on expanding training into underserved regions (Lowcountry and Union County areas), increasing equipment access in identified gaps, expanding the program into neighboring states, and continuing simulator-based trainings to maintain readiness.

For farmers, the practical takeaway is clear: know your nearest trained department and available rescue equipment *before* an emergency occurs.

PROTECTING YIELD POTENTIAL: HOW BT HYBRIDS ARE PERFORMING IN SOUTH CAROLINA

Project: Evaluation of Bt Corn Hybrids in South Carolina
Leads: Francis Reay-Jones & Michael Plumblee

WHY IT MATTERS

Bt corn remains one of the most effective tools for managing key insect pests like corn earworm and fall armyworm. However, shifting pest pressure and resistance to some Bt toxins make it critical to continuously validate performance under South Carolina conditions.

CORN EARWORM

FALL ARMYWORM

- Conducted replicated field trials across multiple South Carolina research locations
- Evaluated paired hybrid families (Bt vs. non-Bt versions with similar genetics) to isolate trait performance. Assessed:
  - Ear and plant injury levels
  - Larval survival within ears
  - Final grain yield under natural pest pressure

KEY TAKEAWAYS

- Bt still works, but it's no longer "set it and forget it."
- Hybrid selection matters more than ever: not all Bt packages deliver the same level of protection
- Scout fields even when planting Bt hybrids to detect unexpected damage early
- Match trait selection to your risk level (planting date, historical pressure, region)
- Protect the technology by planting non-Bt corn as a refuge

MORE DETAILS: PROTECTING YIELD POTENTIAL: HOW BT HYBRIDS ARE PERFORMING IN SOUTH CAROLINA

Project: Evaluation of Bt Corn Hybrids in South Carolina | Leads: Francis Reay-Jones & Michael Plumblee

Insect pressure—particularly from corn earworm and fall armyworm—continues to evolve, with increasing evidence of reduced susceptibility to Bt traits. As resistance develops, hybrid performance becomes more variable, making local data essential for hybrid selection and insect management strategies. This project provides growers with region-specific performance data to guide seed decisions and protect yield potential.

Field trials were conducted at Pee Dee REC (Florence) and Edisto REC (Blackville) using replicated plots of Bt and non-Bt hybrids. Hybrids evaluated included:

- Dekalb: non-Bt, VT2P *(Cry1A.105 + Cry2Ab2)*, and and Trecepta (*Cry1A.105 + Cry2Ab2 + Vip3A*)
- Pioneer: non-Bt, Optimum Intrasect (*Cry1Ab + Cry1F*), and Optimum Leptra (*Cry1Ab +*
- *Cry1F + Vip3A*)

Trials were planted at an early planting window (April) and a kate planting window (June).

Unique to this study was the measurement of corn earworm pupal weight, providing insight into sub-lethal effects of Bt toxins and potential resistance development.

RESULTS

While final results are still being compiled, the study is designed to:

- Quantify differences in insect injury across trait packages
- Evaluate whether Bt hybrids still suppress larval survival
- Determine yield advantages under different planting dates and pest pressures

Preliminary observations suggest that sub-lethal effects (e.g., reduced pupal weight) may be diminishing, indicating possible resistance trends—an important signal for long-term trait durability.

Data collection included:

- Stand counts (V4)
- Fall armyworm injury ratings (V8)
- Corn earworm injury (kernel area damaged)
- Corn earworm pupae collection and weight (to assess survival and sub-lethal effects)
- Final grain yield

The next steps for this trial will be to finalize yield and injury data across all locations, deliver hybrid-specific recommendations prior to 2027 seed purchasing decisions, and integrate findings into broader insect management strategies, including UAV-based spraying for stink bugs.

For growers, this work reinforces that trait selection alone is no longer sufficient—hybrid choice must be paired with active pest management.

Fall armyworm larvae and injury on corn planted at Edisto REC in Blackville, SC. Photo credit: Francis Reay-Jones

TURNING KNOWLEDGE INTO ACTION: NEMATODE MANAGEMENT THAT DELIVERS

Projects: Corn Nematode Management Workshop for Growers, County Agents, and Consultants; Diagnosing and Surveying for Nematodes in South Carolina Corn-Based Farms

Lead: John D. Mueller

WHY IT MATTERS

Nematodes remain a hidden but costly threat to South Carolina corn 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.

526 **SOIL SAMPLES** analyzed in the last year

69 **ROOT SAMPLES** evaluated for in-season diagnosis

2 **HANDS-ON WORKSHOPS** for agents, growers, and consultants

7 **REGION-SPECIFIC BULLETINS** tailored to South Carolina conditions

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: Corn Nematode Management Workshop for Growers, County Agents, and Consultants; Diagnosing and Surveying for Nematodes in South Carolina Corn-Based Farms

Lead: John D. Mueller

Plant-parasitic nematodes continue to be one of the most significant constraints in South Carolina corn 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 two in-depth workshops and developed seven 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 corn 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.

CONTINUING PROJECTS

BUILDING BETTER SOILS: COVER CROPS FOR RESILIENT CORN SYSTEMS

Project: Optimizing Cover Crop Biomass to Enhance Soil Health and Corn Yield
Lead: Rongzhong Ye

WHY IT MATTERS

South Carolina's sandy soils face low nutrient retention and poor water-holding capacity. Cover crops offer a pathway to increase organic matter, reduce nutrient loss, and improve long-term productivity.

CURRENT PROGRESS

FIELD TRIALS ESTABLISHED
with multiple cover crop seeding rates

BASELINE SOIL DATA
collected at multiple sites

COVER CROPS
successfully planted & monitored

WHAT'S AHEAD

- Measure impacts on:
  - Soil health (biological, chemical, physical)
  - Nitrogen use efficiency
  - Corn yield
- Host field days and grower demonstrations
- Publish findings for broader regional adoption

MORE DETAILS: BUILDING BETTER SOILS: COVER CROPS FOR RESILIENT CORN SYSTEMS

Project: Optimizing Cover Crop Biomass to Enhance Soil Health and Corn Yield | Lead: Rongzhong Ye

South Carolina's sandy soils limit water retention, nutrient availability, and overall soil productivity. Cover crops offer a pathway to improve soil organic matter and nutrient cycling, but benefits are highly dependent on biomass production and management. This project aims to quantify how cover crop biomass translates into measurable gains in soil health and corn yield.

The study integrates field trials and laboratory analyses:

- Cover crops established in fall 2025
- Multiple sampling events (three major sampling periods)
- Measurements include:
  - Soil physical properties (bulk density)
  - Chemical properties (pH, nutrients, C and N levels)
  - Biological activity (microbial processes)
  - Nutrient cycling and leaching
  - Cover crop biomass and nutrient contribution

Corn will be planted following cover crop termination, with ongoing monitoring of:

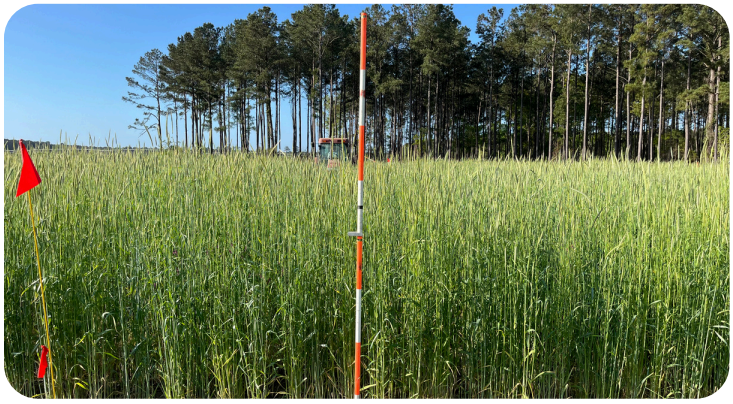
- Growth and development
- Nitrogen use efficiency
- Final yield

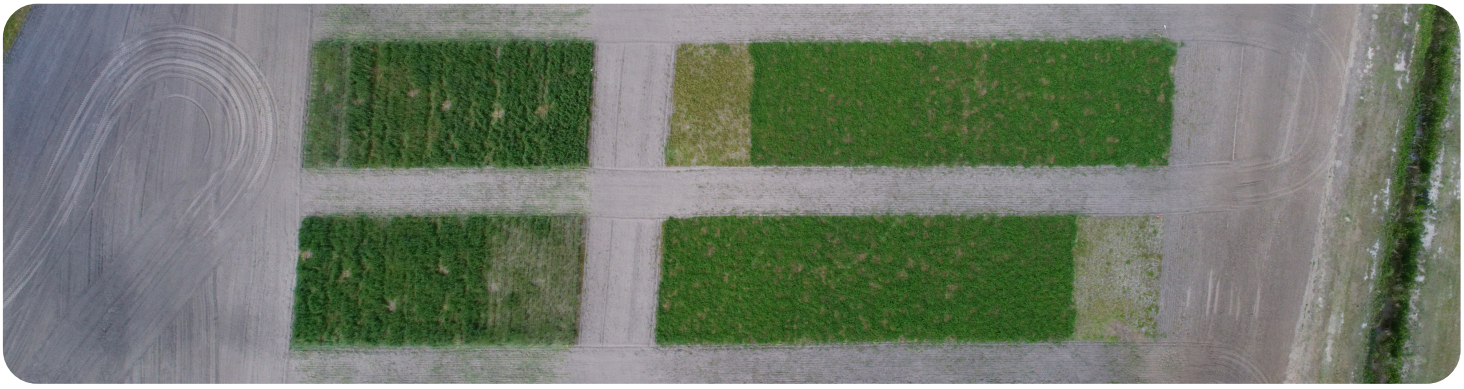
Below: *Drone shot of cover crop plots*
Right*: Monitoring cover crop growth and development in field surveys*

Field plots have been successfully established, and baseline soil data has been collected to support future comparisons. Cover crops have been planted and are developing as expected, contributing to early-stage observations. To better align with biological growing cycles and ensure meaningful results, the project timeline has been extended.

Next steps will focus on quantifying biomass production and nitrogen contribution from winter through spring 2026. Corn will then be planted and monitored throughout the spring and summer growing season. The project will conclude with an evaluation of yield outcomes and soil health improvements in fall 2026.

This project will ultimately provide guidance on how much biomass is needed to justify cover crop investment, a key economic question for growers.





DO STARTER FERTILIZERS PAY OFF? NEW INSIGHTS FOR SMARTER NUTRIENT DECISIONS

Project: The Evaluation of Starter/Pop-up Fertilizer on Corn Grown in South Carolina
L*ead: Michael Plumblee*

WHY IT MATTERS

Fertilizer decisions directly impact profitability. This research evaluated starter sources as well as whether using a starter fertilizer at planting improves yield—and more importantly—returns.

10-34-0

25S UAN

0-46-0

DRYLAND APRIL 28

17-17-0 (50/50)

Untreated Check

INITIAL RESULTS

Based on the 2025 results, if planting non-irrigated corn “early,” there may be a benefit to utilizing a starter fertilizer source containing phosphorus, especially when soil test P levels are low.

When factoring in the yield difference, **the treatment that maximized economic return was the 17-17-0 (50/50 blend) at 30 gal/acre.** Any yield increase observed with other treatments did not offset the added expense of the product in this scenario.

MORE DETAILS: DO STARTER FERTILIZERS PAY OFF? NEW INSIGHTS FOR SMARTER NUTRIENT DECISIONS

Project: The Evaluation of Starter/Pop-up Fertilizer on Corn Grown in SC | Lead: Michael Plumblee

Starter or “pop-up” fertilizers are commonly used in corn production to promote early-season growth, particularly under cool soil conditions that can limit nutrient availability. Nitrogen is often the primary driver behind these applications; however, whether or not to include Phosphorus (P) in the starter is questioned as it plays a key role in early root development and vigor, but previous research has not always shown a yield response. In South Carolina production systems—where soil types, planting windows, and irrigation practices vary widely—the return on investment from starter fertilizers has been inconsistent.

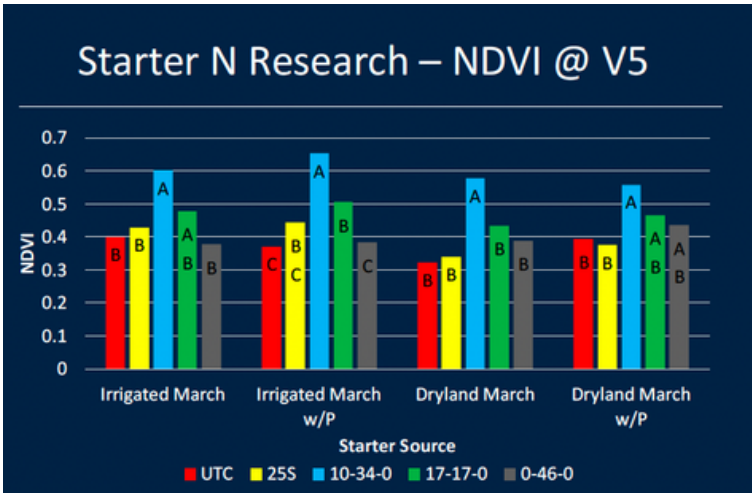
Many growers apply starter fertilizers as standard practice, regardless of soil test levels or planting conditions. This project was designed to determine when starter fertilizers actually provide a yield and economic benefit, and when they represent an unnecessary input cost. Understanding these conditions is critical for improving input efficiency and maximizing profitability.

Field trials were conducted across multiple locations in South Carolina to evaluate a range of starter fertilizer programs under realistic production conditions. Treatments included:

- 25S UAN
- 10-34-0
- 25S UAN + 10-34-0 (50/50 Blend)(17-17-0)
- 0-46-0 TSP Granular (equal to P rate from treatment 2)
- Untreated Check (100% of N applied at V5-V6)

Results from the 2025 growing season showed that starter fertilizer response was highly dependent on environmental conditions and management factors, rather than being universally beneficial.

The most consistent yield response to phosphorus occurred under early-planted, non-irrigated conditions, particularly in fields with lower soil test P levels. In these scenarios, phosphorus-containing starter fertilizers improved early growth and translated into measurable yield gains.



At the V5/V6 growth stage in March planted non-irrigated corn, plots that received 100% 10-34-0 were bigger and greener than the untreated and 0-46-0 only plots. The 17-17-0 and 25S UAN plots were similar to the 10-34-0 plots, and both performed better than the 0-46-0 plots.

However, outside of these conditions, the benefits were limited:

- In irrigated systems, starter fertilizers provided little to no yield advantage
- In normal or later planting windows, early-season growth improvements did not consistently translate into higher yields
- Many treatments increased early vigor but failed to produce an economic return

From an economic standpoint, the treatment that maximized return was: 17-17-0 (50/50 N + P blend) applied at 30 gallons per acre. While some higher-cost or specialty products showed minor yield increases, those gains were not sufficient to offset the added input cost, making them less favorable from a profitability perspective.

This work is being continued in 2026 to confirm or deny results observed in 2025. In addition to this work, five different rates of 17-17-0 across three planting dates are being evaluated in 2026.